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# Inflation Targeting and Unemployment in the South African Retail Sector

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# Inflation Targeting and Unemployment in the South African Retail Sector

Research submitted in partial fulfilment of the requirements for the Master of Business Administration (MBA) degree at Wits Business School, University of the Witwatersrand.

Submitted by: Pfarelo Mutwanamba

Supervisor(s): Dr. Jane Mwebi

2024

## DECLARATION

I, Pfarelo Mutwanamba, hereby confirm that I am the sole author of the research study titled "Inflation Targeting and Unemployment in the South African Retail Sector". This research has been conducted independently, without any external assistance.

I affirm that all aspects of this study, including the conception, design, data collection, analysis, and interpretation of results, have been carried out solely by me. Further, I declare that I have appropriately acknowledged, attributed, and referenced all external sources, data, and ideas utilised in this research. Any contributions from other researchers or sources have been duly credited in the bibliography and citations.

I confirm that this research study has not been previously submitted for any other degree or examination at any institution.



Pfarelo Mutwanamba Johannesburg, South Africa

## ACKNOWLEDGEMENTS

As I stand at the culmination of this academic odyssey, there are not enough words to express my gratitude to those who have been my pillars of strength and support. First and foremost, I bow my head in profound gratitude to the Almighty God, whose wisdom and guidance have illuminated my path throughout this journey.

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## ABSTRACT

This study investigates the impact of inflation targeting on employment in the South African retail sector, addressing concerns from trade unions and stakeholders regarding the nation's monetary policy framework. Spanning from 2000 to 2022, coinciding with the adoption of inflation targeting by the South African Reserve Bank (SARB) in year 2000, the research utilises econometric methods and secondary data to fill gaps in the literature, notably the lack of dedicated research on the retail sector and the mechanisms through which inflation targeting influences retail sector employment. Amidst persistent developmental challenges, including a 32.7% unemployment rate in Q4 2022, heightened poverty and inequality (i.e., South Africa has the highest Gini Coeffient[1] in the world), and sluggish economic growth, the study uncovers nuanced insights. While inflation targeting measures contribute to price stability, they do not directly address the underlying structural issues contributing to elevated unemployment rates. This aligns with the formulated hypotheses that ($H_1$) the implementation of SARB's inflation targeting framework has a significant impact on employment in South Africa's retail industry, and ($H_2$) the approach adopted by the SARB in implementing its inflation targeting policy influences the extent of its impact on employment in South Africa's retail industry – implying that the null hypothesis ($H_0$) is rejected in favour of alternative hypotheses. The study's conclusion, substantiated by Johansen Cointegration, Granger Causality, and Impulse Functions analyses, affirms the substantial impact of SARB's inflation targeting framework on retail sector employment. The Johansen Cointegration analysis establishes a stable, statistically significant long-term relationship between interest rates and retail employment, corroborating the hypotheses. Furthermore, the study highlights the necessity for targeted policy interventions, such as enhanced skills training programs and support for small and medium-sized enterprises (SMEs). Additionally, it emphasises the importance of tailored responses to effectively address unemployment and promote sustainable economic development in South Africa. Notably, the study suggests an expanded role for SARB beyond its mandate of price stability, endorsing proactive measures to tackle the structural issues contributing to unemployment in the retail sector.



**Keywords**: Inflation Targeting Framework, Monetary Policy, Repo Rate, Lending Rate, Unemployment, Statistics South Africa (Stats SA), Retail Sector, SARB.


[1] Gini Coefficient: An effective instrument for evaluating the distribution of wealth or income within a nation.

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**List of Abbreviations and Acronyms**

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| | |
|---|---|
| ACF | Autocorrelation Function |
| ADF | Augmented Dickey-Fuller |
| AIC | Akaike Information Criterion |
| ARIMA | Autoregressive Integrated Moving Average |
| BG | Breusch-Godfrey |
| BIC | Bayesian Information Criterion |
| CPI | Consumer Price Index |
| CPIX | Consumer Price Index (excluding Mortgage Costs) |
| DW | Durbin-Watson |
| EG | Engle-Granger |
| EPWP | Extended Public Works Program |
| GDP | Gross Domestic Product |
| IMF | International Monetary Fund |
| KPSS | Kwiatkowski-Phillips-Schmidt-Shin |
| LM | Lagrange Multiplier |
| MPC | Monetary Policy Committee |
| NDP | National Development Plan |
| NKPC | New Keynesian Phillips Curve |
| OLS | Ordinary Least Squares |
| PO | Phillips-Ouliaris |
| PP | The Phillips-Perron |
| PSD | Power Spectral Density |
| QE | Quantitative easing |
| QLFS | Quarterly Labour Force Survey |
| SARB | South African Reserve Bank |
| SMEs | Small and Medium Sized Enterprises |
| Stats SA | Statistics South Africa |
| SVAR | Structural Vector Autoregression |
| VAR | Vector Autoregression |
| VEC | Vector Error Correction |
| VECM | Vector Error Correction Model |
| YES | Youth Employment Service |
| YoY | Year on Year |
| ZA | Zivot-Andrews |

# CHAPTER 1 – INTRODUCTION

## 1.1 Statement of Purpose

Throughout the world's economies, the inflation targeting framework has been utilised for more than three decades. Countries such as Canada, Australia, the United Kingdom, and several others have explicitly implemented this framework to attain price stability since its introduction in New Zealand in 1990 (Woodford & Walsh, 2005). South Africa was the first economy on the African continent to adopt inflation targeting as its monetary policy framework in 2000 (South African Reserve Bank, 2000). Recently, inflation targeting has become a contentious policy concept in South Africa. The mandate of the South African Reserve Bank (SARB) is to maintain inflation within the range of 3% to 6% through interest rate adjustments. While the SARB's Governor Lesetja Kganyago and the International Monetary Fund (IMF) recommend a change to a more restrictive inflation target to increase South Africa's competitiveness, some have argued for the abandonment of the inflation targeting regime, indicating that inflation targeting may not be the most appropriate framework for South Africa given the country's unique economic challenges, including its declining economic growth, and rising unemployment rate (Potgieter, 2010). Furthermore, inflation targeting by the SARB has a significant negative impact on household consumption, private and public institutions, and the general population of South Africa; thus, it is of uttermost importance to consider its effect on other economic fundamentals. This study seeks to provide evidence-based insights regarding the impact of the SARB's inflation targeting framework on South Africa's labour market in the retail sector. The findings of this study are beneficial to policymakers, economists, and other stakeholders (including the academics) in South Africa as well as other nations that have implemented comparable frameworks. In addition, this paper offers recommendations for enhancing the framework and addressing its limitations.

## 1.2 Background of the Study

The SARB's approach to monetary policy, which focuses on inflation targeting, has been scrutinised. The current state of the South African economy, which is characterised by poor performance, high unemployment rates, widespread poverty, and increasing global dissatisfaction with central bank actions and strategies, has led to growing scepticism about the SARB's limited involvement in the country's economic policy discussions. Inflation targeting has gained popularity among central banks worldwide, including the SARB, (Nene et al., 2022). The SARB adopted this framework in 2000 and set an inflation target range of 3% – 6% to maintain low and stable inflation rates and promote economic stability and growth (Central Bank of South Africa, 2021). However, the effectiveness of inflation targeting in achieving these goals and its potential impact on other macroeconomic variables such as employment has been the subject of much debate.

**Table 1** below outlines South Africa's monetary policy evolution from 1960 to date. Initially, liquidity ratios managed finances, transitioning in the 1980s to a system based on currency reserves with pre-announced money supply targets until 1998. The late 1990s introduced daily repo system auctions with ongoing use of M3 targets and informal inflation goals. Since 2000, the South African Reserve Bank has embraced an inflation targeting framework, emphasising explicit targets for a more transparent and modern policy approach (van Lill, 2017).

**Table 1: The Development of South Africa's Monetary Policy Framework**

| Period | Framework of Monetary Policy |
|---|---|
| 1960 — 1981 | System based on the liquidity asset ratio with quantitative constraints over interest rates and credit |
| 1981 — 1985 | Transitional period characterised by a mixed system. |
| 1985 — 1998 | A system based on currency reserves, which includes pre-announced guidelines for the expansion of money supply (M3). |
| 1998 — 2000 | Daily liquidity auctions via repurchase transactions (repo system), pre-announced M3 targets, and informal core inflation objectives. |
| 2000 — | The South African Reserve Bank's (SARB) inflation targeting framework |

**Source**: Reserve Bank of South Africa

Nevertheless, in South Africa, the implementation of inflation targeting by the SARB has been criticised for its potential adverse effects on employment (Vermeulen, 2015; 2020). While Maumela (2010) asserts that inflation targeting promotes stability in expectations and provides a favourable environment for investment and economic growth, Kruger (2016) and

Vermeulen (2015) argue that the approach limits the central bank's flexibility in responding to economic shocks and may result in high unemployment rates.

Some economists have also argued that inflation targeting may lead to a trade-off between inflation and employment, where low inflation may come at the cost of slower economic growth and higher unemployment (Cecchetti & Ehrmann, 2002; Vermeulen, 2015). On the other hand, proponents of inflation targeting argue that it contributes to economic stability, which in turn, supports economic growth objectives and employment (Bernanke & Gertler, 2001; Mokgola, 2015).

The retail sector in South Africa is the largest employer after the government, with more than 1.9 million people employed in the sector (Statistics South Africa, 2020). However, the retail sector has been hit hard by economic challenges such as inflation, high interest rates, and low economic growth, which have resulted in a decline in employment in the sector. This has led to concerns about the impact of inflation targeting on employment in the retail sector.

Consequently, the purpose of this research is to determine how inflation targeting framework implemented by the SARB has impacted the employment trend in the retail sector in South Africa by investigating the relationship between inflation targeting and employment indicators through a literature review and empirical data collection and analysis. The objective is to ascertain whether the SARB's monetary policy has any adverse effects on the job creation opportunities in the South African retail sector. Further, this study seeks to add to the existing corpus of literature on inflation targeting and its impact on the performance of the retail sector by providing a comprehensive analysis of the South African context.

## 1.3 Problem Statement

Coordination between monetary policy framework and other economic policies is crucial to achieve sustainable and balanced growth targets. Misalignment between monetary policy and other economic frameworks presents challenges. For instance, a focus solely on inflation control conflicts with policies that promote economic growth and reduce unemployment, such as the Extended Public Works Program (EPWP), Youth Employment Service (YES), and Small and Medium Enterprises (SMEs). This leads to a trade-off between low inflation and high economic development objectives, resulting in economic uncertainty and instability (Mahlangu, 2019; Mbanjwa & Maponya, 2019).

Furthermore, lack of coordination adversely affects the exchange rate and the balance of payments, reducing the competitiveness of South African exports and the standard of living of its citizens (Gqubule, 2019). Over time, these issues undermine investor confidence and hinder sustainable economic growth. The misalignment between South Africa's monetary policy and other economic frameworks has significant consequences for economic stability, competitiveness, and prosperity (Mahlangu, 2019).

As per the Quarterly Labour Force Survey (QLFS) released by Statistics South Africa in March 2022, the trade industry, which includes retail, was the second largest employer in South Africa in the fourth quarter of 2021, accounting for 17.4% of the total workforce. It must be noted that using higher interest rates as a means to curb inflation reduces disposable incomes and discourages consumer spending which results in a negative employment trend, especially in the retail sector. In defense of his robust views on the monetary policy approach in South Africa, SARB Governor Lesetja Kganyago suggested that "using high inflation as a means of promoting economic growth is not a viable strategy" and that central banks are not responsible for determining the state of the labour market (Business Day, 2021).

Given the circumstances of a country with low economic growth (4.6% Year on Year in 2022, and 4% forecasted for 2023, Stats SA), high unemployment rates (32.9% in Q1 2023, Stats SA), the highest inequality worldwide, and ongoing poverty challenges (Mdluli & Dunga, 2022), economists have conflicting opinions about the strict and inflexible nature of inflation targeting monetary policy framework. Some observations highlight the need for increased flexibility and alignment of the monetary policy framework with current economic conditions in South Africa (Potgieter, 2010). According to Honohan et al. (2022), in their working paper, the implementation of the SARB's inflation targeting monetary policy framework aims to stabilise prices. However, economists and other stakeholders are debating on how this approach affects other macroeconomic variables such as employment and the overall labour market.

Understanding the relationship between inflation targeting and the employment trend in South Africa's retail sector allows policymakers to make informed decisions regarding monetary policy implementation strategies and their effects on the economy and the general population.

**Figure 1** and **Figure 2** below affirm the languishing economic growth rates and the rising unemployment rates (both using official and expanded definitions[2]) in South Africa.

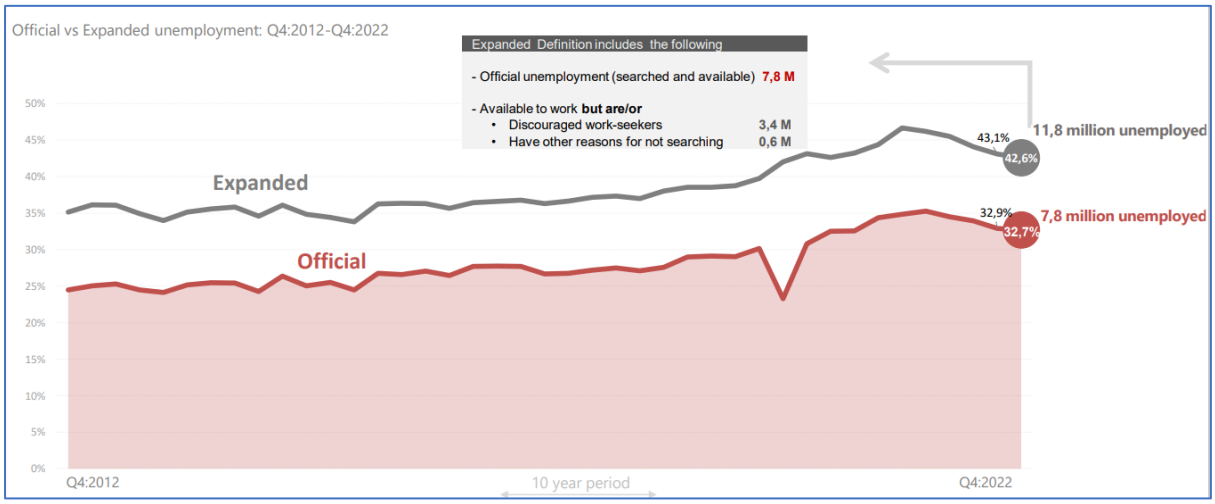



**Figure 1: The Official and Expanded Unemployment Rates**

**Source**: Statistics South Africa (Stats SA)

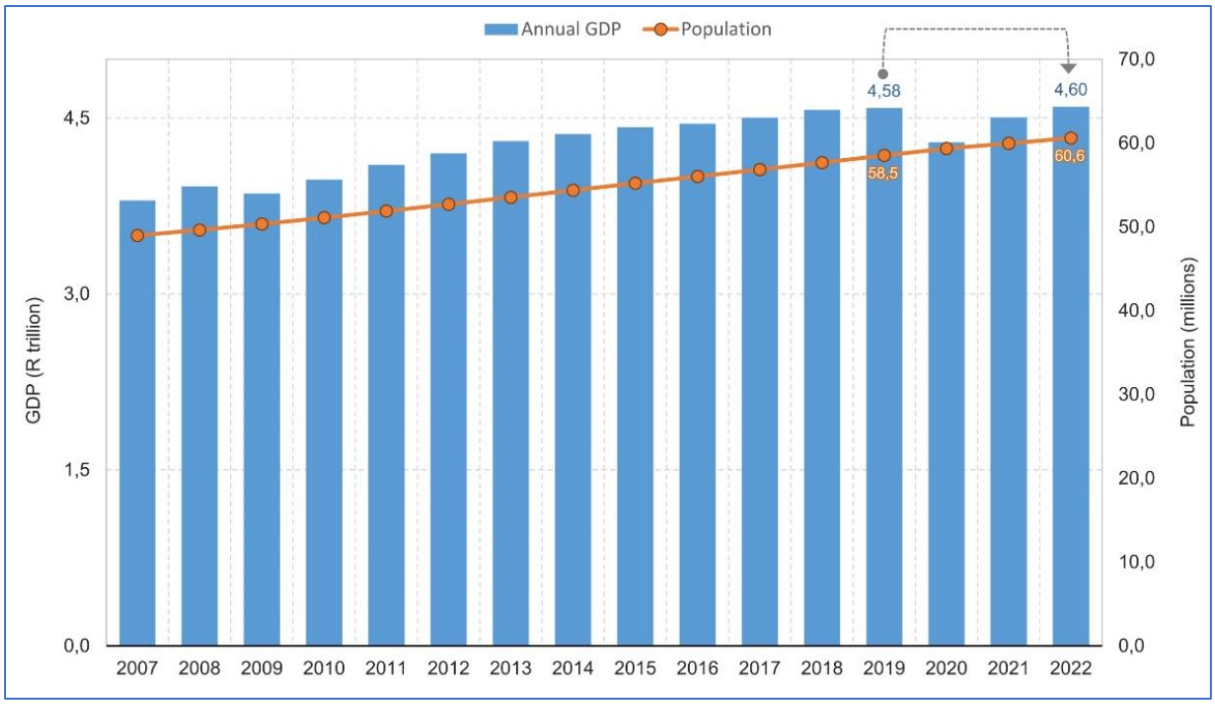



**Figure 2: South African Gross Domestic Product (GDP)**

**Source:** Statistics South Africa (Stats SA)

[2] Expanded definitions of unemployment: According to the expanded definition, a person needs to be actively searching for work to be classified as unemployed.

## 1.4 Research Questions

The inflation targeting policy approach implemented by the SARB has had a notable impact on the consumption patterns of households, private and public institutions, and the overall population in South Africa. Hence, assessing how this policy framework affects other economic fundamentals such as employment is crucial. This research explores the relationship between inflation targeting in South Africa and its effects on employment in South Africa's retail industry. Therefore, to achieve this goal, the research focuses on addressing the following primary research questions:

(1) What is the impact of the SARB's inflation targeting framework on employment in South Africa's retail industry?
(2) To what extent does the SARB's inflation targeting policy implementation approach influence the impact in (1) above?

Furthermore, to enhance the general structure and coherence of this study, the following supplementary secondary questions are also relevant:

(1) What is the historical context of inflation targeting in South Africa, and how has it evolved?
(2) How does the SARB's inflation targeting framework influence monetary policy decisions in South Africa?
(3) What are the strengths and weaknesses of the SARB's inflation targeting framework in terms of its impact on employment in South Africa?
(4) What are the implications of this study for policymakers and stakeholders in South Africa and other countries that have adopted inflation targeting as their monetary policy framework?

The proposed research inquiries are resolved through an extensive evaluation of literature and an analysis of data to present empirical proof of inflation targeting in South Africa and its influence on employment in the retail sector. Furthermore, an extensive analysis of interest rates, inflation data and statistics for employment creation opportunities in the retail industry is employed.

## 1.5 Justification and Rationale of the Study

The ability of the retail sector to absorb unskilled labour is particularly important in South Africa, where high unemployment rates disproportionately affect individuals with limited education or job-specific skills. Given the substantial size of the informal sector in the country, many individuals rely on low-skilled jobs in the retail industry for their livelihoods. Thus, any policy framework that may impact employment opportunities in the retail sector can have a significant ripple effect on the overall labour market and the socio-economic well-being of a large segment of the population (Statistics South Africa, 2021).

Moreover, the retail sector's ability to create employment opportunities for unskilled labour contributes to poverty alleviation and income distribution in South Africa. So, by providing accessible entry-level jobs, the sector plays a crucial role in reducing income inequality and promoting social mobility. Therefore, understanding how inflation targeting influences employment dynamics in the retail industry is of utmost important for assessing the potential implications for poverty reduction and the overall welfare of marginalised populations (Bhorat et al., 2014).

The significance of this study is rooted in its potential to contribute to the ongoing debate regarding the efficacy of inflation targeting as a monetary policy framework and its impact on other economic fundamentals such as employment in the labour market in the South African retail sector. The extent to which inflation targeting affects employment in South Africa is the subject of ongoing debate. While some economists believe the framework has a positive impact, others contend the opposite. Ademola et al. (2021), for instance, noted the lack of empirical evidence on the impact of inflation targeting on the employment situation and economic growth targets in South Africa. They argue that more research is required to assess the correlation between inflation targeting and other economic factors, especially the labour market in the country.

There are numerous reasons to investigate whether inflation targeting in South Africa hinders economic development and negatively affects employment and the labour market.

First, by comprehensively assessing the impact of inflation targeting on the retail sector's ability to absorb unskilled labour, this study seeks to provide evidence-based recommendations that can help to shape monetary policy decisions in a manner that promotes

inclusive growth, reduces unemployment, and addresses socio economic disparities in South Africa.

Second, economic growth objectives and employment are indispensable indicators of economic and social well-being. Therefore, to make informed decisions regarding the implementation and long-term viability of this monetary policy framework, policymakers and stakeholders must have a thorough comprehension of the relationship between inflation targeting, growth targets, and employment opportunities in the retail sector in South Africa.

Third, empirical evidence regarding the impact of inflation targeting on the employment situation in South Africa, specifically the retail sector has been deficient. Although inflation targeting has been widely implemented throughout the globe, there is a dearth of factual information regarding its impact on the job market in the retail sector in South Africa. Consequently, the study provides data driven responses to these debates and elucidates the relationship between inflation targeting and employment in South Africa's retail industry.

As conferred in the previous paragraphs, the retail industry in South Africa employs many semiskilled to unskilled workers. Due to historical and socio-economic factors, a significant portion of these employees has traditionally been from the Black/African population group, reflecting the country's demographic composition and historical patterns of employment. It is important to recognise that efforts continue to be made to address these disparities and promote inclusivity and diversity within the workforce. **Figure 3** below provides development of the labour force participation rate by population group.

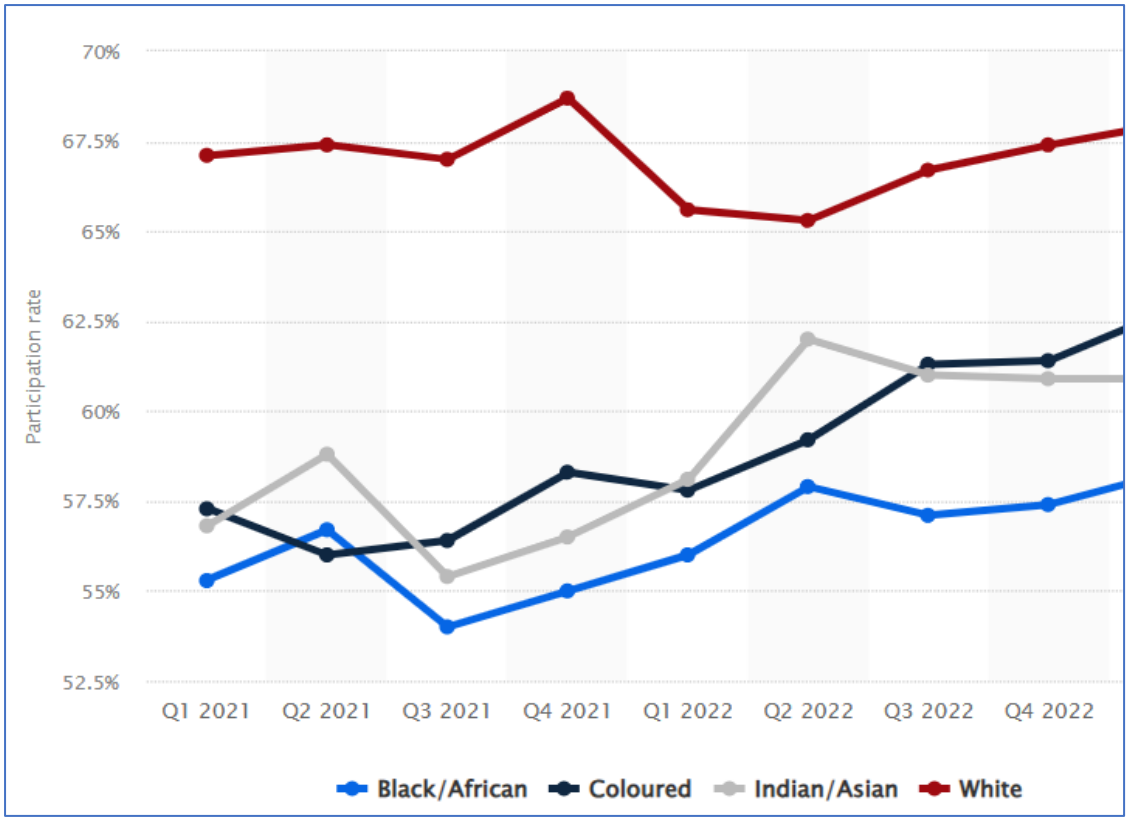



**Figure 3: Labor Force Participation Rate in South Africa from 2021, 2022, by Population Group**

**Source**: The World Bank

In conclusion, exploring the connection between inflation targeting and employment in the retail sector is essential for illuminating the potential consequences of monetary policy decisions on the sector's capacity to absorb unskilled labour amongst other factors. The ultimate goal is to contribute valuable perspectives that extend beyond existing discussions, offering fresh insights into potential effects on income distribution, poverty alleviation, and social inclusion.

## 1.6 Delimitations of the Study

Since the inception of inflation targeting, the SARB has implemented a range of policies to achieve its inflation target, including interest rate adjustments and the use of forward guidance. As a result, there has been considerable interest in studying the impact of inflation targeting on various aspects of the economy, such as economic expansion and the labour market. However, the subject of inflation targeting is vast and complex, and many distinct factors can influence its effectiveness. Therefore, it is important to delimit the scope of this study to ensure a focused and rigorous analysis of the link between inflation targeting and unemployment in the South African retail sector.

In this subsection, the study discusses specific delimitations that have been imposed on this research, including the temporal, data, and conceptual boundaries that ensure a clear and manageable research scope.

Despite the plethora of existing literature on inflation targeting, this study is delimited in the following ways: temporally, by examining the period from 2000 to 2022; in terms of data sources, by utilising secondary data such as published reports and statistics from government agencies and international organisations; and conceptually, by focusing solely on the impact of the SARB's inflation targeting framework on employment in the South African retail sector, without broadly extending the scope into other factors (e.g., skills shortages) that may impact this variable.

## 1.7 Operational Definitions

To ensure a clear and consistent understanding of the key terms used in this study, it is important to provide operational definitions. Operational definitions are precise, measurable descriptions of the concepts being studied, and they play a significant role in ensuring the validity and reliability of research findings (Ribes-Iñesta, 2003). In this subsection, the study provides operational definitions for the key terms used in this study, drawing on relevant literature and sources.

**Inflation targeting**: Inflation targeting is a monetary policy strategy that aims to achieve a specific target for the inflation rate, usually within a defined range, by adjusting the central bank's interest rates or other policy instruments (Posen et al., 1998). In South Africa, the SARB has implemented this monetary policy framework since 2000 to maintain price stability by keeping inflation within a predetermined target range, according to the South African Reserve Bank (2021).

**Unemployment**: Unemployment refers to the percentage of the labour force that is without work but actively seeking employment (Statistics South Africa, 2022).

**Retail Sector**: The retail sector includes all businesses involved in the sale of goods or services to the final consumer for personal or household use (South African Reserve Bank, 2021).

**Economic growth**: Economic growth, as defined by Romer (1990), denotes the rise in the production of goods and services within an economy over a specific timeframe, typically

measured through changes in the Gross Domestic Product (GDP), as stated by the Central Bank of South Africa (2021). Economic growth is an essential factor in the development of a country and its economy as it leads to higher incomes, improved living standards, and increased employment opportunities. It is commonly considered a key indicator of a country's overall economic health and well-being.

**Monetary Policy**: Monetary policy pertains to the measures undertaken by the central bank to control the money supply and interest rates within the economy, with the objective of achieving its policy goals (South African Reserve Bank, 2021).

**South African Reserve Bank (SARB)**: The Central Bank of the Republic of South Africa, SARB is responsible for formulating and implementing monetary policy to achieve and maintain price stability and to ensure sustainable economic growth (Central Bank of South Africa, 2021).

These key terms are central to the research question(s) of this study. They provide a common language and understanding for discussing the concepts and variables that are analysed and tested using econometric methods. These definitions were drawn from relevant literature and sources to ensure that they are accurate and widely accepted within the field of business management and economics.

## 1.8 Structure of the Study

To achieve the research objectives, both logically and comprehensively, the study unfolds systematically through distinct chapters, each serving a crucial purpose in examining the relationship between inflation targeting and unemployment in the South African retail sector. In addition to the first chapter, which presents a thorough overview of the context, issue statement, and research inquiries to be explored in this study, the goals and importance of this investigation, as well as the boundaries and explanations of significant technical terms utilised throughout the research, the essential framework for the ensuing parts in this research are as follows:

Chapter 2 (Literature Review) offers an extensive evaluation of the present theoretical and empirical literature regarding the impact of inflation targeting on the employment in South Africa, specifically with a focus on the retail sector. This review is to be closely scrutinised to establish a strong basis for a thorough empirical analysis. This chapter also carefully

considers the varying conclusions observed in prior studies on inflation targeting and also connects this to the variables outlined in earlier subsections. In short, this encompasses identifying gaps in the literature and highlighting areas where further research is needed, with a focus on the impact of inflation targeting into the labour market in the retail sector.

Chapter 3 (Research Methodology) introduces the research design, data sources and analytical techniques used to test the research questions as well as the justification behind the econometric methods. This chapter also provides a thorough explanation of the methods of data collection and data analysis that are adopted for this study.

Chapter 4 (Empirical Data Analysis and Results) constitutes the empirical backbone of the study, where theoretical concepts are put to the test through rigorous analysis of real-world data. In this chapter, the study meticulously examines the relationship between inflation targeting and unemployment within the South African retail sector by employing advanced econometric methods to explore patterns, correlations, and causalities buried within the data.

Chapter 5 (Discussions of Empirical Results) presents a comprehensive discussion of empirical results, covering various analytical aspects. It explores stationarity through in-depth unit root tests, draws conclusions from normality tests, evaluates Johansen cointegration tests for insights into cointegration, interprets VEC Granger causality tests for causal dynamics, and examines model robustness through diagnostic analysis and impulse responses.

Chapter 6 (Conclusions, Policy implications and Recommendations) is the culmination of this study. This chapter consolidates key findings, offering conclusive insights drawn from the empirical analysis. Additionally, it translates these findings into actionable policy implications and recommendations for policymakers. Acknowledging the study's limitations, this chapter provides a clear framework for future research, bridging the gap between empirical analysis and real-world applications.

By following this structured approach, the study targets to offer a comprehensive and rigorous analysis of the relationship between inflation targeting and unemployment in the South African retail sector. Each chapter contributes significantly, ensuring a logical and coherent presentation of the research process and findings, particularly focusing on the association between these macroeconomic variables.

# CHAPTER 2 – CRITICAL LITERATURE REVIEW

## 2.1 Introduction

The literature review in this study serves two main objectives. The first objective is to conduct an empirical review to identify existing research on the study's subject matter and to identify gaps in the literature, which helps to justify the focus of the study on exploring the impact of inflation targeting on employment in South Africa's retail sector. The second objective is to develop a conceptual framework that serves as the theoretical basis for the study. To establish a suitable theoretical foundation and make relevant policy recommendations, it is essential to introduce a theoretical framework that underpins this study. Additionally, various conventional literature, including empirical literature, is set to be discussed in the next subsections. The purpose of including empirical literature is to consider prior studies conducted by others and apply their research methodologies in this study to identify gaps.

This chapter is structured as follows: an overview of the fundamental concepts of inflation targeting is provided. This is then followed by the historical context and development of inflation targeting in South Africa, the review of the empirical literature focusing on the impact of inflation targeting on employment and identification of the gaps from the literature.

Subsequently, a systematic literature review is conducted to address the following research questions: "What is the impact of the South African Reserve Bank's inflation targeting framework on employment in South Africa's retail industry", and "to what extent does the SARB's inflation targeting policy implementation approach influence this impact"? Based on the rationale established in the introduction section, it is assumed that the inflation targeting framework of the monetary policy is critical for decision making within the South African economic environment, especially the labour market. Therefore, the primary objective of the systematic literature review is to identify any research gaps and establish a basis for the conceptual framework that shall guide the study.

## 2.2 Background and Context

In South Africa, there has been increasing attention on the influence of the inflation targeting framework on economic activities following its adoption by the SARB. Although some studies have assessed the relationship between inflation targeting and unemployment levels in

South Africa, many of these studies are outdated and there is a need to update the research in this area, as instance, Gounder (2009) evaluated the influence of inflation targeting on the growth of the economy and employment in South Africa within the timeframe of 2000 to 2008. Additionally, Aye and Gupta (2010) conducted a study using a structural vector autoregression (SVAR) model considering period from 1994 to 2009 to analyse the effects of inflation targeting on unemployment in South Africa. Their findings indicated that inflation targeting had a positive influence on unemployment in the short run but not in the long run.

Therefore, this literature review purposes to analyse the existing research done on the SARB's inflation targeting framework and its impact on growth development and employment objectives in South Africa for the period 2000 – 2022. Further, the review provides a critical analysis of the literature and further assesses data regarding the correlation between these variables, with a focus on the retail sector.

## 2.3 The Historical Context of Inflation Targeting in South Africa

Inflation refers to the gradual rise in the average cost of goods during a specific duration of time, as stated by Akinsola and Odhiambo (2017). Umaru and Zubairu (2012)'s categorisation of inflation is divided into six groups, which include low inflation that ranges from 1 – 5%, moderate inflation from 5 – 25%, chronic inflation ranging between 25 – 30%, high inflation that ranges between 30 – 50%, extremely high inflation ranging from 50 – 100%, and hyperinflation that exceeds 100%.

Per Ruzima and Veerachamy (2016), inflation is controlled by the central banks using monetary policies. Consequently, the specific control of inflation rates by central banks is referred to as inflation targeting (Idalu, 2015). As discussed in prior sections, an inflation targeting framework is a monetary policy framework that central banks use to set an explicit inflation target and adjust their interest rates to achieve this target (Mishkin & Schmidt-Hebbel, 2007).

For the case of South Africa, this policy framework was established by the government and the SARB in 2000 to preserve price stability and keep inflation within the desired range. The SARB has followed this approach over the years with differing degrees of effectiveness. However, some academics and critics have argued that this policy framework may impedes economic growth purposes and adversely impact employment in South Africa (Nleya & Phiri, 2018; Moloi, 2021).

Several studies have investigated inflation targeting worldwide with some suggesting that the framework promotes economic stability, boost investor confidence, and leads to sustained economic growth. For example, Fountas and Karanasos (2018) found a positive correlation between inflation targeting and long-term economic growth targets in emerging economies. Similarly, Coelho et al. (2020) observed that when accompanied by supportive fiscal policies, inflation targeting aid economic stability and growth. Stability can also be attributed to the framework's ability to avoid boom and bust. For instance, target rates prevent a “loose” economic cycle. Alina and Stone (2016) addressed the uncontrolled inflation rate around 1980 in the United Kingdom, which led to a recession attributed to increased population growth.

However, other studies have argued that inflation targeting may have negative economic consequences, such as slowing economic growth, reducing employment, and increasing income inequality. For example, Debortoli et al. (2019) have examined the potential negative consequences of inflation targeting when households have heterogeneous expectations about inflation. They observed that inflation targeting reduces employment, particularly when households have differing inflation expectations.

Further, Nourani and Mounir (2021) examined the impact of inflation targeting on employment in developing countries. They discovered that inflation targeting policies tend to increase unemployment, particularly in countries with low levels of financial development. Also, Gumata and Kapingura (2019) conducted a study to examine how inflation targeting affects economic growth in South Africa. Their findings suggest that implementation of inflation targeting has adverse effects on the country's economic growth. This is because inflation targeting causes an increase in interest rates, which discourages investment and slows down economic activities. Their study argues that policymakers in South Africa should consider alternative monetary policy frameworks that prioritise both price stability and employment rates targets. There is, however, an argument that the inflation targeting policy can be considered a success because thus far, no country has abandoned it.

## 2.4 How SARB has Implemented the Inflation Targeting Framework during the period 2000–2022

In February of 2000, the Minister of Finance announced that the South African government will be adopting the inflation target. According to Carson et al. (2002), this objective was

defined as an average annual growth rate of between 3 and 6 percent for the Consumer Price Index (CPI) excluding mortgage interest costs (CPIX). In South Africa, inflation targeting involves publicly announcing a specific numerical target for the inflation rate to be achieved within a designated time frame. It is essential to understand that inflation targeting is a framework rather than a strict rule. While the primary focus of monetary policy in an inflation targeting framework is to attain the specified target, it does not imply that the central bank operates solely based on rigid rules and lacks any flexibility or discretion.

During the period 2000 – 2022, the implementation of inflation targeting by SARB had revolved around several key elements: (a) Setting Inflation Targets: The SARB sets an inflation target that reflects the desired level of price stability (3% – 6%). The target is typically announced for a medium-term period and considers factors such as economic growth, external factors, and inflation expectations. (b) Monetary Policy Tools: The SARB utilises various monetary policy tools to influence interest rates and manage liquidity in the economy. These tools include the repo rate[3], which is the rate at which the SARB lends money to commercial banks, and open market operations to manage the money supply. (c) Communication and Transparency: The SARB places emphasis on transparent communication to enhance understanding and credibility. The Monetary Policy Committee (MPC) regularly communicates its decisions, inflation forecasts, and monetary policy stance through publications, press releases, and speeches by SARB officials. (d) Monitoring and Evaluation: The SARB continuously monitors economic indicators, such as inflation rates, economic growth, and other relevant factors, to assess the effectiveness of its monetary policy decisions. The MPC adjusts its policy stance (using interest rates) as deemed necessary to ensure that inflation remains within the target range.

**Figure 4** below presents the development of interest rates between the period 2000 until 2022. The changes in interest rates have varied considerably throughout the past two decades. As shown in the diagram below, the average interest rate of approx. 7% over the period and the variance of 10% signifies greater variability of interest rate changes suggesting significant fluctuations in the interest rates on a year-to-year basis.

[3] Repo rate: The interest rate imposed by a bank when it borrows funds from another financial institution.




**Figure 4: The Interest Rates in South Africa (2000 – 2022)**

**Source:** Trading Economics

## 2.5 Empirical Literature Review

While the inflation targeting framework is assumed to have contributed to macroeconomic stability in South Africa, there is an ongoing debate about whether it adversely affects the labour market. As per some empirical studies, there is a mixed and inconclusive relationship between inflation targeting and unemployment in the South African retail sector. Some studies have suggested that inflation targeting leads to lower unemployment, while others argue that it may lead to increased levels of unemployment. For example, a study by Brixiová et al. (2018) established that inflation targeting has a positive effect on employment rates in South Africa, while another study by Kganyago and Maluleke (2019) suggests that inflation targeting leads to high unemployment rates in the short run. Therefore, more research is needed to understand the complex relationship between inflation targeting and unemployment in the South African retail sector.

Furthermore, recent empirical studies on the connection between inflation targeting and employment in South Africa have also produced conflicting findings, e.g., Chitiga-Mabugu and Ngalawa (2018) found that inflation targeting has had a significant negative effect on employment in the South African retail sector, particularly for low skilled workers. However, their study also found that negative effect of inflation targeting on poverty has been offset by the positive effect of higher economic growth. Similarly, Nkuna (2019) in his study which used a vector autoregression (VAR) model to analyse the relationship between inflation

targeting and unemployment in South Africa, also inferred that inflation targeting has a significant positive effect on unemployment in the short run, but not in the long run.

Additionally, several other studies have uncovered that inflation targeting negatively affect employment in South Africa. For instance, a study by Banerjee et al. (2021) observed that inflation targeting had a negative impact on employment growth in South Africa. The study also disclosed that the detrimental impact of inflation targeting on employment growth was more pronounced in the short term than in the long run. Utilising the VAR model, their study explored the impact of inflation targeting on employment growth in South Africa using quarterly data spanning from 2000 to 2019, coinciding with the period of the SARB's adoption of inflation targeting. To test the robustness of their findings, the study used different VAR specifications and alternative measures of inflation targeting, such as the degree of inflation forecast accuracy and the degree of inflation surprise. Their results consistently showed that inflation targeting had a negative impact on employment growth in South Africa.

Moreover, a study by Tsoanamatsie and Phiri (2020) found that inflation targeting has contributed to a rise in unemployment in South Africa. However, the overall consensus seems to be that the relationship between inflation targeting and employment in the South African retail sector is complex and influenced by various factors, such as macroeconomic conditions, labour market policies, and structural issues within the retail sector.

In conclusion, empirical studies examining the relationship between inflation targeting and unemployment in the South African retail sector present mixed and inconclusive findings. Some studies suggest that inflation targeting leads to lower unemployment, while others argue for an adverse impact on employment. Overall, the consensus is that the relationship is complex and influenced by various factors. Further research is needed to better understand the specific dynamics between inflation targeting and employment in the South African retail sector.

## 2.6 Impact of Inflation Targeting on Employment

According to the National Development Plan (NDP), the government seeks to create 11 million job opportunities by 2030 (NDP, 2013). However, unemployment, poverty and inequality remain the three biggest economic concerns in South Africa (Buthelezi, 2023).

For instance, spanning from year 2000 to 2022, South Africa's average unemployment rate stood at 26.82%, reaching its peaks at 35.30% in the fourth quarter of 2021 and hitting lows of 21.50% during the same quarter in 2008 (South African Reserve Bank, 2022a). These figures primarily stem from two significant economic events, namely the global financial crisis in 2008 and the COVID-19 pandemic in 2020. Consequently, various studies have explored the correlation between inflation targeting and employment in South Africa. To substantiate the above, **Figure 5** presented in the diagram below reflects the unemployment levels in South Africa over the period 2000 to 2022.

The NDP[4a], part of a series of plans since 1994, underscores the government's commitment to economic progress during different phases of the country's transition. However, challenges in implementation persist, including issues like authority distribution, institutional coherence, and capacity (Naidoo & Maré, 2015).




**Figure 5: South African Unemployment Rate (2000 – 2022)**

**Source**: Trading Economics, South Africa Unemployment Rate

[4a] NDP: Adopted by the South African government in 2012, outlines a long-term vision to eradicate poverty and decrease inequality by 2030. Serving as a roadmap, the NDP aims to create a more inclusive, equitable, and sustainable society, addressing key areas such as economic growth, social welfare, and nation building.

Harris and Maluleke (2018) and Mkhabela (2020) explored the empirical connection between South Africa's employment policy and inflation targeting. According to Du Toit and Smit (2017), inflation targeting has a negative effect on employment in South Africa. Corresponding to their findings, firms' capacities to invest and generate jobs is severely impacted by higher interest rates brought on by tighter monetary policy.

Further, other research has revealed that inflation targeting is detrimental to employment and economic growth. Simwaka and Moyo (2019), for instance, discovered that the SARB's inflation targeting policy has reduced South Africa's economic growth. The policy has resulted in higher interest rates, which have reduced investment and consumption. In addition, the policy has resulted in a more robust exchange rate, which has made South African exports less competitive. As a result, the economy has experienced slower growth and higher unemployment rates. Khobai and Kolev (2018) also found that inflation targeting negatively impacted employment, as it led to higher unemployment rates due to the higher interest rates necessary to keep inflation within the target range. He et al. (2020) also concluded that inflation targeting had a negative impact on employment in South Africa, as it led to higher interest rates and reduced investment and economic activities.

Similarly, Mhaka and Bonga-Bonga (2019) found that inflation targeting has a negative impact on employment in South Africa. They have also argued that the policy has resulted in higher interest rates, which have reduced investment and job creation. Additionally, they also assert that this policy has led to a more substantial exchange rate, which has made South African exports less competitive and as a result, the economy has experienced higher unemployment rates. However, in contrast to their 2019 findings, Bonga-Bonga and Mhaka (2020) found that inflation targeting positively impacts employment in South Africa. They argue that the policy has led to a stable macroeconomic environment, boosting investor confidence, and increasing investment. Moreover, the policy has helped to anchor inflation expectations, which has led to lower long-term interest rates, and as a result, the economy has experienced higher job creation rates.

Further recent studies in the South African context have also found similar results about the negative impact of inflation targeting on employment. For example, Mashigo and Phiri (2021) also discovered that inflation targeting negatively affects employment in South Africa. They argue that the policy has led to an overemphasis on price stability at the expense of economic growth ideas and employment. Further, Singh and Nyondo (2019) investigated the

relationship between inflation targeting and employment in South Africa using a structural vector autoregressive (SVAR) model. They discovered that inflation targeting affects employment since it raises interest rates, which inhibit private sector investment and impede job growth. Several other studies have also identified the possible negative impacts of inflation targeting on employment and inequality. For instance, Mlambo and Ojah (2020) discovered that inflation targeting was a factor in South Africa's high unemployment and income inequality. Similarly, Kanyane et al. (2020) claimed that the SARB's ability to implement employment creating initiatives has been constrained by inflation targeting.

However, a study by Tsangarides (2019) peered the impact of inflation targeting on employment in 27 emerging market economies, including South Africa. The study revealed mixed results, with some countries experiencing positive effects on employment and others experiencing negative effects. In the case of South Africa, the study discovered a feeble positive correlation between inflation targeting and employment but noted that the relationship was not statistically significant. Further, a study by Rampersad and Roy (2020) also found no significant correlation between inflation targeting and employment in South Africa for period 2001 to 2019. Their study suggests that this may be because inflation targeting is focused on controlling inflation rather than directly influencing employment levels.

Similarly, a recent study by Essop and Khambule (2021) found no significant relationship between inflation targeting and employment in South Africa. They argue that the lack of a significant relationship may be because inflation targeting is not the only factor affecting employment in South Africa, and that other economic and social factors may also play a role. Moreover, they suggest that the government's fiscal policy may also significantly impact employment in the country.

The employment data presented in **Table 2** below demonstrates fluctuating trends over the observed period. From June 2018 to December 2019, there was a consistent increase in employment, with a peak of 1.6% growth in June 2019. However, a significant downturn followed, leading to a sharp decline of 5.4% in employment by June 2020. The job market started to recover slowly, with positive percentage changes from June 2020 onwards, although employment levels did not fully recover to pre-2020 figures by December 2022. These fluctuations indicate period of instability, with the employment rates experiencing both growth and decline.

**Table 2: Change in Employment (total – all formal non-agricultural industries[4b]), 2018 – 2022**

| *Period* | Quarter | Number # of employees (*in thousands*) | Change in number # of employees (*in thousands*) | % change in number of employees | Change in number of employees (*in thousands*) | % change in number of employees |
|---|---|---|---|---|---|---|
| | | **Grand Total** | **Quarterly Change** | | **Annual Change** | |
| ***Year 2018*** | June | 10,041 | 0 | 0.0% | 0 | 0.0% |
| | September | 10,093 | 52 | 0.5% | 0 | 0.0% |
| | December | 10,195 | 102 | 1.0% | 0 | 0.0% |
| ***Year 2019*** | March | 10,228 | 33 | 0.3% | 0 | 0.0% |
| | June | 10,203 | -25 | -0.2% | 162 | 1.6% |
| | September | 10,220 | 17 | 0.2% | 127 | 1.3% |
| | December | 10,294 | 74 | 0.7% | 99 | 1.0% |
| ***Yea 2020*** | March | 10,305 | 11 | 0.1% | 77 | 0.8% |
| ***%*** | June | 9,651 | -654 | -6.3% | -552 | -5.4% |
| | September | 9,739 | 88 | 0.9% | -481 | -4.7% |
| | December | 9,861 | 122 | 1.3% | -433 | -4.2% |
| ***Year 2021*** | March | 9,904 | 43 | 0.4% | -401 | -3.9% |
| | June | 9,874 | -30 | -0.3% | 223 | 2.3% |
| | September | 9,953 | 79 | 0.8% | 214 | 2.2% |
| | December | 10,062 | 109 | 1.1% | 201 | 2.0% |
| ***Year 2022*** | March | 10,067 | 5 | 0.0% | 163 | 1.6% |
| | June | 9,974 | -93 | -0.9% | 100 | 1.0% |
| | September | 9,920 | -54 | -0.5% | -33 | -0.3% |
| | December | 9,991 | 71 | 0.7% | -71 | -0.7% |

**Source**: Researcher's Own Presentation (data from Stats SA)

## 2.7 Impact on Employment in the Retail Sector

The retail sector holds immense importance within any economy, serving as a linchpin that does not only drive economic activity but also creates vast employment opportunities for millions of individuals globally. In the context of South Africa, the retail sector stands as a cornerstone of the nation's economy, making substantial contributions to the Gross Domestic Product (GDP) and functioning as a major source of employment, particularly for individuals with lower skill levels. This section of the study delves into the existing body of literature, specifically examining the complex relationship between inflation targeting policies and employment dynamics within the retail sector, especially in emerging economies like South Africa.

[4b] Formal non-agricultural industries encompass a broad spectrum of economic activities excluding agriculture, forestry, and fishing (Bhattacharya, 1996).

Focusing on this nexus, the study aims to unravel the impact of inflation targeting on the employment landscape, shedding light on the challenges and opportunities faced by low skilled workers within the retail industry. Through a comprehensive review of literature, the study seeks to identify patterns, trends, and gaps in understanding, paving the way for a more profound exploration of this critical economic interplay.

**Figure 6** below presents the YoY sales in the retail sector and the interest rates development for period until 2022.

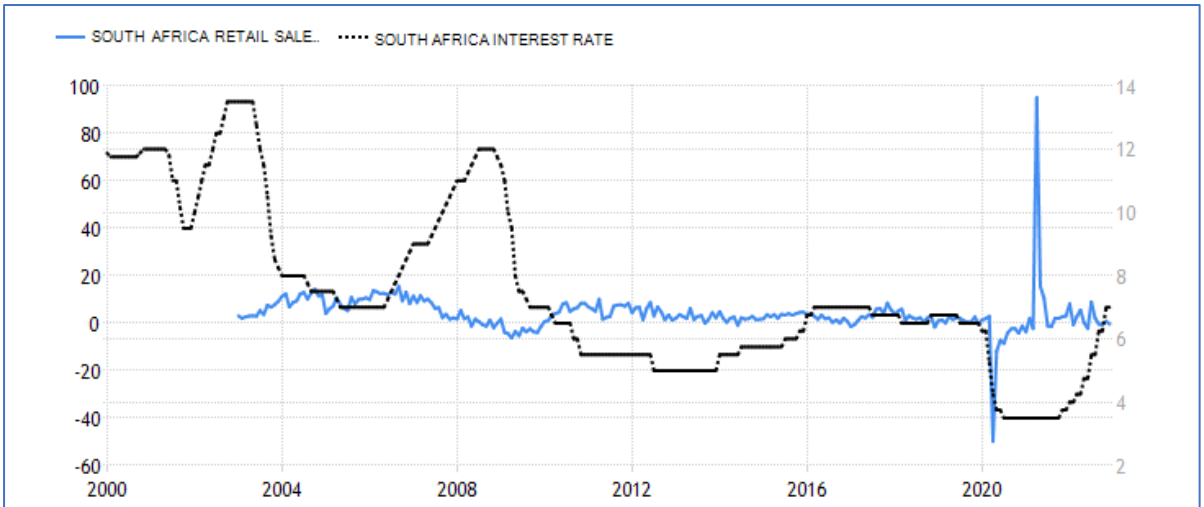



**Figure 6: South Africa Retail Sales Year on Year (YoY) and the Interest Rates**

**Source**: Trading Economics, South Africa Retail Sales Year on Year

From 2000 to 2022, YoY retail sales in South Africa averaged 3.87 percent, reaching a peak of 95.10 percent in April 2021 and a negative growth of -49.90 percent in April 2020. Several studies have examined the impact of inflation targeting on employment in the retail sector. For example, a study conducted by Njuguna et al. (2021) revealed a negative impact of inflation targeting on employment in the retail sector in Kenya. They contend that policies centred around inflation targeting lead to elevated interest rates, escalating borrowing costs and diminishing consumer expenditure. Consequently, the reduction in consumer spending lowers the demand for retail products and services, resulting in diminished sales and profits for retailers, potentially leading to workforce reductions and a decrease in hiring.

Likewise, a study by Costa et al. (2019) on the Brazilian retail sector found that inflation targeting has a negative effect on employment. The study also found that inflation targeting has a disproportionate impact on small and medium sized retailers, who are more vulnerable

to changes in the macroeconomic environment. In contrast, a study by Salazar-Cantú et al. (2019) on the Mexican retail sector discovered that inflation targeting has a positive impact on employment. Their argument is that inflation targeting policies lead to lower inflation expectations, which in turn lead to lower interest rates, increased consumer spending, and higher demand for retail products and services which then leads to higher sales and profits for retailers, resulting in increased hiring.

In the South African context, Harris and Maluleke (2018) as well as Mkhabela (2020) observed an adverse impact of inflation targeting on employment in the retail sector. Likewise, Ndou and Gumata's (2017) study focusing on the effects of inflation targeting on small and medium-sized retailers in South Africa indicated a negative influence on employment. According to their findings, Ndou and Gumata (2017) concluded that the implementation of inflation targeting policies, resulting in higher interest rates, had an unfavourable effect on consumer spending, leading to reduced sales for retailers. Consequently, this had a negative impact on the creation of job opportunities within the retail sector.

Moreover, according to the data presented in **Table 3** below, the breakdown of employment by industries from 2015 to 2022 reveals significant trends in the workforce landscape. Government services emerged as the largest employer with total employment ranging from 26.59% in 2015 to 28.92% in 2021 and 28.13% in 2022 (Statistics South Africa, 2022). Financial intermediation, insurance, real estate, and business services also made substantial contributions, fluctuating from 22.72% in 2015 to 23.61% in 2022 (Statistics South Africa, 2022). Notably, the combined sector of retail and motor trade, along with hotels and restaurants, consistently represented a significant portion of overall employment, ranging from 21.48% in 2015 to 21.83% in 2022 (Statistics South Africa, 2022), highlighting its significance in sustaining the job market. This implies that the retail sector in South Africa has consistently played a crucial role in the job market over the years.

Despite vast fluctuations in other industries, this sector remained stable and substantial, contributing between 21.48% and 21.83% of overall employment during this period (Statistics South Africa, 2022). This stability highlights the sector's resilience and its ongoing ability to provide a significant number of jobs, making it a key pillar in sustaining employment levels within the economy.

**Table 3: Employment Breakdown by Industry (2015-2022)**

| Industry | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Mining and quarrying | 4.78% | 4.67% | 4.57% | 4.44% | 4.39% | 4.60% | 4.55% | 4.73% |
| Manufacturing | 12.34% | 12.25% | 12.09% | 12.10% | 11.42% | 11.17% | 11.70% | 11.91% |
| Electricity, gas, and water supply | 0.63% | 0.64% | 0.63% | 0.61% | 0.60% | 0.60% | 0.59% | 0.58% |
| Construction | 6.09% | 6.26% | 6.28% | 6.00% | 5.97% | 5.65% | 5.42% | 5.09% |
| **Retail and motor trade; hotels and restaurants** | **21.48%** | **21.79%** | **22.07%** | **22.36%** | **22.33%** | **21.70%** | **21.30%** | **21.83%** |
| Transport, storage, and communication | 4.92% | 4.80% | 4.81% | 4.88% | 4.74% | 4.32% | 4.16% | 4.13% |
| Financial intermediation, insurance, real estate, and business services | 22.72% | 22.82% | 22.93% | 23.02% | 23.44% | 23.50% | 23.37% | 23.61% |
| Community, social and personal services | 27.03% | 26.78% | 26.63% | 26.59% | 27.10% | 28.46% | 28.92% | 28.13% |

**Source**: Researcher's Own Presentation (data from Stats SA)

Overall, the literature indicates that the relationship between inflation targeting and employment in the retail sector is intricate and differs among countries. While certain studies suggest a detrimental effect of inflation targeting on employment, others posit a favourable impact. Therefore, further research is needed to fully understand the mechanisms through which inflation targeting affects employment in the retail sector and to identify policy measures that can mitigate any negative effects.

## 2.8 Identification of Research Gaps

The retail industry holds a distinctive position in the economy by employing a significant workforce and playing a crucial role in driving economic activity and consumer demand. Nevertheless, there is a lack of extensive research that examines the precise impact of monetary policy on employment within this sector. It is imperative to understand how monetary policy influences employment in the retail industry because it has implications for workforce dynamics, income distribution, and the overall economic well-being (Batini & Haldane, 2021).

Expanding research on the effects of monetary policy on employment within the retail industry is poised to help bridge the existing gap in the literature. By investigating the specific mechanisms through which monetary policy decisions affect retail employment, for example, analysing investment patterns, consumer spending behaviour, and labour market dynamics, this is set to provide valuable insights to policymakers and stakeholders. These

insights aid in formulating effective monetary policies that consider the unique dynamics and challenges of the retail industry.

Despite the extensive body of literature on monetary policy and its effects on the economy, there remains a gap in research specifically examining the impact of monetary policy on employment within the retail industry. Numerous studies have explored the relationship between monetary policy and employment at a macroeconomic level, however, there is a lack of in-depth analysis focusing specifically on the retail sector (Afonso et al., 2021; Batini & Haldane, 2021). While some studies suggest that inflation targeting has negative effects on employment, there is insufficient empirical evidence to substantiate this assertion, particularly in developing countries such as South Africa. (Marwah & Klein, 2021; Mishra & Montiel, 2019).

Based on the review of the literature, several research gaps need to be addressed. Even though the primary focus of this study is to delve on the main gap alluded to in the paragraphs above, the following gaps from the literature remain important to supplement the overall flow of the study.

First, although previous studies have examined the relationship between inflation targeting and employment, there is a lack of research specifically focused on the retail sector. As noted by Gupta and Ramachandran (2021), the impact of inflation targeting on employment in the retail sector in emerging economies has not been extensively studied. Therefore, there is a need to significantly investigate the relationship between inflation targeting and unemployment specifically in the South African retail sector.

Second, most studies have focused on the overall impact of inflation targeting on economic growth and employment, rather than examining the channels through which inflation targeting affects employment in the retail sector. As noted by Khobai et al., (2020), there is a need to identify the specific mechanisms through which inflation targeting affects employment in the retail sector. For example, does inflation targeting lead to increased investment and expansion by retailers, which in turn leads to increased employment in the sector, or does inflation targeting lead to higher interest rates, which could lead to decreased investment and employment in the sector?

Third, while some studies have examined the impact of inflation targeting on SMEs, there is a lack of research specifically focused on the impact on SMEs in the retail sector. As noted by Ayoki (2019), SMEs play a crucial role in the retail sector in South Africa, and thus there

is a need to examine the impact of inflation targeting on these firms specifically. This is important given that SMEs may be particularly vulnerable to the effects of inflation targeting, given their limited access to credit and other resources.

Fourth, there is a need for more research on the impact of inflation targeting on informal employment in the retail sector. As noted by Dube and Ogbokor (2018), informal employment is a significant component of the retail sector in South Africa, particularly in low-income areas. However, most studies have focused on formal employment in the sector, so there is a lack of research on how inflation targeting affects informal employment in the sector.

Finally, there is a need for additional research on the impact of inflation targeting on wage growth in the retail sector. As noted by Stoffels and van der Merwe (2021), wage growth in the retail sector in South Africa has been relatively stagnant in recent years, and there is a need to examine whether inflation targeting has contributed to this trend. Understanding the impact of inflation targeting on wage growth is important for policymakers seeking to promote inclusive growth and reduce income inequality in the country.

The existing literature on monetary policy and employment tends to provide a broader perspective, examining the overall impact on employment levels, labour market conditions, and specific sectors as a whole. While these studies offer valuable insights into the relationship between monetary policy and employment, they often fail to capture the specific dynamics and nuances of the retail industry.

## 2.9 Summary and Conclusion: Empirical Literature

Subsequent to conducting this literature review, it can be inferred that there is conflicting evidence on how inflation targeting affects employment in South Africa. Although some studies suggest that inflation targeting positively affects growth targets and the labour market, other studies suggest the opposite. Therefore, further investigations are necessary to comprehend the influence of inflation targeting on diverse retail fields and to scrutinise the enduring impacts of this policy. Additional investigation is necessary to fully comprehend the influence of inflation targeting on diverse economic sectors and to evaluate the policy's sustained consequences. Additionally, it is crucial to employ more sophisticated econometric methods to tackle endogeneity and other methodological limitations.

This study is slated to contribute to addressing the gaps in the current literature by conducting more extensive and comprehensive analysis. By using a larger sample size, this study aims to provide a better evaluation of the policy's impact on employment, providing valuable insights for policymaking decisions in South Africa. Ultimately, the outcomes of this study aspire to contribute to a more comprehensive understanding of the influence of inflation targeting on employment in South African retail sector. The objective is to offer valuable insights for policymakers, assisting in the development of well-informed and impactful decisions to tackle employment challenges within the country.

## THEORETICAL FRAMEWORKS UNDERPINNING THE STUDY

### 2.10.1 Introduction

The subsequent sections introduce the Taylor Rule theory, the New Keynesian Phillips Curve (NKPC), and Neo-Fisherian theories as relevant theoretical frameworks for this study.

### 2.10.2 The Taylor Rule Theory

John Taylor, an economist, proposed the Taylor Rule in 1993 as a monetary policy theory. The theoretical framework proposes that central banks should set their interest rates through a formula considering the inflation rate and the output gap. According to this rule, central banks should adjust interest rates to ensure stability in both inflation and output within the economy. The formula necessitates a specified target inflation rate and the disparity between the current and potential output of the economy.

The Taylor Rule theoretical model suggests that central banks should modify interest rates based on shifts in inflation and economic output. If inflation surpasses the target rate or if output exceeds its potential level, the central bank should raise interest rates. Conversely, when inflation is below the target rate or when output is lower than its potential level, interest rates should be decreased. The objective of adhering to the Taylor Rule is to achieve both price stability and full employment while controlling inflation (Taylor, 1993).

The Taylor Rule has been influential in guiding monetary policy decisions in many countries, including the United States, Australia, and Canada (Rudebusch & Williams, 2008). The theory has also been used as a benchmark for evaluating the performance of central banks. While the Taylor Rule has been criticised for its simplicity and assumptions, it remains a widely recognised and studied approach to monetary policy.

Several studies have been conducted to test the effectiveness of the Taylor Rule and variations of the rule in various countries (Clarida et al., 2002). These studies have yielded mixed results, with some finding that the rule performs well in stabilising inflation and output, while others find that it may not be the most effective policy approach in certain economic conditions. Overall, the application of the Taylor Rule has been widely studied and its effectiveness has been found to vary depending on economic conditions and the specific variables included in the rule. Nevertheless, the Taylor Rule remains an essential theoretical

foundation for guiding monetary policy decision making and understanding the relationship between inflation, output, and consequently the labour market.

The Taylor Rule theory is mathematically represented by the following equation:

$$\mathbf{i = r^* + \pi + 0.5(y - y^*) + 0.5(\pi - \pi^*)} \quad \mathbf{(1)}$$

In this equation, i denotes the nominal interest rate determined by the central bank, r* represents the real interest rate aligned with output at its potential level and inflation at its target level, $\pi$ is the inflation rate, y signifies the level of output relative to its potential level y*, and $\pi^*$ corresponds to the central bank's inflation target.

The equation determines the appropriate level of the nominal interest rate (i) based on the disparities of inflation ($\pi$) and output (y) from their target levels, as well as the prevailing real interest rate (r*). The coefficients in the equation dictate the degree to which the nominal interest rate reacts to changes in the gaps of inflation and output.

### 2.10.3 The New Keynesian Phillips Curve (NKPC) Theoretical Framework

According to the New Keynesian Phillips Curve (NKPC), this theory outlines the interrelation between inflation and economic activity, particularly in the context of the labour market. This model is an extension of the traditional Phillips Curve, which suggests that unemployment and inflation are negatively correlated. As unemployment declines, inflation rises, and vice versa. The New Keynesian Phillips Curve incorporates several additional components, including future inflation expectations and the influence of monetary policy on inflation expectations (Clarida et al., 2002). Further, unlike the Phillips Curve, the NKPC posits the significant influence of inflation expectations in shaping the actual inflation rate. It suggests that individuals form their expectations based on their experiences and current economic information (Gali & Monacelli, 2005).

Additionally, one of the primary differences between the two theories is that the Phillips Curve does not explicitly consider inflation expectations, while the NKPC does (Orphanides & Williams, 2005). Another difference is that the Phillips Curve assumes a stable relationship between inflation and unemployment, while the NKPC suggests that this relationship can change over time, depending on the prevailing economic conditions.

The NKPC theory is more commonly used by central banks for inflation targeting as it provides a more comprehensive framework for understanding the relationship between inflation and unemployment and enables central banks to adjust policy actions accordingly (Woodford & Walsh, 2005). The theory posits that monetary policy can affect economic activities and employment by influencing aggregate demand and supply. In addition, it suggests that inflation targeting may lead to reduced inflation and higher output in the short term. However, if interest rates remain elevated for too long, unemployment rates may increase.

Dany-Knedlik and Garcia (2018) suggest that the NKPC serves as a valuable tool in econometric testing to explore the link between inflation and economic activity, particularly within the labour market. The model takes into account the influence of inflation expectations and monetary policy. To assess the impact of inflation targeting on growth targets and employment, various estimation methods, including ordinary least squares, maximum likelihood estimation, and Bayesian methods, are employed. The parameters of the model are estimated using data on inflation and unemployment rates in the retail sector. These estimated parameters are utilised to evaluate the model's performance in describing past data and predicting future inflation and economic activity.

Several studies have utilised the NKPC to scrutinise inflation patterns across various nations and evaluate how effective monetary policies are in regulating inflation. This rigidity creates a compromise between inflation and unemployment in the near term, which can be leveraged by the Central Bank to attain its inflation goal, as seen in studies such as Lopez-Salido et al. (2005) and Galsí and Gertler (2007).

The equation depicting New Keynesian Phillips Curve is expressed as follows:

$$\boldsymbol{\pi_t = E[\pi_{t+1}] + \phi(y_t - y_t^*) + \nu_t} \qquad \textbf{(2)}$$

In this equation, $\pi_t$ signifies the current inflation, $E[\pi_{t+1}]$ denotes the expected inflation in the next period, $\phi$ represents the slope of the Phillips Curve, $y_t$ is the deviation of current output from potential output, $y_t^*$ is the natural rate of output, and $\nu_t$ represents a shock term. The equation implies that inflation is influenced by expected future inflation, the output gap, and economic shocks.

### 2.10.4 The Neo-Fisherian Theory

The Neo-Fisherian theory, within the realm of monetary economics, is a conceptual framework proposing that when a central bank raises its nominal interest rates, expectations about inflation will adapt in a way that the real interest rate remains constant in the long run. Rooted in the concepts of Irving Fisher, a prominent economist from the early 20th century, the theory contends that nominal interest rates are essentially the combination of real interest rates and anticipated inflation (Gobbi et al., 2022).

According to Kim (2022), the Neo-Fisherian theory challenges the conventional view that elevated interest rates result in diminished inflation. The theory proposes that increasing interest rates might, in the short term, lead to increased inflation. This occurs as higher interest rates encourage increased spending, reduced borrowing, and subsequently stimulate economic growth, fostering greater demand for goods and services, and creating employment opportunities – ultimately contributing to price increases. However, in the long run, the theory contends that inflation expectations will adapt, maintaining the real interest rate at a constant level, thereby nullifying the inflationary impacts of heightened nominal interest rates.

The theory has implications for inflation and employment. If the Neo-Fisherian theory holds true, central banks, including the South African Reserve Bank, would need to reconsider their monetary policy strategies. The conventional approach of inflation targeting, widely employed by central banks, may require reassessment, as the assumed straightforward relationship between interest rates and inflation might not align with the theory's assertions. As noted by Stracca (2018), the theory further suggests that the long-term effects of monetary policy on employment may deviate from predictions made by conventional models. This implies that central banks could potentially achieve both price stability and sustainable job creation by utilising interest rate policies to stimulate demand and investment in the short term, without the concern of triggering inflation over the long term.

Cochrane (2011) used the Neo-Fisherian model to explain why interest rates did not rise after the 2008 financial crisis as many economists had predicted. He argued that the model could account for the low interest rates by showing that the expected rate of inflation had fallen. Bauer and Rudebusch (2017) conducted an empirical investigation of the Neo-Fisherian hypothesis using data from several advanced economies. They found some evidence to support the hypothesis, although the results were mixed and dependent on the specific

country and period studied. Selgin et al. (2015) used the Neo-Fisherian model to argue that the Federal Reserve's quantitative easing (QE) policies were ineffective in stimulating economic growth as they did not raise inflation expectations. They suggested that the Federal Reserve would have achieved better results by adopting a more transparent monetary policy framework that emphasised a steady growth rate in the money supply.

Overall, the outcome of these studies has been mixed, with some finding support for the Neo-Fisherian hypothesis and others finding little or no evidence to support it. The theory remains a subject of ongoing debate among economists, however continuously being applied in decision making on the inflation targeting process by the central banks.

In this context, the Neo-Fisherian equation is formulated as follows:

$$i_t = r_t + \pi^e_t \quad (3)$$

Here, i_t denotes the nominal interest rate, r_t represents the real interest rate, and $\pi^e_t$ is the expected inflation rate.

The equation reflects the Fisher equation, asserting that nominal interest rates encompass both real interest rates and expected inflation. The Neo-Fisherian theory posits that when a central bank increases nominal interest rates, it will ultimately induce an equivalent rise in expected inflation, leading to no change in the real interest rate in the long run (Gobbi et al., 2022).

### 2.10.5 Rationale of Theories

The Taylor rule, NKPC, and Neo-Fisherian theories are relevant for this study of inflation targeting framework of the SARB as they all have implications for monetary policy and inflation dynamics. The Taylor rule provides guidance on establishing the suitable interest rate level by considering inflation and output gaps, whilst the NKPC elucidates the correlation between inflation and economic activity, particularly in the labor market, emphasising the impact of inflation expectations and monetary policy. Meanwhile, the Neo-Fisherian theory challenges the conventional belief that higher interest rates result in lower inflation and introduces implications for the interplay among interest rates, inflation, and economic growth.

By employing these theories to the inflation targeting framework of the SARB, the study is set to evaluate the effectiveness of the SARB's monetary policy in controlling inflation,

promoting economic growth ideas, and improving employment. Specifically, the study assesses whether the SARB's policy is consistent with the predictions of these theories and whether deviations from these predictions have had adverse effects on the growth targets and labour market, especially in the retail industry.

### 2.10.6 Implications on Research Methodology, Design, Sample Population and Testing Techniques

The study uses a deductive method; therefore, a quantitative approach is suitable as it permits the collection of numerical data and the application of statistical analysis to examine the impact of inflation targeting on employment in the South African retail sector.

**Figure 7** below provides the variables and theoretical foundation offering concise and graphical guide to the complex dynamics of inflation targeting and its connection to broader economic activities.

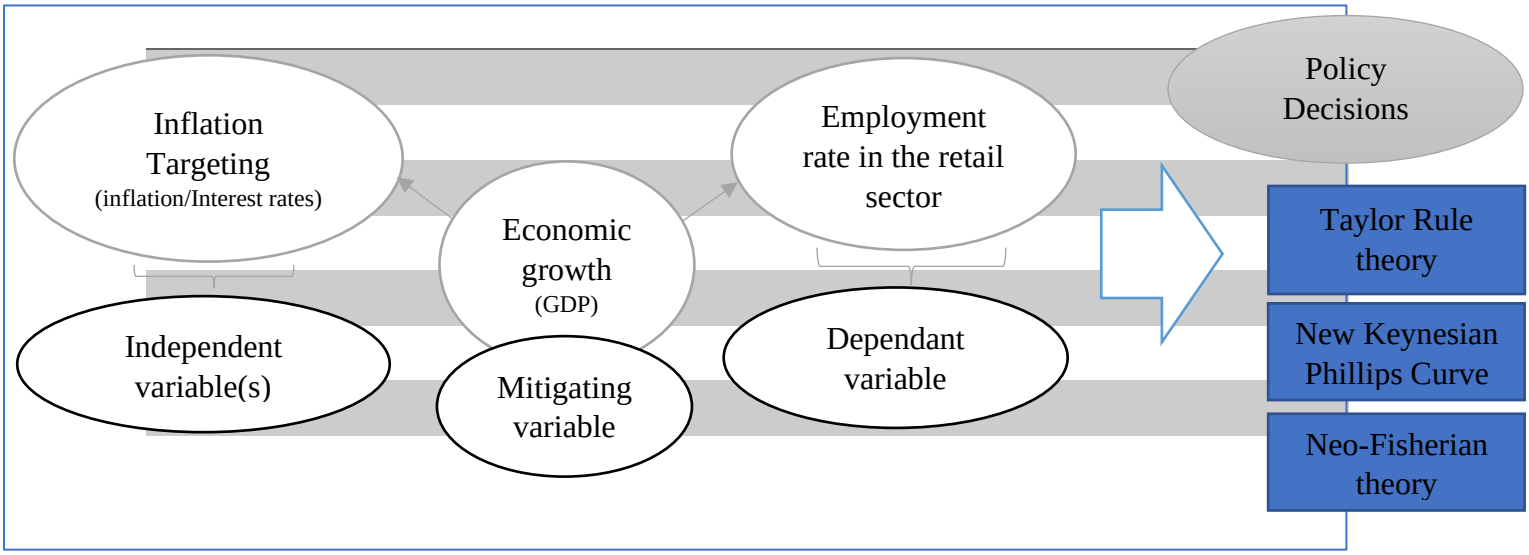



**Figure 7: Variables and the Theoretical Concepts influencing Policy Decisions**

**Source**: Researcher's Own Graphical Presentation

The proposed theoretical framework for this study aims to impart an understanding of the inflation targeting framework and provide guidance and insights to the policymakers in terms of the influence of inflation targeting on other economic activities. Furthermore, this also provides a foundation for application of the econometric tools to use in assessing the impact on the dependent variable as outlined in **Figure 7**. Furthermore, economic growth (mitigating variable), as measured by indicators such as Gross Domestic Product GDP), exerts a

substantial influence on employment. In times of economic expansion, businesses tend to grow, resulting in heightened job opportunities and reduced unemployment rates. Conversely, during periods of economic contraction, job losses and higher unemployment rates are more likely. Economic growth can interact with inflation targeting, affecting the relationship between inflation and employment.

For instance, the NKPC theoretical framework will be applied in conjunction with econometric models such as Johansen Cointegration, and vector error correction model (VECM). The identified relevant theoretical frameworks are based on quantitative data and require the use of statistical methods to estimate the relationships between the variables. Therefore, the quantitative methodology is appropriate for this study because it allows rigorous data analysis and estimation of causal relationships between inflation targeting, economic growth, and employment in South Africa.

Further, this method is appropriate for examining the impact of inflation targeting on employment as it allows for the analysis of large datasets, which is necessary for identifying patterns and relationships that may not be apparent through qualitative analysis. This methodology also permits the testing of hypotheses and the extrapolation of findings to a larger population. The quantitative method allows statistical inference to be used to draw population level conclusions from a sample of data. This permits the findings to be generalised to a larger population.

### 2.10.7 Hypotheses

The hypotheses presented below target to offer precise statements and predictions regarding the correlation between inflation targeting in South Africa and its repercussions on employment in the nation's retail sector. Formulated in alignment with the earlier outlined research questions, these hypotheses are designed to scrutinise the influence of the SARB's inflation targeting framework on employment and delve into the factors shaping this relationship.

By formulating these hypotheses, the study aims to provide a clear and testable framework for the research design, data collection, and analysis. The hypotheses enable an assessment of the extent to which inflation targeting affects employment in the retail industry, evaluate the influence of the SARB's policy implementation approach, and explore the historical context, monetary policy decisions, strengths, and weaknesses of the inflation targeting framework.

**Null Hypothesis ($H_0$)**: There is no significant association between the South African Reserve Bank's inflation targeting framework and employment levels in South Africa's retail industry.

**Hypothesis 1 ($H_1$)**: The implementation of the South African Reserve Bank's inflation targeting framework has a significant impact on employment in South Africa's retail industry.

**Hypothesis 2 ($H_2$)**: The approach adopted by the SARB in implementing its inflation targeting policy influences the extent of its impact on employment in South Africa's retail industry.

### 2.10.8 Conclusion

Taylor rule, New Keynesian Phillips Curve, and Neo-Fisherian models provide valuable perspectives into the relationship between inflation, adjustments in interest rates, and employment. These theories prove particularly beneficial in examining the inflation targeting framework employed by the South African Reserve Bank and its potential impacts on economic activities and the labour market within the country.

The Taylor rule serves as a useful guideline for central banks in setting their interest rate policies and achieving their inflation targets. The NKPC underscores the short-term trade-off between inflation and unemployment, emphasising the role of inflation expectations and monetary policy in shaping inflation dynamics. The Neo-Fisherian model challenges conventional perspectives on the link between interest rates and inflation, proposing that the long-term impacts of monetary policy on economic activities and employment may deviate from conventional models.

Overall, the use of these theoretical frameworks provides valuable insights on the potential influence of inflation targeting on employment within the South African retail sector, aiding policymakers in making well-informed decisions regarding monetary policy.

# CHAPTER 3 – ESTIMATION PROCEDURES | RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter is an essential part of the overall study. It describes the strategies and procedures implemented to collect data and conduct analysis to answer research questions. In this chapter, the study presents an overview of the research approach and design adopted, along with the utilised data sources and analytical tools.

Furthermore, this chapter explores the connection between the inflation targeting framework and unemployment in the retail sector, with a primary emphasis on the data collection and analysis methodology. It delves into the econometric tools and statistical procedures employed to address the research questions and evaluate the hypotheses outlined in chapter 1 and 2, respectively. In addition to this, the chapter highlights various kinds of data that will be used to obtain statistical results.

## 3.2 Research Approach

To evaluate the influence that the SARB's inflation targeting framework has had on employment in South Africa's retail sector, this study adopts a quantitative research technique. The quantitative technique is appropriate for this subject matter since it permits the measurement and statistical analysis of data. Further, this methodology is suitable for examining the effect of inflation targeting on employment as it allows the use of econometric models to assess the causal link between inflation targeting and unemployment rates. The quantitative approach utilised in this study draws its data from secondary sources, notably time series data on interest rates, inflation, and employment statistics in South Africa's retail industry. The data collection process focusses on the three primary sources, namely: the South African Reserve Bank, Statistics South Africa, and the World Bank.

This study employs time series data analysis techniques to address the research question(s) poised in the previous sections focusing on dataset spanning between 2000 and 2022. Given the nature of the data, time series analysis is an appropriate methodology for exploring the dynamic interactions between these variables over time. Additionally, this study is purposed to investigate the impact of the inflation targeting framework by examining patterns and trends within the data. Analysing time series data helps to identify the short and long-term

effects of inflation targeting on the employment variable, thereby providing insights into the potential consequences of the policy.

The SARB is the country's central bank which plays a crucial role in formulating and executing monetary policy. As such, SARB is a significant source of information regarding interest rates, and other macroeconomic indicators. Statistics South Africa, the national statistical agency of South Africa, is tasked with collecting and gathering official statistics on diverse areas of the South African economy. The World Bank is an international organisation that provides information and research on a variety of economic and social concerns, especially macroeconomic indicators such as interest rates, inflation, GDP, and employment data.

Employing secondary data sources offers numerous benefits, such as cost efficiency, ease of access, and the utilisation of historical data. It is crucial, however, to ensure that the information garnered from these sources is reliable, accurate, and relevant to the topic under investigation. Consequently, it is essential to select and evaluate the data sources with care and to employ appropriate statistical techniques when analysing the data.

**Table 4** below serves as a comprehensive guide to the significance of various statistical tests in the context of addressing the research questions and hypotheses outlined in the study. Each test is strategically chosen to fulfil specific objectives that directly contribute to the investigation into the impact of the South African Reserve Bank's (SARB) inflation targeting framework on employment in the country's retail industry. The alignment between the objectives of the tests and the study's goals is crucial for obtaining nuanced insights and robust evidence.

The table systematically outlines the objectives of each test, emphasising how they collectively contribute to answering research questions and substantiating hypotheses ($H_0$, $H_1$ and $H_2$). These tests are instrumental in examining time series data, assessing the presence of unit roots, analysing trends, identifying structural breaks, and evaluating dynamic relationships between variables. Their combined significance lies in providing a rigorous and multifaceted analysis, ensuring the validity, reliability, and depth of the study's findings. The table serves as a key reference for understanding the methodological framework employed and the specific role each test plays in addressing the overarching research questions and hypotheses.

**Table 4: Summary of Statistical Tests and Objectives thereof Relevant for this Study**

| Test | Objective | Mapping Tests to Objectives of the Study (Research Questions and Hypotheses) |
|---|---|---|
| Augmented Dickey-Fuller (ADF) | Examine time series data for unit roots. | Assess structural patterns and long-term trends in the inflation targeting framework (interest rates and inflation) and retail employment variables. |
| Kwiatkowski-Phillips-Schmidt-Shin (KPSS) | Supplement ADF results, addressing limited power and ignoring error process autocorrelation. | Strengthen unit root assessment for a more robust analysis, providing enhanced support for inflation targeting and employment variables. |
| The Phillips-Perron (PP) | Ascertain the presence of a unit root in time series data. | Contribute to identifying structural patterns and trends in the inflation targeting and retail employment variables. |
| Phillips-Ouliaris (PO) | Analyse the time series trend in this study. | Investigate trend components in the time series data of inflation targeting and employment, providing insights into dynamics. |
| Zivot-Andrews (ZA) | Assess time series data for structural breaks. | Examine potential shifts or breaks in the time series of inflation targeting and employment, impacting relationship dynamics. |
| Autocorrelation Function and Power Spectral Density | Compare a signal to its time-shifted form, identifying frequency components in the frequency domain. | Analyse cyclic patterns and periodicity in time series data, exploring how inflation targeting affects employment dynamics in the retail industry. |
| Cointegration Tests, Vector Autoregression and Vector Error Correction Model | Test the long-run equilibrium relationship between inflation targeting and unemployment, analyse cointegrating relationships, and assess short-run and long-run effects on retail sector employment, considering endogeneity and interdependence. | Investigate relationships between inflation targeting and employment variables, providing insights into long-term equilibrium and dynamics of interest rates, inflation, and retail employment dynamics. |

| Test | Objective | Mapping Tests to Objectives of the Study (Research Questions and Hypotheses) |
|---|---|---|
| Granger Causality Tests | Establish causal relationships between study variables. | Supports the study to determine causal linkages between inflation targeting and employment, addressing the objective of understanding relationship dynamics. |
| Stability Tests | Evaluate temporal stability of relationships between variables. | Examine robustness over time, supporting investigation into the long-term impact of inflation targeting on employment in South Africa's retail industry. |
| Diagnostic Tests | Identify stochastic features of estimates, such as serial correlation, heteroscedasticity, and normalcy. | Ensure reliability of statistical estimates for inflation targeting and employment variables, contributing to the validity of the analysis. |
| Autocorrelation tests | Determine if residuals exhibit significant autocorrelation. | Evaluate independence assumption in the regression model, addressing the robustness of the analysis for inflation targeting and employment variables. |
| Heteroscedasticity tests | Assess if residual variance varies predictably with the dependent variable level. | Explore systematic variations in residual variance, providing insights into the stability of relationships over time for inflation targeting and employment. |
| Impulse Response Functions | Examine dynamic relationships between variables. | Explore dynamic interplay between inflation targeting and employment, contributing to nuanced understanding of impact over time. |

**Source**: Researcher's Own Presentation

## 3.3 Assumptions

The quantitative method assumes that the data utilised in the study is accurate and reliable. Additionally, it presupposes that the associations between the variables are linear and that the data fulfill the prerequisites for statistical tests. Furthermore, the dataset for this study is sourced from reputable organisations like the South African Reserve Bank, Statistics South Africa, and the World Bank. These variables are complex and multifaceted concepts which are set to be measured using statistical methods.

Moreover, the quantitative approach makes the assumptions of a cause-and-effect relationship between variables, linearity between variables, and normal data distribution. These propositions are appropriate for this study as they are consistent with the theoretical framework and models utilised in the investigation. Additionally, statistical tools, such as hypothesis testing and goodness-of-fit tests, are utilised to address the research questions. Overall, the use of a quantitative methodology is justifiable for this study because it permits a rigorous examination of the effect of inflation targeting on employment in South Africa's retail industry.

## 3.4 Justification

The quantitative approach is suitable for this study because it permits the collection of numerical data and the application of statistical analysis. Further, the quantitative methodology is apt for this research, as it allows rigorous data analysis and estimation of causal relationships. The identified relevant theoretical frameworks are based on quantitative data and require the use of statistical methods to estimate relationships between the variables.

In addition, this method is appropriate for examining the impact of inflation targeting on employment in the retail industry due to its allowance for the analysis of large datasets, which is necessary for identifying patterns and relationships that may not be apparent through qualitative analysis. This methodology also permits the testing of hypotheses and the extrapolation of findings to a larger population. The quantitative method allows statistical inference to be used to draw population level conclusions from a sample of data. This enables the findings to be generalised to a larger population.

## 3.5 Research Design

As alluded to in prior sections, the study employs time series analysis. The appropriateness of time series analysis lies in its capacity to employ econometric methods for estimating the temporal cause-and-effect connection between inflation targeting and unemployment in the retail sector. Time series analysis enables the examination of the dynamics of the variables of interest and facilitates hypotheses testing concerning the influences of inflation targeting on the economy, particularly the labour market in the retail industry (Roger, 2009).

The time series analysis has several benefits. First, it allows for the recognition of patterns and trends in the data across different time periods, facilitating an examination of the short and long-term effects of inflation targeting on employment. Second, this approach is essential for estimating parameters in econometric models, including the coefficient of determination, providing a metric for assessing the strength of the relationship between variables. Thirdly, it permits the estimation of the impacts of various policy interventions, such as changes in interest rates or inflation targets on employment (Petropoulos et al., 2022).

There are, however, shortcomings to the time series analysis. First, it assumes the data is stationary and the relationship between variables is linear. Non-stationarity and non-linear relationships can result in erroneous estimations of parameters and incorrect conclusions. Second, the design is susceptible to the issue of spurious correlation, which occurs when two variables appear to be causally related, but their relationship is actually due to chance. In addition, the design presumes that the variables are independent, which may not be the case (Petropoulos et al., 2022). Despite these limitations, the time series analysis design is suitable for this study since it provides a rigorous method for examining the effects of inflation targeting on employment in the South African retail sector.

The overall research strategy and data collection methodology for this study is illustrated in the diagram in **Appendix I**.

## 3.6 Data Analysis: Econometric Instruments or Statistical Methods

This subsection is organised as follows: first, a concise exploration of stationarity and unit root testing using the Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), Phillips-Ouliaris (PO), and Zivot-Andrews (ZA) tests; second, an overview of autocorrelation analysis to measure a degree to which a

time series is correlated with its own lagged value; and third, a discussion of cointegration tests.

To ensure the study provides a comprehensive conclusion, an overview of VECM to model the joint behaviour of time series and the cointegrating relationship as well as short-run dynamics between the variables are provided. Furthermore, an in-depth analysis of impulse response, granger causality, stability and diagnostic checks are also provided to give additional insights into the properties of the model and data and to ensure reliability and robustness of the results.

### 3.6.1 Testing for Stationarity and Unit Root

According to Hamilton (1994), stationarity is a statistical property of a time series in which the structure of the mean, variance, and autocorrelation remains constant over time. In a stationary time series, both the mean and variance remain constant, and the covariance between two time points is solely dependent on the time difference between them, disregarding absolute time.

Unit root testing is an essential step in evaluating time series data. The presence of a unit root in a time series signals non-stationarity and the manifestation of random walk behaviour. Therefore, it becomes imperative to ascertain the integration order of the data before embarking on any analysis or modeling, as emphasised by Caporale and Gil-Alana (2019). While the Augmented Dickey-Fuller (ADF) test is commonly employed for unit root testing, this study recognises its limitations, such as low power and a lack of consideration for potential autocorrelation in the error process. To address these shortcomings, the study supplements the ADF results with other econometric tests, including the Kwiatkowski-Phillips-Schmidt-Shin (KPSS).

Furthermore, this study also checks the necessity to employ the Philips-Perron (PP) model for ascertaining the presence of a unit root in the time series data. Although the Philips-Perron test is comparable to the Augmented Dickey-Fuller test, it employs a distinct method for calculating regression parameters. PP tests are also susceptible to autocorrelation in the error process, like ADF tests. As a result, the Philips-Ouliaris model, a variation of the Philips-Perron model, is used to examine the trend in time series employed in this study.

Finally, if there is a structural break detected in the time series data, the Zivot-Andrews (ZA) test is employed to examine the existence of such a break. The ZA tests accommodate the potential occurrence of a single structural break in the data and are utilised to pinpoint the timing of this break, as outlined by Chen et al. (2021).

Accordingly, Feng, and Serletis (2019) resolved that further to testing for unit roots, it is also essential to test for stationarity. Non-stationarity is signaled by the presence of a unit root, while stationarity is indicated when there is absence of a unit root. Therefore, this study tests both the unit root and stationarity hypotheses when evaluating time series data.

This study utilises models of random walk and trend stationarity, commonly employed to denote the non-stationary nature of a series.

(1) According to the random walk model, the series possesses a unit root, signifying non-stationarity and the manifestation of random walk behaviour. Typically expressed by the equation:

$$\mathbf{Y_t = Y_{(t-1)} + \mathcal{E}_t} \quad \textbf{(4)}$$

where, $Y_t$ is the series value at time t, $Y_{(t-1)}$ is the lagged value of the series at time t-1, and $\mathcal{E}_t$ represents the error term.

(2) In the trend stationary model, it is necessary to eliminate a deterministic trend from the series to achieve stationarity. Typically, the trend stationary model is represented by the equation:

$$\mathbf{Y_t = \alpha + \beta_t + \mathcal{E}_t} \quad \textbf{(5)}$$

where, α and β are constants representing the intercept and slope of the trend, t is the time variable, and $\mathcal{E}_t$ is the error term. By differentiating the series, the deterministic trend is eliminated in this model.

Before proceeding with analysis or modelling, it is essential to determine which model best explains the behaviour of the time series data. Traditional statistical methods that assume stationarity cannot be employed if the series exhibits random walking behaviour. Alternatively, if the series exhibits a stationary trend, appropriate transformations, such as differencing, are applied to make the series stationary and amenable to conventional statistical methods.

As outlined in the previous section, the ADF technique is applied to test the unit root of time series, the KPSS test supplements the ADF results, and where necessary, the PP test is

explicitly employed to calculate regression parameters. The PO model examines the trend in time series, and the ZA test is applied to determine structural breaks in time series data.

According to several studies, a shortcoming of Dickey-Fuller tests is their failure to consider potential autocorrelation in the error process, $\mathcal{E}_t$. In cases where $\mathcal{E}_t$ exhibits autocorrelation, the ordinary least squares (OLS) estimates of coefficients tend to be inefficient, and the t-statistics become skewed. Considering this perspective, ADF tests are implemented and are, of course, favoured over Dickey-Fuller statistics. ADF test statistics supplement Dickey and Fuller's work from 1976 and 1979, respectively (Hamilton,1994; Gujarati & Porter, 2009).

The Dickey-Fuller model, used to determine the stationarity or non-stationarity of a time series, relies on the autoregressive model of order1 (AR (1)) which is expressed as follows:

$$\mathbf{y_t = \rho * y_{(t-1)} + \varepsilon_t} \quad \mathbf{(6)}$$

where, $y_t$ represents the value of the time series at time t, ρ is the autoregressive coefficient, $y_{(t-1)}$ is the lagged value of the time series at time t-1, and $\varepsilon_t$ is the error term at time t. Further, the Dickey-Fuller test assesses the null hypothesis, which posits that the autoregressive coefficient is equal to 1 (indicating non-stationarity in the time series), in comparison to the alternative hypothesis, which suggests that the coefficient is less than 1, signifying stationarity in the time series. This can also be stated as:

**$H_0$: ρ = 1** (non-stationary)

**$H_a$: ρ <** 1 (stationary)

The test statistic of the Dickey-Fuller (DF) test is obtained from the t-distribution and is formulated as:

$$\mathbf{DF = (y_t - y_{(t-1)})/s_t} \quad \mathbf{(7)}$$

where, $s_t$ represents the standard deviation of the initial differences of the time series and is defined by formula:

$$\mathbf{s_t = \sqrt{(1/(n-1)\ (n-1)\ \Sigma(y_t - y_{(t-1)} - (y_{(t-1)} - y_{(t-2)}))^2)}} \quad \mathbf{(8)}$$

The null hypothesis of non-stationarity is rejected in favour of the alternative hypothesis of stationarity if the computed DF value is less than the critical value from the t-distribution at a specified significance level. It is important to note that the Dickey-Fuller test can be expanded to incorporate higher-order autoregressive models and additional variables in the regression equation. However, the fundamental principle of the test remains consistent: assessing whether a time series is stationary or non-stationary based on its autocorrelation behaviour.

In the KPSS tests, the null hypothesis assumes stationarity of time series, with the alternative hypothesis suggesting non-stationarity. The test statistic, based on the sum of squared deviations from the estimated mean, is given by:

**KPSS = (1/T) Σ[($y_t$ - μ)^2]** **(9)**

where, $y_t$ denotes the value of the time series at time t, μ is the estimated mean, and T is the length of the time series.

Under the null hypothesis positing stationarity, the KPSS test statistic conforms to a chi-squared distribution. When the computed KPSS value surpasses the critical value from the chi-squared distribution at a designated significance level, the null hypothesis of stationarity is rejected, favouring the alternative hypothesis of non-stationarity. Overall, the KPSS test, used alongside ADF tests, provides a comprehensive analysis of a time series' stationarity properties, encompassing the presence of unit roots and other forms of non-stationarity.

This study uses multiple tests to assess the stationarity properties of a time series, rather than relying on a single test. This is because different tests have different assumptions and can have different power to detect various forms of non-stationarity. Especially, if ADF and KPSS tests produce conflicting results and provide evidence of structural breaks as well as other forms of non-stationarity, additional tests such as the PP, PO or ZA tests will be conducted to provide further information.

The sequential steps in case of conflicting results of ADF and KPSS as well as evidence of structural breaks will follow the structure as outlined in the next sections.

### 3.6.2 Phillips-Perron (PP) test

First: Perform a regression analysis using the first difference of the time series against the lagged levels of the same time series and save the resulting residuals.
Second: Use these residuals to calculate the test statistic, expressed as:

**PP = [(n^1/2) * T * ∑(r_i/T)^2] / (2 * ∫_0^∞ [K(z)^2]dz)^(1/2)** **(10)**

where, n denotes the number of lags used in the regression, T represents the sample size, $r_i$ stands for the residuals, and K(z) is the kernel function. The test statistics adhere to a non-standard distribution, necessitating the retrieval of critical values from statistical tables.
Third: Examine the computed PP statistic against the critical values to ascertain whether the null hypothesis of a unit root can be rejected in favour of asserting stationarity.

### 3.6.3 Philips-Ouliaris (PO) test

Step 1: Select a maximum number of structural breaks and apply the Bai-Perron algorithm to examine the time series for structural breaks.
Step 2: Segment the time series at the identified breakpoints and perform an individual Augmented Dickey-Fuller (ADF) test on each segment.
Step 3: Use the outcomes of the ADF tests to calculate the test statistic, as expressed by:

**PO = [(n^1/2) * T * ∑(ADF$_i$/T)] / (2 * ∫_0^∞ [K(z)^2]dz)^(1/2)** **(11)**

where, n signifies the number of segments, T is the sample size, and $ADF_i$ represents the ADF test statistics for each segment. As with the PP test, the test statistic adheres to a non-standard distribution, requiring the acquisition of critical values from tables or simulations.
Step 4: Compare the calculated PO statistic with the critical values to assess whether the null hypothesis of a unit root can be rejected in favor of asserting stationarity.

### 3.6.4 Zivot-Andrews (ZA) test

First: Perform a regression analysis of the time series against a constant, a trend, and an indicator variable that takes the value 1 for all observations after a specified date and 0 otherwise.
Second: Use the residuals obtained from the regression to calculate the test statistic, expressed as:

**ZA = [(n^1/2) * T * (log(T))^0.5 * ∑(r$_i$/T)^2] / (2 * ∫_0^∞ [K(z)^2]dz)^(1/2)** **(12)**

where, n represents the number of lags used in the regression, T is the sample size, $r_i$ stands for the residuals, and K(z) denotes the kernel function. The test statistics adhere to a non-standard distribution, so critical values will be obtained from statistical tables and through Monte Carlo simulations.
Third: Compare the calculated ZA statistic with the critical values to assess whether the null hypothesis of a unit root can be rejected in favor of asserting stationarity.

### 3.6.5 Autocorrelation Function and Power Spectral Density

Signal processing and time series analysis employ the statistical techniques of autocorrelation and spectral analysis. Autocorrelation examines the similarity between a signal and a time shifted version of itself, whereas spectral analysis identifies the frequency components of a

signal in the frequency domain. These techniques are effective for retrieving information regarding a signal's periodicity and frequency content (Hamilton, 1994).

The investigation of the impact of inflation targeting on employment utilises both the autocorrelation function (ACF) and power spectral density (PSD) to measure the serial dependence and cyclic behaviour to offer valuable insights into the dynamics of inflation targeting, and employment. According to Hamilton (1994), ACF assesses the correlation between a time series and its past values across various time intervals. Its utility lies in identifying serial dependence within a time series, providing insights into how preceding values of a variable impact its present value. The PSD, on the other hand, provides information about the frequency content of a time series. It decomposes a time series into its constituent frequencies and shows how much of the total variation in the data is accounted for by each frequency component. To model the ACF and PSD, the following equations are employed in this study:

**(1) ACF(k) = Cov($Y_t$, Y{t-k}) / Var($Y_t$)** **(13)**

where, Cov($Y_t$, Y{t-k}) represents the covariance between the time series at time t and time t-k, while Var($Y_t$) denotes the variance of the time series at time t.

**(2) PSD(f) = |F(f)|^2** **(14)**

where, PSD(f) is the power spectral density at frequency f, and |F(f)|^2 is the squared magnitude of the Fourier transform properties of the time series at frequency f.

According to Box et al. (2015), the lagged effects, seasonal effects and structural breaks are some of the factors which cause the autocorrelation between two or more variables. Consequently, this study uses the Durbin-Watson (DW) statistical tests to check for the correlation between inflation targeting (interest and inflation rates) and employment. The Breusch-Godfrey (BG) test is also adopted to complement the DW tests. It must be noted, however, that these tests have their limitations and must be used in conjunction with other diagnostic tests and visual inspection of the time series data.

The test statistic for the DW and BG tests will be calculated as follows:

**DW = (sum of squared differences between adjacent residuals) / (sum of squared residuals).** **(15)**

The Durbin-Watson test statistic has a range of 0 to 4, and values close to 2 imply the absence of significant autocorrelation. Values below 2 indicate positive autocorrelation, while

values above 2 indicate negative autocorrelation. BG tests follow the econometric equation below:

**BG = n * R^2** **(16)**

where, n represents the sample size, and R^2 stands for the coefficient of determination derived from an additional regression where residuals are regressed on lagged values of the residuals. The BG test statistic adheres to a chi-squared distribution, with degrees of freedom corresponding to the number of lags tested.

### 3.6.6 Cointegration Tests, VAR, and Vector Error Correction Model

Johansen, (1988) defined cointegration as a statistical technique used to assess the long-term equilibrium relationship between two or more time series variables. If two or more variables are cointegrated, it indicates a persistent relationship, signifying that they move together in the long run, despite potential short-term divergences.

For this study, the cointegration analysis is conducted using the Johansen procedure which involves estimating a vector autoregressive (VAR) model and testing for the number of cointegrating relationships using likelihood ratio tests. If cointegration is detected, vector error correction models (VECM) are employed to estimate the short-run and long-run dynamics between the variables. According to Johansen (1991), VECMs allow for the analysis of both the short-run and long-run effects of inflation targeting on employment in the retail sector, while also accounting for potential endogeneity issues and the interdependence between these variables.

To derive estimations for the VAR model, this methodology relies on the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The AIC and BIC values are determined through the following equations:

**AIC = ln(det(Sigma_u)) + (2/T)*p** **(17)**

**BIC = ln(det(Sigma_u)) + (log(T)/T)*p** **(18)**

where, det(Sigma_u) is the determinant of the residual covariance matrix, T is the number of observations, and p is the number of parameters in the VAR model.

As discussed in the preceding subsection, this study examines cointegration through the Johansen procedure to assess the number of cointegrating relationships between inflation targeting and employment. In the Johansen procedure, the null hypothesis posits the existence

of r cointegrating vectors in the system, where r is less than or equal to the rank of the matrix of coefficients in the vector error correction model. Conversely, the alternative proposition suggests the presence of r+1 cointegrating vectors. The Johansen procedure involves estimating two tests: the Trace test and the Maximum Eigenvalue test. The Trace test examines the null hypothesis of r cointegrating vectors, while the alternative hypothesis implies the presence of r+1 cointegrating vectors. Similarly, the Maximum Eigenvalue test assesses the null hypothesis of r cointegrating vectors, comparing it to the alternative hypothesis, which suggests the presence of r+1 cointegrating vectors. The determination of the appropriate number of cointegrating vectors involves comparing the test statistics with critical values from the relevant distribution (Johansen, 1991).

The rationale of adopting the Johansen approach is that it allows for testing for cointegration among multiple variables simultaneously, whereas other models such as the Engle-Granger approach only considers two variables at a time. Additionally, the Johansen procedure offers insights into the number of cointegrating relationships, in contrast to the Engle-Granger approach, which assumes a single cointegrating relationship (Engle & Granger, 1987; Johansen, 1991).

Furthermore, the Johansen procedure has been found to have better small sample properties compared to the Engle-Granger approach, especially in cases where the variables have different orders of integration. The Johansen procedure also permits for testing for the presence of structural breaks in the cointegrating relationships, which is not possible with the Engle-Granger approach. Therefore, the Johansen procedure is preferred over the Engle-Granger approach when testing for cointegration in this study which involves multiple variables (i.e., the interest rates, inflation (CPI), and employment in the retail sector).

As an extension of the vector autoregressive model – which has been applied to assess the short-term dynamics among the specified variables in this study, the vector error correction model is employed to analyse both short and long-term dynamics among a set of cointegrated variables. This model is estimated through the Ordinary Least Squares (OLS) method and offers insights into the relationships over both short and long durations. Upon determining the optimal lag order using the Akaike Information Criterion (AIC) or the Bayesian Information Criterion (BIC), the VECM is estimated using the OLS method, following this equation:

$$\mathbf{\Delta Y_t = \Gamma 1 \Delta Y_{t-1} + \Gamma 2 \Delta Y_{t-2} + \ldots + \Gamma p \Delta Y_{t-p} + \Pi Y_{t-1} + \varepsilon_t} \qquad \mathbf{(19)}$$

where, $\Delta Y_t$ denotes the vector of the first differences of the variables, $\Gamma i$ represents the short-run dynamics, $\Pi$ is the long-run equilibrium relationship, and $\varepsilon t$ is the error term.

According to several studies (e.g., MacKinnon, 1991; Lütkepohl,2005), implementing the Johansen procedure involves four critical steps. Firstly, the order of integration for all variables in the series must be determined, as cointegration tests necessitate the variables to have the same order of integration before proceeding. Secondly, appropriate lags for the model should be chosen, and the rank of $\pi$ should be determined through evaluation and model identification. Thirdly, the normalised cointegrating vector(s) and speed of adjustment coefficients should be examined. Finally, informal tests should be conducted on the vector error correction model to ensure that the estimated model is reasonable and to determine the number of cointegrating vectors. Upon confirming cointegration, the vector error correction model can be utilised to analyse the long and short-term effects of the variables. According to Stock and Watson (1993) and Enders (2008), first differencing can eliminate important information present in the cointegration relationships.

In order to provide additional insights into the properties of the model and data, and to ensure reliability and robustness of the results, this study adopts the Granger causality test, stability tests, diagnostic tests such as autocorrelation and heteroscedasticity tests, and the impulse response analysis.

### 3.6.7 Granger Causality Tests

Granger Causality tests are utilised to establish the causal relationships between variables. This study adopts a commonly used econometric equation, a multivariate time series model that captures the dynamic relationship between variables over time, to conduct Granger causality tests (the VAR model).

The following VAR model will be utilised for the Granger causality test:

$$\mathbf{Y_t = A1Y_{t-1} + A2Y_{t-2} + \ldots + ApY_{t-p} + B1X_{t-1} + B2X_{t-2} + \ldots + BqX_{t-q} + u_t} \quad \textbf{(20)}$$

where, Y denotes the dependent variables (such the unemployment rates in the retail industry), X represents the independent variable, p represents the lag length for the dependent variables, q denotes the lag length for the independent variable, and $u_t$ represents the error term.

### 3.6.8 Stability Tests

Stability tests are essential for evaluating the temporal stability of relationships between variables. Stability tests helps to determine whether the relationships between inflation targeting policy framework, and employment have remained stable over time or shifted as a result of changes in economic conditions or policy interventions.

The study uses time series data for the variables and estimate rolling window regression to conduct stability tests. The relevant econometric equation for the rolling window regression model to be employed for this study will be:

$$\mathbf{Yt = \beta 0,t + \beta 1,tX1t + \beta 2,tX2t + \ldots + \beta k,tXkt + \varepsilon t,} \quad \mathbf{(21)}$$

where, Yt represents the dependent variable, X1t, X2t, …, Xkt are the independent variables, β0,t is the intercept term, β1,t, β2,t, …, βk,t are the coefficients of the independent variables, and εt is the error term at time t. The Chow test is employed to assess whether the coefficients of the model remain stable over time or exhibit significant changes.

Stability tests employed in this study are set to provide insights into the consistency over time of the connections between inflation targeting policy and employment in the retail sector. By identifying periods of instability and changes in the relationships between variables, these tests contribute to policymakers and investors' understanding of the dynamics of the South African economy.

### 3.6.9 Diagnostic Tests

In analysing the effects of the SARB's inflation targeting policy on employment, diagnostic tests play a crucial role. These analyses do not only provide additional confirmation of the estimated model results, but also aid in assessing the stochastic properties of the estimates, which include serial correlation, heteroscedasticity, and normality (Khan, 2020). Diagnostic analyses are crucial not only in econometrics, but also in other fields that employ linear regression. Checking the goodness-of-fit of time series data is essential, and repeated analyses are advised to guarantee the dependability of the backup plan (Tsay, 2005). Furthermore, the null hypothesis is almost always refuted when sufficient data are available. The focus should not be on whether the model is incorrect (as this is almost always the case), but on whether the irregularities are significant (Khan, 2020).

### (1st) Autocorrelation tests

Autocorrelation tests are necessary for assessing the impact of the SARB's inflation targeting framework on employment. These tests determine whether the residuals from the regression analysis exhibit significant autocorrelation, indicating a violation of the regression model's independence assumption (Hamilton, 1994). Statistically significant autocorrelation indicates that the model is misspecified and that standard errors and p-values may be biased. Autocorrelation tests utilise a variety of test statistics, such as the Durbin-Watson statistic for first-order autocorrelation (Durbin & Watson, 1950) and the Ljung-Box statistic and the Breusch-Godfrey test for higher order autocorrelation (Ljung & Box, 1978; Breusch & Godfrey, 1981). Both time series and cross-sectional data are compatible with these tests. As per outline in the previous sections, BG-Breusch Godfrey tests are suitable for this study.
In conclusion, autocorrelation tests provide crucial insights into the validity of the regression model and contribute to enhancing the precision of estimates and the dependability of the results.

### (2nd) Heteroscedasticity tests

Incorporating heteroscedasticity tests into the analysis of SARB's inflation targeting framework is poised to shed light on the nature of the policy framework's relationship with employment in South Africa. In particular, these tests determine if the variance of the residuals in the regression model varies systematically with the level of the dependent variable or one or more independent variables, indicating the presence of heteroscedasticity. According to Greene (2003) and Wooldridge (2016), the estimation of regression coefficients can be accomplished through weighted least squares regression. This method involves assigning weights to each observation based on their variance, allowing for the consideration of heteroscedasticity. Employing this approach can lead to a more accurate and reliable estimation of the model's parameters, thereby improving the precision of any conclusions derived from the results.

The Breusch-Pagan test, widely employed for assessing heteroscedasticity, examines the existence of non-constant variance by regressing the squared residuals from the initial regression onto the independent variables in the model. The White test, a generalisation of the Breusch-Pagan test that allows for the possibility of cross-sectional correlation in the errors,

is another commonly used test. Therefore, the heteroscedasticity tests for this study will adopt these methods.

### 3.6.10 Impulse Response Functions (IRFs)

Impulse response analysis is a crucial tool in econometrics for examining the dynamic relationships between variables, especially in the context of time series data (Hamilton, 1994). Impulse response checks provide additional insight into the long-term impact of the policy framework on employment in the retail sector.

Further, impulse response tests involve estimating the dynamic response of one or more variables to a shock or change in another variable, while controlling for other variables. This helps to identify any short or long-term effects of the policy framework on employment, as well as any potential spill-over effects or interactions between these variables.

The vector autoregression model, which allows for the estimation of the dynamic response of multiple variables to a shock in one or more variables, is a common method for conducting impulse response checks. The vector autoregressive model is estimated using the ordinary least squares and maximum likelihood.

To conduct impulse response checks with the VAR model, this study estimates the model parameters using a dataset of pertinent variables and then simulates the dynamic response of the variables to a shock in one of the variables. The resulting impulse response function is then plotted, illustrating the time varying dynamic response of the variables to the shock.

## 3.7 Conclusion

This chapter has presented a comprehensive overview of the research methods that are set to be employed to assess the impact of the SARB inflation targeting on unemployment rates in the South African retail sector. It should be emphasised that conducting tests, such as the stationarity and cointegration, and heteroscedasticity tests is critical to ensuring the dependability and validity of the estimated models. The presence of serial correlation in the data was also highlighted, as it could lead to biased and inconsistent estimates. These insertions contribute to a more comprehensive understanding of how inflation targeting impacts employment in the South African retail sector and guide policymakers on how best to achieve sustainable economic growth and job creation.

Further, this chapter has stressed the importance of conducting Granger causality tests to investigate the causal relationship between South Africa's policy framework and employment in the retail industry. Moreover, the significance of performing diagnostic tests to investigate the stochastic properties of the estimated models and to identify any potential misspecification or model deficiencies was discussed. Finally, the chapter also highlighted the importance of conducting impulse response checks with the vector autoregression model to investigate the dynamic relationships between variables and to determine the short- and long-term effects of the policy framework on employment in South Africa. These tests play a crucial role in guaranteeing the precision and dependability of the study's outcomes, which, in turn, can guide policy decisions aiming to foster sustainable economic development and job creation in the retail sector in South Africa.

This chapter's econometric tests are crucial in understanding the impact of SARB inflation targeting on employment in the country's retail sector. The results of these tests are slated to provide significant insights that can aid policymakers in making informed decisions that promote sustainable economic development and job creation opportunities. By establishing a clear understanding of the impact of inflation targeting on employment in the retail sector, policymakers can determine the effectiveness of this policy framework and make necessary adjustments to promote positive outcomes.

# CHAPTER 4 – EMPIRICAL DATA ANALYSIS AND RESULTS

## 4.1 Introduction

In this chapter, the study shifts its focus from theoretical foundations to a thorough examination of empirical data analysis and the results thereof. This chapter serves as the crucible where theoretical assertions meet real world data, enabling a comprehensive exploration of the relationship between inflation targeting and unemployment within the South African retail sector. The statistical analyses employed in this chapter target to answer the primary research questions outlined in Chapter 1, namely (a) What is the impact of the SARB's inflation targeting framework on employment in South Africa's retail industry? and (b) To what extent does the SARB's inflation targeting policy implementation approach influence the impact in (a)?

The study thoroughly examines the empirical evidence using robust econometric tests and analytical methods. These include rigorous assessments of stationarity, cointegration, VECM, Granger causality, and impulse responses. In presenting clear and comprehensive interpretations, the research sheds light on resolving the hypotheses that have been developed in Chapter 2, namely (a) $\mathbf{H_0}$: There is no significant association between the South African Reserve Bank's inflation targeting framework and employment levels in South Africa's retail industry, (b) $\mathbf{H_1}$: The implementation of the South African Reserve Bank's inflation targeting framework has a significant impact on employment in South Africa's retail industry, and (c) $\mathbf{H_2}$: The approach adopted by the SARB in implementing its inflation targeting policy influences the extent of its impact on employment in South Africa's retail industry.

In this context, the application of econometrics models has utilised the key variables that are presented in the diagram below. **Figure 8** provides a flow chart of the monetary policy decisions, their connections to inflation targets and ultimately the flow into the retail industry.

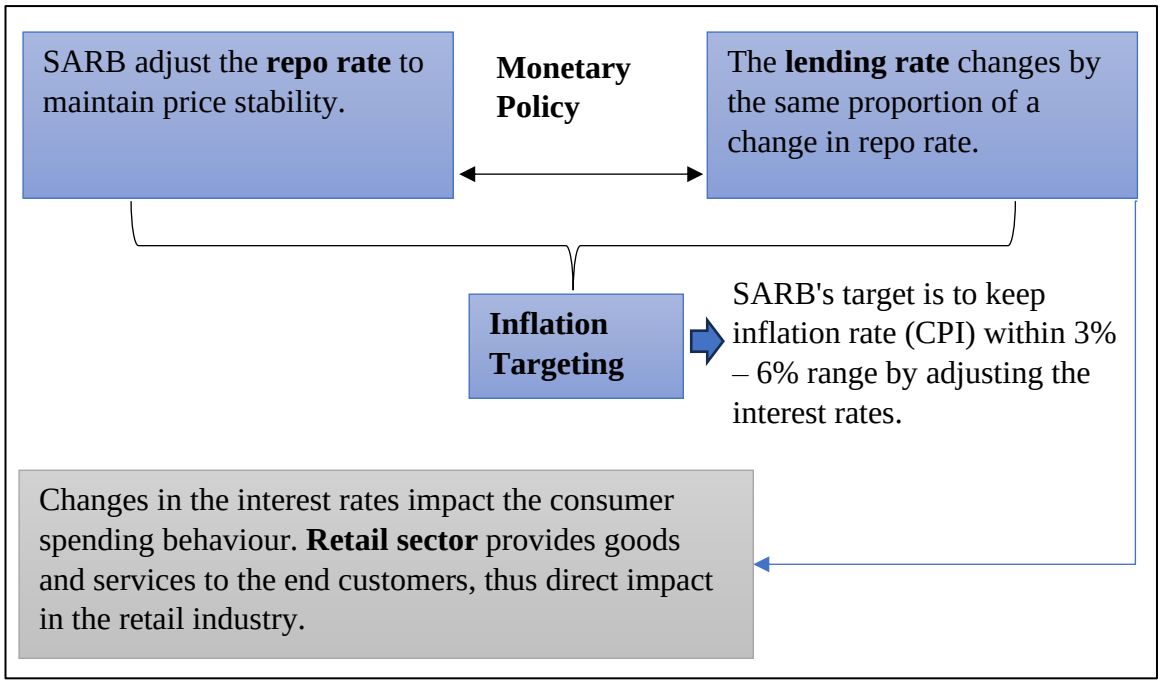



**Figure 8: Illustration of the Flow Chart of Monetary Policy Decisions' Impact on CPI and Retail Sector**

**Source**: Researcher's Own Graphical Presentation

## 4.2 The Unit Root Test Results (2000 – 2022)

Gujarati (2002) noted that the occurrence of a spurious regression is probable when non-stationary variables are utilised in estimating time series data. Therefore, in the examination of time series data, the initial stage focuses on evaluating the stationarity of the variables. This step holds significance for two primary reasons: firstly, establishing the order of integration is crucial for building econometric models and drawing precise inferences; secondly, economic theory posits that certain variables should adhere to a random walk or martingale process. In such instances, conducting thorough tests and accurately determining critical values is imperative (Brooks, 2008). There are two commonly utilised approaches to ascertain whether the stationarity of time series data exist: an informal graphical method and a formal testing method[5]. In this study, the analysis follows formal tests, namely: the ADF and KPSS techniques. The formal approach provides precise quantitative results, ensuring objective and reliable assessments of stationarity compared to the subjective nature of graphical methods.

[5](a) Informal techniques: visually represent the time series through a plot (correlogram). (b) Formal approaches: employ statistical tests to assess stationarity (utilising Dickey-Fuller tests).

It is important to note that, if variables exhibit stationarity after undergoing first differencing, this indicates that all variables are integrated at the same order (1) (Granger & Newbold, 1974). When variables are integrated at the same order, employing cointegration analysis is acceptable.

**Table 5: Unit Root Test: Augmented Dickey-Fuller (At Level) - Null Hypothesis: Variables have a Unit Root**

| **Order of Integration** | **Variables** | **ADF – Augmented Dickey-Fuller** | | | | | |
|---|---|---|---|---|---|---|---|
| | | Individual Intercept | | Individual Intercept and Trend | | None | |
| | | t-statistic | p-value | t-Statistic | p-value | t-Statistic | p-value |
| **AT LEVEL** | REPO_RATE | -2.263000 | 0.1920 | -3.294056 | 0.0945 | -0.910749 | 0.3107 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.788030 | | -4.467895 | | -2.674290 | |
| ***5% level*** | | -3.012363 | | -3.644963 | | -1.957204 | |
| ***10% level*** | | -2.646119 | | -3.261452 | | -1.608175 | |
| **AT LEVEL** | LENDING_RATE | -1.765391 | 0.3866 | -3.751268 | 0.0409 | -1.133451 | 0.2256 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.769597 | | -4.467895 | | -2.674290 | |
| ***5% level*** | | -3.004861 | | -3.644963 | | -1.957204 | |
| ***10% level*** | | -2.642242 | | -3.261452 | | -1.608175 | |
| **AT LEVEL** | INFLATION RATE | -4.110693 | 0.0056 | -4.122568 | 0.0218 | 0.345171 | 0.7739 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.831511 | | -4.532598 | 0.345171 | -2.699769 | |
| ***5% level*** | | -3.029970 | | -3.673616 | -2.699769 | -1.961409 | |
| ***10% level*** | | -2.655194 | | -3.277364 | -1.961409 | -1.606610 | |
| **AT LEVEL** | No. OF EMPLOYEES | -1.114654 | 0.6909 | -2.520399 | 0.3159 | 1.943527 | 0.9843 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.769597 | | -4.467895 | | -2.674290 | |
| ***5% level*** | | -3.004861 | | -3.644963 | | -1.957204 | |
| ***10% level*** | | -2.642242 | | -3.261452 | | -1.608175 | |

**Source**: Researcher's Own Computations (SPSS Statistics)

In the Augmented Dickey-Fuller tests, the null hypothesis posits the presence of a unit root, indicating non-stationarity in the variables. The Augmented Dickey-Fuller test statistic is then compared with critical values to assess whether the null hypothesis should be rejected. If the test statistic is more negative than these critical values, there is support for rejecting the null

hypothesis. Additionally, the p-value gauges the strength of evidence against the null hypothesis. When the p-value exceeds the chosen significance level[6] (typically 0.05), it indicates a failure to reject the null hypothesis, suggesting non-stationarity (Brooks, 2008).

As shown in **Table 5** above, the results of the Augmented Dickey-Fuller tests conducted at the level provide clear insights into the stationarity of the variables. For the repo rate variable, the ADF test statistic of -2.2630000 is greater (less negative) than the critical values at all significance levels (1%, 5%, and 10%), and the corresponding p-value of 0.1920 is higher than 0.05, confirming its non-stationary nature at the level. Similarly, the lending rate[7] variable exhibits non-stationary behaviour as its ADF t-statistic of -1.765391 exceeds the critical values at all significance levels, and the p-value of 0.3866 is also greater than significance level of 0.05.

In the contrast, the inflation[8] variable, with an ADF test statistic of -4.110693 and a p-value of 0.0056, is clearly stationary at the level, as both the test statistic and the p-value provide strong evidence to reject the null hypothesis of non-stationarity. Lastly, the employment variable for number of employees in the retail sector shows non-stationary behaviour at the level, indicated by its ADF test statistic of -1.114654, which is higher than the critical values at all significance levels, coupled with a p-value of 0.6909, signifying its non-stationary nature.

Therefore, the ADF results provides a confirmation of failure to reject the null hypothesis for the variables interest rates (both repo and lending), and the total number of employees in the retail sector.

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[6] Significance level: The predetermined threshold (α) in hypothesis testing, indicating the probability of rejecting a true null hypothesis. Common values include 0.01, 0.05, or 0.10 for different confidence levels.

[7] Lending rate: Interest rate charged by commercial banks to their most creditworthy customers, serving as a benchmark for various loans.

[8] Inflation: Rate at which the general level of prices for goods and services rises, targeted by central banks to maintain economic stability.

**Table 6: Unit Root Test: Augmented Dickey-Fuller (At First Difference) - Null Hypothesis: Variables have Unit Root**

| Order of Integration | Variables | ADF – Augmented Dickey-Fuller | | | | | |
|---|---|---|---|---|---|---|---|
| | | Individual Intercept | | Individual Intercept and Trend | | None | |
| | | t-statistic | p-value | t-statistic | p-value | t-statistic | p-value |
| **AT 1st DIFF.** | REPO_RATE | -4.196921 | 0.0044 | -4.089227 | 0.0222 | -4.100596 | 0.0003 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.808546 | | -4.498307 | | -2.685718 | |
| ***5% level*** | | -3.020686 | | -3.658446 | | -1.959071 | |
| ***10% level*** | | -2.650413 | | -3.268973 | | -1.607456 | |
| **AT 1st DIFF** | LENDING_RATE | -4.550853 | 0.0020 | -4.126450 | 0.0228 | -4.291610 | 0.0002 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.808546 | | -4.571559 | | -2.685718 | |
| ***5% level*** | | -3.020686 | | -3.690814 | | -1.959071 | |
| ***10% level*** | | -2.650413 | | -3.286909 | | -1.607456 | |
| **AT 1st DIFF** | INFLATION RATE | -6.551739 | 0.0000 | -6.470718 | 0.0003 | -6.843008 | 0.0000 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.857386 | | -4.571559 | | -2.699769 | |
| ***5% level*** | | -3.040391 | | -3.690814 | | -1.961409 | |
| ***10% level*** | | -2.660551 | | -3.286909 | | -1.606610 | |
| **AT 1st DIFF** | No. OF EMPLOYEES | -3.927648 | 0.0074 | -3.948756 | 0.0280 | -3.356395 | 0.0019 |
| ***1% level*** | TEST-CRITICAL_VALUES | -3.788030 | | -4.467895 | | -2.679735 | |
| ***5% level*** | | -3.012363 | | -3.644963 | | -1.958088 | |
| ***10% level*** | | -2.646119 | | -3.261452 | | -1.607830 | |

**Source**: Researcher's Own Computations (SPSS Statistics)

Upon a thorough examination of the findings laid out in **Table 6**, it is discernible that the variables in focus exhibit diverse patterns of stationarity. After the first difference, there is a marked decrease in the p-values for all variables, indicating a substantial improvement in their stationarity status. This reduction underscores the efficacy of first differencing in transforming the variables into stationary processes. Thus, the inference being that the null hypothesis of unit root of the variables is rejected.

In a nutshell, the paramount insight gleaned from these results lies in the effectiveness of the first differencing technique in ensuring the stationarity of the variables, forming a robust

foundation for subsequent analyses within the study. This underscores the critical role of judicious differencing methods in guaranteeing the stability of time series data, thereby bolstering the credibility and reliability of the study's conclusions.

### 4.3 The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) Tests (2000 – 2022)

Conducting the Kwiatkowski-Phillips-Schmidt-Shin tests provides a complementary perspective on the stationarity of the variables. The KPSS test is employed to check for stationarity around a deterministic trend. Unlike the ADF test, which tests for stationarity around a stochastic trend (a unit root), the KPSS test examines whether a series is stationary around a deterministic trend. **Table 7** below presents the KPSS tests for the variables under consideration — interest rates, inflation (CPI), and employment in the retail sector.

As previously mentioned, the null hypothesis in the KPSS test asserts that the data exhibits stationarity around a deterministic trend. A low p-value signifies sufficient evidence to reject this null hypothesis. Therefore, with the p-values significantly lower than the chosen significance level (e.g., 1%, 5%, or 10%) as shown in **Table 7** below, the null hypothesis is rejected. This implies that the variables under consideration are not stationary around a deterministic trend.

In a comparative study of the KPSS and ADF tests conducted by Sjösten (2022), it is imperative to underscore the conclusion reached, which elucidates that both the KPSS and ADF tests exhibit limitations in terms of low statistical power and size distortion. Notably, these issues persist across various time series lengths, particularly manifesting challenges when the time series incorporates a trend or comprises a process encompassing both autoregressive and moving average components. However, their study discerns no conclusive evidence regarding the superiority of one test over the other; instead, the effectiveness of either test is contingent upon factors such as sample size, parameter values, and the nature of the Autoregressive Integrated Moving Average (ARIMA) process under consideration. The absence of definitive superiority between the two tests implies that employing both allows for a more robust evaluation of variables under consideration for this study.

**Table 7: KPSS Tests (At Level) - Null Hypothesis: Variables are Stationary**

| Order of Integration | Variables | KPSS – Kwiatkowski-Phillips-Schmidt-Shin | | | | | |
|---|---|---|---|---|---|---|---|
| | | Individual Intercept | | | Individual Intercept & Trend | | |
| | | LM-statistic | t-statistic Constant | p-value Constant | LM-statistic | t-statistic Trend | p-value Trend |
| **AT LEVEL** | REPO_RATE | 0.555940 | 14.27542 | 0.0000 | 0.085322 | -4.121988 | 0.0005 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT LEVEL** | LENDING_RATE | 0.571152 | 21.00638 | 0.0000 | 0.078001 | -5.965117 | 0.0000 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT LEVEL** | INFLATION RATE | 0.048077 | 11.24426 | 0.0000 | 0.047677 | -0.123532 | 0.9029 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT LEVEL** | No. OF EMPLOYEES | 0.644211 | 25.85702 | 0.0000 | 0.089431 | 15.69564 | 0.0000 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |

**Source**: Researcher's Own Computations (SPSS Statistics)

Following the inference from **Table 7** – the KPSS tests at first difference are conducted to check whether the variables are integrated of the same order after the first differencing method – and these are presented in **Table 8** below.

**Table 8: KPSS Tests (At First Difference) - Null Hypothesis: Variables are Stationary**

| Order of Integration | Variables | KPSS – Kwiatkowski-Phillips-Schmidt-Shin | | | | | |
|---|---|---|---|---|---|---|---|
| | | Individual Intercept | | | Individual Intercept and Trend | | |
| | | LM-statistic | t-statistic Constant | p-value Constant | LM-statistic | t-statistic Trend | p-value Trend |
| **AT 1st DIFF** | REPO_RATE | 0.203559 | -0.245991 | 0.8081 | 0.169858 | 0.333912 | 0.7419 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT 1st DIFF** | LENDING_RATE | 0.201555 | -0.768818 | 0.4506 | 0.169244 | 0.344583 | 0.7340 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT 1st DIFF** | INFLATION RATE | 0.254527 | 0.140638 | 0.8895 | 0.225292 | 0.274426 | 0.7866 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |
| **AT 1st DIFF** | No. OF EMPLOYEES | 0.113683 | 2.222736 | 0.0373 | 0.082031 | -0.668541 | 0.5114 |
| ***1% level*** | ASYMPTOTIC-CRITICAL_VALUES | 0.739000 | | | 0.216000 | | |
| ***5% level*** | | 0.463000 | | | 0.146000 | | |
| ***10% level*** | | 0.347000 | | | 0.119000 | | |

**Source**: Researcher's Own Computations (SPSS Statistics)

As shown in **Table 8**, the KPSS test illuminates the stationarity characteristics of the variables under scrutiny in terms of both individual intercept and trend components. It is evident that the KPSS LM statistics for the independent variables (repo, lending, and inflation rate) as well as dependent variable (employment in the retail sector) surpass the asymptotic critical values at 1%, 5%, and 10% significance levels. The null hypothesis of the KPSS test is that the series is stationary around a deterministic trend, thus the KPSS LM statistics in this case indicate failure to reject the null hypothesis.

The results obtained from the KPSS tests confirm the presence of stationarity in all variables, indicating stability in both the intercept and trend components. This highlights the enduring patterns within the time series data. Consequently, the outcomes detailed in **Table 8** emphasise the stable characteristics of the variables, offering valuable insights into their fundamental behaviours.

Following the comprehensive analysis using both the ADF and KPSS tests, it is noticeable that the variables under study demonstrate stationary behaviour. The ADF tests, which focus on detecting a unit root (non-stationarity around a stochastic trend), were complemented by the KPSS tests, which assess stationarity around both individual intercept and trend components. The ADF tests revealed non-stationarity at the level but achieved stationarity for all variables after the first differencing. Subsequently, the KPSS tests confirmed the stationarity of the time series around both individual intercept and trend components, aligning with the ADF test results.

Given that the ADF and KPSS tests produce complementary results, confirming stationarity without conflicting outcomes or evidence of structural breaks, there is no need to perform additional tests such as the PP, PO, or ZA tests. The consistent findings from ADF and KPSS tests provide sufficient evidence regarding the stationarity of the data. Additional tests are typically employed when there are conflicting results or indications of structural breaks or other forms of non-stationarity. However, in this case, the alignment between ADF and KPSS results strengthen the confidence in the conclusion of stationarity, rendering further stationarity tests unnecessary.

### 4.4 Summary Statistics and Normality Tests

In the realm of statistical analysis, and in particular for this study – normality tests serve as crucial tool to assess whether a dataset conforms to a normal distribution, a fundamental assumption in many statistical techniques (Shapiro & Wilk, 1965). Understanding the normality of data is particularly pertinent in empirical studies, such as the exploration of economic phenomena like the relationship between inflation targeting framework and unemployment in retail industry. Further, in the context of this study, employing normality tests becomes essential to validate the assumption of normality within the datasets under examination.

In this subsection, the normality of the datasets is assessed through various statistical tests, putting special focus on the visual aids such as histograms[9]. Histograms, which provide a graphical representation of the data distribution, are preferred due to their ability to illustrate the shape, spread, and skewness of the data (Smith, 2008). The visual nature of histograms enhances understanding of the dataset's distribution, making it easier to interpret deviations from normality and aiding in the decision-making process regarding appropriate statistical methods.

According to the visuals presented in **Figure 9** below, it can be confirmed that interest rates and inflation (CPI) exhibit bell-shaped curves in their histograms. This suggests that the three variables (repo, lending, and inflation rates) demonstrate a relatively symmetric distribution, indicating a closer adherence to a normal distribution. The variable depicting total number of employees in the retail sector, as indicated by the histogram, displays some non-symmetric patterns, suggesting potential deviations from normality. These observations highlight the importance of rigorous statistical tests to confirm the normality assumptions for these variables.

In analysing retail sector employee numbers, it is justified not to transform the data. Employee counts, being non-negative integers, often follow Poisson or negative binomial distributions, making them suitable for analysis without transformation (Cameron & Trivedi, 2013). Transforming the data may lead to non-integer values, hindering meaningful interpretation in the context of employee counts (Hair et al., 2014).

[9] Histograms: Graphical representations illustrating the distribution of a dataset. They display frequency of values, offering a visual overview of the dataset's pattern.

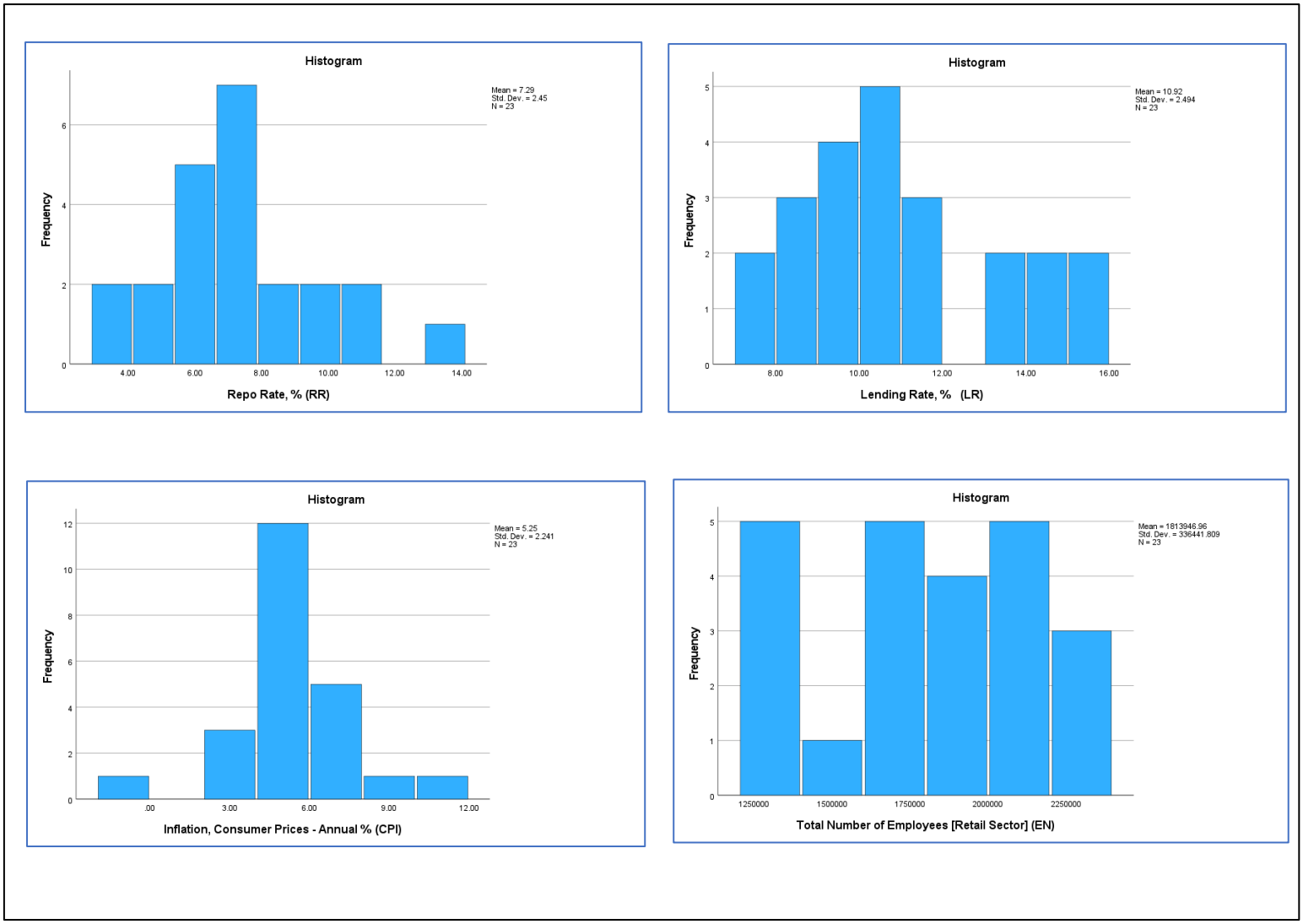



**Figure 9: Summary of Statistics and Normality Tests – Repo and Lending Rates, Inflation and Retail Sector Employment**

**Source**: Researcher's Own Computations (SPSS Statistics)

## 4.5 Testing for Autocorrelation and Power Spectral Density (PSD)

Autocorrelation, also known as serial or lagged correlation, measures the similarity between a time series and its lagged version across successive time intervals. Simply put, it quantifies the relationship between a variable's present value and its past values. In time series analysis, autocorrelation evaluates current values against historical data by overlaying one series onto another, determining the extent of their resemblance (Vecchia & Ballerini, 1991). PSD analysis is useful for exploring the frequency domain characteristics of the time series data. This study primarily focuses on temporal dependencies, thus – autocorrelation test is the primary focus.

The correlation analysis, illustrated in **Figure 10** below, illuminates significant relationships among the variables examined. Repo and lending rates demonstrate a robust positive correlation of 0.905, indicating a strong linear connection between these variables. Repo rate exhibits a moderate positive correlation (0.474) with inflation (CPI), suggesting sensitivity to changes in inflation rates. Conversely, Repo rate shows a moderate negative correlation of -0.573 with the total number of employees in the retail sector, implying a tendency for employment levels to decrease as repo rate rises.

In addition, lending rate displays a moderate positive correlation (0.415) with the inflation rate, indicating its responsiveness to inflationary trends. Notably, lending rate demonstrates a strong negative correlation of -0.713 with the total number of employees in the retail sector, signifying a significant decrease in employment levels as lending rates increase. However, the correlation between inflation and the total number of employees in the retail sector is negligible and non-significant (with correlation coefficient of -0.004). The correlation findings, corroborated by **Figure 10**, provide crucial insights into the interconnections among these variables, contributing to an understanding of their dynamics and potential implications for the subject matter of this study.

**Correlations**

| | | Repo_Rate | Lending_Rate | Inflation_Consumer_Prices_Annual | Total_Number_of_Employees_Retail_Sector |
|---|---|---|---|---|---|
| Repo_Rate | Pearson Correlation | 1 | .905** | .474* | -.573** |
| | Sig. (2-tailed) | | <,001 | .022 | .004 |
| | N | 23 | 23 | 23 | 23 |
| Lending_Rate | Pearson Correlation | .905** | 1 | .415* | -.713** |
| | Sig. (2-tailed) | <,001 | | .049 | <,001 |
| | N | 23 | 23 | 23 | 23 |
| Inflation_Consumer_Prices_Annual | Pearson Correlation | .474* | .415* | 1 | -.004 |
| | Sig. (2-tailed) | .022 | .049 | | .986 |
| | N | 23 | 23 | 23 | 23 |
| Total_Number_of_Employees_Retail_Sector | Pearson Correlation | -.573** | -.713** | -.004 | 1 |
| | Sig. (2-tailed) | .004 | <,001 | .986 | |
| | N | 23 | 23 | 23 | 23 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

**Figure 10: Correlation Analysis – Repo and Lending Rates, Inflation (CPI) and Employment Numbers in the Retail Sector**

**Source:** Researcher's Own Computations (SPSS Statistics)

## 4.6 Cointegration Tests (Johansen Procedure)

The preferred method for modelling the time series data involves utilising cointegration, followed by an equilibrium or vector error correction model (Brooks, 2008). Cointegration, defined formally by Engle and Granger (1987), determines if a group of economic variables can be viewed as cointegrated "if a linear combination of them results in stationarity" (Brooks 2008:336). While not all combinations of I (1) series are automatically cointegrated, various techniques, including formal tests such as the Engle-Granger (EG) and Johansen tests support to assess and confirm cointegration.

The EG cointegration test entails conducting a long-term Ordinary Least Squares (OLS) regression between two variables that are hypothesised to be cointegrated. If the residuals of this regression turn out to be stationary (I (0)), confirming that they do not exhibit a trend, then two or more variables are considered cointegrated (Brooks, 2008). A drawback of EG method is its limitation to estimating only bivariate relationships, and the results may be influenced by the study's choice of the dependent variable. However, in economic data analysis, selecting the dependent variable based on existing economic theory can mitigate this.

The alternative cointegration test, the Johansen test introduced in 1991, is more mathematically complex than EG. It involves estimating a vector autoregression model and evaluating the long-term coefficient matrix (denoted as $\pi$). If the rank of $\pi$ significantly differs from zero, indicating a non-zero number of cointegrating relationships, the variables are considered cointegrated. The Johansen test is generally regarded as superior to EG, especially when dealing with more than two variables, as it can estimate multivariate relationships and detect multiple cointegrating relationships. However, a limitation of the Johansen approach is the challenge of interpreting the cointegrating vectors without prior economic information (Wickens, 1996:256).

**Table 9** below presents results of the cointegration tests, analysed under various scenarios[10] including unrestricted cointegration rank test (Trace), unrestricted cointegration rank test (Max-eigenvalue), unrestricted cointegrating coefficients (normalised by b'*S11*b=I) and unrestricted adjustment coefficients (alpha).

[10] Cointegration tests of different scenarios provide similar results **(see Appendix III).**

**Table 9: Johansen Cointegration Test (Trace and Max-Eigenvalue)**

**Unrestricted Cointegration Rank Test (Trace)**

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** Critical Value |
|---|---|---|---|---|
| None * | 0.734228 | 51.65085 | 47.85613 | 0.0211 |
| At most 1 | 0.529199 | 23.82337 | 29.79707 | 0.2080 |
| At most 2 | 0.244311 | 8.003654 | 15.49471 | 0.4650 |
| At most 3 | 0.096068 | 2.121018 | 3.841465 | 0.1453 |

Trace test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

**Unrestricted Cointegration Rank Test (Max-eigenvalue)**

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** Critical Value |
|---|---|---|---|---|
| None * | 0.734228 | 27.82748 | 27.58434 | 0.0466 |
| At most 1 | 0.529199 | 15.81972 | 21.13162 | 0.2356 |
| At most 2 | 0.244311 | 5.882636 | 14.26460 | 0.6283 |
| At most 3 | 0.096068 | 2.121018 | 3.841465 | 0.1453 |

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

**Source**: Researcher's Own Computations (SPSS Statistics)

**Table 10** below exhibits Cointegration results with cointegrating and adjustment coefficients.

**Table 10: Johansen Cointegration Test (Cointegrating and Adjustment Coefficients-alpha)**

**Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):**

| TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR | INFLATION_CONSUMER_PRICE | LENDING_RATE | REPO_RATE |
|---|---|---|---|
| -1.81E-06 | 0.166800 | -3.273709 | 3.253866 |
| 3.04E-06 | 0.593649 | 1.294211 | -0.994262 |
| 5.18E-06 | -0.426036 | 1.160237 | -0.345519 |
| -2.24E-06 | -0.068474 | -0.081747 | 0.278395 |

**Unrestricted Adjustment Coefficients (alpha):**

| | | | | |
|---|---|---|---|---|
| D(TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR) | -2603.894 | -21344.01 | -28504.32 | 12631.18 |
| D(INFLATION_CONSUMER_PRICE) | 0.145981 | -0.947382 | 0.247439 | -0.402075 |
| D(LENDING_RATE) | 0.108871 | -0.368129 | -0.250282 | -0.262676 |
| D(REPO_RATE) | -0.422665 | -0.689586 | -0.295080 | -0.400726 |

**Source**: Researcher's Own Computations (SPSS Statistics)

Based on the Johansen Cointegration test results (as presented in **Tables 9** and **10**) above, these analyses reveal a stable long-term relationship among the variables.

Both the Trace test and Max-eigenvalue test indicate the presence of a cointegrating equation at the 0.05 significance level. This signifies a long-term relationship among the variables, indicating a stable equilibrium in their interactions. In the context of the study, where the South African Reserve Bank adjusts interest rates to manage inflation within the 3 – 6% range, these conclusions carry substantial implications for policymaking decisions and economic analysis.

In examining the normalised cointegrating coefficients, several critical insights emerge:

(1) Total number of employees in the retail sector: This variable exhibits a negative coefficient (-1.81E-06) concerning inflation (consumer prices), indicating an inverse relationship. As inflation increases, the total number of employees in the retail sector tends to decrease. Furthermore, the positive relationship is observed with variables lending rate (-3.273709) and repo rate (3.253866), implying that higher interest rates correspond to a decline in employment within the retail sector.
(2) Inflation rate (consumer prices): This variable maintains a negative relationship with lending rate (-0.538062) and repo rate (-1.416925). This signifies that higher interest rates are associated with a decrease in inflation, aligning with the SARB's policy objective of controlling inflation.
(3) Interest rates (repo and lending rates): These variables exhibit a negative relationship with total number of employees in the retail sector (-13105.17 and -52171.03, respectively). As interest rates increase, employment in the retail sector decreases. This underlines the impact of monetary policy on employment dynamics, highlighting the challenges faced by businesses in the retail sector when borrowing costs rise.

The adjustment coefficients represent the speed of adjustment towards the long-term equilibrium. In this case, they indicate how quickly the variables adjust when deviations from the equilibrium occur. For instance, an increase in total number of employees in the retail sector leads to adjustments in inflation, lending rate, and repo rate to restore equilibrium. In short, the cointegration results provide evidence of the stable long-term relationships among the variables, enabling a deeper understanding of their interconnected dynamics. These findings serve as a foundation for in-depth analysis and informed policy considerations.

In the analysis of VECM (see **Appendix IV)**, the results of the Vector Error Correction Model analysis provide valuable insights into the intricate relationships amongst the examined macroeconomic variables. The presence of a cointegrating relationship among the variables signals a stable, long-term connection. Notably, even a minute increase in consumer price inflation in the preceding period significantly reduces number of employees in the retail sector, as evidenced by the coefficient of approximately -1.32E-06 (t-statistic of -3.82).

Furthermore, the study sheds light on the immediate impact of changes in repo and lending rates on employment dynamics within the retail sector. A substantial decrease of approximately -5.63E-07 (t-statistic of -1.92) in total retail sector employees is correlated with a unit change in interest rates, underscoring the pivotal role of monetary policy decisions.

In addition, the analysis reveals that the influence of lagged values of the variables on the current period's dynamics is limited, accentuating the significance of short-term adjustments in shaping employment trends. Therefore, implementing responsive economic policies is imperative to maintain stability and foster sustainable growth in the employment landscape of the retail sector.

## 4.7 Granger Causality Analysis, and Diagnostic Checks

Examining Granger causality, and diagnostic checks is indispensable within the setting of this study. Thorough diagnostic analyses are crucial as they evaluate the effectiveness of the econometric models employed. These assessments specifically focus on examining the residuals derived from the evaluation and estimation processes. Any discrepancies or irregularities found in these residuals lead to inefficiencies in the model and distort the estimated specifications (Hood et al., 2008).

To comprehensively address this concern, the analyses encompass diverse facets of the data. These evaluations include scrutinising causality, autoregressive conditional heteroscedasticity, stability, and potential misspecifications (Stenberg, 2016). By subjecting the model to such meticulous scrutiny, the study ensures the precision and robustness of its findings. This rigorous approach guarantees that the study offers reliable insights into the complex relationship between inflation targeting policies and unemployment rates within South Africa's retail industry.

**Table 11** shows causality test results. These diagnostic analyses underscore the validity and dependability of the outcomes.

**Table 11: Granger Causality Test Results, Interest Rates (Repo and Lending), Inflation (CPI) and Total number of Employees in the Retail Sector**

| Null Hypothesis: | Obs. | F-Statistic | Prob.** | Conclusion |
|---|---|---|---|---|
| (1) Inflation rate (CPI) does not Granger Cause total number of employees in Retail Sector | 21 | 1.08929 | 0.3601 | Failure to reject the null hypothesis |
| (1) Total number of employees in Retail Sector does not Granger Cause Inflation rate (CPI) | | 0.02792 | 0.9725 | Failure to reject the null hypothesis |
| (2) Lending rate does not Granger Cause total number of employees in Retail Sector | 21 | 3.15652 | 0.0699 | Failure to reject the null hypothesis |
| (2) Total number of employees in Retail Sector does not Granger Cause Lending rate | | 2.98104 | 0.0794 | Failure to reject the null hypothesis |
| (3) Repo rate does not Granger Cause total number of employees in Retail Sector | 21 | 2.27783 | 0.1347 | Failure to reject the null hypothesis |
| (3) Total number of employees in Retail Sector does not Granger Cause Repo rate | | 3.03732 | 0.0762 | Failure to reject the null hypothesis |
| (4) Lending rate does not Granger Cause Inflation rate (CPI) | 21 | 0.17940 | 0.8374 | Failure to reject the null hypothesis |
| (4) Inflation rate (CPI)does not Granger Cause Lending rate | | 2.28904 | 0.1336 | Failure to reject the null hypothesis |
| (5) Repo rate does not Granger Cause Inflation rate (CPI) | 21 | 1.44663 | 0.2645 | Failure to reject the null hypothesis |
| (5) Inflation rate (CPI)does not Granger Cause Repo rate | | 1.96933 | 0.1719 | Failure to reject the null hypothesis |
| (6) Repo rate does not Granger Cause Lending rate | 21 | 4.12647 | 0.0359 | Reject the null hypothesis |
| (6) Lending rate does not Granger Cause Repo rate | | 0.14779 | 0.8638 | Failure to reject the null hypothesis |
| ** Significance level = 0.05 | | | | |

**Source**: Researcher's Own Computations (using e-Views)

In the realm of Granger Causality analysis, where causality presence is established through F-statistics and corresponding p-values, the outcomes (as depicted in **Table 11** above) offer insights into the temporal connections among crucial economic variables, namely interest rates, inflation, and employment in the retail sector.

Inflation rate and total number of employees in the retail sector: Inflation does not Granger cause retail sector employment (f-statistic: 1.08929, p-value: 0.3601). Similarly, changes in employment do not Granger cause inflation (f-statistic: 0.02792, p-value: 0.9725), indicating no significant causal relationship.

Lending rate and total number of employees in the retail sector: A potential link from lending rates to retail employment exists (f-statistic: 3.15652, p-value: 0.0699). However, employment does not Granger cause lending rates (F-statistic: 2.98104, p-value: 0.0794), suggesting a tentative influence from lending rates to retail employment.

Repo rate and total number of employees in the retail sector: A possible causal relationship from repo rates to retail employment is observed (f-statistic: 2.27783, p-value: 0.1347). Conversely, employment does not Granger cause repo rates (f-statistic: 3.03732, p-value: 0.0762), indicating a potential unidirectional influence.

Lending rate and inflation (consumer prices): No Granger Causality between lending rates and inflation is found (f-statistic: 0.17940, p-value: 0.8374), suggesting no causal link between the two variables.

Repo rate and inflation (consumer prices): Changes in repo rates do not Granger cause inflation (f-statistic: 1.44663, p-value: 0.2645). Similarly, inflation does not Granger cause repo rates (f-statistic: 1.96933, p-value: 0.1719), indicating no significant causal relationship.

Repo rate and lending rate: A significant unidirectional causal influence from repo rates to lending rates is identified (f-statistic: 4.12647, p-value: 0.0359). However, lending rates do not Granger cause repo rates (f-statistic: 0.14779, p-value: 0.8638).

In conclusion, the Granger Causality between interest rates, inflation, and retail sector employment is not decisively established, as indicated by non-significant p-values. The significant causal influence from repo rates to lending rates underscores the complexity of monetary policy instruments. Therefore, the overarching inference will predominantly center on the outcomes of other conducted statistical tests.

### 4.8 Residual Diagnostic Analysis

As shown in **Table 12** below, the findings of the VEC Residual Heteroskedasticity tests are presented, enlightening on the consistency of error variance within the dataset. The joint test, analysing overall variance across all residuals, yields a non-significant chi-square value of 187.5087 with 180 degrees of freedom and a probability of 0.3353. This result suggests a lack of substantial heteroskedasticity in the residuals, indicating stable error variance at the chosen significance level.

Furthermore, individual component tests focusing on specific residual pairs (res1, res2, res3, and res4) reinforce this conclusion. Each test, characterised by non-significant R-squared values and F-statistics, supports the finding of stable error variance. These results collectively indicate that errors remain relatively stable across diverse observations, reaffirming the reliability of the VECM model's estimations and forecasts as outlined in the **Table 12** below.

Further, the VEC Residual plots (see **Appendix V**) validate the diagnostic findings presented in **Table 12**. These plots confirm the absence of systematic patterns or significant correlations in the model's residuals. The scattered and random distribution of points in the plots reaffirms the independence of errors, aligning with the determination of no significant serial correlation. The consistency between the **Appendix V** and **Table 12** underscores the reliability of the VECM model and its suitability for making accurate predictions. Simply put, in the context of examining the impact of the South African Reserve Bank's inflation targeting framework on employment in the retail sector, the validation process utilising VEC Residual plots in Appendix V reinforces the findings presented in Table 12.

**Table 12: The Diagnostic Test Results [Heteroskedasticity]**

**VEC Residual Heteroskedasticity Tests (Levels and Squares)**
Sample: 1 23
Included observations: 20

**Joint test:**

| Chi-sq | df | Prob. |
|---|---|---|
| 187.5087 | 180 | 0.3353 |

**Individual components:**

| Dependent | R-squared | F(18,1) | Prob. | Chi-sq(18) | Prob. |
|---|---|---|---|---|---|
| res1*res1 | 0.711581 | 0.137065 | 0.9854 | 14.23161 | 0.7139 |
| res2*res2 | 0.976180 | 2.276732 | 0.4841 | 19.52360 | 0.3603 |
| res3*res3 | 0.682448 | 0.119394 | 0.9903 | 13.64896 | 0.7517 |
| res4*res4 | 0.664851 | 0.110208 | 0.9925 | 13.29703 | 0.7736 |
| res2*res1 | 0.660331 | 0.108003 | 0.9930 | 13.20663 | 0.7792 |
| res3*res1 | 0.605288 | 0.085194 | 0.9970 | 12.10575 | 0.8417 |
| res3*res2 | 0.786986 | 0.205252 | 0.9595 | 15.73972 | 0.6107 |
| res4*res1 | 0.649640 | 0.103011 | 0.9940 | 12.99279 | 0.7920 |
| res4*res2 | 0.694521 | 0.126308 | 0.9885 | 13.89043 | 0.7362 |
| res4*res3 | 0.666892 | 0.111224 | 0.9923 | 13.33783 | 0.7711 |

**Source:** Researcher's Own Computations using SPSS Statistics

In the next subset, the study analyses the serial correction using the LM[11] test to detect serial correlation in the residuals. Serial correlation indicates whether the errors in a model follow a systematic pattern over time, which can impact the model's reliability and predictions. The VECM residual serial correlation LM tests are presented in **Table 13** below. The VECM residual serial correlation LM tests, conducted for lags 1 to 3, reveal no significant patterns in the model's errors at these intervals. With probabilities ranging from 0.2053 to 0.9169, the tests indicate no notable serial correlation.

Likewise, assessments for lags 1 to h confirm the absence of systematic patterns in the residuals. These results ensure the reliability of the VECM model's estimations and forecasts, affirming the absence of significant serial correlation in the analysed dataset. Therefore, in the context of this study, these findings contribute to the overall confidence in the robustness of analytical framework and the accuracy of the predictions regarding the relationship between inflation targeting and employment in the South African retail sector.

**Table 13: VECM Residual Serial Correlation LM Tests**

**VEC Residual Serial Correlation LM Tests**
Sample: 1 23
Included observations: 20

**Null hypothesis: No serial correlation at lag h**

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 14.66134 | 16 | 0.5496 | 0.853464 | (16, 9.8) | 0.6251 |
| 2 | 20.34107 | 16 | 0.2053 | 1.443105 | (16, 9.8) | 0.2844 |
| 3 | 8.915465 | 16 | 0.9169 | 0.428837 | (16, 9.8) | 0.9360 |

**Null hypothesis: No serial correlation at lags 1 to h**

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 14.66134 | 16 | 0.5496 | 0.853464 | (16, 9.8) | 0.6251 |
| 2 | NA | 32 | NA | NA | (32, NA) | NA |
| 3 | NA | 48 | NA | NA | (48, NA) | NA |

*Edgeworth expansion corrected likelihood ratio statistic.

**Source**: Researcher's Own Computations using e-Views

[11] LM: Lagrange Multiplier detect patterns like serial correlation in data, evaluating errors over lags. Low probability signifies patterns, crucial for validating time series models' independence and reliability.

## 4.9 Impulse Response Functions (IRFs) Tests

Analysing impulse responses stands as an important step in econometric investigations. Its fundamental purpose lies in depicting how a model's variables evolve in response to sudden shifts in one or multiple variables. This functionality allows the study to trace the impact of a single shock within a system of equations, providing valuable insights for evaluating economic policies.

The Cholesky decomposition plots provided in **Figure 11** below demonstrate the system's resilience, this is in alignment with the VECM estimates. Shocks dissipate over time, and the variables tend to revert to their equilibrium states. This resilience indicates that the variables absorb shocks and return to their stable state, showcasing their adaptive capacity and robustness. This implies that the findings collectively support the robustness of the model and provide confidence in the stability of the model under various external influences.

The analysis contributes to addressing the research questions by revealing how variables, namely, interest rates, inflation, and employment in the retail sector, respond to sudden shifts and shocks within the economic system. The observed adaptive capacity and robustness of the variables align with the hypothesis that the South African Reserve Bank's inflation targeting framework has a measurable impact on employment in the retail sector. The ability of the variables to revert to equilibrium states supports the hypothesis that the model is stable under various external influences, reinforcing the credibility of the analytical framework.

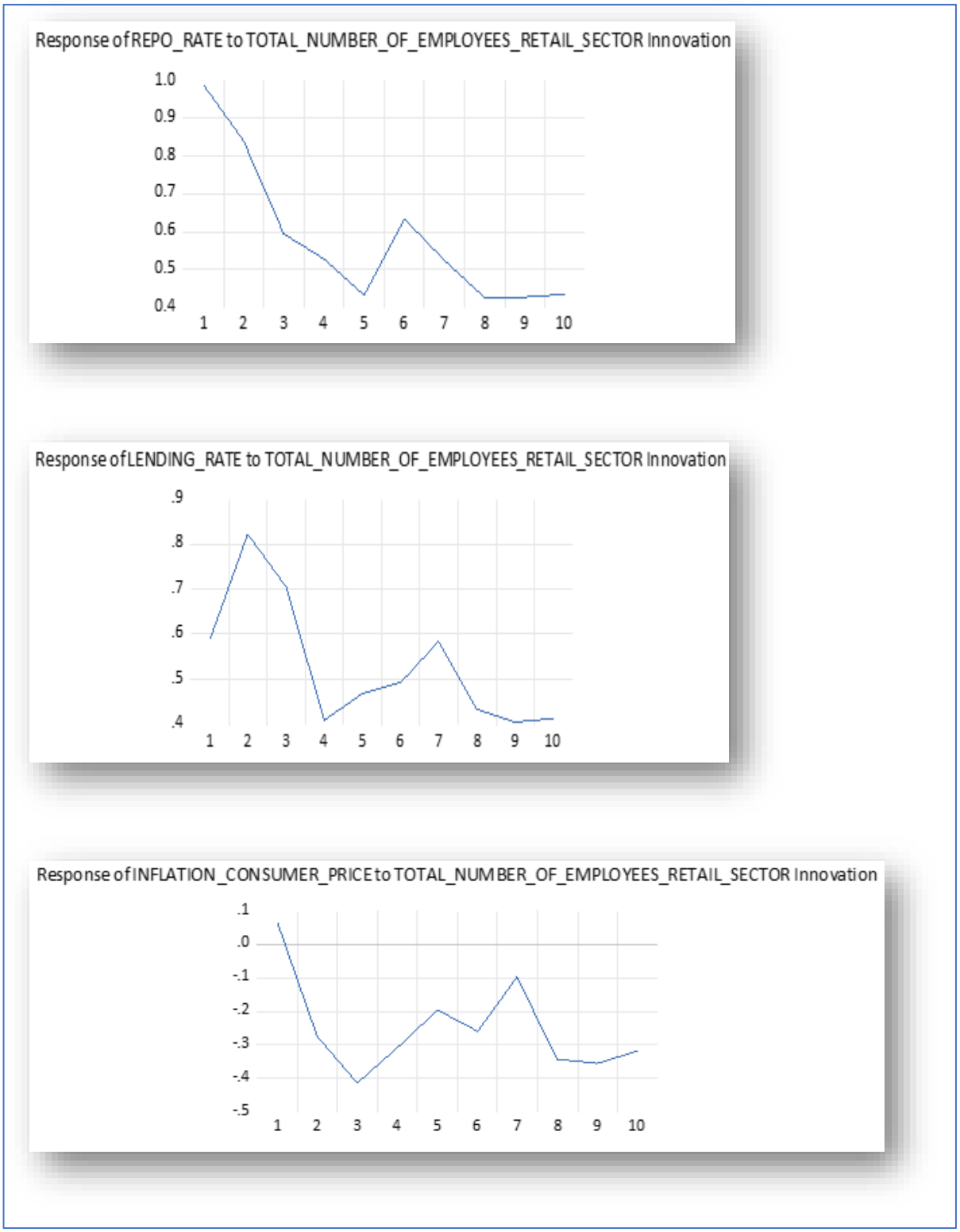



**Figure 11: Charts for Cholesky Decomposition [Response to Cholesky One S.D. (d.f. adjusted)]**

**Source**: Researcher's Own Graphical Presentation (SPSS Cholesky decomposition)

## 4.10 Conclusion

Chapter 4 has systematically conducted unit root testing using both ADF and KPSS methods. In addition, the checks on normal distribution and autocorrelation were also performed, paving the way for Johansen Cointegration tests. Granger Causality analyses have been influential in unveiling whether there are temporal relationships between variables. Diagnostic assessments, including VEC heteroskedasticity and impulse response analyses, contributed to the robustness of the empirical foundation.

The comprehensive statistical analysis set the stage for extensive discussions on empirical results which follows in the next chapter. Therefore, building upon the thorough analyses from Chapter 4, Chapter 5 delves into extensive discussions of the empirical results.

# CHAPTER 5: DISCUSSIONS OF EMPIRICAL RESULTS

## 5.1 Introduction

Chapter 5 explores the essential components of this study, namely the discussions of the empirical results presented in Chapter 4. This section synthesises the statistical test results from the previous chapter, offering a concise summary of the study's key outcomes in addressing the research questions and hypotheses initially posed in the beginning of the study.

The empirical investigation focused on understanding the impact of the South African Reserve Bank's inflation targeting framework on employment in the country's retail industry. The statistical analyses employed dynamic econometric tests, including Augmented Dickey-Fuller and Kwiatkowski-Phillips-Schmidt-Shin, Cointegration, Vector Error Correction Models, Granger Causality, and Impulse Response Function, targeting to uncover the complicated relationships between inflation targeting framework and unemployment within South Africa's retail sector.

## 5.2 Evaluation and Discussion of the Study's Hypotheses

In Chapter 2, hypotheses were formulated to guide the research inquiry

### 5.2.1 $H_0$: There is no significant association between the South African Reserve Bank's inflation targeting framework and employment levels in South Africa's retail industry.

Evidence from the empirical analysis supports the rejection of the null hypothesis ($H_0$). Johansen Cointegration tests revealed long-term relationships between interest rates and employment, further supported by the Vector Error Correction Model (VECM) estimates, which showed a stable, long-term connection. Collectively, these results consistently indicate a significant impact of SARB's monetary policy on retail sector employment, thereby providing strong support to reject the null hypothesis in favour of the alternative hypotheses.

### 5.2.2 $H_1$: The implementation of the South African Reserve Bank's inflation targeting framework has a significant impact on employment in South Africa's retail industry.

The confirmation of hypothesis 1 ($H_1$), asserting that the implementation of the South African Reserve Bank's inflation targeting framework significantly impacts employment in the retail sector, finds strong support in the empirical analyses. The exploration begun with a detailed examination of stationarity through Augmented Dickey-Fuller analyses, which served as a key step in understanding the dynamic relationship between the inflation targeting framework and unemployment in South Africa's retail sector.

#### 5.2.2.1 Exploring Stationarity: In-Depth Discussion of Unit Root Test Results

Chapter 4's analyses unfolded in structured sections, with the first segment dedicated to the examination of time series data properties using Augmented Dickey-Fuller analyses, connecting directly to the overarching research objectives, questions, and hypotheses outlined in this study, with specific relevance to $H_1$. Augmented Dickey-Fuller tests confirmed the non-stationary nature of the variables at their original levels. Subsequent differencing rendered the variables stationary, paving the way for an in-depth analysis of the causal links between inflation targeting framework and unemployment in South Africa's retail sector.

The KPSS supplemental results also affirmed stationarity of the variables, laying the foundation for exploring the short and long-term connections between the SARB's monetary policy framework and employment in South Africa's retail sector. These analyses, grounded in robust econometric methods, form the basis of the conclusions and recommendations presented in the subsequent chapter of this study.

The significance of achieving stationarity cannot be overstated in the context of testing $H_1$. The initial non-stationarity, whether with an intercept, trend, or none, necessitates careful handling. However, the transformation achieved through differencing ensures that, whether with an individual intercept, trend and intercept, or none, all variables attain stationarity. The stationarity of variables is a prerequisite for establishing meaningful causal links, therefore – by achieving stationarity, the study ensures a more reliable foundation for investigating the relationships between the variables considered to explore inflation targeting policy and unemployment in the retail industry.

In essence, the ADF and KPSS test results collectively support $H_1$ by providing a methodologically sound pathway. Stationarity enhances the robustness of the study's conclusions and recommendations. A foundation built on stationary data allows for more confident and reliable insights into the subject matter under investigation, and this, in turn, strengthens the overall validity of the study's findings.

#### 5.2.2.2 Drawing Conclusions: Discussions of Normality Test Results

The conduction of normality tests in this study is imperative for several methodological and interpretative considerations. First and foremost, these tests serve to validate the assumptions underlying various statistical methods and econometric models employed in the analyses. The adherence of the data to a normal distribution is a fundamental prerequisite for ensuring the strength and accuracy of subsequent statistical inferences and model interpretations (Khatun, 2021).

Beyond methodological considerations, normality tests contribute to the holistic understanding and interpretation of the variables under investigation. According to Khatun (2021), a closer adherence to a normal distribution facilitates a more subtlety interpretation of the distributional characteristics and behavioural tendencies of these variables.

Moreover, in the thorough evaluation of the dataset, the application of not only unit root tests but also rigorous normality tests proved essential. These analyses are important in assessing the distribution characteristics of the variables, unveiling the underlying data structure. Visual insights from histograms confirmed that interest rates and inflation exhibit bell-shaped curves, indicative of relatively symmetric distributions and a closer adherence to the normal distribution.

However, a notable departure from symmetry was observed in the variable depicting total number of employees in the retail sector. The histogram indicated potential non-symmetric patterns, suggesting deviations from normality. However – overall, these normality tests served as a critical step in ensuring the integrity of the data's distribution, a fundamental prerequisite for accurate and reliable statistical inference.

As presented in **Figure 12** below, conducting normality tests is integral to methodological accuracy, holistic understanding of variables, dataset evaluation, interpretation of distribution characteristics, and ensuring the integrity of data for statistical inference. These aspects

collectively contribute to the study's ability to address the research questions as well as hypothesis ($H_1$) with accuracy and depth, ultimately contributing to the investigation of the impact of inflation targeting on employment in the retail sector in South Africa.

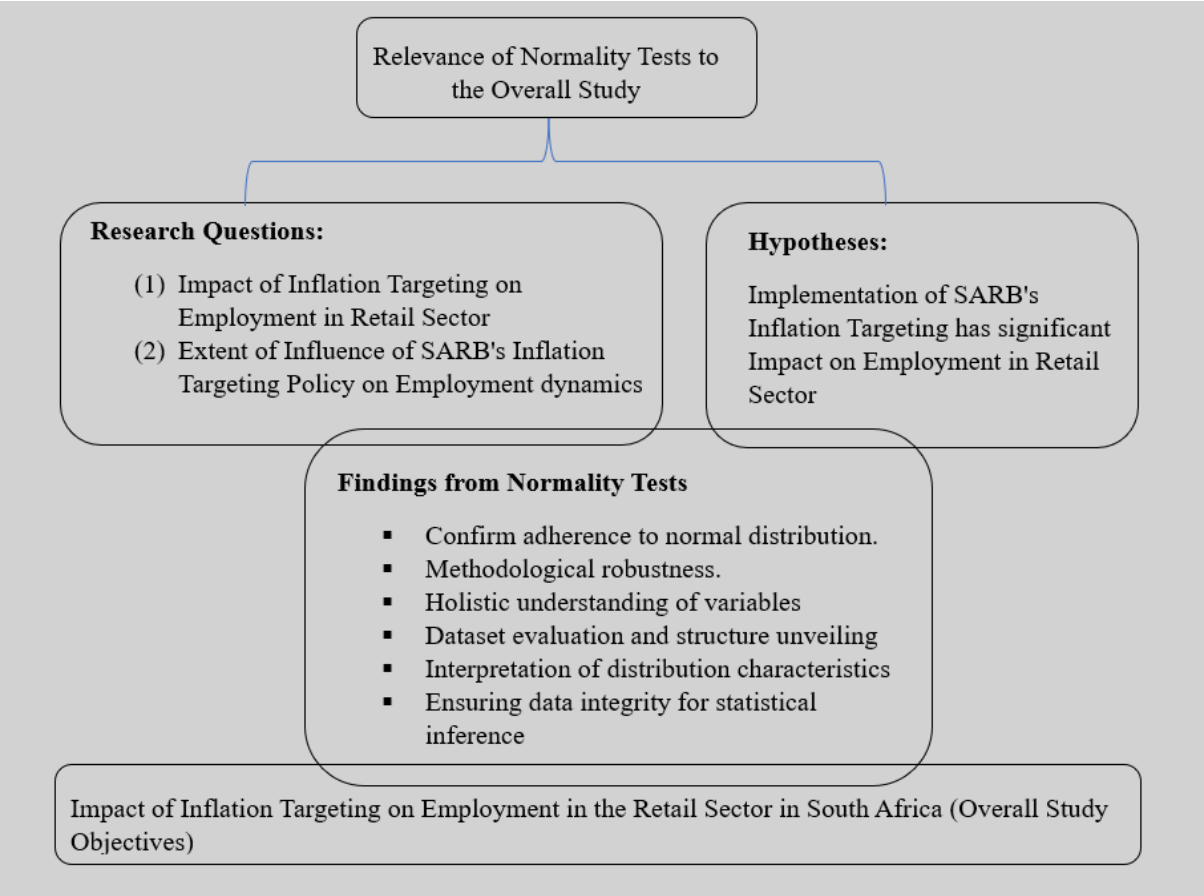



**Figure 12: Relevance of Normality Statistical Findings to the Overall Study Objectives**

**Source**: Researcher's Own Graphical Presentation

### 5.2.2.3 Cointegration Insights: Evaluating Johansen Cointegration Test Results

After the inspection of unit root and normality tests, the application of Johansen Cointegration analysis emerged as a central phase in unravelling the enduring relationships among the variables, with direct implications for $H_1$: The implementation of the South African Reserve Bank's inflation targeting framework has a significant impact on employment in South Africa's retail industry. This analytical approach did not only shed light on the interdependencies among the variables but also revealed the existence of cointegrating long-term relationships, signifying their sustained connection over time.

Of notable significance were the patterns revealed by the cointegrating equation(s), offering intriguing insights into the nature of these relationships. The positive coefficients associated with interest rates, encompassing both repo and lending rates, emerged as the key focal point. These coefficients did not only signal a long-term relationship with employment but also highlighted the influential role of interest rates in shaping the dynamics of the labour market.

Specifically, the positive correlation suggested that variations in interest rates were associated with corresponding changes in employment levels within the retail sector over an extended period. This finding resonates deeply with the economic theory that underpins the study's exploration of the impact of the South African Reserve Bank's inflation targeting framework on employment in the retail industry. The observed relationship implies that an increase in interest rates signals a potential decrease in employment within the retail sector. This alignment with economic principles gains further support as higher interest rates are traditionally associated with reduced consumer spending and diminished business investments. Consequently, the economic implications extend to the labour market similarly impacting employment trends within the retail industry. This interpretation does not only validate the study's research questions regarding the impact of the SARB's inflation targeting framework on retail sector's employment but also highlights the multifaceted nature of economic dynamics.

Furthermore, the integration of Vector Error Correction Model estimates into the analysis serves to strengthen the findings by supporting the Johansen Cointegration results. The presence of a stable, long-term connection among the variables solidifies the study's assertions and contributes to the overall understanding of whether the inflation targeting framework influences employment outcomes in South Africa's retail industry, as well as the extent of influence from the monetary policy framework, further substantiating the study's alignment with and support for $H_1$.

### 5.2.3 $H_2$: The approach adopted by the SARB in implementing its inflation targeting policy influences the extent of its impact on employment in South Africa's retail industry.

The econometric analyses conducted in support of hypothesis 2 ($H_2$) offer compelling evidence, presenting a coherent narrative that dissects the causal relationships between

interest rates, inflation, and retail sector employment. This exploration is further expounded in the subsequent section, the VEC Granger Causality Analysis.

#### 5.2.3.1 Causal Dynamics: Interpretation of VEC Granger Causality Analysis

Following the Johansen Cointegration and Vector Error Correction Model tests, the study progressed to the Granger Causality analyses to unveil relationships amongst interest rates, inflation, and employment within the retail sector. The Granger Causality analysis provided insights into the dynamics of these variables. However, the non-significant p-values obtained across various tests underlined the intricate and nuanced nature of these interactions.

An essential revelation from the Granger Causality analysis was the significant causal influence from repo rates to lending rates. This observation accentuates the complexity embedded in monetary policy instruments, emphasising the need for a comprehensive understanding of the multilayered factors that shape economic dynamics. The chemistry among repo rates and lending rates highlights the tricky nature of interest rate dynamics, signalling the need for sophisticated policy frameworks for effective decision making.

Importantly, this nuanced causal pathway illustrates that adjustments in repo rates significantly shape lending rates, exerting a discernible influence on various facets of employment dynamics within the retail sector. For instance, a repo rate hike triggers an increase in lending rates, subsequently impacting hiring patterns or workforce dynamics in the retail industry. This interplay aligns seamlessly with the expectations articulated in $H_2$, further solidifying the study's comprehensive exploration of the SARB's inflation targeting policy and its impact on employment in South Africa's retail industry.

#### 5.2.3.2 Examining Model Robustness: Insights from Diagnostic Analyses

The statistical analyses conducted to evaluate $H_2$ are fortified by a rigorous examination of model robustness, as revealed through diagnostic assessments, including VEC Residual Heteroskedasticity tests and VECM Residual Serial Correlation LM tests.

The diagnostic assessments, both from the VEC Residual Heteroskedasticity tests and the VECM Residual Serial Correlation LM tests, collectively established the robustness and reliability of the model. The absence of substantial heteroskedasticity in the residuals, as indicated by non-significant chi-square values and individual component tests, signifies

stable error variance. Moreover, the VEC Residual plots supported these findings, confirming the independence of errors with no discernible systematic patterns. The subsequent analysis using the LM test reinforced the model's credibility, demonstrating no significant serial correlation in the residuals across various lags.

These comprehensive evaluations collectively confirmed the suitability of the model for making accurate predictions, instilling confidence in the model's stability and reliability in handling diverse observations. The independence of errors signifies the essential for the model's ability to capture the true relationships amongst interest rates, inflation, and employment in the retail sector without being influenced by external factors. In essence, the absence of discernible patterns in the residuals confirmed through diagnostic analysis, attests that the model is robust, stable, and reliable.

For this study, a robust model is imperative for drawing accurate conclusions about the impact of the South African Reserve Bank's inflation targeting on employment in the country's retail sector. The absence of issues such as heteroskedasticity and serial correlation in the residuals reinforces the credibility of the model, thereby enhancing confidence in the study's findings and supporting the examination of the SARB's inflation targeting policy and its influence on employment dynamics in South Africa's retail industry, as outlined in $H_2$.

#### 5.2.3.3 Deciphering Shocks: Explaining the Impulse Responses

In the pursuit of understanding the dynamics outlined in $H_2$, the study delved into the examination of impulse responses, employing Cholesky One S.D. (d.f. adjusted) to test the robustness of the system.

The Cholesky decomposition was consistent with the VECM estimates illustrating the model's resilience and robustness. The impulse response function, as revealed through the analysis, showcased the system's ability to absorb shocks over time, with the variables demonstrating a tendency to return to their equilibrium states. This resilience suggests that the variables have the ability to absorb shocks and recover to their stable conditions, demonstrating their adaptability and robust nature. Jointly, these observations had affirmed the strength of the model and reinforced confidence in its stability against diverse external influences.

The diminishing impact of shocks over time, coupled with the variables' capacity to return to stable conditions, highlights the model's ability to navigate fluctuations and disruptions. This adaptability is crucial in the context of examining the South African Reserve Bank's inflation targeting policy and its influence on employment dynamics in the country's retail sector, as posited in $H_2$. The impulse response function's portrayal of variable resilience aligns seamlessly with the expectations outlined in $H_2$, fortifying the study's comprehensive analysis, and contributing to the overall understanding of the nuanced impact of inflation targeting on employment in South Africa's retail industry.

## 5.3 Implications for Broader Research Inquiry

The implied patterns derived from the empirical analyses for both $H_1$ and $H_2$ carry significant implications for understanding the interaction between SARB's monetary policy (inflation targeting) framework and employment in South Africa's retail industry. These instances do not only affirm the direct impact of the inflation targeting framework on employment but also highlight the critical role played by the SARB's specific policy implementation approach in shaping such impacts. This level of granularity provides valuable insights into the mechanisms through which monetary policy decisions influence the labour market dynamics, particularly within the retail sector.

## 5.4 Connecting Key Insights: The Relevance to Primary Research Questions

In this subsection, the study endeavours to intricately bridge the discovered insights with the fundamental primary research questions. This investigative interval orbits around two pivotal inquiries: (a) discerning the repercussions of the South African Reserve Bank's (SARB) inflation targeting framework on employment in the retail industry and (b) scrutinising the sway of the SARB's approach to implementing inflation targeting policies on the forementioned impact.

### 5.4.1 Analysing the Nexus: Inflation Targeting and Employment Dynamics

Exploring the first research question, the study explores the links between SARB's inflation targeting and employment in South Africa's retail sector.

#### 5.4.1.1 Unveiling Long-term Relationships through Cointegration Analysis

The unit root results, specifically the Augmented Dickey-Fuller (ADF) and KPSS analyses, played a crucial role in establishing the foundation for the subsequent Johansen Cointegration analysis. Confirming non-stationary variables at their original levels [denoted as I (1)], signifying integration of the same order, highlighted the necessity of differencing for achieving stationarity. This transformation laid the groundwork for cointegration analysis, enabling the exploration of enduring relationships among variables. The positive coefficients unveiled in the Johansen Cointegration analysis for interest rates (both repo and lending) implied a substantial and lasting relationship between these independent variables and employment in the retail sector. This correlation suggests that changes in interest rates are intricately linked to corresponding shifts in employment levels within the retail industry over an extended period.

Within this comprehensive exploration, a pivotal focus emerged – the Johansen Cointegration analysis. This sophisticated analytical tool played a central role in unraveling persistent relationships among variables, specifically, interest rates (repo and lending) and employment in the retail sector. The insights derived from the Johansen Cointegration analysis indicate that higher interest rates correlate with a decrease in employment within the retail industry. This finding shed direct light on the influence of the South African Reserve Bank's inflation targeting framework on employment. In economic terms, higher interest rates lead to reduced consumer spending and diminished business investments, subsequently impacting employment in the retail sector. This negative correlation underscores the potential repercussions of monetary policy decisions on the labor market (Stungwa et al., 2023).

#### 5.4.1.2 Implications of Positive Coefficients: Aligning Findings with Economic Realities

As the study advances, it translates the positive coefficients into tangible economic implications. The correlation between interest rates and employment within the retail industry unveils a dynamic interchange. The relationship suggests that heightened interest rates are associated with a downturn in employment. This finding, rooted in economic impulse, provides a clear response to the overarching questions regarding the impact of the SARB's inflation targeting framework on employment in the retail sector.

Further, this corresponds to the theory of Phillips curve, which proposes a trade-off between inflation and unemployment. The theoretical framework indicates that when unemployment is low, inflation tends to be high, and conversely, when unemployment is high, inflation tends to be low. Put simply, the Phillips curve illustrates an inverse correlation between unemployment and inflation (Salazar, 2019). In the context of this study, an increase in interest rates by the SARB to mitigate high inflationary pressures results in elevated unemployment.

**Figure 13** below illustrates average monetary policy rates, inflation, and unemployment in South Africa. The data depicted in this graphical representation pertains to the period 2000 – 2022. As shown in the diagram, unemployment rates persist at elevated levels when SARB maintains a high repo rate to manage inflation within the target band of 3 – 6%.

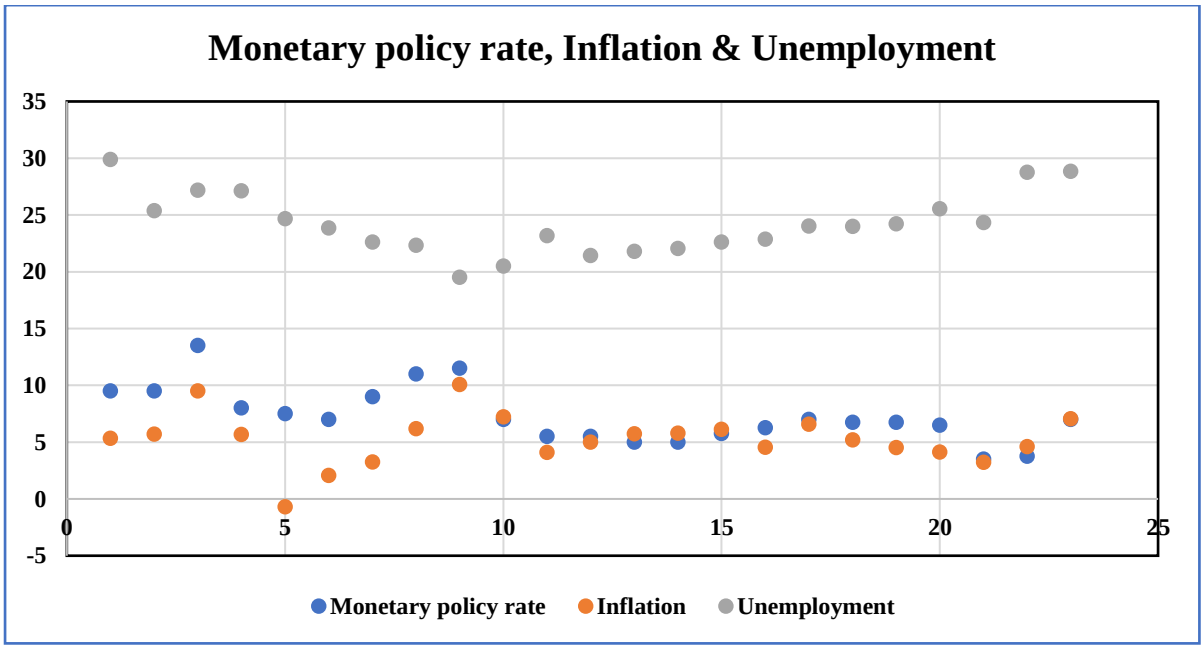



**Figure 13: Average Monetary Policy Rate, Inflation and Unemployment rate - South Africa**

**Source:** Researcher's Own Graphical Presentation (data from Stats SA and The World Bank)

### 5.4.2 Policy Dynamics: Implementation Approaches and Impact Assessment

Shifting focus to the second primary research question, the study probes into the intricacies of the SARB's inflation targeting policy implementation approach and its consequential influence on the identified impact on employment in the retail industry.

#### 5.4.2.1 Policy Measures and Economic Outcomes: A Holistic Review

In the preceding segments, the study has discussed and shown a degree of the influence of SARB's inflation targeting policy implementation approach to the economic outcomes, specifically on the employment activities of the economy.

The current implementation approach, which focuses on price stability by targeting an inflation target band, brings an extended negative influence into some of the key macroeconomic factors, particularly onto the retail sector employment. Therefore, a coordinated approach in policy decision is of utmost importance to resolve the structural challenges.

#### 5.4.2.2 Evaluating Policy Efficacy: Navigating the Impact Landscape

The monetary policy framework of the SARB has been effective in achieving its sole mandate of maintaining price stability. This implies, by raising the interest rates, SARB has been able to curb inflation in and around the 3 – 6% target range, however, the extent of the influence on the labour market from the policy implementation approach cannot be ignored.

In this subset, the study brings the effectiveness of the South African Reserve Bank's inflation targeting policy implementation to the fore. Decisively, the findings shed light on the efficacy of the SARB's inflation targeting policies in influencing employment within the retail sector. This specific evaluation contributes to a delicate understanding of the real-world implications of SARB's policy measures on the ground, allowing for more targeted and informed policy recommendations.

#### 5.4.2.3 Integrating Observations: The Interaction Between Policy Framework and Implementation

Drawing from the outcomes discussed in the earlier segments, the study discerns that monetary policy model directly impacts labour market dynamics. For instance, the Johansen Cointegration analysis revealed that inflation targeting approach (through elevated interest rates) correlates with a downturn in retail employment in the sector. Further, during periods of tightened monetary policy, instances of reduced consumer spending and diminished business investments were noted in the retail sector, substantiating the study's analytical findings.

## 5.5 Conclusion

Chapter 5 provided the concise discussions of the empirical results, offering comprehensions into the impact of the South African Reserve Bank's inflation targeting policy on employment in the retail sector. Through a succinct yet thorough discussion, this chapter provided valuable insights into the significant impact exerted by the inflation targeting framework of the South African Reserve Bank on employment dynamics within the intricate domain of the retail sector. By integrating statistical analyses with theoretical foundations, Chapter 5 has served as a pivotal bridge to the subsequent discussions, implications, and recommendations, providing a cohesive and good understanding of the relationship between monetary policy decisions and employment dynamics in South Africa's retail industry.

In conclusive alignment with hypotheses the empirical findings derived from a thorough examination, encompassing, for instance, the Johansen Cointegration, Granger Causality, and Impulse Functions, and so on, provided compelling evidence of the substantial impact of the South African Reserve Bank's inflation targeting framework on employment in the retail sector. The Johansen Cointegration analysis distinctly unveils a stable, statistically significant long-term relationship between interest rates and retail employment, supported by a cointegrating vector featuring positive coefficients. The dynamic perspective introduced through impulse response analysis further elucidates the aftermath of policy-induced interest rate shocks, revealing a significant, negative response in retail sector employment over time. This comprehensive evidence unequivocally supports the assertion that the SARB's inflation targeting framework has a substantive and statistically significant impact on employment in South Africa's retail sector, thus affirming $H_1$.

To illustrate the real-world implications, consider a scenario where the South African Reserve Bank enacts a policy adjustment, such as a repo rate change; the Granger Causality results unequivocally demonstrate that such an adjustment significantly shapes lending rates. This causal relationship exerts a discernible influence on various facets of employment dynamics within the retail sector. For instance, a repo rate hike triggers an increase in lending rates, subsequently impacting hiring patterns or workforce dynamics in the retail industry. The non-significant p-values across multiple Granger Causality tests underscore the intricate nature of these relationships, emphasising the interplay between monetary policy decisions and employment outcomes within the retail sector, thus aligning with the articulated expectations in $H_2$.

# CHAPTER 6: CONCLUSIONS, POLICY IMPLICATIONS AND RECOMMENDATIONS

## 6.1 Introduction

The chapter covers the study's conclusions (key findings and contribution to the knowledge), policy implications and recommendations, limitations as well as direction of further research in this area.

Key findings highlight the interaction between monetary policies and retail employment, with insights drawn from empirical analyses – overall contributing to the literature by providing a comprehensive understanding of how inflation targeting impacts the retail sector, challenging conventional assumptions. The policy implications segment explores the practical applications of the research outcomes, discussing how the study's insights are set to inform real-world decision-making processes. Thus, by examining the potential impact of the research on economic policies, this analysis provides valuable guidance to policymakers, stakeholders, and relevant institutions.

Further, the recommendations section offers actionable strategies based on the study's results. Grounded in empirical evidence, these recommendations provide practical and feasible steps for addressing the identified challenges and enhancing the positive aspects highlighted in the study. These suggestions guide future actions and initiatives in the studied domain. However, it is essential to acknowledge the limitations of this study, and this is provided in the limitation segment to critically evaluate the constraints faced during the research, which may have influenced the research process or impacted the comprehensiveness of the findings. Recognising these limitations provides context for interpreting the results and highlights potential areas for future research and exploration.

## 6.2 Conclusions (Key Findings and Contribution to Knowledge)

Within the complex economic landscape of South Africa, the retail sector stands as a linchpin, playing a fundamental role in the nation's economic dynamics. Its significance extends beyond commerce, shaping employment patterns, consumer behaviour, and serving as a barometer of economic health. As such, a detailed exploration of the relations between the South African Reserve Bank's inflation targeting framework and the employment

framework within the retail sector becomes imperative. The retail sector, a key driver of economic activity, encapsulates a vast spectrum of businesses, from small enterprises to large corporations, collectively influencing employment at various levels. The alignment of the monetary policy framework, particularly the SARB's inflation targeting approach, with broader economic policies is crucial for sustaining a harmonious economic ecosystem. Policies addressing inflation inherently impact consumer spending patterns, influencing the purchasing power of the populace. For instance, a targeted inflation rate guides interest rate decisions, impacting borrowing costs for businesses within the retail sector. The synergy between inflation targeting and other economic policies thus serves as a critical determinant of the retail sector's health and its ability to generate employment opportunities.

As such, the findings of this study suggest that higher interest rates are associated to a decline in employment within the retail sector, aligning with economic theory, that is rooted in the fundamental understanding that elevated interest rates often lead to reduced consumer spending and diminished business investments (Ernst et al., 2022). The study's findings are further aligned with by Buiter (2008)'s who concluded that during economic downturns, such as the global financial crisis, increased interest rates have been observed to coincide with a subsequent contraction in employment. During the 2008 financial crisis, many central banks increased interest rates as a response to economic uncertainties and inflation concerns. However, the impact of higher interest rates was profound, contributing to decreased consumer expenditure and a significant contraction in the economic activities.

Expanding to the inferences of this study, **Figure 14** below shows the flow and impact of interest rates on retail sector dynamics. Such relationships underpin the critical role of interest rates in shaping the labour market, as higher rates influence consumer spending behaviour and business investments, subsequently impacting employment in the retail industry. These findings emphasise the nuanced and multifaceted nature of economic dynamics, urging policymakers to consider a holistic approach that goes beyond interest rates when formulating policies aimed at fostering employment within the retail sector. Further research in this area could provide deepening insights into the intricate tapestry of factors influencing employment patterns, guiding future policy decisions and economic strategies.

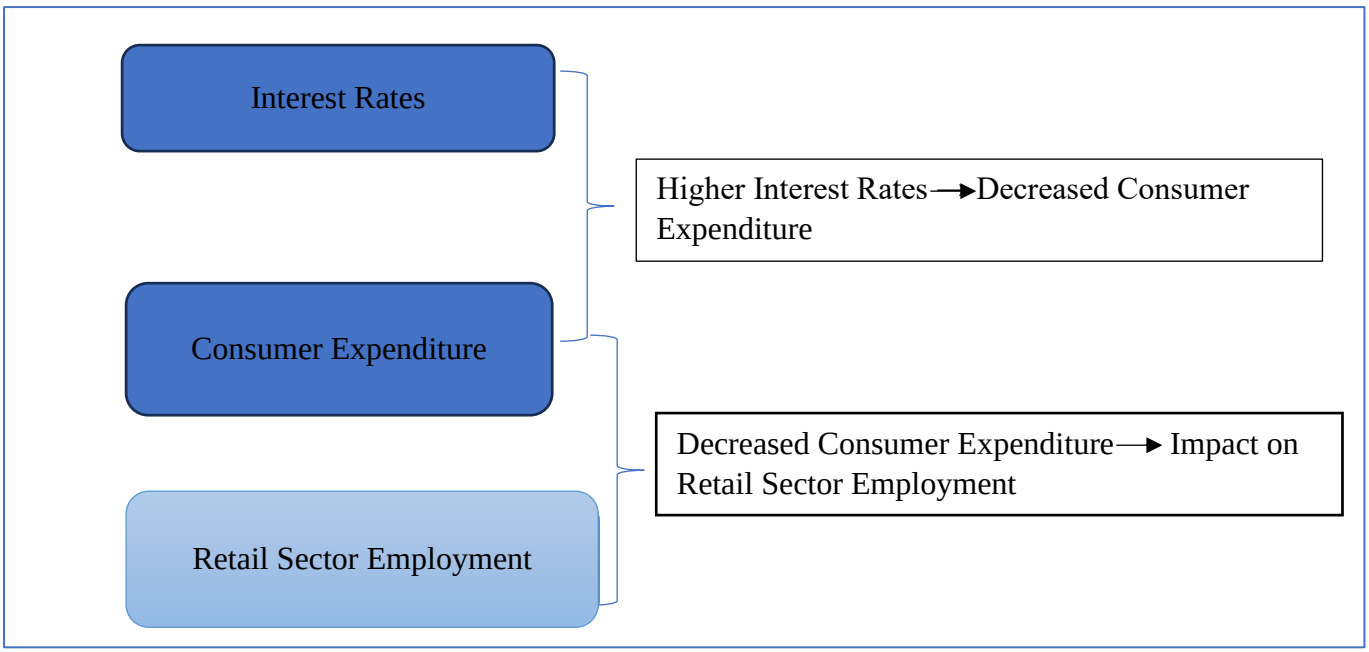



**Figure 14: The Impact of Interest Rates on Retail Sector Dynamics**
**Source**: Researcher's Own Graphical Presentation

**Figure 14** signifies the belief that during economic downturns or tightened monetary policy, higher interest rates lead to decreased consumer expenditure, subsequently impacting employment in the retail sector.

The conclusion of this study fills a significant gap in the existing literature that inadequately addresses the intricate relationship between inflation targeting frameworks and unemployment, specifically within the context of South Africa's retail sector. While prior research has explored general economic implications of inflation targeting, the nuanced dynamics within the retail industry have been overlooked. By focusing on this sector, the study unveils a critical dimension of the impact of inflation targeting on unemployment, offering a more granular understanding of how monetary policy decisions, particularly interest rate adjustments, reverberate through the retail labour market. The dearth of literature in this specific domain underscores the novelty and importance of this research, providing a comprehensive exploration of the complexities involved in the relationships between independent variables and employment patterns within this vital economic sector.

Furthermore, the study contributes to bridging the gap in the literature by empirically substantiating the link between higher interest rates, influenced by the inflation targeting framework, and a decline in employment within the retail sector. This empirical evidence provides a practical foundation for policymakers, economists, and academics to comprehend

the tangible consequences of inflation targeting policy into a sector that holds paramount importance in South Africa's economic landscape. The study's findings, emphasising the multifaceted nature of economic dynamics and the need for a holistic approach in policy formulation, represent a unique addition to the limited literature. In doing so, this research sets the stage for further inquiry and discourse, acting as a catalyst for future investigations into the complicated tapestry of factors influencing employment patterns in the framework of inflation targeting policies in South Africa.

## 6.3 Policy Implications and Recommendations

The most pressing issue confronting South Africa is the need to generate more jobs. The country has been enduring years of sluggish economic growth and limited employment opportunities. The central concern being finding solutions to address the widespread marginalisation and unemployment in South Africa (Altman, 2012).

Further, Altman (2012) also observed that most of the recent employment opportunities have arisen in formal and informal service sectors. It is likely that future job opportunities will continue to emerge from areas such as services, retail trade, and tourism. Consequently, there are two scenarios to bolster job creation opportunities: the first is strong economic growth: Based on current conditions and similar growth rates, the country would likely maintain the same level of unemployment in the longest time in future. The second scenario envisions significant policy improvements, particularly in promoting retail trade in services. Therefore, considering tough economic conditions, policy reform is the most tending solution to address the job creation challenges in South Africa.

Therefore, the findings from this study carry substantial policy implications for South Africa. The study highlights a critical relationship: adjustments in interest rates have a negative impact on employment in the retail sector in South Africa, a pivotal source of jobs for semiskilled and unskilled labour in the country. This underscores the urgent need for targeted policy reforms to strike a delicate balance between the South African Reserve Bank's mandate to protect the value of the currency (maintain price stability) and to assume playing an active role in the labour market.

To address these implications effectively, it is crucial to adopt a discerning approach. This involves striking a balance between the SARB's currency stabilisation goals and employment creation opportunities in the country (especially in the retail sector). Policy reforms should

aim for a refined approach that considers both economic stability and job creation. Further, implementing sector-specific incentives and support programs tailored to the needs of the retail sector, such as training initiatives, small business support, and employment incentives is also crucial.

Additionally, adopting flexible monetary policies responsive to the nuances of different sectors, particularly the retail sector, can mitigate negative employment impact. Collaboration between the government, regulatory bodies, and private sector stakeholders is vital, fostering an environment where policies are collaboratively designed to address the unique challenges faced by the retail sector, and overall other industries in South Africa.

## 6.4 Limitations and Direction for Further Research in this Area

Despite attaining its objectives, the study has several limitations that need to be acknowledged. Firstly, the research focused narrowly on the variables of inflation targeting framework (interest rates, inflation), and employment in the retail sector, overlooking other potentially influential factors such as consumer spending behaviours, technological advancements, and supply chain complexities. This restricted scope limits the comprehensive understanding of the multifaceted nature of employment dynamics within the retail industry.

Secondly, the study has oversimplified the intricate economic factors that influence retail employment, not fully capturing the subtle interaction of socio-economic and political variables. Furthermore, the study concentrated solely on the South African context. It did not delve into regional or sector-specific variations within the retail sector, nor did it consider other factors which influence employment trends.

These limitations highlight the broader scope of array of factors influencing labour market trends, but more importantly the need for further research endeavours to address the gaps and provide a more comprehensive understanding of employment dynamics in the retail sector.

The study has identified the following areas for future and further research:

(1) Consumer Behaviour Analysis: Exploring purchasing habits, preferences, and responses to economic changes is crucial for understanding retail sector employment dynamics. A study on "Unravelling Consumer Behaviour: Impact on Retail Sector Employment" can delve into this area.

(2) Technological Impact: Investigating innovations like e-commerce and automation on retail sector employment is essential. A study on "Technological Revolution: E-commerce and Retail Workforce Dynamics" can guide detailed research in this domain.
(3) Supply Chain and Global Trade: Examining the relationship between supply chain management, trade policies, and global economics in shaping retail sector employment offers a broader perspective. A study on "Global Threads: Supply Chain Dynamics in Retail Sector Employment" can guide research in this complex arena.
(4) Policy Interventions: Evaluating the effectiveness of training programs, tax incentives, and trade policies in stimulating retail sector employment is valuable. A study on "Policy Dynamics: Impact on Retail Sector Employment" can initiate comprehensive research in this field.

In conclusion, although this study has formed valuable insights into the connection between inflation targeting and employment within the South African retail sector, future research endeavours should encompass a broader spectrum of variables and employ diverse research methodologies. Such an approach will contribute to augmenting the depth of the findings, fostering a more comprehensive understanding of the intricate dynamics at play in this economic context.

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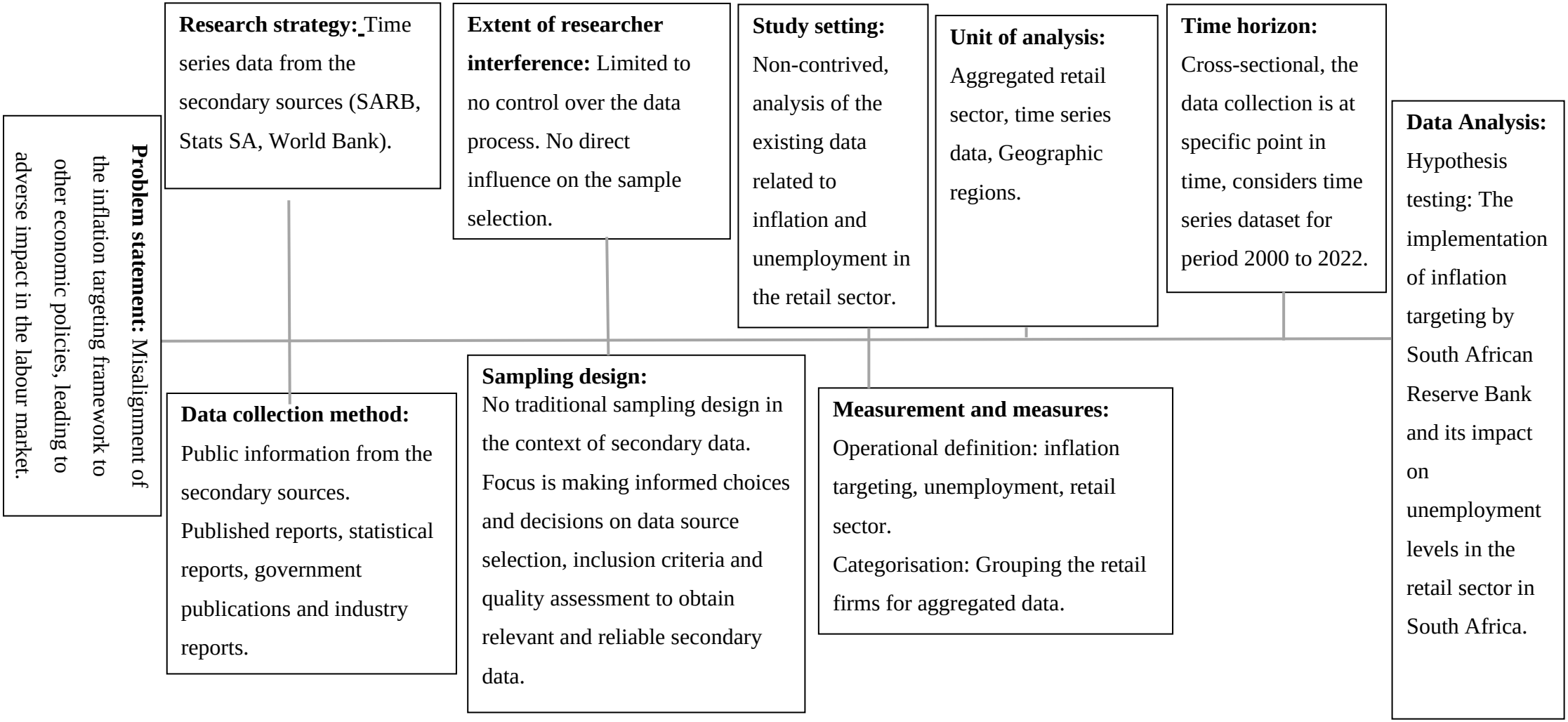
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## Appendices

### Appendix I: The overall research strategy for this study



## Appendix II: The Consistency Matrix

| Author (Year) | Organisational Problem | Research Problem | Conceptual Framework | Population and Sample | Research Gap |
|---|---|---|---|---|---|
| Potgieter, K. (2010) | Economic policy framework | Inflation targeting: Its failure to address unemployment and promote economic propensity | Monetary policy, Macroeconomics fundamentals | Consumer Price Index (CPI) for South Africa since inception of inflation targeting regime | Possible alternatives to inflation targeting given South Africa's unique economic challenges. |
| Bonga-Bonga, L. (2017) | Economic strategies | Effectiveness of monetary policy instrument during inflation targeting period in South Africa | Econometrics tools such as structural vector error correction model (SVECM) to measure the impact of monetary policy | Seasonally adjusted monthly inflation data for South Africa for period February 2000 to August 2016 | An assessment of how inflation react to monetary policy shocks in South Africa |
| Kandil, M. (2018) | Monetary and Economic policies | Inflation targeting and monetary policy in South Africa, how effective? | Various econometrics models to measure the effectiveness of inflation targeting. | Sample population was primarily based on the inflation data | Impact of this framework into other macroeconomic variables |
| Vermeulen, J.C. (2017) | Business and Economic review | Overly strict application of the inflation targeting stifles the labour market in South Africa | Phillips curve estimations to test this hypothesis in the South African current economic conditions | Employment and output, Real GDP and employment growth, and South African Phillips curve | Shortcomings in the South African literature to test the relationship between inflation and unemployment rate |
| Mishkin, F. S., & Schmidt-Hebbel, K. (2021) | Monetary policy and lessens from 2007 – 2009 financial crisis | Examination of where the state of monetary policy was before financial crisis | The Taylor principle is necessary for price stability. The theory of optimal monetary policy | Economic growth and inflation in and around the 2007 – 2009 financial crisis | Impact of the financial crisis on the monetary policy of the central banks |

## Appendix III: Detailed Johansen Cointegration Tests Results [2000 – 2022]

**1 Cointegrating Equation**
Log-Likelihood: -337.9795

Normalized cointegrating coefficients (standard error in parentheses)

| TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR | INFLATION_CONSUMER_PRICE |
|---|---|
| 1.000000 | -92091.35 |
| | (64161.1) |

Adjustment coefficients (standard error in parentheses)

| | |
|---|---|
| D(TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR) | 0.004716 |
| | (0.03577) |
| D(INFLATION_CONSUMER_PRICE) | -2.64E-07 |
| | (8.9E-07) |
| D(LENDING_RATE) | -1.97E-07 |
| | (5.2E-07) |
| D(REPO_RATE) | 7.66E-07 |
| | (8.1E-07) |

**2 Cointegrating Equations**
Log-Likelihood: -330.0696

Normalized cointegrating coefficients (standard error in parentheses)

| TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR | INFLATION_CONSUMER_PRICE | LENDING_RATE | REPO_RATE |
|---|---|---|---|
| 1.000000 | 0.000000 | 1363940. | -1324897. |
| | | (185528.) | (196292.) |
| 0.000000 | 1.000000 | -4.815833 | 5.120834 |
| | | (1.19077) | (1.25986) |

Adjustment coefficients (standard error in parentheses)

| | | |
|---|---|---|
| D(TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR) | -0.060275 | -13105.17 |
| | (0.06954) | (12104.0) |
| D(INFLATION_CONSUMER_PRICE) | -3.15E-06 | -0.538062 |
| | (1.6E-06) | (0.27278) |
| D(LENDING_RATE) | -1.32E-06 | -0.200380 |
| | (9.9E-07) | (0.17281) |
| D(REPO_RATE) | -1.33E-06 | -0.479872 |
| | (1.5E-06) | (0.26139) |

**3 Cointegrating Equations**
Log-Likelihood: -327.1283

Normalized cointegrating coefficients (standard error in parentheses)

| TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR | INFLATION_CONSUMER_PRICE |
|---|---|
| 1.000000 | 0.000000 |
| 0.000000 | 1.000000 |
| 0.000000 | 0.000000 |

Adjustment coefficients (standard error in parentheses)

| | |
|---|---|
| D(TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR) | -0.208048 |
| | (0.11788) |
| D(INFLATION_CONSUMER_PRICE) | -1.87E-06 |
| | (2.9E-06) |
| D(LENDING_RATE) | -2.62E-06 |
| | (1.8E-06) |
| D(REPO_RATE) | -2.86E-06 |
| | (2.7E-06) |

## Appendix IV: Vector Error Correction Model Tests Results [2000 – 2022]

**Vector Error Correction Estimates**

Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.

| Error Correction: | D(TOTAL_NUMBER_OF_EMPLOYEES_RETAIL_SECTOR) | D(INFLATION_CONSUMER_PRICE) | D(LENDING_RATE) | D(REPO_RATE) |
|---|---|---|---|---|
| COINTEQ1 | 0.018416 | -1.32E-06 | -5.63E-07 | -1.16E-06 |
| | (0.01990) | (3.5E-07) | (2.9E-07) | (3.8E-07) |
| | [0.92537] | [-3.82092] | [-1.92355] | [-3.06418] |
| R-squared | 0.555477 | 0.844216 | 0.705364 | 0.711506 |
| Adj. R-squared | 0.155407 | 0.704010 | 0.440192 | 0.451861 |
| Sum sq. resids | 6.44E+10 | 19.45949 | 13.91670 | 23.29952 |
| S.E. equation | 80274.64 | 1.394973 | 1.179691 | 1.526418 |
| F-statistic | 1.388449 | 6.021254 | 2.660024 | 2.740304 |
| Log likelihood | -247.3115 | -28.10480 | -24.75235 | -29.90577 |
| Akaike AIC | 25.73115 | 3.810480 | 3.475235 | 3.990577 |
| Schwarz SC | 26.22901 | 4.308346 | 3.973101 | 4.488444 |
| Mean dependent | 44826.50 | -0.122749 | -0.347917 | -0.325000 |
| S.D. dependent | 87348.33 | 2.564053 | 1.576699 | 2.061712 |

| | |
|---|---|
| Determinant resid covariance (dof adj.) | 5.75E+08 |
| Determinant resid covariance | 35937168 |
| Log likelihood | -287.4879 |
| Akaike information criterion | 33.14879 |
| Schwarz criterion | 35.33940 |
| Number of coefficients | 44 |

## Appendix V: Plots of Vector Error Correction Model Residual

