THE IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET PERFORMANCE IN SOUTH AFRICA

BY

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DECLARATION

I, Mihuvho Mafuna, hereby declare that this dissertation **THE IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET PERFORMANCE: THE CASE OF LARGE COMPANIES IN SOUTH AFRICA** for the Master of Commerce in Economics in the Faculty of Management, Commerce and Law submitted to the Department of Economics at the University of Venda has not been submitted previously for any degree at this or another University. It is original in design and in execution, and all reference material contained therein has been duly acknowledged.

Student:______________ Date: 15/08/2024

ABSTRACT

A well-functioning stock market is regarded as a reflection of a working economy. The stock market raises primary capital by rechannelling cash resources into productive economic projects aimed at building the economy while enhancing jobs and wealth creation. The South African economy has for the past decade been affected by different macroeconomic challenges which subjected the bourse into different risk factors, most specifically, the systematic risk factors. It is against this backdrop that this study aims to provide a critical review of the impact of macroeconomic changes on stock market performance in South Africa. This study used the Financial Times Stock Exchange (FTSE) and the Johannesburg Stock Exchange (JSE) top 40 index as the stock market performance benchmark, using time series quarterly data covering the period spanning from 2008 to 2021. Seven macroeconomic variables namely: economic growth, interest rate, inflation, money supply, exchange rate, crude oil prices and industrial production were used in the study. A multifactor regression model based on the arbitrage pricing theory was used to estimate the impact of each variable on market performance. Furthermore, the Ordinary Least Squares (OLS) method was used to establish the relationship between stock returns and macroeconomic variables. The study findings shows that economic growth, industrial production, and exchange rate affect stock market positively while inflation, interest rates have a negative impact. The implication of these results is that the government of South Africa should craft policies that increase the Gross Domestic Product (GDP) and industrial production to positively influence stock market performance, while policies to reduce inflation are recommended.

Keywords: Arbitrage Pricing Theory, FTSE/JSE Top40, multifactor regression model, OLS, Systematic risk.

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
AMC	Annual Market Capitalisation
ANOVA	Analysis of Variance
APPP	Absolute purchasing Power Parity
APT	Arbitrage Pricing Theory
ARDL	Auto Regressive Distributed Lag
ARMA	Auto regressive moving Average
ASEA	African Securities Exchange Association
BESA	Bond Exchange of South Africa
BLUE	Best Linear Unbiased Estimator
BRICS	Brazil, Russia, India, China, and South Africa
CAPM	Capital Asset Pricing Model
COP	Crude Oil Price
COSSE	Committee of SADC Stock Exchange
CPI	Consumer Price Index
	Development
DY	Dividend Yield
ECM	Error Correction Model
EHM	Efficient Market Hypothesis
FSCA	Financial Sector Conduct Authority
FTSE	Financial Times Stock Exchange
GARCH	Generalised Auto Regressive Conditional
GDP	Gross Domestic Product
	Heteroskedasticity
HQ	Hannan Quinn
IRF	Impulse Response Functions
JSE	Johannesburg Stock Exchange
KPSS	Kwiatkowski-Phillips-Schmidt-Shin

LR	Likelihood Ratio
LSE	London Stock Exchange
MS	Money Supply
OECD	Organization for Economic Co-operation and
OLS	Ordinary Least Squares
OLS	Ordinary least Squares
PA	Prudential Authority
PE	Price Earnings ratio
PP	Philip Peron
PPP	Purchasing Power Parity
PPPCF	Purchasing Power Parity Conversion Factor
RAMSEY	Ramsey Regression Equation Specification Error Test
RFR	Risk Free Rate of Return
RPPP	Relative Purchasing Power Parity
SA	South Africa
SADC	Southern African Development Community
SARB	South Africa Reserve Bank
SC	Schwartz Criterion
SSEI	Sustainable Exchange Initiative
StatsSA	Statistics South Africa
UK	United Kingdom
US	United States
VAR	Vector Auto Regressive
VD	Variance Decomposition
WF	Weak Form
WFE	World Federation of Exchanges

CHAPTER ONE

INTRODUCTION

1.1 Background

Stock markets play a vital role in the development and progression of any economy. According to Mahoza (2019), stock markets development is important for economic growth and for any economy to grow the financial sector needs to be fully developed. Stock markets raise primary capital by rechannelling cash resources into prospective projects aimed at growing the economy while increasing jobs and creating wealth (Molefi, 2019). Almost every government in the developing world has turned to stock market to raise capital instead of depending only on financial institutions for funds. El Wassal (2013) indicates that an efficient stock market plays a decisive role and serves as a mechanism that transforms savings into financing the real sector. However, Hayes (2021) on the other hand postulates that inefficient stock market will most likely lead to investment risk, financial irregulating and information asymmetry problems.

Unlike the well-established stock markets of developed economies, the stock markets in developing countries started to expand at a faster pace only in the past two to three decades. Despite numerous attempts that have been made to stabilize and expand stock markets, developing economies are considered to have the most volatile stock markets (Klagge and Zademach, 2018). This phenomenon usually leaves policy makers and investors without a concise plan on how to revitalise and improve the future of domestic stock markets.

According to Frijns (2015), stock market prices are believed to be volatile following the changes in macroeconomic variables. Fama (1981) suggested that there is an inclusive set of macroeconomic variables that influence stock market price and the performance of the bourse in its entirety. As a result, the impact of macroeconomic variables on stock market performance has attracted widespread attention in the literature, both in the developed and developing economies. In the past two decades there has been growing efforts to empirically examine the relationship between macroeconomic variables and stock market performance. Several studies have been conducted to model the relationship between asset prices and real economic activities, economic growth rate, unemployment, interest rate, inflation, yield spread, exchange rate in the context of developed countries, (Barakat, 2013; Bordo, 2009; Sadive, 2014; Saniannidis et. al. 2010; Sohoo, 2020; Wallin, 2020). Similar attention is also observed in the developing economies by (Fosu et al., 2014; Issahaku et al., 2013; Khalid, 2012; Majija, 2017; Molele, 2019).

1.2 Problem Statement

The importance of the stock market performance in an economy cannot be emphasized. Given the current slow economic growth experienced in South Africa, it is worthwhile to explore whether the macroeconomic variables influence how the stock market perform. Although several studies have been conducted to determine the relationship between macroeconomic variables and stock prices in developing countries and in the context of South Africa, results from such studies remain inconclusive.

The South African stock market has gone through many technical and structural changes since the attainment of democracy. Several studies have investigated the impact of exchange rate, GDP, interest, and inflation on the stock market (Banda, 2017; Ndlovu, 2018;). These studies report contradicting results on the relationship between the exchange rate, money supply, price of oil, inflation, interest rates, and stock prices.

The literature contains several gaps in terms of the relationship between macroeconomic variables and the performance of the stock market. Firstly, the impact of macroeconomic variables on the South African leading index (FTSE/JSE Top40) is not usually investigated. Studies constantly focus on the broad general index (FTSE/JSE All Share). Secondly, studies that use more recent data are scarce in the literature. Data for the most recent years contains special trends which would make contributions to the literature more interesting. Lastly, it is important to capture a period when South Africa was faced with various macroeconomic challenges including low economic growth, political instability (corruption and improper governance), low consumer and business confidence, and most recently, the Covid-19 pandemic.

1.3 Research Aim and Objectives

The aim of this study is to investigate the relationship between macroeconomic variables and stock market performance in South Africa. This aim is achieved through the fulfilment of the following specific objectives:

i. To examine the impact of selected macroeconomic variables (economic growth, inflation, interest rate, and exchange rates) on stock market performance in South Africa,

ii. To examine the impact of crude oil prices on stock market performance in South Africa,

iii. To establish the impact of money supply on stock market performance in South Africa.

iv. To examine the impact of industrial production on stock market performance in South Africa.

1.4 Hypothesis of the Study

This study tests the following alternative hypotheses:

i. Macroeconomic variables have a negative and significant impact on stock market performance in South Africa.

ii. There is a negative significant relationship between crude oil and stock market performance in South Africa.

iii. There is a negative significant relationship between money supply and stock market performance in South Africa.

iv. There is a negative significant relationship between industrial production and stock market performance in South Africa.

1.5 Significance of the Study

Very limited studies have been conducted on this subject matter in South Africa. As a result, this study will contribute immensely to the body of knowledge. Secondly, long term investors and portfolio managers making use of comprehensive analysts' reports will have a better understanding of how various macroeconomic surprises impact individual stocks, consequently avoiding short term noise trading and making well-informed long-term investment decisions that ultimately benefit the broad economy. Lastly, the results of the study will be helpful to policy makers in gaining a deeper understanding of how local monetary policy decisions impact individual stocks on the FTSE/JSE Top40.

1.6 Delimitation of the Study

Economists and arbitrage pricing model practitioners are still unsure of the precise number of macroeconomic parameters that will be incorporated into the model. More than the seven macroeconomic factors are likely to have an impact on stock performance. The study will only focus on seven macroeconomic variables (GPD, exchange rate, interest rate, inflation, money supply, crude oil prices, and industrial production) because there are an infinite number of factors that can influence stock market performance. These variables have been chosen specifically to help the study achieve its research goals. However, the present study's time frame will only be 13 years long, from 2008 to 2021.

1.7 Operational Definition

FTSE/JSE Top40 index: The FTSE/JSE Top40 index, also known as the FTSE/JSE, is a capitalization-weighted index that includes the top 40 largest businesses by market capitalization listed on the Financial Times Stock Exchange (FTSE) and Johannesburg Stock Exchange (JSE) (SA shares, 2019).

Arbitrage Pricing Theory: "is a multifactor asset pricing model that relies on the notion that the linear relationship between an asset's expected return and a variety of macroeconomic variables that account for systematic risk can be used to predict an asset's return" (Hayes, 2019).

Multi-factor Regression Model: is an extension of the conventional least squares regression that incorporates multiple explanatory variables. It is a statistical strategy for predicting the results of a response variable.

Ordinary Least Squares (OLS): is a variant or type of the linear least squares method that is used to estimate the unknown parameters in a linear regression model under the premise that the errors are normally distributed. The approach calculates the association by reducing the sum of squares in the difference between the observed and anticipated values of the dependent variable using a straight-line configuration.

Systematic Risk: Systematic or aggregate risk arises from market structure or dynamics which produce shocks or uncertainty faced by all agents in the market; such shocks could arise from government policy, international economic forces, or acts of nature.

1.8 Organisation of the Study

The current study is made up of 6 distinct chapters as follows:

Chapter 1: Introduction and background: The research problem is explained in this chapter, which also serves as an introduction to the study. Chapter 2: Overview: The performance of the Johannesburg Stock Exchange overall relative to the chosen macroeconomic indicators will be covered in this study. Chapter 3: Literature Review: The focus of this chapter is to review appropriate literature on APT, CAPM, EMH and other empirical findings. Chapter 4: Methodology: The research approach used in the study will be explained and motivated in this chapter. The chapter will also go through the methodology and tools used to analyse the data. Chapter 5: Presentation of results: The econometric results will be presented in the form of tables and figures. Chapter 6: Conclusion and recommendations: An overview of the study, as well as conclusions and suggestions based on the findings, are presented in this chapter. Also, recommendations for additional study will be made.

CHAPTER TWO

OVERVIEW

2.1 Introduction

This chapter provides a background of the JSE, an overview of the FTSE/JSE Top40 Index and the particulars concerning its size, composition, and importance in the financial markets. The chapter is crucial to assist in understanding the background of the JSE, the overview of the key variables, the trend of the variables, and how they will be useful in the achievement of the study objectives. The exposition of the variables and their trend will be substantiated with the use of line graphs. This chapter also discusses the variations of macroeconomic variables that have been selected for this study.

2.2 Background of the Johannesburg Stock Exchange (JSE)

With over a hundred year of operation the Johannesburg stock exchange remains to be the oldest securities exchange in Africa. The South African stock market which is formally regarded as the Johannesburg stock exchange (JSE), it is in Sandton`s financial district in Johannesburg. The JSE is regarded as the engine room for the South African economy since it is the main facilitator of capital creation. It also serves as a gate way to African economies by creating a link between international markets and the rest of the continent (JSE, 2020). The JSE was instituted in 1887 during the boom of the mining industry to raise the much-needed capital to expand operations and pursue new initiatives.

Over the years the JSE has gone through different technological advancements and upgrades. It has since evolved to become a full-service modern-day securities exchange providing full electronic listing, trading, clearing and settlement operations. Furthermore, the JSE moved its trading system from London stock exchange back to South Africa to achieve high processing speed and high-performance operational stability (JSE, 2019). The JSE also managed to improve its liquidity and its overall market efficiency over the years of its operation.

The JSE is open to both local and international investors seeking investment opportunities in South Africa. According to JSE (2021), there are more than 350 listed companies on the JSE board including 62 foreign domiciled companies. The JSE is comprised of different asset classes (Equities, Commodities, interest rate instruments, etc) and have also acquired the JSE Debt market which was previously known as the bond exchange of south Africa (BESA) and the South African futures exchange (SAfex) in addition to other investment products such as the exchange traded funds (ETF`s), fixed income securities and financial derivatives as a way of helping investors to diversify their investment portfolios (JSE, 2019). It also offers other services such as post-trade services, information services, issuer services, technology, and regulation (JSE, 2020). The JSE is the largest stock market in Africa by market capitalisation and ranks 16th in the world with a market capitalisation of approximately R9.7 billion as of December 2021 (JSE, 2021). It a member of the world federation of exchanges (WFE), the committee of SADC stock exchange (COSSE) and African securities exchange association (ASEA). It is also a founding member of sustainable exchange initiative (SSEI).

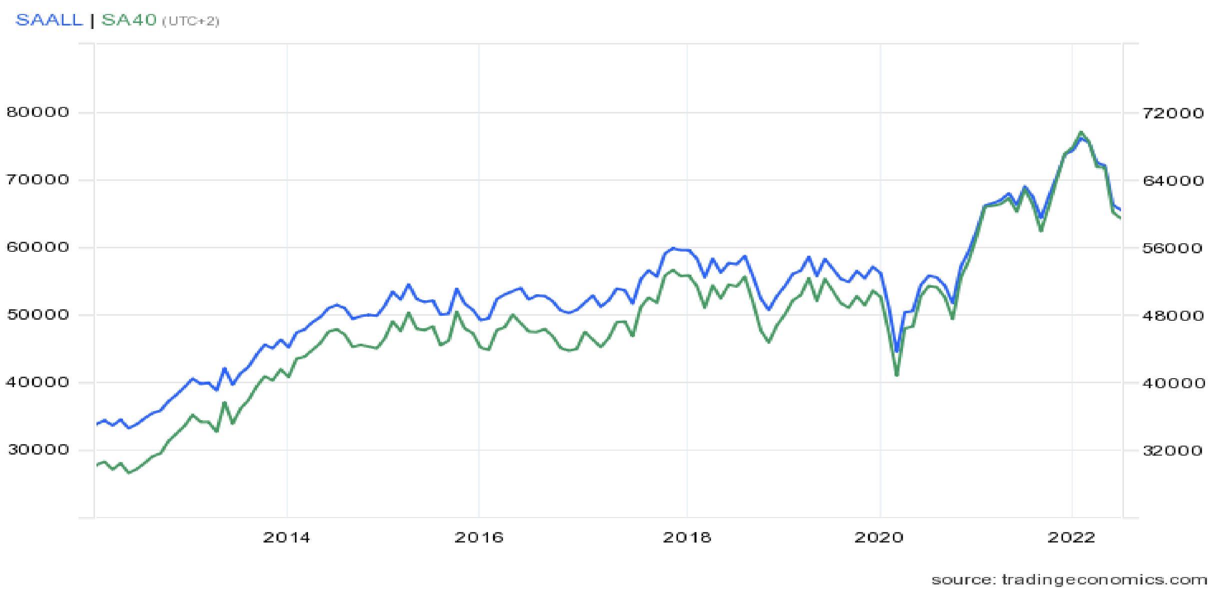


Figure 2. 1: JSE All share index vs JSE Top40 index performance.

Source: Trading Economics (2021)

Figure 2.1 captures the historical performance of the two main indices of the JSE, the JSE All share index and the JSE Top40 index. The JSE all share index corresponds to 99% of the full market capitalization of all eligible equities listed (Large cap, Mid-cap, and small cap) on the main JSE board known as the free float market capitalization weighted. The JSE Top40 index on the other hand includes the top biggest companies listed on the exchange by market capitalization (JSE, 2019).

2.3 Overview of the FTSE/JSE Top40 Index

The FTSE/JSE Top40 is the South African leading index that consists of 40 largest companies in South Africa ranked by market capitalization (investible market value) of all listed companies in FTSE/JSE All share index, and it is considered the most efficient and diverse portfolio. It is a fair reflection of what happens in the South African stock market (SA Shares, 2019). According to JSE (2019), the index was formed to use as performance benchmark and in the creation of derivatives and index tracking funds. The stocks of individual constituents of the FTSE/JSE Top 40 are carefully selected, screened, and weighted to ensure that the index is tradable and investible at the same time. JSE (2021) further asserts that the index uses a transparent, rule-base construction process that is strictly regulated by JSE regulators, the prudential authority (PA) and financial sector conduct authority (FSCA).

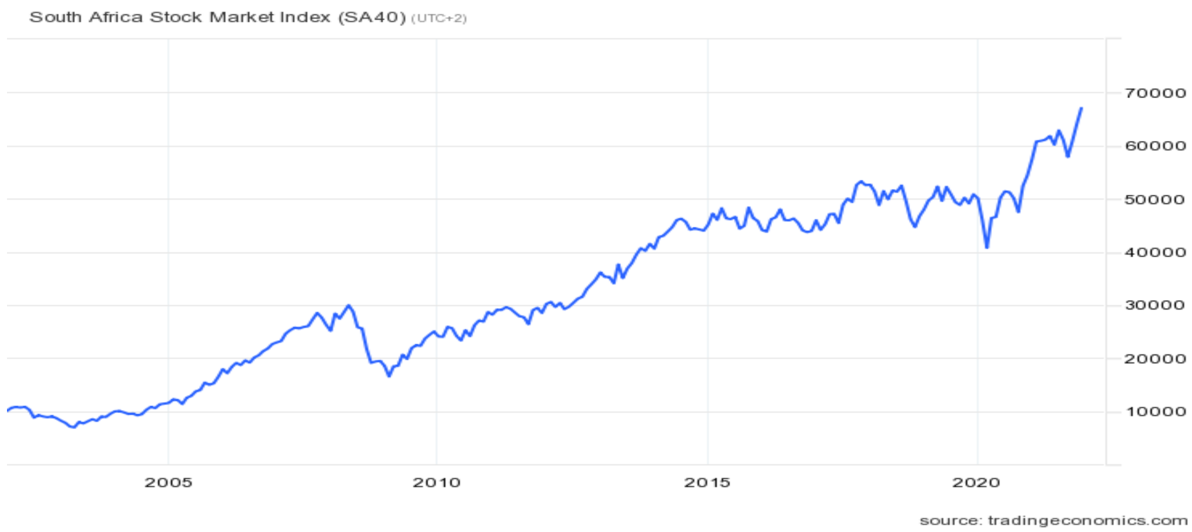


Figure 2. 2: FTSE/JSE Top performance

Source: Trading Economics (2021)

Figure 2.2 captures the historical performance of the FTSE/JSE Top 40 index since its launch in 2002. The index was initially launched with a base trading volume of only 10300.31 points. This index has continued to raise over the years and has been able to overcome the challenges presented by the 2008/09 global financial crises, recessions and the challenges posed by macroeconomic instabilities and the coronavirus pandemic-2019 (Covid-19) to increasing its trading volume from its base trading points to a high of over 67000 points as of December 2021 (JSE, 2021). The FTSE/JSE Top40 index can be traded by financial market players with a trading code j200. The index demonstrated great resilience over the years through its robust risk mitigation systems. This index is composed of relatively large liquid companies representing a significant portion of the JSE market cap. Companies in question are mostly consumer oriented with a significant offshore listing (Money Web, 2020).

It is of paramount importance to show the index characteristics which include the number of companies that make up the FTSE/JSE Top40 index, the net market capitalisation, and the divided yield. Table 2.1 below shows the index characteristics.

Table 2. 1: FTSE/JSE Top40 Index characteristics

Attribute	FTSE/Top 40
Number of constituents	41
Net Mcap	5991490
Dividend yield (%)	3.82
Constituent size (Net Mcap (ZAR/m)	
Average	146134
Large	880940
Small	25175
Median	86740
Weight of largest constituent (%)	14.70
Top 10 holdings (% index cap)	60.54

Source: Own table

Table 2.1 represents the index characteristics which include the number of companies that make up the FTSE/JSE Top40 index, the net market capitalisation, and the divided yield. The table 2.1 also show the averaged market capitalization of the JSE Top40 constituents. Compagnie Financière Richemont AG is the largest company by market capitalization with a net market cap of approximately $US880 040 million and a weighted average of 14.70%. Lastly, Table 2.1 includes the percentage weight of the top 10 companies which translate to 60.54% of the JSE Top40 index.

2.4 Changes in macroeconomic variables

It is crucial to note that macroeconomic variables are not static, they are dynamic and continuously change due to various factors from within and outside the borders. The For instance, the global financial crisis of 2008/09 affected many macro-economic variables and economic policies. The line graphs in figure 2.3 below illustrate the trend of the relationship between macroeconomic variables and FTSE/JSE Top40 index for the period under study.

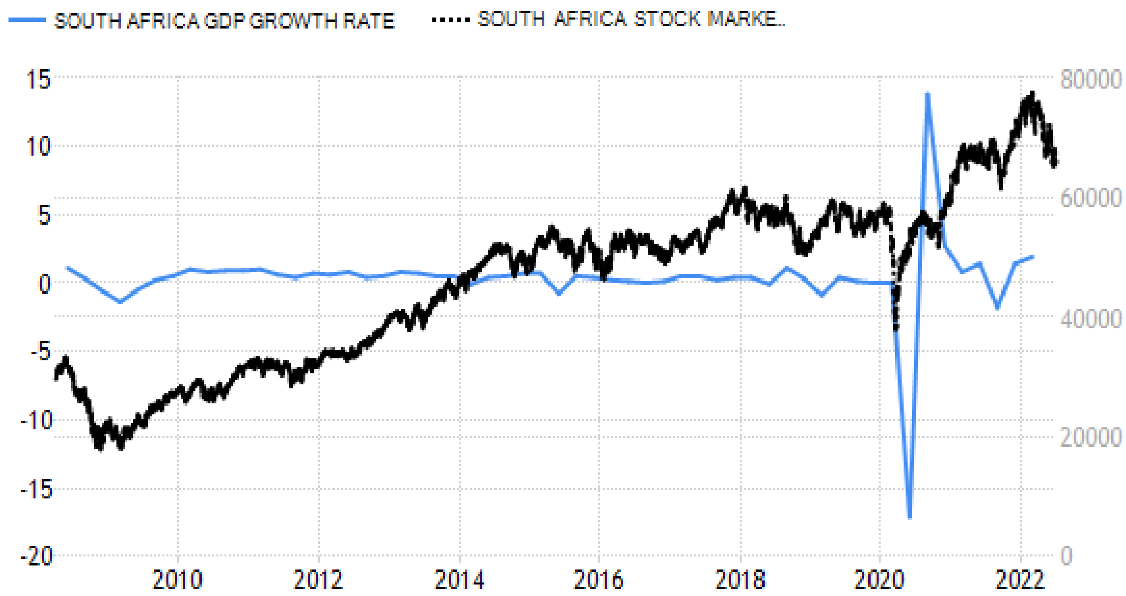


Figure 2. 3: JSE Top40 and GDP

Source: StatsSA (2021)

Figure 2.3 shows that both the FTSE/JSE Top 40 index and GDP fell abruptly following the 2008/09 global financial crises. The JSE Top40 index fell from approx. 29939.96

trading points from 2008Q1 to 16514.30 trading points in 2009Q2. GDP growth rate contracted by an annualized rate of 2.1% from 2008Q2 to 2009Q2 (South African Reserve Bank, 2013). Recovery in both the JSE Top40 index and GDP growth began by the end 2009Q2, with the JSE top40 index increasing at a faster rate than GDP to a high of approximately 53269.83 trading points in 2017Q4. GDP for the same period has since only increased moderately with short-term quarter on quarter (Q on Q) fluctuations. GDP contracted by an annualized 2.2% in the first quarter of 2018 (SARB, 2018), despite a notable improvement in domestic business and consumer confidence the JSE Top40 index also dropped to 48794.50. According to SARB (2020), South Africa's real GDP contracted by a massive 16.4% In the second quarter of 2020 and the top40 decreased by 21% mostly due to lockdowns implemented to curb the spread of the outbreak of the Covid-19 pandemic. Both the FTSE/JSE Top40 index and Domestic economic growth rebounded significantly in the third quarter of 2020 with the easing of the COVID-19 lockdown restrictions. The pace of increase in domestic economic activity moderated further in the first quarter of 2021 with the Top 40 rising to an all-time high of 67052.40 trading points in 2021Q4. Thus, the JSE Top and GDP

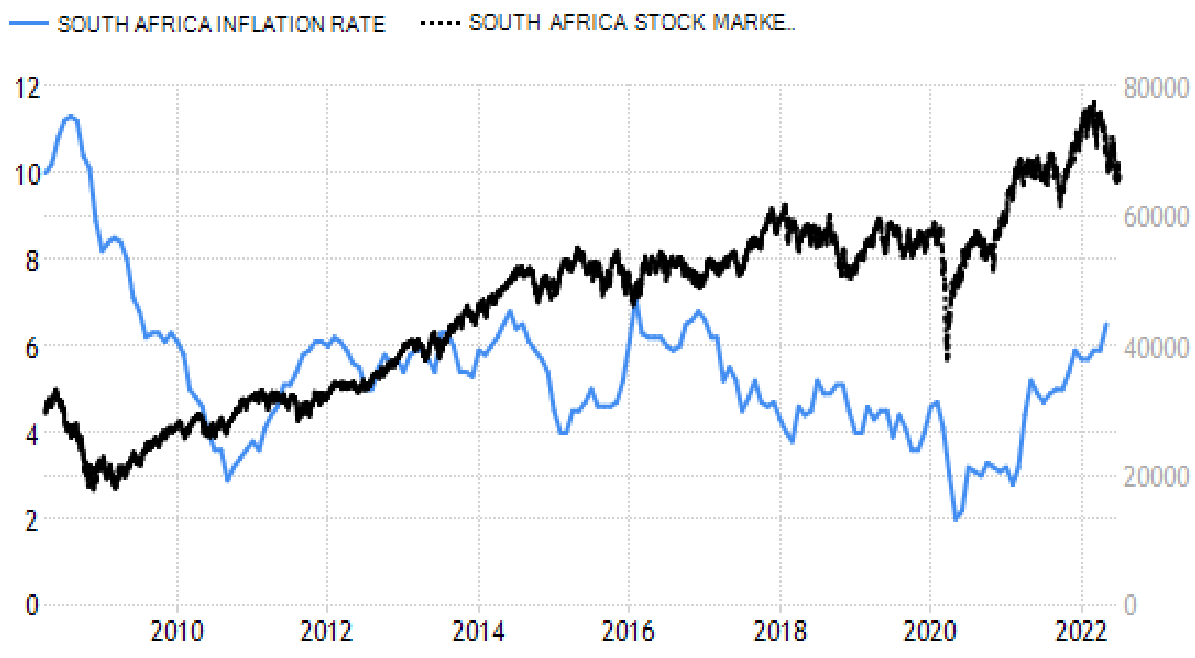


Figure 2. 4: JSE Top40 and inflation rate

Source: StatsSA (2021)

The results depicted on figure 2.4 shows that both the JSE Top40 index and the inflation rate as measured by CPI were decreasing during the advent of the global financial crises indicating a positive relationship. The top40 decreased significantly by approximately 45% from 2008Q1 to 2009Q1 with inflation rate falling from 11.3% in 2008Q2 to a more desirable inflation target of 6% in 2009Q4. However, post the financial crises CPI has not explained the movement in prices of the JSE Top40 index as indicated by the movement in opposite direction. The JSE Top40 has since displayed a sharp increase from a low of 16514.30 in 2009Q2 to a high of 50816.05 trading volume in 2019Q4 whereas inflation rate has moved broadly sideways mostly remaining within the inflation target of 3-6 per cent. Financial market across the world crashed in March 2020, both the JSE Top40 and the inflation rate decreased significantly with the JSE Top40 dropping to 40738.57 trading points in 2020Q1 and CPI decreasing to a 16-year low of 2.1% in 2020Q2 (SARB, 2020). Following the easing of Covid-19 restrictions and increasing global demand in 2020Q2 both the JSE Top40 and inflation rate have been increasing to 2021Q4.

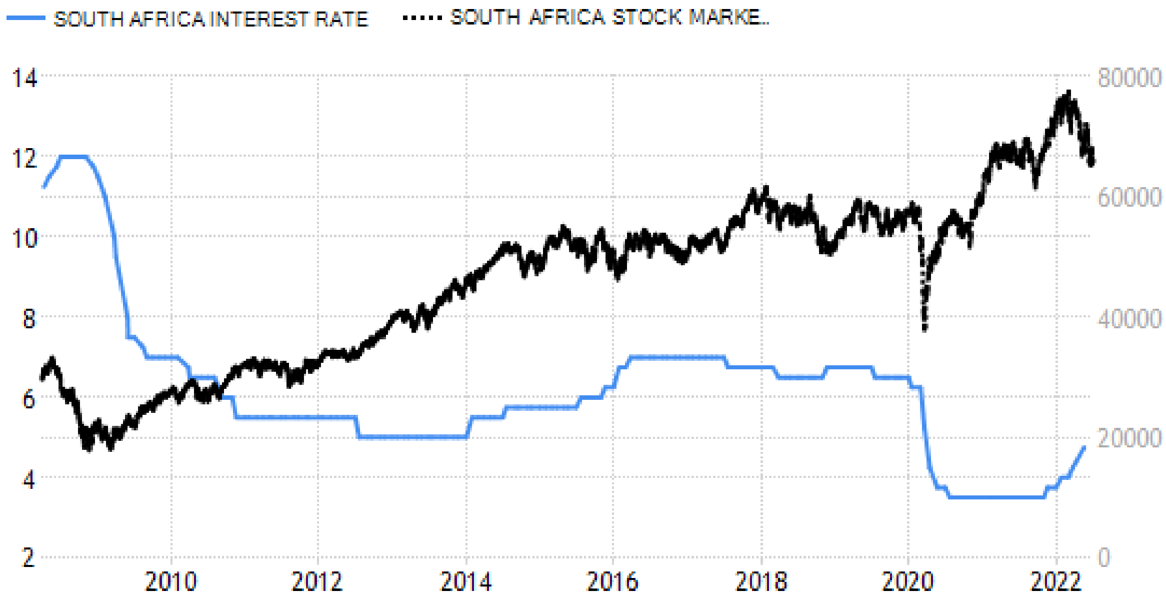


Figure 2. 5: JSE Top40 and interest rate

Source: StatsSA (2021)

The graph in figure 2.5 shows that the JSE Top40 index fell drastically by over 13000 trading points from 2008Q1 to 2009Q1 due to the impact of the global financial crisis. The SARB on the other hand increased interest rate by 50 basis points on each occasion in 2008Q2 and 2008Q3. This indicates a significant negative relationship. The JSE Top40 rebounded at a face pace from 16514.30 in 2009Q2 and kept a consistent capital appreciation rising to a price of 48195.48 by 2015Q2 after which the index kept a constant upward trend with q-on-q fluctuation. The monetary policy committee (MPC) of the SARB only started reducing the repurchase rate in 2008Q4 and by 2009Q3 had reduced the policy rate by a cumulative total of 450 basis points (SARB, 2010). central banks around the world adopted a quantitative easing approach between 2013 and 2015 and as a result the SARB further decreased rates to 5.0% by the end of 2013Q4 further implying a negative relationship between the JSE Top40 index and interest rate. both the JSE Top 40 index and interest rate have remained relatively flat moving in opposite directions. In 2020Q1 a stock market crash caused by Covid-19 restrictions caused the JSE Top40 to decrease by 19.8% (10077.48 trading points) however the impact of the crash was short lived due to the easing of Covid-19 restrictions and the JSE Top40 has since risen to 67052.40 in 2021Q4 (JSE, 2021). The SARB decrease interest rates from 6.5% in 2019Q4 to a low of 3.75% by 2021Q4 (SARB, 2021).

Figure 2. 6: JSE Top40 AND USD/ZAR

Source: StatsSA (2021)

The trend depicted in Figure 2.6 shows that the USD/ZAR exchange rate increased by 23,5% from 2008Q4 to September 2009Q3. Simultaneously, equity prices declined considerably with the JSE Top40 prices falling from 2008Q1 to 2009Q2, while exchange rates also adjusted significantly with various emerging-market currencies experiencing downward pressure as some international investors liquidated their emerging-market exposures, favouring the familiarity of the developed economies (JSE, 2010). From 2010Q2 both the JSE Top40 and the USD/ZAR exchange rate increased significantly with the JSE Top40 increasing at a much greater pace than the USD/ZAR exchange rate until 2016Q4 indicating a positive relationship. According to SARB (2020), the exchange rate fell noticeably by 16.4% between 2019Q1 and 2020Q2, which reflects increased domestic producers' ability to compete on global markets during this time. Therefore, from 50816.05 trading points in the 2019Q4 to 40738.57 in the 2020Q1, the JSE Top40 index fell. This decline was primarily caused by the abrupt devaluation of currency at the start of the COVID-19 pandemic and the ensuing lockdown restrictions at the end of March 2020. From April 2020 and November 2020, the USD/ZAR exchange rate increased by 7.6%, while domestic COVID-19 lockdown limitations were gradually relaxed. Since the easing of covid-19 lockdowns in 2020q3 both variables have shown sign of increase in the same direction. The observation of both variables moving in the same direction is testament to the fact that a significant proportion of the earnings of constituents of the FTSE/JSE Top40 index are obtained from outside South Africa, thereby being resistant to exchange rate (Rand) shocks.

One of the most important macro-economic variables is Money Supply (MS) and can be in the form of M1, M2, or M3. For the purposes of this study, MS will be restricted to M3 also known as the broad money supply. The trend of MS is shown in figure 2.7 below and the explanation and description of the figure will be made after. What is crucial to point out is that M3 performance affect other macro-economic variables and the South African Reserve Bank (SARB) is responsible for controlling this variable through its monetary policy. Money supply will increase if SARB follows expansionary monetary policy and the opposite holds if SARB opt for tight monetary policy.

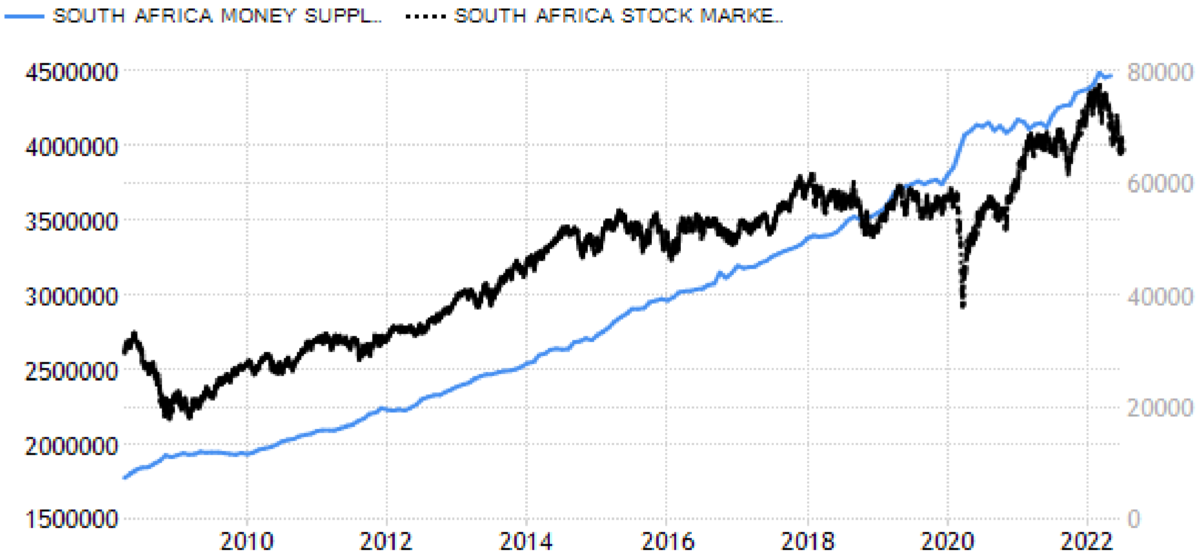


Figure 2. 7: JSE Top40/MONEY SUPPLY

Source: StatsSA (2021)

The graph illustrated on figure 2.7 above shows that growth over twelve months in M3 decelerated from 24,5% in 2008q1 to 15,2% 2008q3, before picking up slightly to 15,6% in the fourth quarter (SARB, 2009), the JSE Top40 index decelerated by approximately 45% from 2008q1 to 2009q1 before bouncing back in 2009q2. From 2010q1 both variables accelerated further up until 2018q1 with m3 increasing slower than the JSE Top40 index, mostly recording single digits increases. According to SARB (2018), this was caused tight economic conditions and low levels of consumer and business confidence. Subsequently m3 accelerated further in 2018q3, rising above the JSE Top40 buoyed by higher corporate deposits amid higher uncertainty in financial markets. The JSE Top40 decelerated due to persistent political instability in, and announcement made by major credit rating agencies to further downgrade South Africa's investment rating to Baa3. This also resulted in South Africa being removed from the Citi world government bond index (JSE, 2018). Following the discovery of the coronavirus pandemic in 2019q4 which was followed by intense lockdowns across the world, growth broadly defined money supply accelerated notably in 2020q1 to 2020q2 driven by increases in non-financial corporate deposits and household deposits as well. The JSE top40 index on the other side decelerated significantly by 19.8% from 2019q4 to 2020q1. However, as lockdown restriction were starting to ease I the second quarter of 2020 the JSE Top40 began to increase. Consequently, m3 moderated from 2020q3 following the rebound in economic activities and had slowed

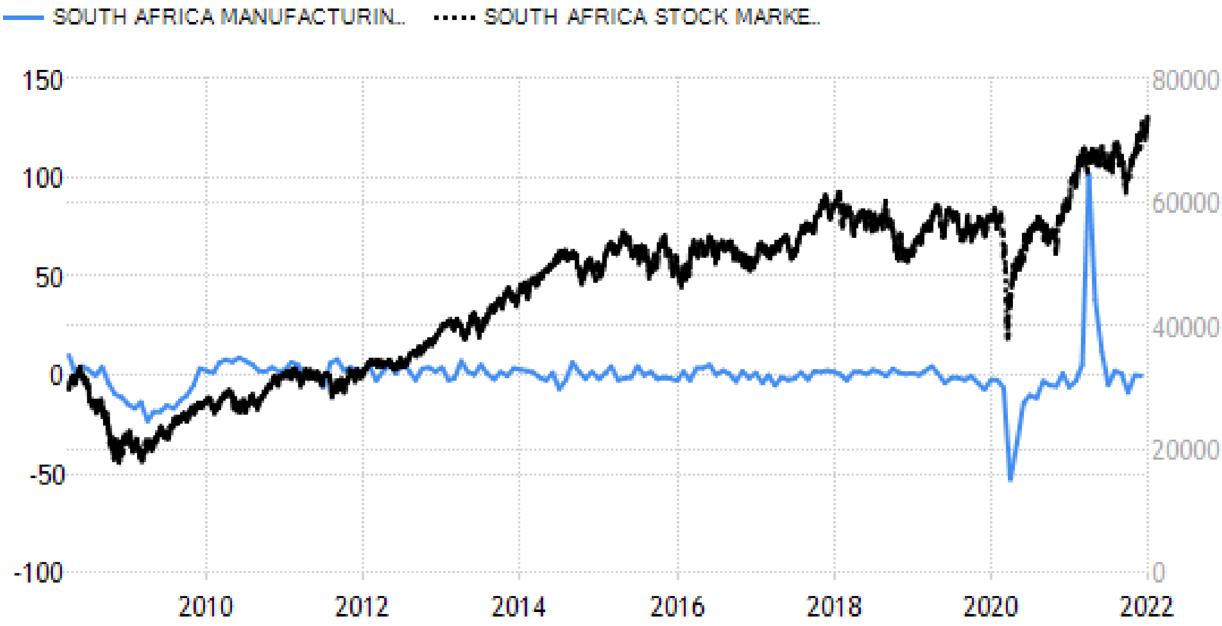


Figure 2. 8: JSE Top40/Industrial Production

Source (Trading Economics, 2022)

The graph in figure 2.8 show that both the JSE top 40 index and industrial production recoded a dismal performance for the year 2008 which was highly impacted by the 2008/09 global financial crises. From mid-2009 both variables showed signs of tentative growth and continued to increase in the same pace until 2011Q2. The JSE top40 index accelerated further at a faster pace rising from approximately 26000 trading points in 2011q2 to approximately 50000 trading points by the end of 2019q4. However, industrial production remained subdued in same period with q-on-q fluctuations. According to SARB (2018), the largest negative contribution to industrial production growth came from the manufacturing sector, with widespread contractions in the various subsectors, the most prominent declines being in the manufacturing of chemicals, and wood and paper products. The JSE Top40 decreased considerably in the first quarter of 2020 following the disruption in financial markets caused by covid-19 pandemic. Industrial production also contracted in the same period due the fact that mining production was suppressed by supply-chain disruptions related to domestic and international lockdown restrictions, and after the initial hard lockdown by regulations that prohibited mines from operating at full capacity in the interest of the safety of workers. Mining, manufacturing, and agricultural exports all saw significant increases in 2020 Q3 to 2020 Q3, driven by better global commodity prices, increasing worldwide demand, and an improvement in loading rates at home ports, according to SARB (2021). This has also boosted the financial markets in emerging markets and as a result the JSE To40 index has since accelerated to a high of approximately 67000 trading points (JSE, 2021).

The graph in the figure 2.9 below shows that both variables deteriorated sharply due to declining global demand and a fall in global commodity prices posed by the global financial crises. International crude oil prices dropped from a peak of more than $146 per barrel in 2008Q2 to levels of about $50 per barrel with the JSE Top40 dropping from approximately 30000 trading points in 2008Q1 to a low of about 16000 trading points in 2009Q2. Post the financial crises both the top40 index and crude oil prices increased with crude oil prices trading above JSE Top40 index up until 2014Q2. Consequently, by the end of 2014Q2 crude oil prices declined considerably and continue to trend lower to 2014Q4 while the JSE Top40 continue to rise above crude oil prices.

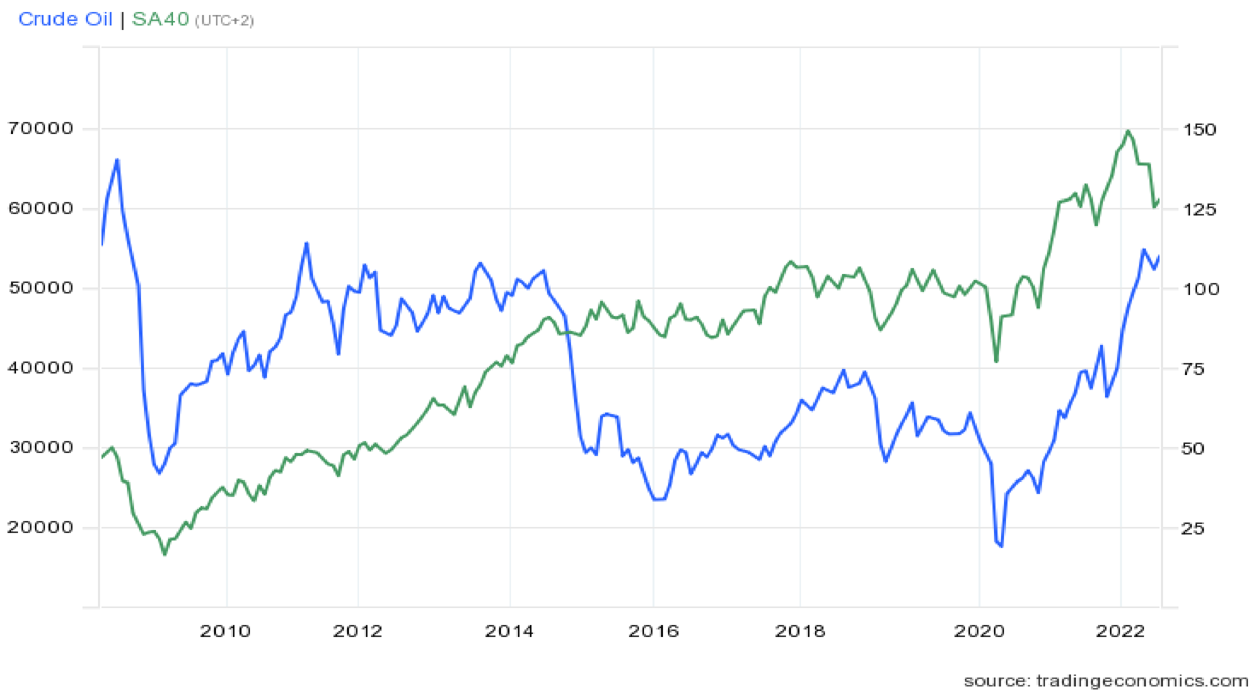


Figure 2. 9: JSE Top40/ Crude-Oil

Source: StatsSA (2021)

According to a SARB (2016) analysis, the price of crude oil fell to a six-year low in 2015 Q1, selling at around $45 per barrel, before rising again in 2016. The decision by the Organization of Petroleum Exporting Countries (OPEC) to cut oil production, according to JSE (2017), helped the recovery. International crude oil prices and equity prices drastically decreased after the COVID-19 pandemic's emergence and quick global spread as most nations-imposed lockdown restrictions. The price of Brent crude oil originally increased to a high of US$69 per barrel in early January 2020 amid hope that a US-China trade agreement would improve prospects for global economic development, according to SARB (2020). However, in the middle of February, oil prices dropped significantly because of worries that the coronavirus pandemic (COVID-19) would reduce worldwide demand. As a result of these developments, investors' risk appetite significantly changed, as evidenced by the rapid decline in global equities and bond prices in the first two weeks of March, according to JSE (2020). Around 10,000 trading points were lost by the JSE Top40 within the same time frame. As the virus spread to several nations, oil prices fell even more, dropping dramatically to about $18.60 per barrel in 2020Q2.

2.5. Summary

In this chapter a discussion of the background of the Johannesburg stock exchange (JSE), the overview of the FTSE/JSE Top40 Index and the particulars concerning its size, composition and importance in the financial markets was done. This chapter also discussed the variations of macroeconomic variables that have been selected for this study and the factors that contributed to their fluctuations which included the external factors such as the financial crisis and the COVID-19 pandemic.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter is divided into two main sections. The first section discusses the theories underpinning the stock market performance. The second section discusses the empirical literature on the relationship between macroeconomic variables and the performance of the stock market. In doing this, the chapter positions the study in the macroeconomic literature as well as establishing the research gap and providing insights into the model building and variables inclusion.

3.2 Theoretical Literature

The purpose of theoretical literature is to properly examine theories that are used to justify and support arguments, variables and the phenomena that is being studied. Theoretical literature review assists in establishing the theories that has been developed already, the link between them, degree of their investigation and to formulate new hypothesis. As far as this study is concerned, theories that will be evaluated here are efficient market hypothesis, capital asset pricing model and the arbitrage pricing model as well as the Purchasing Power Parity.

3.2.1 The Efficient Market Hypothesis

The main functions of the capital market are to distribute ownership of the capital stock of the economy. The random walk theory introduced by Kendall in 1953, served as the foundation for the growth of the market efficiency theory, and is related to the efficient market hypothesis (EMH). According to Kendall (1953), information is promptly reflected in stock prices, meaning that a change in price today will not affect prices tomorrow. In a similar vein, information from the day before does not influence price movements in the present. This shows that because news or information can change at any time, any price movements that ensue are thought to be random. According to the efficient market hypothesis, which is a theory of investing, it is challenging to consistently outperform the market because current share prices frequently incorporate and represent all relevant information because of stock market performance. According to Reilly and Brown (2011), a successful capital market is one where security markets rapidly adjust to new information and where current security prices accurately reflect all relevant information about the security.

All stock prices should follow a random walk since, according to Fama (1965), an efficient market is one in which prices accurately represent all information that is accessible. Because changes in macroeconomic variables are completely reflected in the current share prices. Malkiel and Fama (1970) claim that anomalous returns achieved by investors are only possible by chance. If ongoing gains occur, however, it suggests that the market is not information efficient. EMH makes the supposition that all investors are rational and respond to information. Because past data cannot be used to anticipate future prices, the market is said to be efficient if the price response to new information is immediate and unbiased.

Fama (1970) created a framework for describing how efficient markets are. Three sub-hypotheses or forms of EMH can be distinguished: the weak form, the semi-strong form, and the strong form of efficiency. The less persuasive version suggests that share prices solely reflect historical market statistics, which include all previous iterations of share prices, rates of return, trading volume data, and other data derived from the market. The semi-strong form assumes that stock prices react quickly to the disclosure of all publicly available information. Prices respond rapidly and accurately to new information in a semi-efficient market. All market information, including trading volume statistics, security prices, and rate of return information, is available in the semi-strong form, which includes the weak-form hypothesis. Any non-market data, such as dividend announcements, price to earnings ratios (P/E), and dividend yields (D/Y), may also be noteworthy public information.

Analysis of information that is readily available to the public is meaningless in a semi-strong market. According to McMillan (2011), it is useless to examine earnings reports from corporations to find under- or overpriced securities because the values of these securities already reflect all information that is readily available to the public. Since no investor has access to information that other market participants do not, if markets are semi-strong efficient in this regard, no investor can acquire an edge in forecasting future securities prices. The strong type claims that stock prices accurately reflect both public and private information in its final argument. This guarantees that no other buying group has monopoly access to information that could influence pricing structure (Malkiel, 2005).

The strong form efficient market hypothesis, which considers all previous security data and reflects both public and private information or insider knowledge, incorporates both the weak form and semi-strong form. The strong form applies the effective market theory's notion that prices react swiftly to the disclosure of new public information by assuming ideal markets in which all information is transparent and available to everyone at the same time. Without being weak-form efficient, markets can be semi-strong or strong-form efficient. Markets that exhibit semi-strong form efficiency need not exhibit strong form efficiency, but they must exhibit weak form efficiency. Competitive markets point to rates that accurately reflect the information available regarding underlying values. In most market-based systems, market rates determine which firms (and which projects) receive funding; if these prices do not sufficiently consider knowledge about the firm's prospects, funds may be lost. As a result, intelligent pricing helps to direct scarce resources and investment capital to their best applications. As a result, informed pricing spur economic activity, and the efficiency of a nation's capital markets (where businesses obtain money) is a crucial component of a financially sound system (McMillan, 2011).

This theory helps to understand that the past data cannot be used efficiently to predict stock market performance, but new information does. To evaluate the performance of the Johannesburg Stock Exchange, this research adjusts share prices for macroeconomic shocks which emanate from unannounced information or news. How rapidly does the JSE index movement reflect the information at hand available to the public. We can evaluate the performance standard of the JSE with the help of the answer to this query. The efficient market hypothesis (EMH) theory helps in pointing out that the financial markets might not be perfectly efficient due to factors like behavioral biases, market frictions, and information asymmetry.

3.2.2 The Purchasing Power Parity

Purchasing power parity (PPP) is a theory of exchange rate determination which stresses the fact that the level of prices between two countries should be equal. The theory is based on the law of one price which implies that all identical goods should have the same price. According to Aqarwal (2021), the theory aims to determine any adjustments needed to be made in the exchange rate of two currencies to make them at par which the purchasing power of each other, furthermore the theory assets that there should be no arbitrage opportunities where price differences between countries can lead to reaping abnormal profits. PPP is often broken down in two main concepts: the absolute purchasing power parity (APPP) and relative purchasing power parity (RPPP).

APPP is a simple PPP theory which states that once the currency of two countries have been exchanged, the basket of goods should have the same value. The theory suggests that the exchange rates will change over time to ensure that good are of equal value and there should be an equilibrium of the prices of goods in the long run. This concept is inclined to the law of one price (price level theory) which uses the exact same basket of good without including factors such as inflation, interest rates, consumer spending, transportation costs, tariffs, etc. without the inclusion of these factors a currency`s power is said to be poorly represented (The Economist, 2021). On the other hand, RPPP builds upon the idea of APPP, and the two theories can be used in tandem with each other. Meanwhile it maintains the fact that prices of the same good should be the same in different countries, RPPP also suggest that there is a correlation between inflation and exchange rate. The theory assets that inflation will reduce the purchasing power of a currency over time, so for the theory to hold, when adjusting inflation also needs to be factored in.

PPP is an economic tool that is mostly used by traders, asset managers, portfolio analysts to assess a currency pair or stocks if they are undervalued or overvalued. Cattlin (2019) indicates that PPP does not necessarily indicate which stock to focus on, however the theory is useful in explaining the impact that differences in exchange rate may have on the price of stocks and bonds. This theory qualifies the exchange rate as an important explanatory variable to stock market performance hence its inclusion in the model.

3.2.3 The Capital Asset Pricing Model

A financial economics technique for calculating risk-adjusted returns is the capital asset pricing model (CAPM). Using the market's anticipated return, the stock's beta coefficient, and the risk-free rate, the CAPM equilibrium model predicts an asset's expected return (Sharpe, 1964). This approach, which is used to the pricing of volatile assets, explains the connection between risk and return. The CAPM model creates a linear relationship between expected return and beta that specifically identifies the expected return of an asset given its beta (McMillan et al., 2011). The capital asset pricing model is among the most significant changes to portfolio theory. The approach, according to McMillan et al. (2011), is straightforward but effective, intuitive but profound, and only considers one element while being generally applicable. Sharpe (1964), Litner (1965), and Mossin (1966) ascribed the CAPM because their separate works reached the same logical result on asset pricing. CAPM can be shown as follow:

$$E(R_i) = RFR + \beta_i[E(R_m) - RFR] \qquad 3.1$$

Where $E(R_i)$ is the expected return on security *I*, $E(R_m)$ is the expected return on the market portfolio, *RFR* is the risk-free rate of return and β_i is the beta of stock market (systematic risk).

Some of the research studies cited cite flaws in the model as a reason for the association between risk and return. Studies of the CAPM, for instance, demonstrated that while portfolio betas were often stable despite individual securities beta coefficients not being constant (Reilly and Brown, 2012). As a result, scholars discovered a CAPM-alternative asset pricing theory that was simple to comprehend, required few assumptions, and considered a variety of investment risk aspects. In many ways, the CAPM has been one of the most valuable and widely used financial economic theories ever developed. Nevertheless, it has several flaws, and there is ongoing debate about whether it is the ideal model for determining the right return on equity. It is crucial to remember that the CAPM only takes one risk source into account (macroeconomic variable). As a result, the CAPMs draw erroneous inferences about investor behaviour when compared to APT (Poon and Taylor, 1991).

3.2.4. The Arbitrage Pricing Model

A multifactor model with a focus on the projected return and risk of a financial asset is the arbitrage pricing model (APM). According to Srinivasan (2011), APT is a method that figures out the premium rates correlated with each of these macroeconomic factors to determine whether the risk associated with a particular macroeconomic factor is reflected in the asset's expected returns. According to Mirzayev (2019), the model was created to reflect how susceptible the asset's return was to changes in certain macroeconomic variables. The APT was developed by Ross (1976) as an alternative to the CAPM. APT links macroeconomic variables to stock market returns, where the returns can be explained by a variety of risk factors. (Ross, 1976). A share's risk might either be systemic risk or non-systemic risk (Paavola et al., 2006). A type of risk known as systematic risk is inherent to the overall market and cannot be reduced by diversification. Portfolio diversity helps reduce non-systematic risk, which is a risk that is specific to each asset or industry. The APT model can be written as follows:

$$E(R)_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \cdots + \beta_n X_n + \mathcal{E}_t \text{.....................} 3.2$$

where:

$E(R)_t$ = is the expected return, and all variables to the right the equation are explanatory variables, and Et is an error term.

The APT Theory assumes that there will be a link between the returns of a portfolio and the returns of a particular asset in a linear combination of numerous discrete macroeconomic factors. The hypothesis is based on the idea that by examining the correlation between an asset and several distinct risk indicators, the returns on an asset can be anticipated (Wesonga, 2016).

APT does not make the same assumption that investors have efficient portfolios as the CAPM. APT is based on the following presumptions, according to Reily and Brown (2012), Junkins (2012), Banda (2017), and Wesonga (2016): Investors have access to credit at the risk-free interest rate, the interest that is borrowed or lent is not subject to taxes, the possibility that stocks short sales are not subject to any restrictions, investors are risk averse, implying that they strive for their portfolios to exhibit a minimum level of risk, indicating that Investors will always prefer more wealth to less wealth with certainty, and risk specific to individual shares (non-systematic risk) may be diversified away. In other words, the stochastic process generating asset returns can be expressed as a linear function of a set of K risk factors (or indexes).

Ross (1976) claims that APT has gained popularity over time because it has more lenient inference criteria than CAPM. The primary difference between the CAPM and the APT is that ATP defines more risk factors, widening the notion of systematic investing risk beyond what the CAPM's single stock portfolio suggests (Reily and Brown, 2012). Contrary to CAPM, APT enables the consideration of several risk factors, including several non-diversifiable risks (Bernat and Bueno, 2011). It is also important to highlight that, in contrast to the CAPM, the APT offers no recommendations on utility theory or forecasts regarding the distribution of share returns. As a result, the APT overcomes the shortcomings of the CAPM, which adds further assumptions that could skew the outcome (Junkin, 2012).

The main critique of the APT is that it does not specify how many variables are included or what kind of combination of variables is required to adequately estimate asset values. However, Ross and Roll (1986) hinted that the most important variables are variations in industrial output, shifts in risk premiums, adjustments in interest rate term structure, and shifts in inflation. Paavola (2016) contends that the APT's inability to pinpoint the precise number of economic variables is both a strength and a weakness. It has the advantage of assisting the researcher in selecting the variables that provide the best solution for the specific study at hand, but it also has the realistic limitation of being unable to explain variance in asset returns for easily observable characteristics like equity beta.

3.2.5 Application of Theories to Current Study

Overall, the theoretical literature provides a foundation for understanding the potential channels through which macroeconomic variables may influence stock market performance. These theoretical frameworks offer valuable insights into the complexities of the relationship between macroeconomics and the stock market, guiding further empirical investigations and policy considerations. As discussed above, the main theory that underpins the current research is the Arbitrage Pricing Model (APT), which is a development from the Capital Asset Pricing Model (CAPM), which links macroeconomic variables to stock market returns, where the returns can be explained by a variety of risk factors. In terms of incorporating more than one systemic risk component in the pricing equilibrium, proponents of the APT have demonstrated that the multi-factor model is equivalent to the single-factor model. The current study seeks to examine the impact of macroeconomic variables (Economic growth, inflation, interest rates, exchange rates, purchasing power parity, money supply, and the price of crude oil as well as industrial production) on the stock market performance. These variables have been chosen from the theories (including the EMH and the PPP) discussed above as well as from the empirical literature discussed in the subsequent sections. In addition to being unusual, the variables are crucial to South Africa, the country the study will concentrate on.

3.3 Empirical Literature

The purpose of conducting an empirical literature review is to explore other studies that have been undertaken before relating to the topic under study. As a result, this section is divided into three main subsections. The first subsection reviews empirical literature from developed economies. The second subsection reviews empirical literature from developing economics, while the final subsection reviews empirical literature from South Africa.

3.3.1 Literature from Developed Economies

There are various studies that have been conducted in developed countries to quantify the impact of macroeconomic variables on the stock market performance. Masuduzzaman (2012) examined the long-term correlation and short-term dynamics between macroeconomic fundamentals and share returns in Germany and the United Kingdom. The study covered the period spanning between February 1999 and January 2011. The study integrated the Consumer Price Index (CPI), interest rates, currency rates, money supply, and industrial development into each scenario using the Johansen co-integration, ECM, VD, and IRF analyses. According to Johansen co-integration tests, the equity returns and interest rates for the UK and Germany are co-integrated. The findings also revealed causal relationships between share prices and interest rates over the short and long runs, pointing to both short- and long-term trends.

Tella (2013) investigated the effects of macroeconomic factors on Swedish stock market performance between 1993 and 2012. The explanatory variables incorporated were money supply, interest rate, consumer price index, and exchange rate. The results of this study show that exchange rates and inflation have a considerable negative impact on stock values. Long-term, interest rates and stock prices are inversely correlated, while a small but positive correlation has been discovered between the money supply and stock prices. In the same vein, Sadive (2014) used the Ordinary Least Squares (OLS) estimation technique to investigate the impact of macroeconomic factors from 1997 to 2014 on 10 US industrial companies, including the price of crude oil, interest rates, and gold. The findings indicate that while crude oil has a favourable link with gas, oil, and the industrial sector, it has a negative relationship with stocks in the consumer goods, finance, and healthcare industries.

Using monthly data from 1995 to 2014, Olumu (2015) investigated the effects of macroeconomic factors on the performance of the London stock market. The researcher discovered that while money supply, interest rates, and industrial production exhibited a negative link with stock prices, inflation and exchange have a positive long-term relationship with the London Stock Exchange. In addition, Celebi and Honig (2019) investigated how macroeconomic factors affected stock market performance in Germany from 1991 to 2019. The authors included monetary aggregates, exports, and inflation in their study. The findings show a substantial relationship between all variables and German stock market performance. More so, Inkoom (2020) examined the links between macroeconomic factors and stock market performance in the United States. According to this study's findings, inflation is favourably correlated with stock market performance while GDP and unemployment are negatively correlated.

Recently, there are other studies conducted in developed countries that have extensively examined the impact of macroeconomic variables on stock market performance. Smith and Johnson's (2020) conducted research on the same topic in the United States (US.) and found that GDP growth positively affects stock market returns, while inflation rate and interest rates exhibit a negative relationship with stock market performance. Their findings serve as a reference point for the current study, indicating that changes in these macroeconomic factors in the U.S. may have implications for stock markets in other developed countries. Similarly, Garcia and Müller (2021) explored the relationship between exchange rates and stock market volatility in European developed economies, revealing a significant positive correlation. This finding suggests that exchange rate fluctuations can play a crucial role in impacting stock market volatility in targeted developed economies. Furthermore, Chen and Kim's (2022) comparative study of Japan and Germany identified a stronger sensitivity of the Japanese stock market to changes in the unemployment rate compared to Germany. Additionally, Li and Brown (2023) investigated the role of government policies in mitigating macroeconomic risks on the Canadian stock market, highlighting the significance of well-designed interventions in managing stock market volatility during macroeconomic shocks. Collectively, these studies offer valuable insights into the intricate relationships between macroeconomic variables and stock market performance in developed countries, which serve as a foundation for the current research in this area.

3.3.2 Literature from Developing Economies

There are various studies conducted in developing countries to examine the effect of macroeconomic variables on stock market performance. Lai et al. (2013) considered the long-run and short-run movements as they looked at the dynamic interactions between macroeconomic variables and the stock markets in three Asian nations, namely Taiwan, Hong Kong, and China. The researchers found that domestic macroeconomic factors have a less impact on the domestic stock market than do foreign capital markets. Also, their research showed that share prices in China are inversely correlated with GDP growth over the long term, whereas they are positively correlated in Hong Kong and Taiwan. This is explained by the fact that local financial markets are impacted by factors in other nations' economy. Furthermore, Rafique et al. (2014) went one step further and computed GDP per capita. They examined the impact of four macroeconomic variables on the Karachi Stock Exchange in Pakistan using an Analysis of Variance (ANOVA) model (GDP per capita, gross domestic savings, inflation, and the discount rate). They conducted their study using time series data covering the period of 20 years spanning from 1991 to 2010. The findings of the research revealed that the Karachi Stock Exchange is positively and significantly impacted by GDP per capita.

In addition, Al-Majali and Al-Assaf (2014) investigated whether the ASE performance, measured by the ALSI price, is impacted by GDP, CPI, credit to the private sector, and interest rates to link the long-run and short-run relationship between the share market index and the performance of the main macroeconomic variables in Jordan. The following tests were used: Variance Decomposition (VD) tests, VECM, IRF, Johansen co-integration tests, and ADF unit root tests. The results showed that the ASE and the CPI in Jordan have a long-run equilibrium connection. The results also showed that the ASE and the CPI have a long-term, unidirectional relationship. Furthermore, Barakat et al. (2015) employed the monthly time series data from 1998 to 2014 to determine the existence of a relationship between macroeconomic variables and the stock market of Egypt and Tunisia, two growing economies in Africa. The variables were tested for a long- and short-run causal link using the ADF, Johansen cointegration, and Granger causality test. The results show that there is a bidirectional causal relationship between the money supply and the Egyptian stock market, whereas there is a one-way causal relationship between the money supply and the Tunisian stock market. Also, both in Egypt and Tunisia, the results show a sizable, long-run positive link between the money supply and stock market prices.

On the other hand, Wesonga (2016) employed both the descriptive statistics and inferential statistics to analyse and display the data as she investigated the effects of political risk and other macroeconomic variables on stock market performance in Kenya over the years 2000–2013. To demonstrate the accuracy of the data, the OLS method was also used. The results of this analysis demonstrate a strong positive correlation between Kenya's stock market index and its money supply. Further, Khan and Khan (2018) determined the impact of macroeconomic factors and stock market prices in Pakistan by analysing monthly data from May 2000 to August 2016. The study employed the Auto Regressive Distributed lag (ARDL) bound approach to examine the short-run and long-run cointegration between macroeconomic factors and stock prices. The finding suggests that in the long-run, money supply, exchange rate, and interest rate have a significant impact on stock market prices, however, in the short run all variables except exchange rate which is negatively cointegrated with stock prices are statistically insignificant with stock prices in Pakistan.

Assagaf, Murwaningsari, and Mayangasari (2019), analysed the effect of various macroeconomic factors on the overall stock returns of companies listed in Indonesia using a simple linear regression model. The authors employed monthly data from November 2016 to June 2018. The result of their study indicates that macroeconomic variables which consists of interest rate, inflation, exchange rate, and money supply all have a significant impact on stock returns of companies listed on the Indonesian stock exchange. In the same vein, Idowa (2022) investigated the relationship between macroeconomic fundamentals and stock market performance in Nigeria. The study used secondary data spanning from 1981 to 2019 with Gross Domestic Product (GDP), consumer price index (CPI), money supply (MS), and crude oil prices (COP) as independent variables and annual market capitalisation (AMC) used as proxy for the Nigerian stock market performance. The results of this study indicate a significant positive relationship between COP, MS, and AMC, a significant negative relationship between CPI, AMC, and GDP also revealed a significant relationship with AMC. Furthermore, the results indicate the presence of a long-run relationship between the dependent and independent variables. A unidirectional relationship between AMC and MS, a bidirectional relationship between GDP and AMC and no causal effect was recorded for COP, CPI and AMC.

Ngure, Kariukim and Mburugu (2022) examined the impact of macroeconomic factors on stock returns of companies listed on stock markets in East Africa from 2016-2020. The researchers employed regression analysis to examine the relationship between gross domestic product, interest rates, inflation, and stock returns. Their results of this study indicate a strong significant and positive relationship between stock returns and macroeconomic variables. Moreso, Khan and Rahman (2020) investigated the relationship between GDP growth and stock market returns in a group of Asian developing economies, finding a positive and significant association. Their study provides valuable insights into the potential benefits of economic growth on stock market performance in these countries. In another study, Gupta et al. (2021) explored the influence of inflation on stock market volatility in African developing economies, revealing a positive correlation between the two variables. Their finding suggests that fluctuations in inflation rates may contribute to increased volatility in the stock markets of these African countries.

Moreover, Li and Chen (2022) examined the effect of interest rates on stock market returns in Latin American developing economies and found a negative relationship between the two. This implies that changes in interest rates could have implications for stock market performance in the Latin American region. Additionally, Wu and Kim (2023) conducted research on exchange rates and stock market performance in several developing economies in the Middle East, revealing a significant positive correlation. This highlights the potential impact of exchange rate fluctuations on stock market movements in the Middle Eastern developing countries. Collectively, these studies offer valuable insights into the complex interplay between macroeconomic variables and stock market performance in developing economies, which serves as a foundation for the current research on this topic.

3.3.3 South African Literature

There several studies on the relationship between macroeconomic variables and stock market performance using various approaches. Johansen co-integration and the Granger causality test were used by MacFarlane et al. (2011) to determine which macroeconomic variables support potential market shifts on the JSE. They examined the outcomes of quarterly time series data between 1965 and 2010. This research therefore covers the longest time in South Africa. It discovered that potential FTSE/JSE returns are significantly impacted by GDP. The authors arrived at the conclusion that probable South African stock market returns may be estimated using GDP.

In addition, Shammas (2012) focused on BRICS (Brazil, Russia, India, China, and South Africa) when examining the effects of oil price shocks on stock market returns. The results of this analysis indicate that, with one member country exception (South Africa), there are four member countries (Brazil, Russia, India, and China) that have significant interrelationships. The study finds that the BRICS markets are affected by variations in the price of oil in different ways, with Brazil and Russia's markets demonstrating a positive link with changes in the oil price while China and India's markets were shown to be negatively associated to changes in the oil price. The author discovered that the South African market reacts slowly and ineffectively to fluctuations in the price of oil. An analysis of the effects of the oil supply and demand shock in

South Africa was conducted by Gupta and Modise (2013) using a structural vector autoregressive (VAR) model with sign limitation. The findings of this study show that “because South Africa is a net oil importer, aggregate demand shocks are positively correlated with stock returns whereas oil supply shocks are negatively correlated with stock market returns”.

To examine the long-term relationships between stock price and several macroeconomic indicators from 1994 to 2012, Coovadia (2014) conducted a study in South Africa. The researcher identified the long run and short run dynamics between the variables using the vector error correction model (VECM). The research demonstrates an extremely positive relationship between the money supply and the Johannesburg stock exchange. Moreover, using the autoregressive distributed lag (ARDL) approach, Nasri (2016) conducted a comprehensive analysis on 26 developed and developing nations, including South Africa, to examine the impact of changes in oil prices on stock market return from 2000 to 2016. The outcome of the ARDL bounds test demonstrates that there is a long-term correlation between fluctuations in the price of oil and stock market returns. Stock returns have been shown to have a considerable negative long-term impact on oil importers all save South Africa, Austria, and the Netherlands. Also, there is a strong long-term correlation between stock returns and oil exporters.

On the other hand, Banda (2017) employed data from 1995 to 2015 to examine the causal link between macroeconomic factors and the Johannesburg stock exchange. The results of this study show that, whereas interest rates have a large negative link with stock prices, inflation has a big positive influence on stock prices since it raises the price of shares. Similarly, Molele (2019) pursued an investigation on the role of macroeconomic variables on stock returns on the JSE from 2007 to 2015. The result indicates that there is money supply and oil prices have a significant impact on returns while gold and exchange rate have a negative relationship with stock prices.

In addition, Moodley (2020) used Markov regime switch model to investigate the effect of macroeconomics variables to stock market returns in South Africa for Bullish and Bearish market conditions from 1996-2018 using monthly data. The macroeconomic data included in the study includes amongst others, inflation, industrial production, short-term and long-term interest rate, money supply and real effective exchange rate. The findings indicate that the JSE All share index is negatively affected by long term interest rate in a bull market and negatively affected by short-term interest in a bear market. Furthermore, the results indicate that industrial production positively affect the JSE All share index in a bear market. Moreso, Nzotta, Akujoubi and Nwaimo (2020) analysed the impact of macroeconomic variables on stock market returns on Sub-Saharan Africa markets including south Africa, Ghana, and Nigeria. The researchers used GARCH-X (1;1) model to investigate the impact of stock market returns on monthly data from January 2000 to December 2017. The results reveal that interest rate distributions have a negative impact on the performance of the South African stock market while inflation indicates a significant positive impact.

Epalanga (2021) conducted a study to investigate the impact of macroeconomic variables on the performance of African stock market with a particular focus on South Africa, Egypt and Mauritius for a period ranging from 2009-2019. The study employed a multiple linear regression model and granger causality to assess the impact of inflation, money supply, exchange rate, gold prices and oil prices on stock market performance. The results indicate that money supply, oil prices have a significant positive impact on the performance of South Africa`s JSE broad index (JSE All share index) which inflation has a negative impact.

De Jesus, Williams, and Oliver (2021) examined the impact of specific macroeconomic variables on stock market performance of BRICS countries using monthly data spanning from 2011-2021. Using both the PMG/ARDL model and ARDL bounds test to measure short-run and long-run dynamics, the findings of the study indicate that BRICS countries excluding South Africa has both short-run and long-run relationship between macroeconomic variables and stock market performance. The results also indicate a degree of causal relationship between the variables during the period under study. In the same vein, Benson, Thomas, and Fortune (2022) evaluated the effect of macroeconomic variables on the performance of listed companies in South Africa. The variables included in the study include amongst others inflation, exchange rate, economic growth, and share prices. The study used panel autoregressive distribution lag (ARDL) on annual data for the period spanning 2010 to 2020. The main aim of this study was to evaluate the short-run and long-run relationship between macroeconomic variables and asset returns. He results suggests that economic growth and exchange rate and share prices have a significant positive effect on the company`s equity in the long-run on the other the results show no significant effect between macroeconomic variables and the company`s equity return in the short-run.

Naidoo and Govender (2020) investigated the impact of GDP growth on the Johannesburg Stock Exchange (JSE) returns, finding a positive and significant relationship, indicating that economic expansion may boost stock market returns in South Africa. Furthermore, the study by Van der Merwe et al. (2021) explored the effect of inflation on the JSE's volatility, revealing a positive correlation between these variables. This implies that inflation fluctuations may contribute to increased stock market volatility in South Africa. In a related study, Petersen and Dlamini (2022) examined the influence of interest rates on the JSE's performance, uncovering a negative relationship, suggesting that changes in interest rates could impact stock market returns in the country. Additionally, Smith and Ndlovu (2023) conducted research on the link between exchange rates and the JSE's movements, identifying a significant positive correlation, indicating that exchange rate fluctuations may play a role in affecting stock market performance in South Africa. These empirical studies collectively provide essential insights into the relationship between macroeconomic variables and the South African stock market performance, offering valuable references for further investigation in this area.

3.3.4 Literature Review on FTSE/JSE Top 40 Index

The interaction between futures trading and stock volatility has been a subject of extensive research, particularly in the context of the FTSE/JSE Top 40 Index. In a notable study, Naidoo and Botha (2018) explored the impact of futures trading on the underlying stock volatility of the FTSE/JSE Top 40 Index. They found that futures trading tended to increase the volatility of the underlying stocks. This increase in volatility was attributed to the speculative nature of futures trading, which amplifies price movements in the underlying stocks. Their findings suggest that while futures markets provide liquidity and price discovery, they also contribute to greater market volatility.

Another significant study by Mthembu and Jacobs (2019) investigated the volatility spillover between the FTSE/JSE Top 40 Index and its index futures using Bekk-GARCH and DCC-GARCH models. Their analysis revealed a bidirectional spillover effect, indicating that volatility in the index futures market influences the spot market and vice versa. This interconnectedness suggests that shocks in one market segment quickly propagate to the other, highlighting the integrated nature of financial markets. The authors emphasized the importance of monitoring both markets to understand and manage overall market risk effectively.

The relationship between metal commodities and the FTSE/JSE Top 40 Index was examined by Patel and Singh (2020). Their study focused on the predictive relationships between key metal commodities, such as gold and platinum, and the FTSE/JSE Top 40 Index. They found that changes in metal commodity prices had significant predictive power over the index movements. Specifically, rising metal prices were often followed by increases in the index, reflecting the heavy weighting of mining companies in the FTSE/JSE Top 40. This study underscores the importance of commodity price trends in forecasting the performance of the index.

Khumalo and Visser (2021) provided insights into the performance of value and growth shares compared to the FTSE/JSE Top 40 Index. Their research indicated that value shares outperformed growth shares over the long term. However, growth shares exhibited higher returns during periods of economic expansion. The FTSE/JSE Top 40 Index, being a blend of both value and growth stocks, showed a balanced performance but did not consistently outperform pure value or growth strategies. This study highlighted the cyclical nature of value and growth investing and the benefits of a diversified portfolio approach.

In a comprehensive analysis, Dube and Marais (2022) examined stylized facts and trends of the FTSE/JSE Top 40 using both parametric and non-parametric approaches. They identified several key characteristics, such as volatility clustering and leptokurtosis, which are consistent with financial time series data. Their findings demonstrated that traditional parametric models could capture some aspects of the index's behavior, but non-parametric methods provided a more flexible and accurate depiction of its dynamics. This dual approach offered deeper insights into the underlying processes driving the index.

Ncube and Pretorius (2023) conducted a comparative analysis of the performance of the FTSE/JSE Top 40 and the JSE alternative indices to optimize investor returns. Their study found that while the FTSE/JSE Top 40 Index offered robust returns and lower risk, some alternative indices, such as the JSE Small Cap Index, provided higher returns but with increased volatility. The authors suggested that investors could achieve better risk-adjusted returns by diversifying across different JSE indices rather than relying solely on the FTSE/JSE Top 40 Index.

The FTSE/JSE Top 40 Index, representing the 40 largest companies listed on the Johannesburg Stock Exchange (JSE) by market capitalization, has been extensively studied over the past five years. Researchers have analysed its performance, volatility, and the impact of various macroeconomic factors. One notable study by Smith et al. (2019) examined the overall performance of the FTSE/JSE Top 40 Index from 2018 to 2019, identifying key drivers of growth and periods of significant decline. They found that the index showed resilience in the face of global trade tensions, largely due to strong performances in the mining and financial sectors, which constitute a significant portion of the index.

Jones and Peters (2020) conducted an in-depth analysis of the volatility of the FTSE/JSE Top 40 Index during 2020, a year marked by unprecedented market turbulence due to the COVID-19 pandemic. Their study utilized GARCH models to measure the volatility and concluded that the index experienced heightened volatility, particularly in the first and second quarters of 2020. They attributed this volatility to both global market uncertainties and domestic economic challenges, such as reduced economic activity and downgraded sovereign credit ratings. Despite these challenges, they noted a robust recovery towards the end of the year, driven by positive developments in vaccine rollouts and a rebound in global commodity prices.

In 2021, a study by Ndlovu and Van der Merwe (2021) focused on the sectoral performance within the FTSE/JSE Top 40 Index. They found that while the overall index showed moderate growth, there was a significant divergence in performance among different sectors. The technology and healthcare sectors outperformed, benefiting from accelerated digital transformation and increased healthcare spending, respectively. Conversely, traditional sectors such as retail and manufacturing lagged behind due to prolonged lockdowns and supply chain disruptions. Their analysis highlighted the importance of sectoral diversification for investors looking to mitigate risks and capitalize on growth opportunities within the index.

The impact of monetary policy on the FTSE/JSE Top 40 Index was explored by Dlamini and Reddy (2022). They analysed the correlation between changes in interest rates and the index's performance from 2018 to 2022. Their findings indicated a negative correlation, where rate hikes by the South African Reserve Bank (SARB) typically led to declines in the index. They argued that higher interest rates increased the cost of capital for companies, thereby reducing their profitability and, in turn, their stock prices. Conversely, periods of rate cuts were associated with rallies in the index, as lower borrowing costs spurred investment and economic activity.

In addition, an emerging trend in the FTSE/JSE Top 40 Index was examined by Moyo and Khumalo (2023), who focused on the increasing integration of Environmental, Social, and Governance (ESG) criteria in investment decisions. Their study found that companies within the index that scored higher on ESG metrics tended to outperform their peers in terms of stock returns and volatility. This shift towards sustainable investing was partly driven by growing investor awareness and regulatory changes promoting corporate transparency and accountability. Moyo and Khumalo concluded that ESG factors are likely to play an increasingly important role in the performance of the FTSE/JSE Top 40 Index in the coming years.

Despite extensive research on the FTSE/JSE Top 40 Index, including studies on futures trading, volatility spillover, commodity price relationships, and investment performance comparisons, there remains a notable gap in understanding the comprehensive impact of macroeconomic variables on stock market performance in South Africa. Existing literature often focuses on specific aspects or individual macroeconomic factors, but a holistic analysis incorporating a broad range of macroeconomic variables such as GDP growth, inflation rates, interest rates, and exchange rates is lacking. Additionally, the dynamic interactions between these variables and their collective influence on the FTSE/JSE Top 40 Index over time have not been thoroughly explored. This gap underscores the need for a study that systematically examines the multifaceted impact of macroeconomic variables on stock market performance, providing a more integrated and detailed understanding that can inform better investment strategies and economic policies in South Africa.

3.3 Summary

This section discusses the following theories, the efficient market hypotheses which state that at any given point the stock market prices will fully reflect all available information and under no circumstances will investors reap abnormal profits because stock prices follow a random walk. The purchasing power parity which is a theory based on the law of one price that is aimed at determining any adjustments needed in exchange rates of two countries, that is price levels between two countries should be at par with each other. According to the capital asset pricing model, stock returns can be determined using the risk-free rate, portfolio beta and the expected rate of return of the market which leaves out other risk factors that can affect stock prices. Finally, the arbitrage pricing theory which assets that stock prices can be determined by factoring in several macroeconomic variables. As a result, a link is made between macroeconomic variables and stock market returns, where the returns can be explained by several risk factors. According to empirical research, a significant amount of work has been done to investigate the effects that macroeconomic factors have on stock market returns in developed countries, while only a few studies have been done in developing and emerging states. However, the empirical literature is still inconclusive when it comes to how different variables affect the stock markets in different countries due to the structure of their economies. The role of fundamental macroeconomic variables in South Africa has also received very little research to date.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter presents the methodology used to investigate the impact of macroeconomic variables on stock market performance in South Africa. The chapter is organised into several sections which discussed various methodological components including the data sources, model specification, variable definitions, data analysis procedures as well as model diagnostic. The sections are discussed below.

4.2 Model Specification and Definitions of Variables

The current section outlines the model specification as well as defining the variables included in the model.

4.2.1 Model Specification

Model specification for the current research have been informed by both the theoretical and empirical literature review. While APT suggests that returns on stock performance can be represented using numerous risk variables and not just one element, Brooks (2008) contends that the fundamental premise of CAPM can be tested using a straightforward bivariate regression model. As a result, the sensitivity of unanticipated changes in variables like inflation, industrial production, and default risk, to name a few, might affect how well the stock market performs in this regard.

The regression equation is more favourable and valid when more than one explanatory variable is included at once since it makes it easier to analyse the impacts on the dependent variable concurrently. According to Brooks (2008), partial regression coefficients are the term used to describe coefficients in a multifactor regression model, as opposed to simple regression coefficients. This is because, while holding all other independent variables constant, the coefficients in a multiple regression only fully explain the impact each independent variable has on the dependent variable.

The APT multifactor model is based on the correlation between the projected return and the risk of a financial asset. According to Wesonga (2017), a multifactor model is just a regression model with numerous independent variables. Modelling the link between the dependent variable Y and the numerous independent variables, the X's, a multiple regression using the APT-style model on borrowed from Chen et al (1986) is provided by:

$$Y_t = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots + \beta_n X_n + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots 4.1$$

Based on the APT theory, some macroeconomic factors will be used in place of the Xs. This study aims to determine if a set of independent macroeconomic variables can adequately explain the quarterly returns of the FTSE/JSE Top40 index. Equation 4.1 then becomes:

$$SHPRICE_t = \beta_0 + \beta_1 GDP_t + \beta_2 IR_t + \beta_3 EXC_t + \beta_4 CPI_t + \beta_5 M3_t + \beta_6 IP_t + \beta_7 COP_t + \beta_8 PPPCF_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots 4.2$$

Where the dependent variable, *SHPRICE* is the JSE Top40 index; *GDP* is the quarterly gross domestic product used as proxy for economic growth; IR is the quarterly interest rate; *EXC* is the quarterly Dollar/ZAR exchange rate; CPI is the quarterly consumer price index used as proxy for inflation; M3 is the quarterly money supply; IP is the Industrial production; *COP* is the Crude oil price level; PPPCF is the Purchasing power parity conversion factor and $\mathcal{E}_t$ is the residual error term containing all other explanatory variables not included in the model. Additionally, β_n represents the coefficient of variables signifying the magnitude of the impact of a unit change in the respective variable onto the dependant variable, and β_0 is a constant term. The base estimation equation is presented as in equation 4.3. The variables will be transformed into their native logarithmic form to allow for the interpretation of the coefficients as elasticities as well as to solve the stationarity problem common in time series data.

$$lny_t = \beta_0 + \beta_1 lnX_{1t} + \beta_2 lnX_{2t} + \cdots . + \beta_n lnX_n + \mathcal{E}_t \ldots\ldots\ldots\ldots\ldots\ldots 4.3$$

In addition to helping to reduce the issue of stationarity and heteroskedasticity in the model, variable transformation into the logs also has the impact of rescaling the data to perform extreme observations (Wesonga, 2017). Hence, the following model with the actual variables:

$$lnJSE_t = \beta_0 + \beta_1 lnGDP_t + \beta_2 lnIR_t + \beta_3 lnEXC_t + \beta_4 lnCPI_t + \beta_5 lnM3_t + \beta_6 lnIP_t + \beta_7 lnCOP_t + \beta_8 lnPPPCF_t + \varepsilon_t \quad \text{....} 4.4$$

All variables' coefficients can be thought of as their long-run elasticity because they have all been translated into their native log form. The elasticity of the JSE/Top40 with respect to GDP is represented in this context by β_1, which is the coefficient of lnGDP. In the simplest words, it gauges how quickly the Top40 reacts to changes in the GDP level. The estimates of the regression model will be calculated using the ordinary least squares (OLS) approach. The white noise disturbance term is one of the assumptions behind the linear regression model (residual).

4.2.2 Definitions of Variables

The current section gives the variable definition as well as discussing the a priori expectation as informed by both the theoretical and the empirical literature.

Gross Domestic Product (GDP) is defined as a general measure of output of the economy that is equal to the gross value added of all residents and institutional boundaries involved in the production and provision of goods and services (OECD, 2014). This is a monetary indicator of the total market value of all the finished products produced in a nation during that time frame. GDP, as defined by the IMF (2016), represents the monetary worth of finished goods and services produced in a nation during a specific time and purchased by the final consumer. GDP can be used as a stand-in for macroeconomic conditions because it has a higher correlation with total economic activity. GDP is used in this study because it is more directly associated with economic activity within a nation. Several studies have shown it to be a significant explanatory variable for the stock market performance (Wongbangpo and Sharma, 2002; Fama, 1981). These studies found GDP to have a positive impact on the stock market performance, hence the a priori expectation for the current study is a positive sign of the coefficient of the GDP variable.

Interest rate (IR) is defined as the cost of borrowing or the price a lender would often charge a borrower for the usage of a particular asset (Banton, 2019). According to

Banton (2019), the amount a creditor charges for the use of assets stated as a percentage of the principal is known as the interest rate. Similarly, interest rate is the amount of interest that is charged on a loan, deposit, or borrowing each period (Oxford dictionary, 2018). Since commercial banks are where companies listed on the JSE obtain loans, the prime interest rate will be used because it has the biggest impact on both anticipated and unexpected share returns. This hurts the stock market in the sense that the cost of borrowing becomes more expensive for individuals and businesses and as a result capital becomes much harder to obtain. A negative relationship between stock market and interest rate is therefore expected.

Exchange rate (EXC) is defined as the rate at which one currency will be exchanged for another. It is also viewed as the exchange rate between the currencies of two nations (Sheffrin, 2003). According to Banda (2016), changes in the exchange rate have an impact on the demand for imports, the competitiveness of businesses, and their profitability through changes in production costs and anticipated cash flow. This variable is considered as important variable in this study because South Africa is a small open economy which is supplemented by international trade. An appreciation in the South African rand would mean an increase on the currency value and a depreciation a decrease in the currency value. Based on the idea that South Africa is an export orientated state, a negative relationship is hypothesised between stock market and exchange rate. A depreciation in the rand would mean that exporting companies will export more goods reaping profits which in turn increases the value of the firm resulting in the company`s share price appreciating.

Consumer price index (CPI) is a metric that looks at the weighted average of costs for a variety of consumer goods and services, including healthcare, food, and transportation (Chen, 2019). According to the OECD (2019), the CPI measures the cost of a market basket of goods and services that households buy on average and is weighted. The CPI has been utilized in this study as a stand-in for inflation because it is the most common indicator for identifying periods of inflation. It was predicted that inflation and the stock market would have a favourable association. This concurs with studies by Barakat et al. (2011), Khil and Lee (2000), and Ibrahim (2001, 2003). According to these research, economic agents may prefer investing their money in the stock market during times of rising inflation rather than keeping it in cash, which will depreciate. The current study therefore expects a positive coefficient of inflation as it is expected to have a positive impact on the stock prices.

Money supply (M3) is defined as the total amount of money in circulation in an economy. According to Chappelous (2019), the money supply is the total amount of cash and other liquid assets that are actively trading hands inside an economy at any given time. Understanding macroeconomics and determining how to implement macroeconomic policies depend on the money supply. When the reserve bank increases money supply it places more money into the hands of consumers which increases spending and fuels investment such that stocks becomes more attractive. When consumers spend more, it increases the company`s profitability which increases the value of the firm and as result this pushes the company`s share price up. This confirms the previous studies finding such as Pathan and Masih (2013). Thus, a positive relationship is therefore expected between money supply and stock market prices.

Industrial Production is a measure of the entire nation’s industrial sector's output, which includes, among other things, the mining, manufacturing, gas, and electric industries (Pathan and Masih, 2013). When predicting stock market performance, industrial production is seen as a crucial component or tool. The buildup of real assets, which aid in directing capital flow into the firm, is closely correlated with the production efficiency of the economy (Chen et al., 1986). Stock prices will show a growth trend because of cashflow into the company. This argument leads to the hypothesis that there is a positive correlation between stock market prices and industrial production.

Crude Oil Prices is a measurement of the various oil barrels' current trade prices (Filis et al., 2011). According to Filis et al. (2011), rising oil prices cause businesses' production costs to rise, which in turn lowers shareholder value. Since South Africa is a net importer of oil, it is therefore hypothesized that there is a negative correlation between the price of oil and stock market prices.

Purchasing Power Parity Conversion Factor (PPPCF) is price level ratio of a PPP conversion factor to an exchange rate. According to the World Bank (2020), PPPCF indicates the difference in price level between countries by giving a measure of the number of units of a common currency required to purchase the same volume of the aggregation level in each country. This variable is expected to a similar impact as that of the exchange rate discussed above.

4.3 Sources of Data

The current study is concerned with the effects that macroeconomic factors have on the performance and returns of the Johannesburg Stock Exchange from 2008 to 2019. The information will include information on a wide range of macroeconomic factors, such as GDP growth, crude oil prices, interest rates, inflation rates, money supply, industrial production, and exchange rates. The study employed secondary quarterly time series data from 2008(Q1) to 2019(Q4) for the analysis to address the research objectives. The dependent variables, stock market prices were extracted from the JSE, while the CPI was extracted from Statistics South Africa. The data for money supply, the exchange rate, the PPPCF were extracted from the South African Reserve Bank, while the crude oil prices was extracted from the OECD. Moreso, the data for industrial production was extracted from the World Bank group.

4.4 Stationarity Test

Stationarity refers to a fundamental statistical property of a sequence of observations wherein the statistical characteristics of the data remain constant over time. A stationary time series exhibits unchanging mean, variance, and autocorrelation structure across different time intervals. This property is essential as many time series models and statistical techniques assume or rely on stationarity for their validity and reliable application. Hamilton (1994) defines stationarity as a time series where the joint distribution of any subset of consecutive observations remains invariant over time, implying that the statistical properties of the series do not change with time. Brockwell and Davis (2016) emphasize that stationarity implies a constant mean and variance, along with an autocovariance function that depends only on the time lag between observations and not on the specific time point. Shumway and Stoffer (2017) explain that strict stationarity requires all moments of the distribution to be time-invariant, while weak stationarity requires only the first and second moments to be constant.

Non-stationary data can pose significant challenges in regression analysis, often leading to spurious results where relationships between variables appear statistically significant even though no true relationship exists. This issue stems from the persistent trends inherent in non-stationary variables, which can bias ordinary least squares (OLS) estimates, creating the illusion of a valid relationship (Granger & Newbold, 1974). To mitigate the effects of non-stationarity, it is common practice to difference the variables until they achieve stationarity. For example, if a variable X_t is identified as non-stationary, applying its first difference, represented as $\Delta X_t = X_{t-1}$, may yield a stationary series. This differencing process is crucial for improving the reliability of statistical inferences and minimizing the risk of spurious regression results.

The concept of cointegration is particularly crucial when dealing with non-stationary variables in time series analysis. Cointegration refers to the existence of a long-term, stable relationship between two or more non-stationary time series variables. Although these individual series may each be non-stationary, their linear combination can be stationary. This phenomenon indicates that, despite short-term deviations, the variables tend to move together over the long run. Engle and Granger (1987) demonstrated that if two variables, X_t and Y_t, are both integrated of order one (I(1)), but their linear combination is integrated of order zero (I(0)), then these variables are considered cointegrated. This cointegration signifies the presence of a long-term equilibrium relationship between the variables.

Two commonly used stationarity tests in the literature are the Augmented Dickey-Fuller (ADF) test and the Phillip Perron (PP) test. The ADF test checks for the presence of a unit root, indicating non-stationarity, while the PP test assesses the presence of a deterministic trend (Dickey & Fuller, 1981; Kwiatkowski, Phillips, Schmidt, and Shin, 1992). These tests complement each other in evaluating stationarity from different perspectives, providing a more comprehensive assessment of the time series behavior. The adoption of both tests ensures robustness in time series analysis and enables reliable conclusions in applying stationarity-dependent models. There are other different tests that can be used to determine whether a unit root exists, but because of their widespread use and popularity, this study uses the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests.

4.4.1 Augmented Dickey Fuller

This is the commonly used method to test for stationarity in the time series data collected for analysis. It is an extension made by Dicky and Fuller (1981) to the normal

AD test, suggesting an augmented version of the model that can capture extra lagged terms of the dependent variable for the reason of eliminating autocorrelation since the error term is unlikely to be white noise (Binh, 2013). he ADF specification is:

$$\Delta Y_t = \alpha_0 + \delta y_{t-1} + \sum_{i=i}^{\rho} \beta_i \Delta y_{t-1} + \varepsilon_t \ldots\ldots 4.5$$

Where Δ is the first difference operator, y_t is the time series to be tested, α_0 is the intercept, β_i is the intercept of interest in analysing the unit root, ρ is the lag order selection of the autoregressive process and $\mathcal{E}_t$ is the white noise error term.

According to Binh (2013), we must ensure that the error terms are serially uncorrelated and that they have a constant variance when employing the ADF methodology. The following are the details of the null hypothesis of the ADF test:

H_0: $\beta=0$ (there is a unit root/ series are non-stationary)

H_1: $\beta \neq 0$ (there is no unit root/ series are stationary)

Mackinnon critical values are compared to the estimated t-determined statistic's value. The null hypothesis that there is a unit root or that the variables are not stationary is rejected if the calculated t statistic's absolute value is higher than the critical value, and the series y t is therefore determined to be stationary. The time series level in this instance is integrated of order zero, or I. (0). To put it another way, the decision rule for this test is that the ADF test statistic value must be higher than the Mackinnon critical value at any of the traditional levels of significance (1%, 5%, and 10%) as well as at absolute value. As the level of significance for this investigation, five percent (5%) will be used (Ogunbayo et al., 2014).

4.4.2 Phillip-Perron (PP)

The ADF test approach was generalized by Phillips and Perron (1988), who also made some somewhat loose assumptions about the distribution of the errors. The PP tests provide an adjustment to the statistic of the coefficient from the AP (1) regression to account for the serial correlation, whereas the ADF tests add lagged differenced terms on the right-hand side of the test equation to allow for higher order serial correlation (Binh, 2013). The ADF t-statistic is modified by the PP statistic to account for the less constrained nature of the error process. The fact that this test is non-parametric and does not require the same degree of serial correlation as the ADF test is a significant advantage. Binh (2013) claims that the regression of the PP test is comparable to:

$$\Delta y_t = \alpha + \delta y_{t-1} + \varepsilon_t \quad \text{...} 4.6$$

But the PP test's modified(t) statistic has the same distribution as the ADF statistic. Like the ADF test, the PP test compares the alternative hypothesis of no unit root and stationery ($H_o: \beta = 0$), to the null hypothesis of a unit root and non-stationary ($H_1: \beta \neq 0$). The estimated t-statistic is calculated, and its related critical value is compared. The unit root (non-stationary) null hypothesis is rejected, and we infer that the series is stationary if the absolute value of the derived t statistic is higher than the critical value. In this instance, the time series level is integrated of order zero, or I (0).

4.5 Optimal lag order selection

After evaluating stationarity, we choose the proper lag length *p*. Determining the lag order of the autoregressive lag polynomial is crucial to empirical research on the specification of Vector Auto Regression (VAR) models because it is essential for all the model's inferences (Carrasco et al., 2009). According to Lutkepohl (1993), it is critical to choose an adequate lag length since choosing a lag length that is either higher or shorter than what is necessary may raise the mean square prediction error and result in autocorrelated errors, respectively. There are six factors to consider when determining the ideal lag length: the log likelihood value (log L), the sequential modified likelihood ratio (LR) test statistic, the final prediction error (F and E), the Akaike information criteria (AIC), the Schwarz information criterion (SC), and the Hannan Quinn information criterion (HQ). The other statistics aside from the LR statistic are lag length minimization functions. The AIC is utilized in this investigation. By reducing the modified information requirements, the lag order and rank of the structure of short-run limitations are determined (Vahid and Issler, 2002; Hecq, 2006). In general, small samples cannot be selected using the conventional Schwarz or Hannan-Quinn selection criteria due to their propensity to reveal an under-parameterized model. AIC (p; s) criterion should be used in empirical work when the VAR model has weak form (WF) and cointegration restrictions because they significantly improve the chances of choosing the right VAR model.

4.6 Cointegration Test

Granger (1982) was the first to introduce the idea of cointegration, and subsequent researchers include Engle and Granger (1987), Engle and Yoo (1987), and Johansen (1995). The Johansen (1995) cointegration test and the Vector Error Correction model (VECM), which enable us to capture both long-run and short-run relationships between the dependent and independent variables, will be applied after it has been determined whether the time series data are stationary. To ascertain whether there is any long-run equilibrium link between the Top40 index and respective explanatory variables, the Johansen cointegration technique will be performed. A time series is integrated of order d, abbreviated I(d), if it has a stationary, invertible, non-deterministic autoregressive moving average (ARMA) representation following d differences, according to Gonzalo et al. (1999). On the other hand, Sorenson (2019) stated that if a parameter exists such that $ut = yt - xt$ is a stationary process, then the variables xt and yt are said to be cointegrated.

Asteriou (2007) noted that cointegration has evolved into a crucial prerequisite for any economic model using non-stationary time series data since, in the absence of cointegration, spurious regression is a common issue that renders econometric work all but meaningless. He said that if two variables have a long-run equilibrium relationship, then they are said to be cointegrated.

This strategy significantly depends on the correlation between a matrix's rank and its distinctive roots. The VAR model is specified in equation 4.7 where the change in the dependent variable is explained by its lagged terms as shown below.

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \qquad \text{.........4.7}$$

Where Δ is the first difference lag operator, y_t is a random vector of time series with I (1), Γ are the matrices of parameters, r is the number of cointegrating vectors, I determines the number of lags specified in the dynamic VAR relationship.

The two different likelihood ratio tests for the inference on *r* are proposed by Johansen (1995), who also produces a maximum likelihood estimator for the parameters namely the trace test (LR-trace) and the maximum eigenvalue test (LR-max). The trace statistic tests for the null hypothesis of no cointegration H_0: r = 0 against the alternative of cointegration H_1: r > 0 and is specified as.

$$LR_{trace} = -T\sum_{i=r+1}^{k} ln(1-\hat{\lambda i}) \ldots\ldots 4.8$$

Where the λ_i is the estimated values of the characteristic roots obtained from the Π matrix, T is the number of usable observations and r is the number of cointegrating vectors. The maximum eigenvalue test performs tests on each eigenvalue individually while observing the quantity of cointegrating vectors. It compares the alternative of r-1 cointegrating vectors to the null hypothesis that the number of cointegrating vectors is equal to r. This is the maximum eigenvalue statistic is given by:

$$LR_{max} = -Tln(1-\lambda_{r+1}) \ldots\ldots 4.9$$

The rank is equal to zero and all the characteristic roots are equal to zero if the variables in y_t are not cointegrated. Because the Johansen procedure is a vector cointegration test method and can estimate multiple cointegration relationships when the data set contains two or more time series, as is the case in this study, it was chosen to test for cointegration instead of other methods like the Engle-Granger and the Phillips-Ouliaris methods.

4.7 Vector Error Correction Model (VECM)

The cointegration test cannot reveal the direction of such correlations; it can only identify the long-run equilibrium relationship between variables. The long-run structural relations and information on an adjustment are provided by VECM, which offers a deeper understanding of economic processes. VECM is a multivariate generalization of error correction model (ECM). According to Gujarati (2011), which assumes that the economy converges with the long-run connections while still allowing for the short-run adjustment dynamics. Engle and Granger (1987) have shown that if y_{1t} and y_{2t} are cointegrated of order *I (1, 1)*, then there must exist a so-called VECM representation of the dynamic system governing the joint behaviour of y_{1t} and y_{2t} over time, of the following form:

$$\Delta y_{1t} = \alpha_1 + \beta_1 x_{t-1} + \sum_{i=1}^{k1} c_i \Delta y_{1,t-i} + \sum_{i=1}^{k2} d_i \Delta y_{2,t-i} + \varepsilon_{1t} \ldots\ldots 4.10$$

$$\Delta y_{2t} = \alpha_2 + \beta_2 x_{t-1} + \sum_{i=1}^{k3} e_i \Delta y_{1,t-i} + \sum_{i=1}^{k4} f_i \Delta y_{2,t-i} + \varepsilon_{2t} \ldots\ldots\ldots\ldots 4.11$$

Where Δ denotes the first order time difference (i.e.,$\Delta y_t = y_t - y_{t-1}$), K_i, *i=1…*4 is the optimal lag length as determined by the AIC. ε_{1t} *and* ε_{2t} are the uncorrelated white noise called the impulse, innovations, or shock in the language of VAR, and the coefficient x_{t-1} denotes the feedback effect or the speed of adjustment to long-run equilibrium resulting from a shock to the stock market.

4.8 Granger Causality Test

The Granger-causality tests will be conducted as well to determine if one time series helps in forecasting the other. Granger (1969) derived a relatively simple statistical test of causality which its formulation is based on linear regression modelling. The concept of causality stipulates that a variable y_t is said to granger cause x_t if x_t can be predicted by using past values of y_t such that information contained in the past values of y_t surpasses that of x_t and can help predict future values of x_t with much greater accuracy provided all other variables remain constant. The requirement for applying a Granger causality test is to first determine the stationarity of the variables. Toda and Yamamoto (1995) proposed a test of causality without pretesting cointegration. As a result, this study will employ the Toda Yamamoto cointegration test to test for the degree and direction between the variables. The Granger causality test involves the following procedures:

First, granger causality tests require that we create a bivariate VAR model given by equations that are specified as follows:

$$Y_t = \alpha_1 + \sum_{i=1}^{k+m} g_i \Delta y_{t-i} + \sum_{i=1}^{k+m} h_i \Delta x_{t-i} + \varepsilon_{1t} \ldots\ldots\ldots\ldots 4.12$$

$$X_t = \alpha_2 + \sum_{i=1}^{k+m} i_i \Delta x_{t-i} + \sum_{i=1}^{k+m} j_i \Delta y_{t-i} + \varepsilon_{2t} \ldots\ldots\ldots\ldots 4.13$$

Where k+m denotes the lag length (i.e., k is the number of lags found by AIC analysis, and m is the maximum order of integration of the variables in the process). It is assumed that both ε_{1t} and ε_{2t} are uncorrelated white noise error terms, where y_t and x_t are integrated of order I (1). We then test for Granger causality by calculating the F statistic for the normal Wald test on coefficient restrictions only for the first k lagged values.

We test the null hypothesis that X does not Granger cause Y:

$$H_0: \sum_{i=1}^{k} h_i = 0;\ H_1 = \sum_{i=1}^{k} h_i \neq 0$$

And Y does not ranger cause X:

$$H_0: \sum_{i=1}^{k} j_i = 0;\ H_1 = \sum_{i=1}^{k} j_i \neq 0$$

We reject the null hypothesis H_0 if the computed F statistic is greater than the critical value and conclude that X_t causes Y_t. Rejecting the H_0 implies that the selected macroeconomic variable Granger causes JSETop40 and that past values of former significantly predict stock prices. Similarly, rejecting H_0 in the second equation also implies that JSETop40 Granger causes the selected macroeconomic variable as such past values of the index could be used to predict the macroeconomic variables in question.

4.9 Diagnostic test

Ordinary least squares (OLS) are the most used technique for fitting a line to the data. This is the main method for econometric model estimation is this one. The OLS approach involves squaring each vertical distance between a point and a line, then minimizing the sum of all the squared-off areas. For the data utilized in this work, diagnostic tests such as the normality test, heteroskedasticity test, autocorrelation, test for multicollinearity, and model specification were run.

4.9.1 Normality Test

The OLS assumes that the error term has a normal distribution, a mean of zero, and a constant variance over all observations. When this is not the case, even if OLS estimates are the best linear unbiased estimators, they cannot be trusted. Bowman and Shanton (1975) combined the squares of normalised skewness and kurtosis into a single statistic, introducing the Jarque-Bera test statistic for the first time. It is used to assess whether sample data came from a population that was regularly distributed. In statistics, normality tests are used to assess how well a data set fits the model of a normal distribution and to estimate the likelihood that a random variable underlying the data set is distributed normally. According to Razali et. Al. (2 2011) when compared to Kolmogorov-Smirnov and Lilliefors, Shapiro-Wilk and Anderson-Darling have the best power for a given significance. The Jarque-Bera test is still preferred over the other normality tests mentioned above, according to certain published publications, according to the Journal of Statistical Modelling and Analytics. The JB test statistic will be used in this study to check the data's normalcy because it has gained widespread popularity among practitioners, particularly in economics and business.

The Jarque-Bera test statistic is defined by Kaya des (2017) as:

$$JB = (\frac{n}{6})(S^2 + \frac{(K-3)}{4}) \qquad \text{.......} 4.14$$

Where, for a normal distribution, S=0 (skewness) and K=3 (kurtosis), and their corresponding asymptotic variances are 6/n and 24/n. The JB test statistic has a chi-squared distribution with two degrees of freedom when normality is assumed.

4.9.2 Heteroskedasticity

Assumption 2 of the OLS as stated by Brooks (2008) assumes that that the variance of the error term is constant over time (i.e., Var (u_t)= σ^2<∞), this what is known as the homoscedasticity assumption. If the variance of the errors does not remain constant over time, they are said to be heteroscedastic. According to Wesonga (2017), In the presence of heteroscedasticity, the formula given for the coefficient standard error does not hold as a result the error term no longer constitute the minimum variance within the class of unbiased estimator. If the OLS method is used I the presence of heteroscedasticity the consequence thereof is that the OLS estimator is no longer regarded as the best linear unbiased estimator (BLUE) in the sense that the standard error could be wrong, and any inferences made may be misleading (Luus, 2016). The most widely used test for heteroscedasticity is the white general test developed by White (1980). This statistical test is ranked high particularly for its ability to establish whether the variance of the error in the regression model is constant or not and as a result this study will adopt the general white test to test for the presence of heteroscedasticity.

4.9.3 Autocorrelation

Assumption number 3 of the OLS made about the disturbance term indicate that covariance between the error term is zero over time (Cov $(u_i, u_j) = 0\ for\ i = j$). The assumption is based on the circumstance that the errors are independent from each other over time (Brooks, 2008). Autocorrelation in this regard occurs when the covariance between the error terms is found not to be independent from each other as a matter of future values being influenced by past values. Testing for the presence of autocorrelation in the residual series from the model estimated can be archived by means of plotting graphs and looking for patterns. However graphical method has proved to be difficult to interpret in practice for which a formal statistical test appears to the most favourable which should be applied in this regard. For this study the Durbin-Watson test statistic will be applied to test for the first order autocorrelation.

4.9.4 Multicollinearity

The fourth assumption that is adopted when using the OLS estimation method states that explanatory variables should be independent from each other. If the regressors does not show any form of relationship among each other, they would be said to be statistically independent (orthogonal). Consequently, the addition or removal of a variable in the equation would not have any impact on the value of the coefficient in the equation if indeed that no relation exists between the regressors (brooks 2008). If the regressors in the multiple regression model are correlated, the model fails to capture the separate explanatory effects each independent variable has on the dependent variable (Watsham and Parramore, 1997). Other method like the ridge regression and the principal components method techniques to detect multicollinearity have been proposed before but due to their complexities researcher find then hard to apply. Thus, with the aid of E-views statistical package (which only consider the matrix of correlation between the individual variable) test for multicollinearity between independent variables will be conducted because in most cases macroeconomic indicators often have correlation with one another the explanatory variables are not correlated with one another.

4.9.5 Misspecification Test

Furthermore, the OLS estimator assumes that the appropriate functional form for the model should be linear. A model that is not correctly specified can result to biased coefficients error terms and tend to have biased parameter estimates. A model that is assumed appropriate is one which can be outlined using a straight line. Model specification is mostly performed using Ramsey`s (1969) RESET test. Like many other studies this study will also use the Ramsey RESET test to test if the model has been correctly specified.

4.10 Innovation Accounting

To examine the interactions between the selected macroeconomic variables and the stock market, innovation accounting is employed as a complementary evaluation technique. This is accomplished by looking at how the stock market reacts to a large change in the chosen macroeconomic variables. The forecast error variance decomposition and the impulse response function are two techniques that are frequently used to determine how the variables are related to one another (Gan et al., 2006). To evaluate the impulse response and variance decomposition, this study will apply the VAR specification, which captures the dynamic interactions among the variables, as per studies conducted both locally and internationally by Macfarlane (2011), Coovadia (2014), Wongbangpo and Sharma (2001).

4.10.1 Impulse Response Functions

In the current research the Impulse Response Functions (IRFs) was utilised as a fundamental tool for analysing the dynamic relationships between macroeconomic variables and stock market performance in South Africa. IRFs are a widely used technique in time series analysis, particularly in Vector Autoregression (VAR) models. They provide a comprehensive framework to investigate how a shock to one variable propagates through the system over time, revealing the magnitude and duration of the impact on other variables. By estimating IRFs, we can observe the short-term and long-term effects of macroeconomic shocks on the stock market and gain insights into the transmission mechanisms. The IRFs enable us to capture the dynamic responses and interdependencies between key macroeconomic indicators and stock market returns and volatility, enhancing the overall understanding of their relationship. The analysis of IRFs will be conducted using the econometric software package EViews 12, following the methodology outlined by Lütkepohl (2005) and Sims (1980), who provided foundational works on the application of impulse response analysis in time series econometrics.

4.10.2 Variance Decomposition

The Variance Decomposition was employed as a crucial technique to enhance the understanding of the interplay between macroeconomic variables and stock market performance in South Africa. Variance Decomposition is an essential component of Vector Autoregression (VAR) models, allowing us to quantify the relative contributions of individual macroeconomic variables in explaining the fluctuations in stock market returns and volatility. By decomposing the forecast error variance of the dependent variable into the contributions from each variable in the VAR model, we can discern the significance and magnitude of shocks arising from different macroeconomic factors. This analysis provides valuable insights into the key drivers of stock market movements and their relative importance in shaping the overall market dynamics. The Variance Decomposition will be carried out using the econometric software package EViews 12, following the methodology outlined by Sims (1980) and Lütkepohl (2005), who laid the foundation for applying Variance Decomposition in the context of time series econometrics. By incorporating Variance Decomposition in our analysis, we aim to provide a comprehensive assessment of the interactions between macroeconomic variables and the stock market in developed countries, contributing to the overall understanding of their impact on financial markets.

4.11 Summary

The current section specified the model to be estimated by the study, describing, and defining the variables included as well as discussion the a priori expectation. The pre-model estimation tests were discussed as well as the model diagnostic tests. The complementary econometric analysis, impulse response functions and the variance decomposition was discussed in the current chapter. The proceeding chapter will present the results from the data analysis as well as the results discussion.

CHAPTER 5

DATA PRESENTATION AND ANALYSIS

5.1 Introduction

The previous chapter gave a full description of the methodology that this study will use to analyse data. The actual analysis and presentation of the results will be done in this chapter. The study will first present the descriptive statistics. The following tests: Unit root test, the Granger Causality Tests, Cointegration Tests, as well as the Diagnostic test were carried out to validate the model using the EViews software. The researcher has also discussed the results and findings of this study in relation the literature review conducted.

5.2 Descriptive Statistics

Table 5.1 presents the descriptive statistics of all the time series variables included in the model.

Table 5. 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
SHPRICE	56	39948.43	11786.44	18159.49	61351.10

GDP	56	0.33	3.05	-17.09	13.76
STINT	56	6.44	1.74	3.61	11.28
CPI	56	5.49	1.79	2.33	11.27
M3	56	99.42	27.03	59.99	150.89
IP	56	97.42	5.90	66.57	108.30
ZARUSDEXC	56	11.41	3.17	6.80	17.95
CRUDEOIL	56	91.07	24.63	41.58	133.87
PPPCF	56	5.69	0.98	3.93	7.23

The results in Table 5.1 shows there were 56 time series observation for each variable implying that there were no missing data. The standard deviation for the dependent variable is high implying that there is very high volatility in stock prices and the distribution is negatively skewed as the mean is closer to the minimum value than to the maximum value. All other variables were less volatile as seen from the respective standard deviations. The results show that the data were normally distributed as the mean is almost central to the minimum and maximum values. The minimum value of the growth rate was 17% implying that corresponds to the worst recession in the South African economy. This exploratory data analysis mean that the data is ready for analysis as the data has no missing values and no outliers which may distort the results.

5.3 Unit Root Tests

It is important to note that the researcher performed unit root tests for stationarity using the Augmented-Dickey Fuller and the Phillips-Perron as complementary method. What is important to note is variables have a tendency of being non-stationary in their level forms. It is of paramount importance to perform a stationary test for each variable in the study. Table 5.2 shows ADF stationery test in level form for every variable.

Table 5. 2: ADF Test in Level form

Variable	**ADF t-Statistic**	**Critical value ADF (5%)**	**Critical value ADF (10%)**	**p-value**	**Order**
CPI	-2.295918**	-2.915522	-2.595565	0.1769	I (1)
Crude-oil	-2.173081**	-2.916566	-2.596116	0.2182	I (1)
GDP	-10.87044*	-2.915522	-2.595565	0.0000	I (0)

IP	-4.132354*	-2.915522	-2.595565	0.0019	I (0)
M3	-2.013391**	-2.915522	-2.595565	0.9998	I (1)
PPPCF	-0.946414**	-2.916566	-2.596116	0.7657	I (1)
SHPRICE	-0.121306**	-2.915522	-2.595565	0.9416	I (1)
STINT	-3.493162	-2.916566	-2.596116	0.0119	I (1)
ZAR-USD	-0.911639	-2.915522	-2.595565	0.7773	I (1)

*Stationary in Level, **stationary at first difference

It is worth noting that the Augmented Dickey Fuller was carried to refute the null hypothesis which says the model's variables are stationary. Table 5.1 above shows the results of unit root performed at level form. The researcher fails to reject the null hypothesis on two variables namely GDP and IP (Industrial production) because the ADF *t*-statistic is greater than the respective critical values. ADF t-statistic for GDP and IP are less than the critical values in at both 5% and 10% level of significance and we conclude that these two variables are stationary in level form. To conclude on the stationarity of the variables we can also make use of the *p-value.* The *p-value* for GDP is 0.0000 and for IP is 0.0019 both less than 0.005 implies that null hypothesis is not rejected. However, the rest of the variables are non-stationary in level form because the *p-values* are greater than 5% implies that we reject the null hypothesis which says variables are stationary. The *p-value* STINT (interest rate) is 0.0119 > 0.005 implies non-stationary, for SHPRICE is 0.9416 > 0.05 implies non-stationary, for PPPCF is 0.7657 > 0.005 implying non-stationary, for M3 is 0.9998 > 0.005 implying non-stationary, for crude oil is 0.2182 > 0.005 implying non-stationary, and for CPI is 0.1769 > 0.005 implying non-stationary. For all the variables that are non-stationary in level, unit root test was further performed taking the first difference as shown in table 5.3.

Table 5. 3: ADF Test at first difference

Variable	ADF t- Statistic	Critical value ADF (5%)	Critical value ADF (10%)	p-value	Order
CPI	-4.306489**	-2.919952	-2.259790	0.0012	I (1)
Crude-oil	-3.854927**	-2.916566	-2.596116	0.0043	I (1)

GDP	-4.469927*	-2.923780	-2.599925	0.0008	I (0)
IP	-9.527817*	-2.916566	-2.596116	0.0000	I (0)
M3	-5.641428**	-2.917650	-2.596689	0.0000	I (1)
PPPCF	-3.873939**	-2.916566	-2.596116	0.0041	I (1)
SHPRICE	-7.093234**	-2.916566	-2.596116	0.0000	I (1)
STINT	-4.308252**	-2.916566	-2.596116	0.0011	I (1)
ZAR-USD	-6.148247**	-2.916566	-2.596116	0.0000	I (1)

*Stationary in Level, **stationary at first difference

As indicated earlier some variables in their level forms are non-stationary as seen in table 5.1 which called for the researcher to perform unit root after first difference. In table 5.3 all the variables are now stationary because the *p-values* are now less than 0.05. By also looking at the ADF-statistic and critical values in table 5.3 above at both 5% and 10% we can therefore fail to reject the null hypothesis and conclude that the variables are now stationary because ADF statistics is less than critical values. It is advisable to perform another confirmatory test for unit root other than ADF to further cement the decision obtained. In this study, Phillips-Perron was performed to confirm the ADF results above. Table 5.4 and 5.5 below shows Phillips-Perron test at level and after 1st difference.

Table 5. 4:Phillips-Perron in Level Form*

Variable	**ADF t-Statistic**	**Critical value ADF (5%)**	**Critical value ADF (10%)**	**p-value**	**Order**
CPI	-2.451183**	-2.915522	-2.595565	0.1328	I (1)
Crude-oil	-1.735864**	-2.915522	-2.595565	0.4079	I (1)
GDP	-17.87823**	-2.915522	-2.595565	0.0000	I (0)
IP	-4.132354**	-2.915522	-2.595565	0.0019	I (0)
M3	-3.724424**	-2.915522	-2.595565	1.0000	I (1)
PPPCF	-1.552823**	-2.915522	-2.595565	0.4996	I (1)
SHPRICE	-0.175387**	-2.915522	-2.595565	0.9350	I (1)

STINT	-1.822486**	-2.915522	-2.595565	0.3660	I (1)
ZAR-USD	-0.929213**	-2.915522	-2.595565	0.7716	I (1)

*Stationary in Level, **stationary at first difference

What is important to note is that Phillips-Perron uses same basis as ADF because on for variables to be stationary their *p-values* must be less than 0.05. As indicated in table 5.3 the *p-values* for GDP and IP are < *0.05* at both 5% and 10% level of significance which implies that we reject the null hypothesis and conclude that GDP and IP are stationary in level form. However, we fail to reject the null hypothesis for all other variables because their corresponding *p-values* are greater than 0.05 and hence it is advisable to difference them as shown in figure 5.5 below.

Table 5. 5: Phillips-Perron after first difference*

Variable	**ADF t-Statistic**	**Critical value ADF (5%)**	**Critical value ADF (10%)**	**p-value**	**Order**
CPI	-6.238978**	-2.916566	-2.596116	0.0000	I (1)
Crude-oil	-3.843741**	-2.916566	-2.596116	0.0045	I (1)
GDP	-71.94332**	-2.916566	-2.596116	0.0000	I (0)
IP	-11.50294**	-2.916566	-2.596116	0.0000	I (0)
M3	-5.915995**	-2.916566	-2.596116	0.0000	I (1)
PPPCF	-3.961915**	-2.916566	-2.596116	0.0032	I (1)
SHPRICE	-7.094702**	-2.916566	-2.596116	0.0000	I (1)
STINT	-4.343684**	-2.916566	-2.596116	0.0010	I (1)
ZAR-USD	-6.047063**	-2.916566	-2.596116	0.0000	I (1)

*Stationary in Level, **stationary at first difference

It is crucial to note the variables are now stationary after differencing them and this is indicated by *p-values* < *0.05* and therefore we reject the null hypothesis and conclude that the variables are stationary. The Phillips-Perron results confirmed the results from the ADF test for unit root.

Table 5. 6: Optimal lag selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1400.652	NA	2.84e+12	54.21739	54.55511	54.34687
1	-799.0808	971.7693	5991.911	34.19541	37.57257*	35.49014
2	-724.9978	94.02837	10292.69	34.46145	40.87804	36.92142
3	-611.3260	104.9278*	6683.530	33.20485	42.66087	36.83007
4	-442.7877	97.23363	1834.779*	29.83799*	42.33345	34.62846*

Based on the above lag selection methods, the advisable option will be to use lag 4 because it is suggested by most of the tests shown by a * to be specific, FPE, AIC, and HQ suggests that we use lag 4, while LR opt for lag 3, SC opt for lag 1. Thus, lag 4 was used for further tests because it was optimal according to the optimal lag selection.

5.4 Cointegration Test

After having performed the unit root test which implied the model is not spurious, the researcher performed the cointegration test. What is important to point out is that the null hypothesis in this test is that the model variables are not cointegrated to each other. To test for cointegration, the unrestricted cointegration rank test (Trace) was used. Null hypothesis is rejected if *p-value* from the Trace is less than 0.05.

Table 5. 7: Unrestricted Cointegration Rank Test (Trace)

Hypothesised No. of CE(s)	Eigenvalue	Trace-Statistic	0.05 Critical-Value	Prob**
None*	0.821056	364.8615	197.3709	0.0000
At most 1*	0.755091	273.6652	159.5297	0.0000
At most 2*	0.684434	199.1012	125.6154	0.0000
At most 3*	0.575693	137.9717	95.75366	0.0000
At most 4	0.451337	92.53487	69.81889	0.0003
At most 5	0.424593	60.72054	47.85613	0.0020
At most 6	0.273812	31.42864	29.79707	0.0322
At most 7	0.238381	14.47147	15.49471	0.0709

At most 8	0.000737	0.039084	3.841466	0.8432

As can be seen in the table above, the Trace test shows 7 cointegrated equations at 5% level of significance. What is important to note is that the * sign denotes the rejection of the hypothesis at 5% level of significance. From the above table we reject the null hypothesis because *p-value* is < 0.05 and conclude that at least some of the variables in our study model are cointegrated. What it implies is that there is a long run association/relationship between some of the variables in the model. Because a long run association exist between the variables, the researcher performed an error correction model.

5.5 Vector Error Correction Model (VECM)

Using the VECM and the systems equation model from EViews we run the following equation to decide on whether to reject or accept the null hypothesis. Having run the equation with 20 coefficients, the following output of VECM is produced which helps us to determine the long run causality and short run association between the variables.

Table 5. 8: Vector Error Correction Model (VECM)

VARIABLE	COEFFICIENT	STD ERROR	t-STATISTIC	PROB
PPPCF	-0.07828	0.15088	-0.50146	0.0093
GDP	0.07702	0.04152	1.73280	0.01595
STINT	0.01249	0.04190	0.27855	0.74262
CPI	0.07968	0.04296	1.79272	0.0165
M3	0.01293	0.04335	0.28818	0.7683
IP	-0.07058	0.05341	-1.27743	0.0993
ZARUSDEXC	0.00112	0.00048	2.24295	0.0295
CRUDEOIL	0.07479	0.08377	0.86296	0.0321
ECM (-1)	-0.34341	0.19960	-1.72044	0.0355

It is important to point out is that the VECM results are shown in table 5.8 above. From the table above, all explanatory variables are statistically significant except for interest rate and money supply. This is because their respective *p-values* are less than 0.05. It is worth noting that even though a long run equilibrium exists between the study's variables, unexpected shocks have a capacity to disturb these variables which can cause them to deviate from the equilibrium. The ECM (-1) is significant as shown by its corresponding negative value and a *p-value* less than 5% which implies that the model is good and long run adjustments can be performed in this circumstance. The ECM (-1) coefficient of -0.343408 is an indicator of the speed to which the model moves towards equilibrium position and to be specific the speed of adjustment is about 34.34% per/unit time or per quarter in this case. It is important to note that -0.343408 is the error correction term measuring the speed of adjustment process from the short run to the long run.

5.5 Granger Causality Test

Granger Causality Test was performed to assess the causality relationship between share price, the dependent variable and its independent variables that include industrial production, exchange rate, interest rate, GDP, M3, purchasing power parity, CPI, and crude oil prices. By testing for granger causality, we can deduce three outcomes bidirectional, unilateral, or no relationship between the variables. The researcher employed the Pairwise Granger Causality test, and the results are presented in the following tables.

Table 5. 9: Share price and CPI causality

Equation	Null hypothesis	F-statistic	Probability
1	CPI does not Granger Cause SHPRICE	6.97483	0.0022
2	SHPRICE does not Granger Cause CPI	0.50505	0.6066

The null hypothesis in equation 1 is that CPI does not granger cause SHPRICE and this can be rejected because the corresponding value is less than 0.05 and conclude that CPI granger cause share price. The null hypothesis in equation 2 in table 5.9 above is that SHPRICE does not granger cause CPI and we fail to reject the null hypothesis because the corresponding *p-value* is greater than 0.05. From the results in table 5.9 we can conclude that there is a unilateral relationship between the variables in question. This result in in commensurate with the findings of Lai et al. (2013) who examined the dynamic interactions between macroeconomic variables and the stock markets in three Asian nations, namely Taiwan, Hong Kong, and China, considering both long- and short-term movements. Their study found that there is a unidirectional causality between the inflation rate and the stock prices running from inflation. The results mean that stock market developments respond to inflation developments and the inflation rate does not respond to the developments in the stock market. This is justified in South Africa as inflation cause people to invest in stocks unlike keeping the cash since it loses value and vice versa is not true.

Table 5. 10: Share price and crude-oil price causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	CRUDE_OIL does not Granger Cause SHPRICE	*0.14317*	*0.8670*
2	SHPRICE does not Granger Cause CRUDE_OIL	*4.62672*	*0.0144*

The null hypothesis in equation 1 is that Crude-Oil price does not granger cause SHPRICE and we fail to reject the null hypothesis because the corresponding value of probability is more than 0.05 and conclude that Crude-Oil price does not granger cause share price. The null hypothesis in equation 2 in table 5.10 above is that SHPRICE does not granger cause crude oil and we reject the null hypothesis because the corresponding *p-value* is less than 0.05. From the results in table 5.10 we can conclude that there is a unilateral relationship between the variables in question running from stock prices to crude oil. The results are in contrary to the wide literature including the findings of Al-Majali and Al-Assaf (2014) who connected the long-run and short-run relationships between the share market index and the crude oil prices in Jordan. This is contrary to the a priori expectation since South Africa was assumed to be the net exporter. This is possibly so because, in terms of the top 40 companies used I the sample are net importers instead hence this unidirectional causality running from share prices to crude oil prices. More so, the top 40 companies are hugely multinational companies hence their stock performance have a bearing on the prices of crude oil worldwide.

Table 5. 11: Share price and GDP causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	GDP does not Granger Cause SHPRICE	*4.52150*	*0.0158*
2	SHPRICE does not Granger Cause GDP	*0.83931*	*0.4381*

The null hypothesis in equation 1 in table 5.11 above is that GDP does not granger cause SHPRICE and we reject the null hypothesis because the corresponding value of probability is less than 0.05 and conclude that GDP does granger cause share price. The null hypothesis in equation 2 in table 5.11 above is that SHPRICE does not granger cause GDP and we fail to reject the null hypothesis because the corresponding *p-value* is more than 0.05. From the results in table 5.11 the researcher concludes that there is a unilateral relationship between the variables in question running from GDP to share price. This avers to the several results in literature that have shown it to be a positive significant explanatory variable for the stock market performance (Wongbangpo and Sharma, 2002; Fama, 1981). These studies found GDP to have a positive impact on the stock market performance. This is also in tandem with the a priori expectation for the current study is a positive sign of the coefficient of the GDP variable. This is because more GDP imply more disposable incomes hence more savings to be allocated towards investments in stock market for future returns.

Table 5. 12: Share price and Industrial production causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	IP does not Granger Cause SHPRICE	*4.50183*	*0.0160*
2	SHPRICE does not Granger Cause IP	*0.44501*	*0.6434*

The null hypothesis in equation 1 in table 5.12 above is that industrial production does not granger cause SHPRICE and we reject the null hypothesis because the corresponding value of probability is less than 0.05 and conclude that industrial production does granger cause share price. The null hypothesis in equation 2 in table 5.12 above is that SHPRICE does not granger cause industrial production and we fail to reject the null hypothesis because the corresponding *p-value* is more than 0.05. From the results in table 5.12 the researcher concludes that there is a unilateral relationship between the variables in question. This is in line with the findings in the literature by Chen et al. (1986) who concluded that industrial production allows for the build-up of real assets, which aid in directing capital flow into the firm, and is closely correlated with the production efficiency of the economy. This is possibly because the stock prices will show a growth trend because of cashflow into the company. This is therefore in tandem with the a priori expectation of the current study.

Table 5. 13: Share Price and M3 causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	M3 does not Granger Cause SHPRICE	*2.76466*	*0.0728*
2	SHPRICE does not Granger Cause M3	*3.75580*	*0.0304*

The null hypothesis in equation 1 in table 5.13 above is that M3 does not granger cause SHPRICE and we fail to reject the null hypothesis because the corresponding value of probability is more than 0.05 and conclude that M3 does not granger cause share price. The null hypothesis in equation 2 in table 5.12 above is that SHPRICE does not granger cause M3 and we reject the null hypothesis because the corresponding *p-value* is less than 0.05. From the results in table 5.13 we can conclude that there is a unilateral relationship between the variables in question running from share price to M3. The results are contrary to the a priori expectation set out in chapter 3 that grounding from the fact that if the reserve bank increases money supply it places more money into the hands of consumers which increases spending and fuels investment such that stocks becomes more attractive. When consumers spend more, it increases the company`s profitability which increases the value of the firm and as result this pushes the company`s share price up. This result is also contrary to the findings of Pathan and Masih (2013) and is possibly so because the increase in money supply unarguably led to inflation leading to less profitability by companies, hence less demand for the stocks hence leading to low prices.

Table 5. 14: Share Price and PPPCF causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	PPPCF does not Granger Cause SHPRICE	*5.86260*	*0.0052*
2	SHPRICE does not Granger Cause PPPCF	*1.62260*	*0.2078*

The null hypothesis in equation 1 in table 5.14 above is that purchasing power parity does not granger cause SHPRICE and we reject the null hypothesis because the corresponding value of probability is less than 0.05 and conclude that purchasing power parity does granger cause share price. The null hypothesis in equation 2 in table 5.13 above is that SHPRICE does not granger cause purchasing power parity and we fail to reject the null hypothesis because the corresponding *p-value* is more than 0.05. From the results in table 5.14 the researcher concludes that there is a unilateral relationship between the variables in question running from PPP to SHPRCE. The results are in tandem with the a priori expectation that the PPPCF affect the share prices since South Africa is a net importer.

Table 5. 15: Share price and interest rate causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	STINT does not Granger Cause SHPRICE	*10.1985*	*0.0002*
2	SHPRICE does not Granger Cause STINT	*1.32397*	*0.2754*

The null hypothesis in equation 1 in table 5.15 above is that interest rate (STINT) does not granger cause SHPRICE and we reject the null hypothesis because the corresponding value of probability is less than 0.05 and conclude that interest rate does granger cause share price. The null hypothesis in equation 2 in table 5.15 above is that SHPRICE does not granger cause interest rate and we fail to reject the null hypothesis because the corresponding *p-value* is more than 0.05. From the results in table 5.15 the researcher concludes that there is a unilateral relationship between the variables in question running from STINT to SHPRC. This is in line with the a priori expectation as well as majority of the literature. This is possibly so because an increase in the interest rate makes it expensive for individuals to borrow and invest in the stock market causing low demand for stocks hence a price fall. This avers to the findings of Banda (2016).

Table 5. 16: Share price and exchange rate causality

Equation	***Null hypothesis***	***F-statistic***	***Probability***
1	ZAR-USD-EXC does not Granger Cause SHPRICE	*1.01432*	*0.3698*
2	SHPRICE does not Granger Cause ZAR-USD-EXC	*10.7656*	*0.0001*

The null hypothesis in equation 1 in table 5.16 above is that exchange rate does not granger cause SHPRICE and we fail to reject the null hypothesis because the corresponding value of probability is more than 0.05 and conclude that exchange rate does not granger cause share price. The null hypothesis in equation 2 in table 5.16 above is that SHPRICE does not granger cause exchange and we reject the null hypothesis because the corresponding *p-value* is less than 0.05. From the results in table 5.16 we can conclude that there is a unilateral relationship between the variables in question running from share prices to exchange rate. This is contrary to the a priori expectation which assumed that exchange causes share price since South Africa is export oriented. This is also contrary to the findings of Sheffrin (2003). This is because the Top40 companies in the sample might not be export as anticipated for the rest of South Africa hence the reverse results.

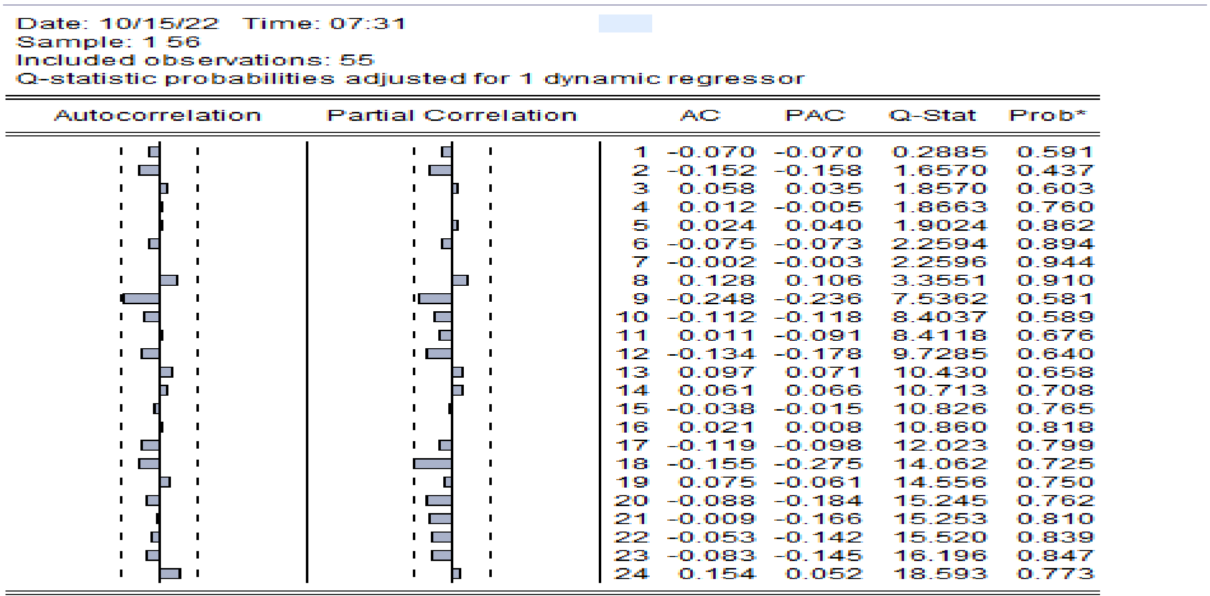
5.6. Diagnostic Tests

The justification of performing the diagnostic tests is that these are the tests that validate the model. The model should be best linear unbiased estimator (BLUE). The following results of diagnostic tests are presented.

Table 5. 17: L-M Serial Correlation Test

Breusch-Godfrey Serial Correlation			
F-statistic	1.763562	Prob. F (2,24)	0.1836
Obs*R^2	4.169436	Prob. X^2(2)	0.1243
Durbin-Watson (DW)	1.831529		

The first test that was performed to test for autocorrelation is the LM test and with the probability which is greater than 0.05 we can conclude that the model is not suffering from serial correlation. The null hypothesis is not rejected and to note is that the Durbin Watson value of 1.831429 further confirm the presence of no serial correlation because it falls within the stipulated rule of thumb between 1.5 and 2. The researcher also performed a confirmatory Correlogram Q-statistic probabilities test to check for serial correlation and the following figure 5.1 shows the results.


Date: 10/15/22 Time: 07:31
Sample: 1 56
Included observations: 55
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.070	-0.070	0.2885	0.591
		2	-0.152	-0.158	1.6570	0.437
		3	0.058	0.035	1.8570	0.603
		4	0.012	-0.005	1.8663	0.760
		5	0.024	0.040	1.9024	0.862
		6	-0.075	-0.073	2.2594	0.894
		7	-0.002	-0.003	2.2596	0.944
		8	0.128	0.106	3.3551	0.910
		9	-0.248	-0.236	7.5362	0.581
		10	-0.112	-0.118	8.4037	0.589
		11	0.011	-0.091	8.4118	0.676
		12	-0.134	-0.178	9.7285	0.640
		13	0.097	0.071	10.430	0.658
		14	0.061	0.066	10.713	0.708
		15	-0.038	-0.015	10.826	0.765
		16	0.021	0.008	10.860	0.818
		17	-0.119	-0.098	12.023	0.799
		18	-0.155	-0.275	14.062	0.725
		19	0.075	-0.061	14.556	0.750
		20	-0.088	-0.184	15.245	0.762
		21	-0.009	-0.166	15.253	0.810
		22	-0.053	-0.142	15.520	0.839
		23	-0.083	-0.145	16.196	0.847
		24	0.154	0.052	18.593	0.773

Figure 5. 1: Correlogram Q-statistic

The results of the Q-statistic probabilities confirm the results of the L-M test of the absence of serial correlation, and this is so because the *p-values are* greater than 0.05. Following the Q-statistic probabilities, we fail to reject the null hypothesis that there is no serial correlation conforming to the CLRM assumption.

Table 5. 18: Heteroskedasticity Test: Breusch-Pagan- Godfrey

Breusch-Pagan Godfrey test			
F-statistic	1.105099	Prob. F (8,47)	0.3770
Obs*R^2	8.865997	Prob. X^2(8)	0.3537

The Breusch-Pagan-Godfrey test was used to test for heteroscedasticity. Table 5.18 above shows that there is no heteroskedasticity in our model because the *p*-value obtained is > 0.05. The results make us fail to reject the hypothesis which say there is homoscedastic conforming to the CLRM assumption.

Table 5. 19: Misspecification- Ramsey Reset

	Value	DF	Probability
F-statistic	0.226423	(1, 46)	0.6364
Likelihood ratio	0.226423	1	0.6000
t-statistic	0.475840		

The researcher to check for misspecification employed the Ramsey Reset test. The results in table 5.19 indicates that the model is correctly specified because the *p-value* is greater 0.05 and because of that we fail to reject the null hypothesis.

Table 5. 20: Normality Test

Jarque-Bera	0.277676
P-Value	0.870369

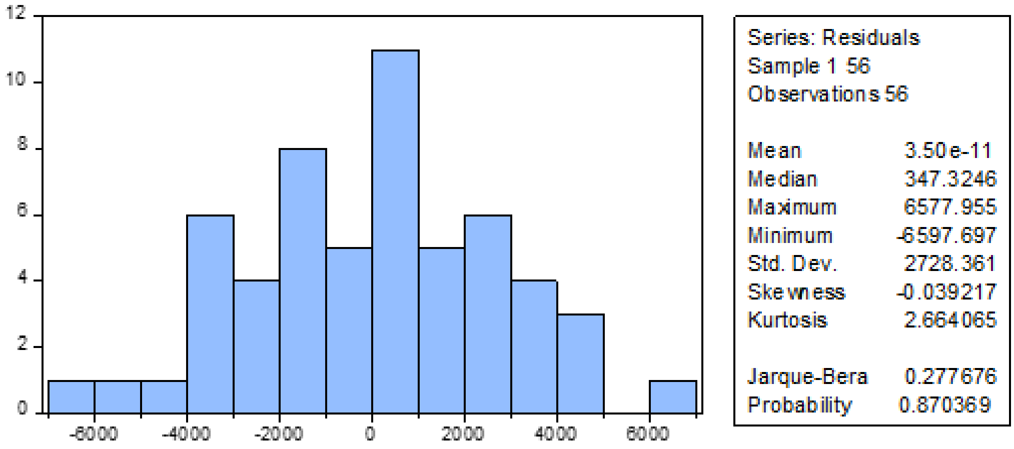


Figure 5. 2: Jarque- Bera. Source (Own EViews testing)

The J-B test was used to evaluate the distribution of model residuals. Since the residuals appear to have a normal distribution according to the p-value (0.870369), which is > 5%, the null hypothesis is not rejected. The developed model is normally distributed hence it is a good model conforming to the homosphericity assumption of CLRM assumption.

5.7 Innovation Accounting

For innovation accounting impulse response function was performed on EViews and the following output was obtained.

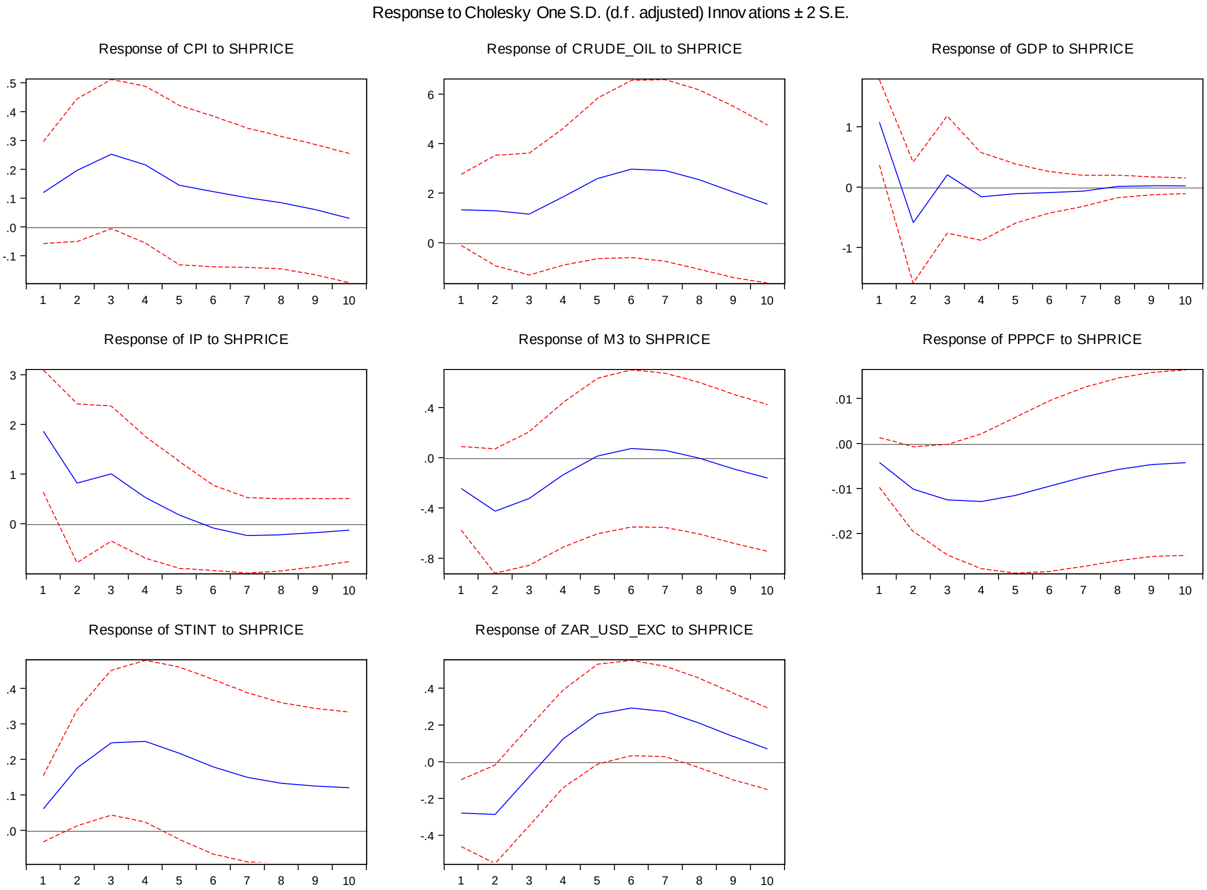


Figure 5. 3: Impulse response function

The graphs above show the reaction of the independent variables to a unit standard deviation shock on the dependent variable (Share price). The blue lines are the impulse response while the red lines are the 95% confidence intervals. The impulse response must always lie between the 95% confidence intervals as indicated in the above graphs. The response of CPI to share price start by sharp increase from period

1 and 3 and gradually declines from period 4 to period 10. The response of crude oil to share price is stable from period 1 to 3 and increases from period 4 to 6, become stable from period 6 and 7, and gradually declines from period 8 to 10. The response of GDP to share price sharply declines from period 1 to 2 to become negative and constantly fluctuates in an increasing rate from period 3 to 10. The response of industrial production to share price declines from first period to the last period. The response of M3 to share price is negative and started by decreasing and eventually increased but still being negative. The response of purchasing power parity is almost stable but negative as shown by the graph above. Interest rate's response to share price is positive and increasing from period 1 to period 2, becomes constant between period 3 and 4 and started declining from period 5. The response of exchange rate which started on a negative from period 1 to 3, was on an increasing trend and became positive from period 4 to 10. The IRF are commensurate with the Granger causality discussed above.

5.8 Summary

In this chapter an actual data analysis and presentation of results was done. The chapter started by testing for unit root using ADF test method which proved that the variables were stationary after first difference. The Phillips Parron was used a confirmatory and similar finding as of ADF test were established. The cointegration test were done using the Johannesen cointegration test and the unrestricted cointegration rank test (Trace) revealed a long-run association between the variables. Vector error correction model was performed, and the ECM (-1) was found to be significant as shown by its corresponding negative value and a *p-value* less than 5% which implies that the model is perfect and long run adjustments can be performed in this circumstance. Various diagnostic test was performed, and the model was found to be correctly specified through the Ramsey Reset, no presence of heteroskedasticity through the White General Test, no serial correlation through Breusch Pagan Godfrey test, and to be normally distributed throw the Chow-Break Point.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The researcher in the previous chapter managed to do an actual data analysis and presentation of the results and their discussion. In this chapter, the researcher is building upon the findings from the previous chapter to draw the policy recommendations as well as summarising the research conclusion. It is in this chapter in which the researcher will present the limitations as well as areas for further studies for future researchers.

6.2 Summary of the Study

This study was carried with the aim of investigating the relationship between macroeconomic variables and stock market performance in South Africa. It is important to note that the study's specific objectives were articulated as: to analyse the impact of macroeconomic variables (economic growth, inflation, interest rate, and exchange rates) on stock market performance in South Africa; to determine the impact of crude oil prices on stock market performance in South Africa. to investigate the impact of money supply on stock market performance in South Africa, and to evaluate the impact of industrial production on stock market performance in South Africa.

The background, justification, objectives, hypotheses, as well as the problem statement were the focus of chapter 1. Chapter 2 provided an overview of the stock market and the changes and trends in the macroeconomic variables in this study. Chapter 3 presented the literature review pertaining to the impact of macroeconomic variables on stock market performance. Various stock market models were presented on theoretical literature in chapter 3 and this chapter further presented the empirical review on which various scholars who invested this phenomenon were acknowledged together with what they concluded. Chapter 4 presented the methodology and various aspects for collecting, analysing, and presenting data were noted. It is in this chapter the model for this study was developed and definition of key terms was done. Chapter 5 is where data analysis and presentation were done and EViews was used to perform various econometrics tests. Chapter 6 concludes and offers recommendations.

6.3 Key Findings

The variables that impact stock market either negatively or positively were established in this study. The overarching aim of this study was to ascertain the causality and association between stock market performance and various macroeconomic variables. The study findings have revealed a positive significant relationship to exist between industrial production and stock market performance, between GDP and stock market performance, between exchange rate and stock market performance. An ambiguous relationship was found to exist between stock market performance and money supply. A unilateral relationship was established between interest rates and stock market performance. It is crucial to point out that the researcher carried out the diagnostic tests to validate the model. The study findings show no presence of heteroskedasticity since the corresponding *p-value* was greater than 0.05 which is the rule of thumb. The LM test was used for autocorrelation and the DW-test which is within the acceptable range of 1.5 to 2 indicates that there is no presence of serial correlation in our model. Test for normality were done using the Ramsey Reset and the obtained histogram which is bell shaped shows that the model is normally distribute. The kurtosis value which is around 2.67 implies soon it can reach 3 and together with the Jarque-Bera statistic implies the study's residuals are normally distributed. Inflation was found to influence stock market performance negatively.

The study findings served as a confirmatory to what other previous researchers have established in the same field. It is also crucial to find out the findings also contradicts what other researchers put forward and the reason for the difference could be because the other researchers were investigating for developed countries while this study is conducted for a developing country, South Africa. As an illustration, Lai et al. (2013) examined the dynamic interactions between macroeconomic variables and the stock markets in three Asian nations, namely Taiwan, Hong Kong, and China, considering both long- and short-term movements. According to the researchers' results, domestic macroeconomic factors have a smaller impact on the domestic stock market than do overseas capital markets. Furthermore, their research showed that share prices in Hong Kong and Taiwan are long-term indicators of GDP development. Similar conclusions were reached in this study, which showed that GDP has a beneficial impact on the stock market. The granger causality performed between GDP and share price as a proxy for stock market revealed that GDP influence is statistically significant in influencing stock market because the corresponding *p-value* was less than 0.05.

Rafique et al. (2014) went a step further by calculating GDP per person. They examined the impact of four macroeconomic variables on the Karachi Stock Exchange in Pakistan using an Analysis of Variance (ANOVA) model (GDP per capita, gross domestic savings, inflation, and the discount rate). They conducted their study using series data covering the 20-year timeframe from 1991 to 2010. The data research revealed that the Karachi Stock Exchange ALSI is positively and significantly impacted by GDP per capita, with a 142.661 coefficient. The stock market was found to be adversely correlated with inflation. Similar results were discovered in this study, which found that GDP and industrial production were favourably correlated with stock market whereas CPI was shown to be adversely correlated with stock market.

6.4 Policy Recommendations

Following the findings of the study policy recommendations can be provided. It was established that GDP positively influence stock market performance and the government of South Africa is advised to devise strategies that improves GDP. There are many things the government of South Africa can consider raising GDP which include supply side policies like education to make people effective or demand side like lowering interest rates to promote investment holding all other factors constant. Industrial production was found to be positively related to stock market performance and efforts should be done to promote production and similar policies to raise GDP can be used to improve industrial production. The impact of interest rate on stock market was found to be negative implying as interest rate increases stock market performs badly and it is therefore recommended that the government of South Africa through the reserve bank keeps interest rates at an acceptable rate and not to continuously change it which affect investors' confidence in the market. Efforts should be made to ensure that inflation rate is at minimum to improve stock market performance. This is so because, stock market performance was found to be negatively influenced by interest rates. Stock market performance is also affected by volatility and fluctuations in the various macroeconomic variables and therefore the government of South Africa should make sure that policies are put in place that guarantees stability of the various macroeconomic variables.

6.5 Limitations and Areas of Further Research

This study was not without its limitations, the first limitation is pertaining to the time frame that the study covered which is from 2008 to 2021. Rich and better results could have been obtained by using a longer period that stretches back to 1990. It is also important to note that despite using many explanatory variables, other key variables such as corruption and taxation could have been employed since they too affect stock market performance. The study also covered a period of covid-19 pandemic. The study period coincides with the challenging times of the COVID-19 pandemic, a factor that undoubtedly influenced stock market performance, particularly within the JSE Top40 index. By including a COVID-19 dummy variable, future research could better capture and understand the nuanced impacts of the pandemic on the market. This approach would enrich the analysis, offering a more comprehensive view of how such an unprecedented global event shaped the performance of the Top40 index. Different results could have been obtained had the researcher made use of panel data. The obvious limitation was time and cost constraints which affected the quality of the study. The future researchers can capitalise on the limitations of this study to investigate the same issue making use of the panel data. They can also incorporate other deterministic variables such as corruption, urbanisation, exports, and imports.

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Appendices

Data

TIME	SHPRICE	GDP	STINT	CPI	M3	IP	ZAR/USD EXC	CRUDE OIL	PPPCF
2008-Q1	26571.98	0.42	10.26	8.95	59.99	105.77	7.55	91.92	3.93
2008-Q2	28675.11	1.22	11.09	9.92	62.79	108.30	7.78	94.82	4.04
2008-Q3	26681.35	0.24	11.28	11.27	64.41	105.47	7.78	103.28	4.13
2008-Q4	20057.79	-0.57	10.86	10.11	66.36	96.50	9.94	110.19	4.22

2009-Q1	18159.49	-1.56	9.50	8.85	68.17	89.03	10.13	123.94	4.30
2009-Q2	19187.11	-0.34	7.73	8.15	67.96	87.57	8.47	133.05	4.38
2009-Q3	21354.74	0.23	7.16	6.28	67.61	89.77	7.80	133.87	4.44
2009-Q4	23432.61	0.67	7.01	5.72	67.63	91.97	7.49	113.85	4.50
2010-Q1	24344.27	1.17	7.05	5.38	68.75	92.10	7.51	99.06	4.55
2010-Q2	25207.12	0.84	6.57	4.17	69.08	94.70	7.55	72.84	4.60
2010-Q3	24215.49	0.89	6.33	3.38	70.32	93.93	7.32	53.24	4.64
2010-Q4	26684.17	0.93	5.74	3.49	72.08	94.07	6.91	41.58	4.69
2011-Q1	28620.86	0.98	5.52	3.68	73.81	96.87	7.01	44.86	4.69
2011-Q2	29291.94	0.56	5.46	4.65	73.34	95.57	6.80	43.24	4.74
2011-Q3	28030.67	0.41	5.49	5.43	74.63	96.13	7.15	46.84	4.80
2011-Q4	28274.92	0.68	5.48	6.21	77.41	97.13	8.09	50.85	4.87
2012-Q1	29730.90	0.57	5.50	6.18	78.70	97.90	7.76	57.94	5.01
2012-Q2	29723.30	0.83	5.57	5.90	78.07	98.17	8.13	68.62	5.08
2012-Q3	30399.60	0.41	5.12	5.20	80.48	98.83	8.27	64.91	5.14
2012-Q4	32796.27	0.48	4.95	5.63	82.16	99.40	8.69	72.50	5.20
2013-Q1	35379.55	0.78	5.05	5.88	84.11	99.07	8.96	67.69	5.21
2013-Q2	35610.23	0.73	5.09	5.57	85.43	100.17	9.50	73.19	5.26
2013-Q3	36586.16	0.47	5.09	6.26	86.49	99.23	9.99	77.04	5.32
2013-Q4	40092.57	0.54	5.08	5.43	87.57	100.77	10.17	74.67	5.39
2014-Q1	41613.58	-0.14	5.51	5.80	89.36	100.40	10.87	76.37	5.47
2014-Q2	43814.29	0.39	5.75	6.64	91.67	100.30	10.54	74.31	5.54
2014-Q3	45940.89	0.48	6.01	6.39	92.43	97.97	10.78	79.27	5.61
2014-Q4	44250.35	0.75	5.92	5.69	94.53	101.40	11.21	84.98	5.67
2015-Q1	45414.27	0.72	5.90	4.28	96.01	101.37	11.74	76.25	5.72
2015-Q2	46832.70	-0.84	5.76	4.53	99.10	98.67	12.09	74.84	5.79
2015-Q3	45682.99	0.45	6.14	4.51	101.32	99.97	13.00	74.74	5.86
2015-Q4	46509.40	0.43	6.41	4.83	103.57	99.63	14.21	76.69	5.94
2016-Q1	44555.14	0.24	6.94	6.51	104.53	100.53	15.84	77.79	6.04
2016-Q2	46861.69	0.10	7.18	6.50	105.89	102.33	15.03	82.92	6.12
2016-Q3	46050.60	-0.01	7.31	6.41	106.58	100.73	14.06	85.67	6.20
2016-Q4	44378.80	0.08	7.48	6.87	109.54	98.90	13.91	91.80	6.27
2017-Q1	44654.02	0.47	7.32	6.50	111.50	99.17	13.25	96.29	6.35
2017-Q2	46464.26	0.55	7.39	5.21	111.99	99.77	13.24	103.96	6.41
2017-Q3	48097.39	0.18	7.20	4.56	113.89	100.03	13.17	114.44	6.45
2017-Q4	51738.83	0.39	7.41	4.52	116.29	101.00	13.64	123.07	6.49
2018-Q1	52177.05	0.42	7.17	3.95	118.57	99.80	11.95	114.46	6.48
2018-Q2	49999.21	-0.21	7.01	4.31	118.76	100.30	12.63	113.76	6.51
2018-Q3	51765.02	1.28	7.11	4.92	121.28	101.20	14.09	116.46	6.54
2018-Q4	46772.92	0.35	7.33	4.88	123.28	102.53	14.25	110.08	6.58
2019-Q1	48116.56	-0.91	7.27	4.15	125.01	100.53	14.01	110.88	6.62
2019-Q2	50711.81	0.41	7.13	4.44	128.91	101.20	14.39	109.47	6.67
2019-Q3	50772.62	0.14	6.96	4.16	130.69	99.23	14.68	110.50	6.72
2019-Q4	49358.41	-0.03	6.98	3.74	131.88	98.27	14.72	107.91	6.78
2020-Q1	48913.47	0.00	6.43	4.32	134.44	96.23	15.34	111.16	6.88
2020-Q2	44543.87	#####	4.45	2.33	142.37	66.57	17.95	119.70	6.94

2020-Q3	50923.08	13.76	3.70	3.04	144.53	90.73	16.91	124.93	7.00
2020-Q4	49963.62	2.70	3.61	3.17	143.96	95.47	15.64	120.46	7.05
2021-Q1	57610.58	0.82	3.80	3.10	144.97	95.57	14.95	110.52	7.10
2021-Q2	61253.46	1.39	4.28	4.95	145.03	94.63	14.13	95.59	7.15
2021-Q3	61351.10	-1.80	3.81	4.94	147.32	90.20	14.62	103.14	7.19
2021-Q4	60911.70	1.37	3.81	5.44	150.89	92.37	15.41	113.34	7.23