

RHODES UNIVERSITY

THE STOCK MARKET AND THE BUSINESS CYCLE IN SOUTH  
AFRICA

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## PLAGIARISM DECLARATION

I Patience Pokoo, do declare that except for references specifically indicated in the text and such help as has been provided by my supervisors, this thesis is wholly my original work and has not been submitted at any other University or Technikon for any degree purposes.

*Patience*

Signed by \_\_\_\_\_ on this 22<sup>nd</sup> day of January 2024.

## ABSTRACT

The relationship between the stock market and economic activity has long been a topic for research. Several studies done in both advanced and emerging economies including South Africa before COVID-19 found stock market prices predict the cycle of real economic activity and some found it to be the reversal. Therefore, this Study seeks to examine this topic and will extend beyond the post-covid period exploring the relationship between the stock market (proxied by the JSE All-Share Index) and the business cycle (represented by the Coincident Business Cycle Indicator of the SARB) in South Africa. The study also investigates if the relationship between the stock market and the business cycle is homogenous across the three selected sectors of the JSE using a combination of the “financial accelerator theory”, the “wealth effect theory”, the “traditional valuation model of stock prices”, the “stock prices as aggregators of expectations”, and the “cost of raising equity capital”. The Econometrics models employed include time-series and panel cointegration techniques, relying on the ARDL estimation model and a Granger-Causality Test. The findings of this study indicate that a long-run relationship exists between the stock market and the business cycle in South Africa. The findings support the notion that the stock market predicts economic activity, and this relationship is assumed to be homogenous across the selected Sectors of the JSE (namely, Resources, Financials, and Industrials). Again, the Granger-Causality Test confirms the relationship between the stock market and the business cycle in South Africa to be unidirectional. It is recommended that since the stock market affects South African economic activity positively in the long run which is consistent with findings of similar studies done on the JSE, the South African Reserve Bank (SARB) must strengthen existing policy to ensure financial system stability and sustainable economic growth in South Africa. Again, the stock market being a leading indicator of the business cycle is something different. As a recommendation, we need to look at ways to use the prediction ability in a business setting. Investors and Portfolio Managers can follow trends of the stock market to forecast the direction of the future economy to make educated decisions to hedge their investments and diversify their portfolios against huge losses in crises such as the Financial Crises and the Global Health Crisis (COVID-19), however, with the caveat that the stock market does not always accurately predict the business cycle.

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## LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ALSI	All-Share Index
AR	Autoregressive
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distributed Lag
ARIMA	Autoregressive Integrated Moving Average
BSE	Bombay Stock Exchange
CBCI	Coincident Business Cycle Indicator
CCBCI	Composite Coincident Business Cycle Indicator
CPI	Total Consumer Prices Index
CUSUM	Cumulative Sum of recursive residuals
CUSUM-SQ	Cumulative Sum of Squares
DF	Dickey-Fuller
ECT	Error Correction Term
EIEWS	Econometric Views
FDI	Foreign Direct Investment
FIN	Financials
FMP	Federal Reserve-M.I.T.- (University of) Pennsylvania representing the Institutions sponsoring the model
FTSE	Financial Times Stock Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticity

GDP	Gross Domestic Product
GJ	Greenwood-Jovanovic
GNP	Gross National Product
HCPI	Harmonized Consumer Price Index
IND	Industrials
IP	Industrial Production
IRESS	Integrated Real-time Equity Systems
ISE 100	Istanbul Stock Exchange Price Index 100
JMCAP	JSE Market Capitalization
JSE	Johannesburg Stock Exchange
KLCI	Kuala Lumpur Composite Index
KSE	Karachi Stock Exchange Index
LCH	Life Cycle Hypothesis
M1	The Narrow Money Supply
MC	Market Capitalization
MG	Mean Group
MSE	Mexico Stock Exchange
MTS	Manufacturing and Trade Sales
NACE	Non-Agricultural Civilian Employment
NARDL	Nonlinear Autoregressive Distributed Lag
NBER	National Bureau of Economic Research
NSE	National Stock Exchange

OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
OMXV	Lithuanian Stock Market Index
PE	Price-earnings Ratio
PILTP	Total Personal Income Less Transfer Payments
PMG	Pooled Mean Group
PP	Philips-Perron
RES	Resources
RETURN	The Continuously Compounded Monthly Returns of the three Sub-indices
S&P 500	Standard and Poor's Composite Index of 500 stocks
SARB	South African Reserve Bank
SES	Stock Exchange of Singapore
SM	Stock Market
U.K.	United Kingdom
U.S.A.	United States of America
UR	Unemployment Rate
USD_LTL	The Exchange Rate of Litas against the U.S. Dollar
VAR	Vector Auto Regressive
VECM	Vector Error Correction Model
VILIBOR3M	Three Months Vilnius Interbank Offered Rate
WACC	Weighted Average Cost of Capital
YC	Yield Curve

ZAR\_USD

Rand/Dollar Exchange Rate

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The relationship between the stock market and economic activity has long been a topic for research. Studies have found that stock market prices tend to rise during the expansionary phases of the business cycle and fall during the contraction phases (Kennedy and Prag, 2017). This forward-looking behavior of stock price fluctuations underlies its predictive ability to inform the trends of business cycles and could be advantageous to investors and portfolio managers regarding making investment decisions.

According to Sayed and Page (2016), it is perceived that a substantial rise in stock prices shows prospective economic growth whereas a substantial fall in stock prices delineates an imminent recession. Due to this reason, investors have a significant stake in formulating exact forecasts about the future economy. It is believed that the expectations about a firm's profit is reflected in the prices of stocks and a firm's profitability is linked directly to real economic activity, therefore, upturns, and downturns in the prices of stock influence the direction of the future real economy.

Following from above, if the relationship between the stock market and the business cycle is well determined, it will have a significant impact on the economic growth of nations including South Africa. This is because the stock market is one of the major tools for generating capital for businesses or companies to finance their operations, expand their business, or innovate products. Such a benefit would therefore be beneficial to the development of the economy.

## **1.2 Rationale and Problem Statement**

In South Africa, only a limited number of studies on this topic have been done and they need updating. Moreover, the last study done in this area of research in South Africa was in 2021 by Naidoo using a data timeframe from 1999 to 2019. Hence the gap created after post- covid poses the need for further studies in this area. This is because growth in the stock market and its dynamics have changed their role in the economy and there is a need to understand the relationship better. Previous SA studies on this topic did not include the sub-indices of the stock market. Other differences between this study and the earlier ones will be explained further below.

## **1.3 Goals of the Research**

The overall goal of the research is to investigate the relationship between the stock market and the business cycle in South Africa. The sub-goals are to:

- 1.3.1 Determine the relationship between the stock market, (proxied by the JSE All-Share Price Index) and the business cycle (represented by the Coincident Business Cycle Indicator of the SARB).
- 1.3.2 Determine if the relationship between the stock market and the business cycle is homogenous across selected sectors of the JSE, namely the Resource, Industrial, and Financial sectors.

## **1.4 Methods, Procedures, Techniques, and Ethical Consideration**

The data to be used for this research will cover the timeframe from 2005 – 2022, in monthly frequency. The reason for the chosen timeframe is to examine a long-term period of economic activity. The variables to be used include the JSE All-Share Price Index, three of the sub-indices (Resources, Industrials & Financials), the long-term interest rate, the inflation rate, and the

exchange rate. Data for the variables will be obtained from the South African Reserve Bank, IRESS, and Thompson's Reuters DataStream. Operating under the post-positivist paradigm, the study employs a similar model as adopted from Choudry, Papadimitriou, and Sabi (2016) as well as Bom and Khumalo (2021) by applying the data to analyze the relationship between the stock market and economic activity. Following Auret and Golding (2012), this study will use the All-Share Price Index and the three sub-indices from the JSE as a proxy for the stock market (independent variable). The Coincident Business Cycle Indicator (dependent variable) will be a proxy for economic activity in South Africa. And as the research progresses, any other variable that may come up will serve as the controlled variable.

For objective (1.3.1), the research will make use of quantitative techniques. A time series co-integration study, relying on the Autoregressive Distributed Lag (ARDL) estimation model, will be used. This will determine the short and long-run relationship between the variables. Also, the ARDL will allow estimating variables with different co-integrating orders. For objective (1.3.2), a panel cointegration approach using the ARDL will be employed. The panel cointegration approach is useful for analyzing data exhibiting both time-series and cross-sectional dependence; and where the variables of interest are non-stationary. The results will be used to test the hypothesis that there is no relationship between the stock market and the business cycle across the selected sectors of the JSE.

Both objectives will include testing for Granger-Causality, which is a statistical hypothesis test for ascertaining whether one variable helps forecast another variable (Granger, 1969). The Granger-Causality tests will be done using the Vector Auto Regression (VAR) method to examine the long-run relationship and to include the possibility of reverse causality between stock prices and the business cycle (Sayed and Page, 2016:28).

Since "true causality" is contentious, it is therefore important to note that the Granger-Causality test does not test true causality: it rather deals with the prediction or precedence of multiple variables (Granger, 1969).

Regarding ethical considerations, no ethics application form will be submitted as all the data required for the research is publicly available.

## **1.5 Outline of the Thesis**

This research paper is organized as follows: Chapter 2 presents the underlying theories of stock prices as a predictor of the business cycle. Chapter 3 presents the existing empirical findings from advanced and emerging economies. In Chapter 4, the research design and model are discussed whilst the results of the time series and panel cointegrations both relying on the Autoregressive Distributed Lag (ARDL) estimation model, unit root tests, and Granger causality test are presented in Chapter 5. Chapter 6 summarizes and concludes the paper as well as gives recommendations.

## **CHAPTER 2**

### **UNDERLYING THEORIES OF STOCK PRICES AND THE BUSINESS CYCLE.**

#### **2.1 Introduction**

This chapter aims to give an overview of the underpinning theories of the stock market and the business cycle. Among the theories to be discussed include the “financial accelerator theory”, the “wealth effect theory”, the “traditional valuation model of stock prices”, “stock prices as aggregators of expectations”, and the “cost of raising equity capital” as introduced in the studies of Comincioli (1996), Ikoku (2010), and Sayed and Page (2016). Prior to discussing these theories, a review of the background of classical economic theory is relevant.

#### **2.2 Background Overview of the Classical Economic Theory on the Relationship between Financial Growth and the Business Cycle.**

To give a background overview of the classical economic theory, Schumpeter, among others, Robinson, and Patrick have given varied views regarding the link between financial growth and economic activity. Some of these views are reviewed below:

##### **2.2.1 Schumpeter’s View**

For background and going back to classical economic theory, Schumpeter (1934) delineates that financial intermediary play a significant role in economic growth by allocating bank credit and savings to entrepreneurs for the most productive investments and implementation of innovative

products. This argument is further supported by the studies of McKinnon (1973) and Shaw (1973) who established a structure by which financial institutions stimulate economic growth by raising savings and investment. In order to accomplish this goal, advocacy for interest rates liberalization was done; and so, a rise in real interest rates served as an incentive to save more, hence leading to an increase in the marginal propensity to save. This stimulates investment spending and productivity in the economy which in turn creates employment and provides income to households. According to Schumpeter (1934), “the creation of a bank credit is assumed to accelerate money incomes and prices in the economy”.

Moreover, according to demand and supply analysis, an increase in income will lead to an increase in demand for goods and services (normal goods), creating a shortage that needs to be met through increased prices by producers until equilibrium is reached in the market. This implies that people will spend more and as they do, more new businesses are created which in turn yield more profits and investment returns rise. As this occurs, investors’ views regarding the reaction of the economy and stock market prices become positive. This instills confidence in the economy, hence leading to economic expansion. On the other hand, when there is uncertainty in the confidence of the economy, stock market prices begin to fall. This causes panic and investors tend to sell to avoid losses. Stocks then become less attractive to investors and economic growth declines, leading to a recession.

However, Schumpeter’s view of financial intermediation spurring economic growth cannot be accepted as the absolute truth. There is also a possibility that economic growth could lead to financial development. A recent study by Wang and Ajit (2013) using unit root and cointegration framework demonstrated that in most cases, the stock market development does not contribute positively to economic growth in developing countries if the stock market is mainly an administratively-driven market. In addition, findings from the studies of Pilinkus and Boguslauskas (2009), Basdas and Soytaş (2009), and Li, Li, and Bai (2019) oppose the theoretical view of Schumpeter (1934). Therefore, the next paragraph will review the theoretical argument opposing the Schumpeterian view.

### 2.2.2 Robinson's View

In contrast, Joan Robinson (1952:86) dissented from Schumpeter (1934) on the notion that economic growth drives the financial sector. Robinson specifies this causality by declaring that “where enterprise leads finance follows”. According to this perspective, economic development is active in the growth process. That is an expansion in economic activity engenders demand for specific categories of financial plans, and these demands are responded to spontaneously by financial systems in the economy. Therefore, economic development causes financial growth. In this regard, in a scenario where finance is not channeled through the right source for economic development but channeled through existing property (for example houses), the value of houses may appreciate which will cause the prices of houses to rise. However, there will be no impact on economic growth.

In addition, according to Mayer (1988), big stock markets in the world are not even essential sources of corporate finance. Hence stock markets have no effect on economic development. Moreover, from the perspective of Devereux and Smith (1994), international risk sharing via globally integrated stock markets can potentially lower rates of saving and lead to recession. However, recent studies by Azam, Haseeb, Sansi, and Raji (2016) investigated the role of stock markets in the economic growth of Asian Countries (namely Bangladesh, India, China and Singapore) over the period 1991 to 2012. By using the ARDL bound testing technique, they demonstrated that stock market development and foreign direct investment inflows play crucial role in the selected country's economic growth and development. Again, by employing Granger causality tests using the cointegration and vector error-correction model, (Abu-Badar and Abu-Qarn, 2007) demonstrated the causal association between financial development and economic growth in Egypt during the period 1960 -2001. The Authors' result confirmed a bi-directional relationship between financial development and economic growth. Considering the views of both Schumpeter (1934) and Robinson (1952) shows the possibility that a two-way relationship might exist, and this leads to the next paragraph.

### **2.2.3 Patrick's View**

Patrick (1966) integrates these varied views mentioned above as supply-leading and demand-following phenomena. As suggested by Robinson (1952), “where enterprise leads, finance follows” implies that economic growth creates a demand for financial services, and this in turn generates a supply response in the growth of the financial system i.e., the – demand-following approach. Whereas the supply-leading approach follows the Schumpeterian view, financial intermediation allocates resources (funds) to enhance and stimulate an entrepreneurial response. Hence finance is active in the growth process.

Therefore, according to Patrick (1966), finance stimulates economic growth at the beginning (supply-leading), and as economic activity increases, it in turn bolsters finance as suggested by the demand-following approach. A study by Greenwood and Jovanovic (1990) claimed that there is an inseparable nexus between finance and growth which further strengthens Patrick's argument. Findings reveal that the role of finance during the inception phases of economic development enhances economic growth by fostering increased capital returns. Subsequently, in the end, economic growth reinforces financial growth.

## **2.3 Theories of the Stock Market as a Predictor of the Business Cycle**

### **2.3.1 Financial Accelerator Theory**

The financial accelerator channel is one of the most relevant theories that underlie the stock market as a predictor of the business cycle. This theory is reinforced by studies of Bernanke, and Gertler (1995), Fazzari, Hubbard, and Peterson (1988), and Bernanke, Gertler, and Gilchrist (1996) which assert that rising stock market prices enhance the balance sheets of firms and households. This enables firms and households to borrow more at a reduced borrowing cost as a result of the improvement of their creditworthiness, which in turn stimulates investment spending and current

consumption. This link between the borrower's balance sheet and the business cycle is what Bernanke termed the "financial accelerator".

The financial accelerator theory is ascribed to Ben Bernanke, Mark Gertler, and Simon Gilchrist (1996). This theory was first invented as the Accelerator theory by Thomas Nixon Carver and Albert Aftalion, among others, before John Maynard Keynes, but only gained public attention in 2008 when Bernanke was the Chair of the Federal Reserve Board during a financial crisis that resulted in the Great Recession. This idea served as a tool to direct policy to pay attention to the adverse shocks to the economy as a result of credit market conditions. According to them, "Firms and households tend to be financially overextended and therefore "vulnerable" at cyclical peaks" (p.1). The occurrence of an unexpected shock may significantly exacerbate financial conditions, which in turn hinders firms and households from accessing credit or raising external funds through the stock market to finance their business or operation activity. This causes a decline in investment spending leading to a reduction in aggregate demand since investment is one of the major components in computing aggregate demand. That is, businesses would have to cut back on capital expenditures such as buildings, investing in research and development, buying equipment, etc. Consequently, productivity in the economy will decline as a result of the decline in investment spending. This clearly reveals that investment spending has a significant multiplier effect on the economy: because when businesses invest, jobs are created which provides income to households, who in turn spend on goods and services which stimulates demand. Conversely, there is an inverse multiplier effect on the economy when investment spending decreases. That is households earn low income reducing their consumption spending and in turn causing a decline in production resulting in a worsened recession. Therefore, this amplification of initial shocks as a result of changes in the credit and stock market conditions is what Bernanke, Gertler, and Gilchrist termed as the financial accelerator.

The theoretical underpinnings of the financial accelerator according to Bernanke et al., (1996) include the "Principal-agent" view of the credit markets and the "General-equilibrium models of Macroeconomic Dynamics".

From the aforementioned lists, one of the theoretical frameworks of the financial accelerator is the “principal-agent” or “lenders and borrowers” approach to the credit market. This theory argues that due to asymmetric information, one party may possess more information than the other and this influences the agency’s cost of lending or securing external finance. Due to this reasoning, external finance is more costly than internal finance except in the condition where external finance is collateralized. Hence, if the cost of borrowing increases or the required rate of return decreases, then this will impair borrowers (Agencies) from raising capital through the credit market to undertake profitable investment projects. This causes a decline in investment spending leading to a decline in economic activity in the end. Moreover, given the total amount of finance needed, the net worth of borrowers comprising of both internal funds (liquid assets) and the collateral value of illiquid assets differs negatively (inversely) with the premium on external finance given an increase in the amount of external finance required will result in a decrease in the borrower’s net worth. Hence, reducing borrowers’ spending and production causes a negative impact on economic activity and vice versa.

Another underlying theory of the financial accelerator is the flight to quality which forms part of the “General-equilibrium models of Macroeconomic Dynamics”. This theory asserts that Agencies (borrowers) with relatively high agency costs in the credit market will be most affected during recessions. “In the Bernanke and Gertler model, lenders have access to an alternative investment technology that pays a safe, fixed return. When prospective agency costs of lending increase, lenders reduce the amount of credit extended to firms that require monitoring and invest a greater share of their savings in the safe alternative. It is straightforward to extend the arguments to motivate a reallocation of credit in downturns from low-net-worth to high-net-worth borrowers” (p.4). Moreover, “the financial accelerator is analogous to the cost of capital channel as both function through the capital structure. However, whereas the cost of capital channel is traditionally deemed to operate through the issuance of equity and the financial accelerator through the issuance of debt, both channels conceivable operate through the issuance of both debt and equity” (Ikoku 2010: p.18).

### 2.3.2 The Wealth Effect Theory

The “wealth effect” theory is another theoretical argument that supports stock market prices as predictors of economic activity. This theory has its basis in the theory of the Life Cycle Hypothesis (LCH) developed by Modigliani and Brumberg (1963). Based on the Life Cycle Model, households both store up and use their wealth with the view of maintaining a consistent level of consumption. That is, households plan their resources and spread them out over their anticipated lifetime and then make choices pertaining to the consumption flows that align best with their preferences. Households face constraints where the value of their projected consumption over the expected years today must equal the present value of their anticipated future incomes. These anticipated future incomes are sourced from their holdings of tangible assets which include bonds, land, real estate property, and stocks, with the remainder amounting to their expected incomes from labor. The model anticipates that in the presence of unpredictable changes in wealth, households will strategically adjust their consumption. Nonetheless, if households do not encounter any unpredictable shift in their wealth, the model suggests that though consumption will remain unchanged, wealth might considerably differ throughout a household’s lifetime. Hence, the model asserts that in the condition where there are foreseeable changes in the prices of assets, consumption should not respond whereas there should be a response in consumption in the case of unpredictable fluctuations in asset prices. The wealth effect is an economic phenomenon whereby a rise in stock prices induces households to increase spending, consequently, the value of investment portfolios rises. For instance, assuming that a household has an anticipated lifetime of 40 years and wants to maintain a consistent level of consumption every year, the life-cycle model forecasts that the household would distribute any rise in wealth equally over 40 years. If there is a rise in the net wealth of households of about R 3000, then consumption spending of households would also increase by R 75 every year over the 40-year expected lifetime. Thus  $(R\ 3000 / 40)$ . According to Poterba (2000: p.103), “the logic of budget constraints dictates that when an individual’s wealth rises, the individual must either spend that wealth while living, or leave the money to other individuals, charities, or the government after death. Except in the extreme case of an individual who does not increase consumption at any date as a result of a favorable wealth

shocks, and who bequeaths to heirs who behave in the same way, an increase in wealth will raise consumption at some point”.

Pearce (1983) and Darby (1987), suggest that consumer spending increases significantly when there is an increase in the overall portfolio's performance. As an assumption of the traditional macroeconomic model, consumption does not only depend on income, but on wealth also. In the presence of bear or bull markets, stock prices decline or rise, which impacts the overall performance of investors' portfolios either negatively or positively. A negative impact on portfolio performance reduces consumers' spending while a positive impact increases consumers' spending. Since consumption is one of the major variables in determining economic output, any change in consumption spending also affects the real economy. Empirical findings by Janor, Halid, and Rahman (2005) to bolster the wealth effect argue that prices of stock lead real economic activity by either activating or failing to activate the investors consumption pattern which later impact the economy's demand and production. Also, according to Otoo (1999) rising stock market wealth seems to enhance consumer view which elevates expectations of future higher incomes. The operation of the wealth effect was vastly visible in the United States before the global financial crisis, with households utilizing home equity loans to exploit the increasing home values to finance consumption spending (Ikoku, 2010). Again, Paiella (2007) suggests that the significance of the wealth effect in ascertaining stock prices role as a predictor crucially relies on the level of ownership of stock in an economy.

When analyzing the wealth effects, the key issue to consider is timing. This is because the time difference between a positive shock to the balance sheets of households and a rise in consumption spending might take ages to commence. Consequently, sudden fluctuations in the stock market might not substantially impact on overall expenditure. Nonetheless, if the relationship between net worth and consumption is strong and instantaneous, abrupt changes in asset values could influence changes in consumer spending patterns (Poterba, 2000) leading to overall changes in economic activity. Furthermore, Paiella (2009) reveals a strong relationship between wealth and consumer spending. Again, over a 3-year period, a 10% rise (fall) in stock prices is linked, on average, with a 0.2% to 0.4% rise(fall) in private consumption (Funke, 2004).

### 2.3.3 The Traditional Valuation Model of Stock Prices

Another theoretical argument that supports the role of stock market prices as a predictor of economic activity is the “traditional valuation model of stock prices”. This theory posits that stock market prices reflect expectations about the future economy; hence it can predict the business cycle. According to the traditional equity valuation model, the share value of common stock is expressed as the present value of the expected future dividends discounted at the required rate of return expected to be received by investors. The Gordon (1959) constant growth model links expected dividends, the required return on equities, and the anticipated growth rate of earnings to the current price of common stocks. Nevertheless, according to Brealey et al., (2020), the constant growth model holds only when the anticipated growth rate of earnings is less than the required rate of return on equities. Moreover, the growth rate should be constant. This is because, as the anticipated growth rate of earnings approaches the required rate of return, the price of the stock approaches infinity. The current price of common stocks is universally valued as the present value of a perpetual stream of cash dividends. This is mathematically expressed as:

$$P_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1+r)^t} \dots\dots\dots (2.1)$$

The level of current dividends is associated with measures of economic output (Burmeister and Wall, 1986). Stock prices rely on expected dividends, which in turn depend on economic activity via the profitability of firms, therefore fluctuations in stock market prices seem linked to the phases of business cycles. Due to this reasoning, stock prices should rise if investors anticipate economic growth and fall if they envisage a decline in economic activity. Therefore, Stock and Watson (2003) concluded that because stock and other asset prices are forward-looking economic variables, they are forecasters of the business cycle.

However, how investors’ expectations are formed needs to be considered. In this regard, several models attempting to explain this have been put forward which include but are not limited to Pearce and Roley (1985) and Debondt and Thaler (1985). Although this is not the focal point of this research, knowing it helps us comprehend that prices of stock rely highly on the expectations of investors. Therefore, according to Comincioli (1996), such models include the adaptive and

rational expectations models. Adaptive expectations pose those expectations are formed via past experience, whereas rational expectations suggest that expectations are established using all available current information. These models presume to some extent that expectations arise out of experience or historical data. Hence, if recent experiences change, this can cause investors to shift their expectations about the future real economy, which moves investors to bid stock prices low or high.

Furthermore, according to Pearce (1983), it may be onerous to distinguish the effects of fluctuations in stock price on consumption from the effect of interest rate fluctuations on consumption. Regarding the traditional valuation model of stock prices, a decrease in the real interest rate measured as the nominal rate less expected inflation should increase stock prices due to the reason that it makes the present value of anticipated real corporate earnings soar. Moreover, a decline in the real interest rate may concurrently increase consumption spending directly. This is because a decline in real interest rates serves as a disincentive to households to save more from their income. Therefore, households' savings decrease which makes the marginal propensity to consume increase. A rise in total consumption spending will translate into rising share prices even if there is no causal link between wealth and consumption. Hence, the decline in the real interest rate may cause both real wealth and consumption to increase.

The stock market should furnish sophisticated information about the economy because share prices characterize the sum of anticipated future cash flows discounted at the risk-adjusted discount rate. This assertion is established in two-fold. To begin with, equity earnings and cashflows are inherently correlated with economic activity. Secondly, equity discount rates, which account for equity risk premia, are connected to systematic common risk factors that are affected by macroeconomic variables. Consequently, even if there is an assumption of constant discount rates or discount rates unlinked to macroeconomic variables, current stock prices should be linked to future economic activity through the cash-flow channel (Maio and Philip, 2013).

### 2.3.4 Stock Prices as Aggregators of Expectations

This theory claims that stock prices contain information that reflects future expectations about the economy. Pearce (1983) highlighted the significance of psychological elements as viewpoints of stock prices as aggregators of future expectations about economic activity. In this regard, stock prices are not determined by the traditional valuation model but rather move with the general level of pessimism or optimism or what Keynes termed “animal spirits” (Keynes, 1936). That is, if individuals perceive that the economy is declining, prices of stocks begin to fall, and individuals become reluctant to make financial investments in risky assets like common stocks. On the contrary, if individuals perceive that the economy is improving, stock prices begin to soar and thus are willing to make financial investments in risky assets such as common stocks. In this context, share prices are influenced by a state of confidence instead of a forecast of higher corporate earnings. In the case where optimism or pessimism is unsubstantiated, stock prices may be poor predictors of business cycles.

In addition, Barberis (2011) argues that finance innovation and particularly the impact of irrational thinking including Bubbles, cognitive dissonance, and psychological amplification mechanisms adversely affect the real economy.

Bubbles are generally belief or preference driven and when a disagreement (friction) in the economy leads to a bubble outburst, it affects virtually everything within the economy leading to irrational thinking (disagreement about assets prospects and short-sale constraints) and examination (overhaul) of their overvaluation or devaluation of assets like stock prices. The logic here is that, assuming that some investors are very bullish about an asset’s prospects, while others are very bearish. When there is short-sale constraints, asset prices (common stock) will reveal the bullish perspectives only: bearish investors will stay out of the market. Hence, the asset will be overpriced. In addition, when investors experience gains in their holdings of an asset, they become less risk averse because of a “house money” effect. This is because they believe that future losses could be catered for by the previous gains earned. Their reduced risk aversion leads them to buy more assets hence pushing prices further up. According to Pearce (1983), higher share prices decrease the cost of raising funds which enables businesses to increase their investment spending

on plants and equipment. Hence, the reduced cost of raising funds increases the incentive to expand productive capacity since producers are motivated by higher prices to produce more. In the end, this leads to upturns in economic activity.

Furthermore, from the perspective of Barberis (2011), the second aspect that led to the financial crisis is cognitive dissonance and risks in the banking system. Sometimes employees at the Bank are blinded by “Bad incentives” to trigger irrational thinking by putting institutions at risk to advance their personal standing or image in the industry. This has an adverse effect on the real economy. To understand this better, the “bad incentives” view suggests that people on the mortgage desks of banks were aware that, through their activities, they were exposing their institutions to significant risk, but that they did not care, because their compensation schemes did not force them to face the consequences of the risks they were taking. This action can drive asset prices such as stock price performance either negatively or positively which in turn affects economic activity.

Lastly, Psychological amplification mechanisms were also part of the reason behind the financial crisis that led to the recession in 2008 as claimed by Barberis (2011). Loss and ambiguity aversion form part of the psychological amplification mechanisms. Both concepts hold that after suffering losses in their risky holdings both the institution and the individual experience an increase in loss and ambiguity aversion. This in turn causes them to reduce their holdings and push the prices of risky assets like common stocks even further down. This affects investment spending negatively since decreased share prices increase the cost of raising funds for profitable investment projects. Hence decreasing the incentive to expand productivity (Pearce, 1983).

### **2.3.5 The Cost of Raising Equity Capital**

According to Pearce (1983), the Cost-of-Capital model posits that the purpose of investment decisions is to maximize a firm’s value. A company expands through its investment decisions that are anticipated to increase revenues and profits. The means by which it can obtain funds to finance such investment projects are by using either debt or equity financing. This therefore leads to the optimal capital structure which includes a mix of debt and equity, the cost of equity capital which

is a very important element of most firms weighted average cost of capital, the hurdle rate (minimum rate of return) for investment projects (Ikoku, 2010). The cost of equity capital is crucial because equity financing is a more expensive and permanent source of raising funds with higher financial flexibility as analogous to debt financing.

As already established from the previously discussed theories, changes in stock prices impact investment spending by changing the cost of physical capital to either low or high, which is usually known as the user capital cost. In determining the cost of additional capital, firms must take into account the new equipment price, the relevant tax laws, and the financial cost of the needed capital. Consideration of this last factor is where stock prices emerge (Pearce, 1983). The financial cost of capital is usually estimated by a weighted average of the cost of bond finance and equity finance, with the weightings indicating the proportions of the firms' assets financed by equity and debt.

From the perspective of Pearce (1983), the cost of debt finance is determined by the after-tax corporate bond rate less expected inflation. Whereas the equity finance cost is the real rate of return required by shareholders which is measured by the ratio of corporate earnings to prices of stocks. Therefore, an increase in stock prices with no increase in corporate earnings delineates a reduced required return, a lower cost of capital financing, and hence a lower user cost of capital. Furthermore, according to Ritter (1991), given the expensive cost of raising external funds, firms may be more inclined to issue equity when the prices of stocks are high. Since the cost of equity is a component of the weighted average cost of capital (WACC), Baker and Wurglar (2001) argue that if a lower cost of equity decreases the WACC and makes additional capital projects more economically viable, a direct (positive) relationship could develop between stock prices and subsequent economic activity.

## **2.4 Conclusion**

To conclude, this chapter discusses the theoretical underpinnings of the stock market and the business cycle. Prior to the discussion of the theories, a background overview of the classical economic theory was given which affirms that some renowned people from academia argue that

financial intermediaries actively play a significant role in economic growth by allocating bank credit and savings to entrepreneurs for the most productive investments and implementation of innovative products. The other school of thought also argues that economic growth drives the financial sector which leads to an inconclusive outcome. However, Patrick combined these differing views and categorized them as supply-leading and demand-following phenomena.

The underpinning theories of the stock market as a predictor of the business cycle looked at the financial accelerator theory, which established that the link between the Borrower's Balance Sheet and the Business Cycle is what Bernanke referred to as the "Financial Accelerator". This was followed by the wealth effect theory which also asserts that consumer spending increases significantly when there is an increase in the overall portfolio's performance. Next was the traditional valuation model of stock prices which posits that stock market prices reflect expectations about the future economy. Moreover, stock prices as aggregators of expectations were found to be a theoretical basis for stock prices as Pearce claimed in this context that stock prices are not determined by the traditional valuation model but rather move with the general level of pessimism or optimism or what Keynes termed "animal spirits". Lastly, the cost of raising equity capital was discussed which also states that if a lower cost of equity decreases the Weighted Average Cost of Capital (WACC) and makes additional capital projects more economically viable, a direct (positive) relationship could develop between stock prices and subsequent economic activity.

In summation, according to the financial accelerator theory, the wealth effect theory, and the cost of raising equity capital, fluctuations in stock prices cause changes in the real economy. Whilst, according to the traditional valuation model of stock prices and the theory of stock prices as aggregators of expectations, stock prices reflect expectations about the future economy. That is, stock prices rely on the future economy's expectations. For this reason, expected variations in the real economy cause stock price values. However, it is noteworthy to indicate that whereas the causation in all the theories varies, all the theories suggest that the stock market contains useful information about future economic activity. Hence it can predict the real economic activity and therefore the cyclical pattern of the business cycle.

## **CHAPTER 3**

### **EXISTING EMPIRICAL EVIDENCE ON STOCK MARKET PRICES AS PREDICTORS OF THE BUSINESS CYCLE.**

#### **3.1 Introduction**

A crucial element of the empirical analysis of the relationship between the stock market and the business cycle (the main goal of the research) and determine if this relationship is homogenous across the selected sectors of the JSE, namely the Resource, Industrial, and Financial sectors (the sub-goal) is to ascertain if the stock market is a predictor of the business cycle. The occurrence of stock market ups and downturns being associated with turning points in the business cycle has attracted a lot of academics and researchers to the study of this subject since it is a primary key to determining decision-making by investors, investment managers, and policymakers. This chapter furnishes existing empirical studies on the predictive ability of the stock market on the business cycle.

#### **3.2 Existing Empirical Evidence in Favor of Stock Prices as a Predictor of The Business Cycle from Developed Economies.**

Several studies of developed economies have found stock prices to be a dependable indicator of the business cycle. Due to its leading function in the utilization of leading indicators to forecast the business cycles, the greatest number of studies of the developed countries have been done on the U.S. economy.

Pearce (1983) scrutinized the relationship between stock prices and the economy with the countries of focus consisting of Canada, France, Germany, the UK, and the U.S.A. The methodology

employed was the FMP econometric model to stimulate the likely time paths of the economy with or without the increase in stock prices. The paper examined data over the period 1955 to 1983 using quarterly data. The data variables used comprise of industrial production index and stock prices of the various countries listed above. Due to the FMP model used, the endogenous variable was specified as the value of corporate equity, and the exogenous variables as the exchange rate, the price of oil, government expenditures, and the tax structure. The goal of the paper was to examine the past performance of stock prices as a leading indicator of the business cycle turning points. Findings reveal that stock prices appear to be a valuable, but not reliable, leading indicator of business fluctuations in the United States. It was also detected that stock prices have always risen midway through an economic contraction since 1955.

A study in the U.S. by Harvey (1989) focused on the forecasts of economic growth from the bond and stock markets. The methodology used was a consumption-based asset pricing model. The research examined data over the period 1953-1989 using quarterly data. The variables employed include GNP, yield curve measures (yield spread), and stock return variables (S&P return). The objective of the research was to use the stock and bond markets to predict economic growth. Findings show that stock prices and yield curve led GDP growth.

Another study in the U.S.A. by Atje and Jovanovic (1993) examined the relationship between the stock markets and economic development. The method of approach used the GJ model to test for growth effects and the Mankiw, Romer, and Weil (1992), henceforth MRW structure was used to test for level effects. The paper scrutinized data over the period from 1960 to 1988. This paper aimed to determine if stock market development affects the level and(or) the growth rate of economic activity. Findings confirmed that the stock market has a significant effect on both. Hence, the stock markets have a great effect on subsequent economic development.

Again, Levine and Zervos (1996) conducted research to determine the relationship between stock market development and long-run growth using data on forty-one countries over the period 1976 to 1993. Pooled cross-country, time-series regression was the methodology to estimate the association between stock market development and economic growth. The variables included in the study were the GDP and the conglomerate index of overall stock market development

established by Demigiic-Kunt and Levine (1996) as a measure of stock market development. The research goal was to determine the robustness of the relationship between overall stock market development and economic growth to changes in the conditioning information set. The findings of the paper revealed a strong positive correlation between overall stock market development and long-run economic growth.

Using the Granger Causality test approach, Comincioli (1996) examined the stock market as a leading Indicator over the period 1970 to 1994 in the USA using quarterly data. The variables used were Standard and Poor's Composite Index of 500 stocks (S&P 500) and GDP. The paper aimed to investigate the stock market as a leading economic indicator and explore causal associations between stock prices and the economy. Findings show that a "causal" relationship exists between the stock market and the economy. Also, it was found that whereas stock prices Granger-caused economic activity, no reverse causality was noticed. Hence, the stock market can predict the future economy.

A study in the USA by Chauvet (1999) investigated the stock market fluctuations and the business cycle. The Markov Switching model was employed for modeling. The variables used were excess stock return, S & P 500 dividend yield, S & P 500 price-earnings ratio (PE), and the 3-month T-bill rate as proxy for the stock market and the business cycle was represented by the manufacturing and trade sales in 1982 dollars (MTS), total personal income less transfer payments in 1987 dollars (PILTP), non-agricultural civilian employment (NACE), and industrial production (IP). The time period for the data used was from 1954 to 1994 in monthly frequency. The goal of the research was to explore the possibility of forecasting and identifying business cycle turning points using financial variables that were promptly available. Findings indicated that the stock market index is useful in forecasting the state of the business cycle in real-time and is advantageous over the unrevised composite leading Indicator.

Moreover, a study in the USA by Beck and Levine (2002) examined the effect of stock markets and banks on economic growth over the time period 1976 to 1998. A generalized method of moments techniques was used to analyze the dynamic panel data set. The data variables used included the turnover ratio measure of market liquidity as a proxy for stock market development,

bank credit as a proxy for bank development, and real GDP per capita. The paper showed evidence that stock markets and banks positively impact economic growth.

Foresti (2007) investigated the relationship between stock prices and economic growth in the U.S.A. over the time period 2000 to 2005 in quarterly frequency. The Granger causality test approach was employed. The variables used were the growth rate of real values of Standard and Poor's composite index (S&P) as a proxy for stock prices and the rate of growth of real GDP represented changes in economic growth. Findings confirmed that stock market prices predict economic growth, but the reverse is not true.

Nguyen and Pham (2014) investigated the relationship between stock market development and economic growth over the time period 1981 to 2012. The countries of focus were Canada and Australia. The Granger Causality test was used as the method of approach. The variables employed included Real GDP and Foreign Direct Investment (FDI) as a proxy for economic growth and Market Capitalization (MC) as a proxy for the stock market (SM). Findings show that there exists causality between stock market development and economic growth in Canada, but this is not the case in Australia. It was observed that there is a long-run association between the stock market and economic growth and that the stock market development does enhance the future economic growth in some advanced economies.

Ferreira (2018) evaluated stock market cross-sectional skewness and business cycle fluctuations using U.S. data from 1926 to 2015. The methodology employed was vector autoregressions and a dynamic stochastic general equilibrium model. The data variables used were the U.S. stock market returns and GDP. According to the findings, financial skewness – a measure comparing cross-sectional down and upside risks of the distribution of stock market returns of financial firms – is a potent predictor of business cycle fluctuations.

### **3.3 Existing Empirical Evidence in Favor of the Stock Market as a Predictor of the Business Cycle from Emerging Markets.**

A study in Singapore by Leigh (1997) evaluated the stock market equilibrium and macroeconomic fundamentals over the time period 1975 to 1991 in quarterly frequency. The method of approach employed includes “weak” and “semi-strong” form efficiency tests, variance-bound tests, Granger Causality tests, and the ARCH and GARCH models. The variables used were the Straits Times index (share price index) of the Stock Exchange of Singapore (SES), earnings and dividend yields, market capitalization of the SES and its ratio to Nominal GNP, value of traded stocks and shares at the SES, total stocks and shares at the SES, total stock market returns, GDP. Findings indicate that stock market development emerges to be systematically linked to the overall economy. Hence, stock prices Granger-cause GDP.

Mauro (2003) investigated the correlation between stock returns and output growth in emerging and advanced economies over the time period 1971 to 1998 in both quarterly and annual frequency. The countries of focus included Argentina, Chile, Greece, South Korea, Zimbabwe, India, Thailand, and Mexico. The methodology employed were individual-country regressions, univariate regressions, and panel regressions. The data variables used included real stock returns, real GDP, and industrial production. Findings show that stock prices in all countries led GDP by up to four quarters except India. It also confirms a strong correlation in countries with high market capitalization.

Nishat and Shaheen (2004) investigated macroeconomic factors and the Pakistani equity market over the time period 1973 to 2002 in quarterly frequency. The country of focus was Pakistan. The method of approach used was Johansen’s Vector error-correction model (VECM) for the cointegration test between integrated time series, Augmented Dickey-Fuller test, and Granger Causality test. The variables employed included the Karachi Stock Exchange Index (KSE) as a proxy for Pakistan’s stock market, the industrial production index, the consumer price index, M1, and the money market rate in the interbank market as a proxy for the macroeconomic variables. Findings confirmed that stock prices Granger caused industrial production by one quarter.

Mun, Siong, and Thing (2008) examined the relationship between the stock market and economic growth in Malaysia for the period 1977 to 2006 in annual frequency. The VAR model, ADF tests, and Granger Causality test were used for methodology. The variables used included Real GDP and the Kuala Lumpur Composite Index (KLCI). Findings confirmed that stock market granger caused economic activity with a lag of two years with no reverse causality noticed.

A study in Nigeria by Nurudeen (2009) examined if stock market development raised economic growth over the period 1981 to 2007. The paper used the error-correction method to evaluate the quantitative impacts of the stock market on economic development. Data variables used were GDP, market capitalization, market turnover, the openness of the economy (captured by total exports and imports to nominal GDP ratio), minimum rediscount rate, and the Nigerian all-share index. Findings depicted that stock market development (market capitalization) affects economic growth positively.

Ikoku (2010) examined the stock market as a leading indicator of economic activity in Nigeria over the time period 1984 to 2008 in quarterly frequency of data. Granger causality test, Vector error correction models estimation, AR (1), ARIMA, structural ARIMA, and VEC models were used for the methodological approach. The variables used were stock market prices in Nigeria, real GDP, and the industrial production index in Nigeria. Results confirm that stock prices and GDP are cointegrated. Hence, stock prices contain useful information that can be used to enhance the prediction of the accuracy of GDP.

Alajekwu and Achugbu (2011) investigated the role of the stock market development on economic growth in Nigeria using time series data from 1994 to 2008. The ordinary least square (OLS) technique was used for the analysis. The variable used included the stock market capitalization ratio as a representation of market size whereas market liquidity was proxied by the value traded ratio and turnover ratio, and the GDP. Findings show evidence there exists a very weak negative correlation between market capitalization and value traded ratio with economic growth. Also, stock market capitalization has a strong positive correlation with the stock turnover ratio. This means that liquidity has a propensity to stimulate economic growth in Nigeria and that market capitalization impacts liquidity.

Ihendinihu and Onwuchekwa (2011) investigated the stock market performance and economic growth in Nigeria. The paper covered the period from 1984 to 2011. The neo-classical model and error correction model (ECM) were used. Data variables included annual data on market capitalization, value of transactions in the market, All-shares index, the total number of listed companies in the Nigerian stock market, and the GDP. According to findings from the paper, about 88% of the changes in economic growth could be explained by changes in stock market performance in the short run, implying that market capitalization, the value of transactions in the market, and the All-Share Index are significant forecasters.

Paramati and Gupta (2011) examined an empirical analysis of stock market performance and economic growth in India over the time period 1996 to 2009 in monthly and quarterly frequency of data. The methodological approach employed included unit root tests (ADF, PP, and KPSS), Granger Causality test, Engle-Granger cointegration test, and Error Correction Model. The monthly variables for analysis were Industrial Production (IP) as a representation of GDP, BSE-SENSEX, and NSE-S&P CNX Nifty. For quarterly analysis, the variables were RGDP, BSE-SENSEX, and NSE-S&P CNX Nifty (quarterly average closing prices). According to findings from the paper, the Granger Causality test for the monthly data posits that there is a bidirectional relationship between Industrial Production (IP) and stock prices (Bombay Stock Exchange (BSE) and National Stock Exchange (NSE)). Whereas the quarterly results show that there is no relationship between GDP and BSE in the situation of NSE and GDP, there is a unidirectional relationship that runs from GDP to NSE. The Engle-Granger residual-based cointegration tests assert that there is a long-run relationship between stock market performance and economic growth. Likewise, the outcome of the error correction model indicated that when the long-run equilibrium deviates then the economic growth adjusts to restore equilibrium by correcting the disequilibrium. Hence, the paper supported the “demand following” hypothesis approach in the short run.

Lahura and Vega (2014) examined the causal effect of stock market development on real economic activity in Peru over the time period 1965 to 2013 in annual data frequency. The methodological approach used was the Vector Autoregressive models (VARs). The variables used included Real Gross Domestic Product (RGDP) per capita and the stock market development indicators were

proxied by value traded to GDP, turnover ratio, and stock market capitalization to GDP ratio. Findings indicated that the dynamic assumption between real gross domestic product (RGDP) per capita and the Peruvian Stock Market has changed over time. And that the stock market shocks have had a short-run causal effect on real GDP per capita after 1991 only. Hence, the authors suggested that the outcome is consistent with Granger Causality tests: especially, a one standard deviation shock to value traded/GDP, turnover ratio, and capitalization/GDP stimulates GDP per capita after one year by 1%, 1.4%, and 1.0% respectively. Nonetheless, the impacts of stock market shocks on GDP growth changes have been small which is evident from their results. The authors further concluded that the policy actions geared at further developing the stock market of Peru will affect the dynamics of economic development positively.

Castillo-Ponce, Rodriguez-Espinosa, and Gaytan-Alfaro (2015) examined the relationship between stock market development and economic performance in Mexico over the time period 1993 to 2011 in monthly frequency. Cointegration and common cycle tests were used as the methodology. The data variables employed included stock prices index (IPC), value of stocks (value), and level of operations (operations) as indicators for Mexico Stock Exchange (MSE), and Real GDP and industrial production as measures of economic activity. Findings reveal that stock market indicators, including the price index, share a common trend with real GDP, decreases (enhancements) in stock market activity are connected with declines(increases) in economic activity. Hence the stock market does improve economic growth.

### **3.4 Existing Empirical Evidence from South Africa**

In South Africa, a limited number of studies regarding this area of research have been done. These Papers include Auret and Golding (2012), Choga and Muchaonyerwa (2015), Sayeed and Page (2016), and Naidoo and Moores-Pitt (2021) which shall further be reviewed below:

Auret and Golding (2012) evaluated the information content of stock prices of the Johannesburg Stock Exchange (JSE) over the time period 1969 to 2010 in quarterly and annual frequency of data. By using an autoregressive model, they tested whether the cycle of the real stock prices can

be a useful indicator of economic activity. The variables used included the cycle of the real GDP, industrial production as a proxy for investment in South Africa, and the cycle of real stock market prices. The goal of the research was to investigate if stock prices can be used to explain future real output as measured by gross domestic product (GDP) and industrial production (IP). Findings confirmed that the cycle of real stock prices on the JSE predicts both the cycle of real economic activity and the cycle of real industrial production in the South African context.

Choga and Muchaonyerwa (2015) examined the relationship between business cycles and stock market performance in South Africa over the period 2002 to 2009 in monthly frequency. The method of approach employed was the Vector Error Correction Model (VECM). The variables used were specified as the business cycle coincident indicator of South Africa as the independent variable, which was explained by the All-Share Price Index, Real Effective Exchange Rate, Money Supply, Inflation, and the prime overdraft rate. The findings indicated a positive association between stock market performance and business cycles.

Sayed and Page (2016) investigated the validity of the stock market as a leading indicator of economic activity in South Africa over the period 1992 to 2014 in the quarterly frequency of time-series data. The methodological approach used was the Granger-Causality test and the Johansen cointegration method. The variables employed included the JSE All Share Index, Real GDP, and Real Industrial Production. Findings reveal that there exists a unidirectional causality between the nominal and real stock indices and economic activity in South Africa. Again, it was further confirmed that there exists a long-run association between the JSE stock prices and real GDP and real industrial production. Therefore, their results were consistent with the findings of Auret and Golding (2012) and confirmed that the stock market leads the real economic activity in South Africa.

Naidoo and Moores-Pitt (2021) conducted an analysis of share prices and economic activity in South Africa over the period 1999 to 2019 in the quarterly frequency of data. The methodology used was the Nonlinear Autoregressive Distributed Lag (NARDL). The variables used in the study included the Real Gross Domestic Product (RGDP), and JSE All Share Price Index (ALSI). The authors argued that the evidence of allowing for nonlinearity and asymmetric movements has been

less predominant in this area of research especially in South Africa. Therefore, their key focus was to examine share price fluctuations and their influence on economic growth, with the goal of identifying the nonlinearity and asymmetric effects in the relationship by taking into account a primary and sectoral analysis, in the context of South Africa. Findings show that the association between stock prices and economic development depicts evidence of structural breaks. Moreover, it was deduced that the nexus between the stock market and economic activity during the global financial crisis in 2008 was strong. Furthermore, the study inferred that there is strong evidence of nonlinearity and asymmetric adjustment in the cointegration association between stock prices and economic development, hence concluding that economic activity is sensitive to the fluctuation of the stock market in South Africa.

### **3.5 Existing Empirical Evidence Negating Stock Market as Predictor of the Business Cycle**

Binswanger (2000) scrutinized the connection between stock returns and real activity over the period 1953 to 1995. Variables used were stock returns, production growth rates, and GDP growth rates. Findings revealed that there has been a breakdown in the relationship between stock returns and future real activity in the U.S. economy since the early 1980s. Hence, stock returns do not seem to contain useful information about future economic activity.

Burgstaller (2002) investigated if stock returns are leading indicators of real macroeconomic developments in Austria, Japan, and the USA over the time period 1976 to 2000 in both monthly and quarterly frequency of data. The method of approach employed included the Johansen method, vector error correction model (VECM), Granger Causality tests, Impulse response, and variance decompositions. The variables used included domestic real activity proxied by industrial production and retail sales, The financial and international variables are the 3-month interest rate, the effective exchange rate, the inflation rate, an index reflecting oil price developments, a stock price index, and OECD industrial production. The results showed that Granger Causality tests, impulse response functions, and variance decompositions led to the conclusion that stock returns

are not valuable for predicting changes in growth rates of industrial production, gross fixed capital formation, or consumption.

Guo (2002) investigated and provided information on why the predictability of stock market returns on future economic activity is limited. The data timeframe covered the period from 1953 to 2000 in the quarterly frequency of data. The variables used included GDP, S&P 500 stock returns, and dividends. A decomposition analysis of expected return, shocks to expected future return, and shocks to the expected future dividend were conducted to explore the excess stock market returns of the S&P 500 predictability on economic activities. Findings revealed that stock prices are not sensitive to dividend news, and due to this, the dividend component has less predictive power for GDP and its components. Conversely, it was found that the expected return and shocks to the expected future return, especially the former, a strong forecaster of economic growth. Nevertheless, their predictive patterns vary, especially over long horizons.

Bahadur and Neupane (2006) investigated the existence of a causality association between the stock market and economic development over the time period 1988 to 2005 in Nepal using annual frequency data. The methodology used was the Granger causality test. The variables included were real GDP, nominal GDP, stock market index, and market capitalization. According to the findings, stock prices did not affect economic growth. Nevertheless, market capitalization granger caused GDP with a lag of three to four years.

Pilinkus and Boguslauskas (2009) examined the short-run relationship between stock market prices and macroeconomic variables in Lithuania. The paper covered the period from 2000 to 2009 in monthly frequency. The impulse response function was used as an econometric technique for analysis. The variables used included seasonally adjusted GDP at previous year prices, harmonized consumer price index (HCPI), the narrow money supply (M1), unemployment rate (UR), three months Vilnius interbank offered rate (VILIBOR3M), and the exchange rate of Litas against the US dollar (USD\_LTL) – all represented macroeconomic variables whereas the stock price movements were proxied by the main Lithuanian stock market index -OMXV index. According to findings from the paper, macroeconomic variables are useful determinants for stock market prices in Lithuania.

Again, a study in Turkey by Basdas and Soytaş (2009) investigated the connection between stock market returns and economic growth over the period 1997 to 2008 in monthly frequency. The methods used were the VAR model and Granger causality tests. The variables employed were the industrial production index, consumer price index, Istanbul Stock Exchange Price Index 100 (ISE 100), and monthly interest rates on deposits all representing the real activity, inflation, stock returns, and interest rates, respectively. Findings show that the connection between real growth and real stock returns no longer exists after the crisis in 2001.

Li, Li, and Bai (2019) investigated the stock market cycle and the business cycle in China over the time period 1992 to 2016 in quarterly frequency. The Bootstrap Rolling Window approach was used as the methodology approach. The variables used were the Shanghai Stock Exchange Composite Index as a proxy for the stock price of China and GDP. Findings show that bi-directional causality between the stock market cycle and the business cycle in China does show significant time variations. Also, the causal impact of the stock market cycle on the business cycle is much weaker than that of the business cycle on the stock market cycle. Therefore, the stock market volatility is not the main driver of the business cycle formation and growth in China.

### **3.6 Conclusion**

On balance, according to the literature reviewed above, some studies argued that the stock markets contain useful information in predicting future economic activity and these are consistent with theories that are in favor of the predictive ability of the stock market in the previous chapter. However, other studies provide evidence to contradict the predictive ability of the stock market which is also consistent with theories that negate the predictive ability of the stock market. Hence, due to this inconclusive outcome, the relationship between the stock market and the business cycle shall be explored further in the next chapter.

## **CHAPTER 4**

### **RESEARCH METHODOLOGY, DESIGN, AND DATA**

#### **4.1 Introduction**

This chapter aims to delineate the empirical approach utilized in analyzing the nexus between the stock market and the business cycle in South Africa as the main goal and with the sub-goal to determine if the relationship between the stock market and the business cycle is homogenous across the three selected sectors of the JSE. The purpose of this chapter is to provide a structure from which the empirical findings are established, analyzed, and discussed. The chapter is outlined as follows: 4.2 discusses the research paradigm, 4.3 provides the research design, 4.4 presents the causality test and 4.5 concludes.

#### **4.2 Research Paradigm**

A paradigm is a system of ideas, beliefs, and values that lays the foundation of a mindset about the world and shapes the researcher's approach to the research. The existence of this concept is attributed to Thomas Kuhn in 1962. Hence, the research paradigm is the framework that serves as a guide to carry out research (Kivunja and Kuyini, 2017). This study mimics the post-positivism paradigm due to its conceptual ability to combine positivism and interpretivism methods. Hence, emerging as a response to the limitations and critiques of the positivism paradigm (Panhwar, Ansari, and Shah, 2017). Even though post-positivist research strives to examine the phenomena, it believes the absolute truth is nowhere to be found, as opposed to positivist research (Phillips and Burbules, 2000). Post-positivist paradigm fosters the triangulation of quantitative and qualitative techniques that investigate the multiplicity of facts researchable via different kinds of

investigations while respecting and valuing all findings as the crucial components for knowledge development (Fischer, 1998). According to Guba (1990), this paradigm does not aim to criticize the scientific/quantitative elements of positivism in the research, rather it provides a good comprehension of the study from a multi-dimensional perspective.

Panhwar et al. (2017), and Chilisa and Kawulich (2015), suggest that post-positivist research seeks to forecast outcomes, test a theory, find the strength of relationships between variables, and/ or identify causal relationships between variables. Therefore, the main goal of this research is to determine the relationship between the stock market and the business cycle in South Africa. This study also tests if the relationship between the stock market and the business cycle is homogenous across the selected sectors of the JSE (namely, the Resources, Industrials, and Financials). This study employs a quantitative approach as it allows for statistical analysis of the All-Share Price Index and the Coincident Business Cycle Indicator of the South African Reserve Bank. A quantitative method as described by (Chilisa and Kawulich, 2015), is a set of hypotheses that can be explored to derive outcomes and conclusions. Furthermore, the research will be able to report on the causal relationships and comment on the statistical significance of the research findings. Using quantitative data analysis gives the benefit of maintaining the study as objective as possible whilst producing reliable results. It also permits the comparability of the study to other research papers.

## **4.3 Research Design**

### **4.3.1 Theoretical Framework and Model Specification**

#### **4.3.1.1 Theoretical Framework**

The study uses time series data and panel data cointegration techniques both relying on the Autoregressive Distributed Lag (ARDL) due to the research objectives as well as their widespread usage in financial literature.

A time series is a set of observations on the values taken on by a variable at regular time intervals such as daily, weekly, monthly, quarterly, annually, etc. (Gujarati and Porter, 2009, p.22). Several studies including Comincioli (1996), Ikoku (2010), Auret and Golding (2012), Sayed and Page (2016), Naidoo and Moores-Pitt (2021), Bom and Khumalo (2021) all used the time series data approach. Although there are some challenges associated with time series data, it has several advantages in its usage which is very useful in achieving the first objective of this study. Time series approaches are well-equipped to address the issue of causality since each country may have its causality pattern and unique evolution path over time. Due to the non-stationary nature of many macroeconomic time series variables, conventional hypothesis testing procedures become unreliable. Hence, employing traditional regression techniques to examine their relationship is not suitable. Time-series data breach the underlying assumptions of linear regression since residual errors are correlated by pure construction resulting in inconsistent coefficient estimates. Furthermore, changes in the mean and /or variance of independent variables over time can lead to invalid regression outcomes. Therefore, to prevent the problem of spurious outcomes, a time series econometric technique is applied for data analysis (Rousseau and Wachtel, 1988).

On the other hand, according to Gujarati and Porter (2009, p.591), Panel data is a combination of time series and cross-section data. Many studies including Bils (1985), Hsu et.al. (2011), Rafindadi and Yosuf (2013), Humpe and McMillan (2020) all utilized panel data techniques. This approach is useful for analyzing data exhibiting both time-series and cross-sectional dependence; and where

the variables of interest are non-stationary. This is relevant to this research because it would allow investigating if the relationship between the stock market and the business cycle is homogenous across the selected sectors of the JSE namely the Industrials, Financials, and Resources, and also give findings on the relationship between the individual variables. Moreover, Panel data accounts for heterogeneity hence minimizing or eliminating any bias result. It provides more informative data, more variability, less collinearity among variables, more degrees of freedom, and more efficiency. Lastly, panel data can better identify and measure effects that cannot easily be observed in pure cross-sections or pure time series (Gujarati and Porter, 2009, p.592).

Both techniques will rely on the ARDL estimation model. This will determine the short and long-run relationship between the variables. Additionally, the ARDL will also allow estimating variables with different co-integrating orders.

#### 4.3.1.2 Model Specification

The study will make use of the model adopted from Choudry, Papadimitriou, and Sabi (2016) as well as the ARDL cointegration method from Bom and Khumalo (2021) for the time series analysis. The panel ARDL cointegration approach will be adopted from Humpe and McMillan (2020) for the panel data analysis.

- **Time Series ARDL Cointegration Approach**

Following the model from Choudry et.al., (2016), the continuously compounded monthly stock returns are calculated as follows:

$$R_t = \ln \left( \frac{ALSI_t}{ALSI_{t-1}} \right) \dots\dots\dots (4.1)$$

where  $ALSI_t$  and  $ALSI_{t-1}$  indicate the stock index prices at t and t-1 respectively. In addition, the relationship between the stock market and the business cycle is estimated using the ARDL approach from Bom and Khumalo (2021). They used an ARDL model to estimate the relationship

between monetary policy credibility and inflation expectations. Their model was specified as follows:

$$\text{INFEX}_t = \alpha + \beta_1 \text{REER}_t + \beta_2 \text{ZPRICE}_t + \beta_3 \text{OIL}_t + \beta_4 \text{REPO}_t + \beta_5 \text{MPCD}_t + \beta_6 \text{IMPCD}_t + U_t \dots (4.2)$$

Where inflation expectations (INFEX<sub>t</sub>) are explained by monetary policy credibility variables such as real effective exchange rate, import prices index, Brent oil price, repo rate, monetary policy credibility dummy variable, and an interaction threshold; a product of the inflation rate and monetary policy credibility dummy variable.

This research will follow Bom and Khumalo's (2021) model to address its first objective. The explanatory variables involved in this research model are the continuously compounded monthly return of the JSE All-Share Index, the JSE market capitalization, the yield curve, the inflation rate, and the exchange rate. Therefore, we specify the model:

$$\text{CBCI}_t = \alpha + \beta_1 R_{t1} + \beta_2 \text{JMCAP}_t + \beta_3 \text{YC}_t + \beta_4 \text{CPI}_t + \beta_5 \text{ZAR\_USD}_t + U_t \dots (4.3)$$

Where CBCI<sub>t</sub> is the dependent variable in period t for the business cycle, α is the intercept term denoting the mean or average effect on CBCI of all the variables (explanatory variables) if excluded from the model. The term R<sub>t1</sub> is logarithm continuously compounded monthly returns of the All-Share Price Index, JMCAP<sub>t</sub> is the JSE market capitalization, YC<sub>t</sub> is the yield curve, CPI<sub>t</sub> is total consumer prices index, ZAR\_ USD<sub>t</sub> is the exchange rate and U<sub>t</sub> is the random error term.

- **Panel ARDL Cointegration Technique**

Adopting the panel ARDL cointegration approach used by Humpe and McMillan (2020), we will model to determine if the relationship between the stock market and the business cycle is homogenous across the three selected sectors of the JSE. Humpe and McMillan (2020) applied a panel ARDL method to explore the long-run relationship between macroeconomic variables and the stock market performance. They specify their model as follows:

$$\text{Sp}_{it} = \alpha_0 + \alpha_1 \text{ip}_{it} + \alpha_2 \text{cpi}_{it} + \alpha_3 \text{10y}_{it} + \varepsilon_{it} \dots (4.4)$$

where  $sp_{it}$  as a proxy for the stock market is explained by the macroeconomic variables consisting of real industrial production ( $ip_{it}$ ), the consumer price index ( $cpi_{it}$ ), and  $10y_{it}$  real interest rates.

This research shall imitate the model of Humpe and McMillan (2020). The independent variables for modeling this study include the continuously compounded monthly returns of the three sub-indices (RETURN), the exchange rate (ZAR\_USD), the yield curve (YC), the total consumer price index (CPI), the JSE market capitalization (JMCAP) and the dependent variable is represented by the Coincident Business Cycle Indicator (CBCI). Hence, we specify the following model:

$$CBCI_{it} = \alpha_0 + \alpha_1 RETURN_{it} + \alpha_2 JMCAP_{it} + \alpha_3 YC_{it} + \alpha_4 CPI_{it} + \alpha_5 ZAR\_USD_{it} + \varepsilon_{it} \dots \dots \dots (4.5)$$

Where  $CBCI_{it}$  is the regressand in period t. The term  $\alpha_0$  is the intercept representing the mean or average effect on CBCI of all the variables (explanatory variables) if excluded from the model. The  $RETURN_{it}$  is the logarithm of continuously compounded monthly returns for sector i. The term  $JMCAP_{it}$  is the JSE market capitalization,  $YC_{it}$  is the yield curve,  $CPI_{it}$  is the total consumer price index,  $ZAR\_USD_{it}$  is the exchange rate, and  $\varepsilon_{it}$  is the random error term.

### 4.3.2 Definition of Variables

#### 4.3.2.1 JSE All-Share Price Index and the Sub-Indices

- **JSE All-Share Index**

This study uses the JSE All-Share Price Index and its three sub-indices (namely, the Industrials, Financials, and Resources) as a proxy for the stock market. The Johannesburg Stock Exchange (JSE) was established in 1887. It is the oldest and the largest stock exchange in Africa currently (Ndako, 2010). The FTSE/JSE All-Share Price Index is a market capitalization-weighted index, and it is designed to represent the performance of South African companies, therefore giving a comprehensive and complementary set of indexes to investors. These indexes comprise the top 99% of the total pre-free-float market capitalization of all listed companies on the JSE and measure

the performance of the major capital and industry segments of the South African Market (Sayed and Page, 2016).

- **JSE Industrials Index**

According to the Industry Classification Benchmark (2019), the JSE Industrials Index comprises sectors such as Construction and Materials, Aerospace and Defence, General Industrials, Electronic and Electrical Equipment, Industrial Engineering, Industrial Transportation, and Support Services. Studies by Hackland (2015), and Mapanda, Keeton, and Khumalo (2019) have used this as a representation to measure stock market performance.

- **JSE Financials Index**

The JSE Financials Index includes sectors such as Banks, Nonlife and Life Insurance, Real Estate Investment and Services, Real Estate Investment Trusts, and Financial Services (Industry Classification Benchmark, 2019). This variable was adopted from the study by Hackland (2015), and Mapanda, Keeton, and Khumalo (2019) as a proxy to measure stock market performance.

- **JSE Resources Index**

JSE Resources consists of companies operating in mining. The sectors included in this Index are Basic Materials and Energy (Industry Classification Benchmark, 2019). This variable was adopted from the study by Hackland (2015), and it was used as a proxy to measure stock market performance.

On balance, the continuously compounded monthly returns computed from the JSE All-Share Price Index and its sub-indices with their lag values are used. It is calculated as follows as exhibited in equation 4.1 following the model of Choudry et.al., (2016):

$$R_t = \ln \left( \frac{ALSI_t}{ALSI_{t-1}} \right)$$

#### 4.3.2.2 Coincident Business Cycle Indicator

The Coincident Business Cycle Indicator used in this study as the dependent variable is derived from the Composite Business Cycle Indicators from the South African Reserve Bank (SARB, 2022). According to Smit and Van der Watt (1970), the reference turning points in the business cycle were first published by the SARB in 1970. The SARB always imitates the approach of NBER in the United States of America as the basis for the business cycle analysis in South Africa.

Regarding business cycle analysis in South Africa, instead of real gross domestic product or manufacturing production, the composite coincident business cycle indicator (CCBCI) is used as the reference series (Venter, n.d.). This is because the CCBCI reflects aggregate economic activity, and it currently includes five-time series components in its compilation. These are

- The gross value added at constant prices, excluding agriculture, forestry, and fishing.
- The value of wholesale, retail, and new vehicle sales at constant prices, weighted according to their respective contributions to gross domestic product.
- Production capacity utilization in the manufacturing sector.
- Total formal non-agricultural employment, and
- An industrial production index, comprising the physical volume of manufacturing production, the physical volume of mining production, and electricity generated, weighted according to each sector's contribution to gross domestic product.

Furthermore, the reason for using the Coincident Business Cycle Indicator (CBCI) instead of GDP or Industrial Production is that South African GDP is measured in quarterly frequency whereas this study employs only monthly data. Again, converting quarterly data to monthly data may not often precisely capture short-term changes in a data series. Hence, it might lead to a misleading outcome in the case of converting time series data with a trend. Also, the use of Industrial Production as a proxy for the business cycle in South Africa is inappropriate since the Industrial Production of South Africa only records a small portion of GDP (Mapanda et.al., 2019). Therefore, this variable is adopted from the study by Mapanda et.al. (2019).

### **4.3.2.3 JSE Market Capitalization**

According to Meyer and Habanabakize (2018), South Africa is used in several cases as a representation of emerging economies. Market Capitalization used in this study is adopted from the studies by (Leigh, 1997; Nurudeen, 2009; Alajekwu and Achugbu, 2011; Ihendinihu and Onwuchekwa, 2011; Lahura and Vega, 2014; Ngugen and Pham, 2014). According to Nugen and Pham (2014), Market Capitalization is considered a useful tool for evaluating public opinion of a company's net worth since stocks are bought and sold in the Capital Market. Hence, stock market total capitalization as a whole offers an accurate snapshot of the stock market which is analogous to economic indicators such as Foreign Direct Investment and Gross Domestic Product.

### **4.3.2.4 The Yield Curve**

The yield curve (YC) is basically established by comparing the yields provided on 10-year Government bonds and 91-day Treasury bills in South Africa (Nel, 1996; Moolman, 2002; Aziakpono and Khomo, 2007). According to Aziakpono and Khomo (2007, pp. 194-195), the yield curve has a significant relationship with real economic activity which in this case is relevant to the study. Therefore, it serves as one of the tools for predicting future economic activity. It thus measures as follows:

$$YC = 10\text{-Year Bond} - 91\text{-Day Treasury Bill} \dots\dots\dots (4.6)$$

This variable included in this study is adopted from the study conducted by Harvey (1989) which aimed to forecast economic growth from the bond and stock markets.

### **4.3.2.5 Total Consumer Price Index**

According to Fourie and Burger (2017), the consumer price Index (CPI) can be defined as the general and continuous increase in levels of price of goods and services in a country. The average price level is estimated by using the consumer price index. CPI represents a basket of goods

consumed over time and it is seen as one of the predictors of economic activity in the business cycle of a country (Meyer and Habanabakize, 2018). The most used economic indicator in South Africa is the CPI and it is employed to estimate rates of inflation on a monthly basis (Mohr, 2001). This variable is adopted from the study by Meyer and Habanabakize (2018) which aimed to analyze the relationships and causality between the consumer price index (CPI), the producer price index (PPI,) and the purchasing manager's index (PMI) in South Africa.

#### **4.3.2.6 The Exchange Rate**

An exchange rate is the rate at which the currency of one country is exchanged for another country's currency. According to Khomo and Aziakpono (2020), the exchange rate has a great impact on economic activity mainly through the external sector since it shows a country's competitiveness in International Markets. This variable is adopted from the study by Pilinkus (2009).

#### **4.3.3 Data description and sources**

The data to be used for this research will cover the timeframe from 2005 – 2022, in monthly frequency. The reason for the chosen timeframe is to examine a long-term period of economic activity. The variables to be used include the return of the JSE All-Share Price Index, the return of the three sub-indices (Resources, Industrials & Financials), the Coincident Business Cycle Indicator, the JSE Market Capitalization, the Yield Curve, the Total Consumer Price Index (CPI), and the Rand/Dollar Exchange Rate. Data for the variables will be obtained from the South African Reserve Bank, IRESS, and Thompson's Reuters DataStream. Consistent with other studies done on the JSE, this study will use the All-Share Price Index and the three sub-indices from the JSE as a proxy for the stock market (Independent variable). The Coincident Business Cycle Indicator (dependent variable) will be a proxy for economic activity in South Africa. The Consumer Price Index (CPI), JSE Market Capitalization (JMCAP), Yield Curve (YC), and the Rand/Dollar Exchange Rate (ZAR\_USD) will serve as the other controlled variables. Statistical tools such as

Econometrics View (EViews 13) and Stata are used to analyze the data. A table summary of the variables, codes, and sources can be found in Appendix 4.1

#### 4.3.4 Estimation Techniques

##### 4.3.4.1 Unit Root Stochastic Process

According to Gujarati and Porter (2009; p.740), a collection of random variables ordered in time is termed a stochastic process. Stationarity results if the mean and variance of a stochastic process are constant over time as well as its covariance which implies that they are time-invariant. This portrays that, the time series is mean reverting, and fluctuations around this mean will have a widely constant amplitude. On the other hand, Gujarati, and Porter (2009), argued that a time series that is not stationary will have a time-varying mean or variance or both which cannot be generalized to other time periods. This is because; a nonstationary time series behavior can be examined for the period of time under consideration. Hence affecting its forecasting power.

A purely random stochastic process is defined as a process that has zero mean, constant variance, and is serially uncorrelated. That is,  $E(Y_t) = 0$  and  $Var(Y_t) = \frac{1}{(1-\rho^2)}$

Given a Random Walk Model:

$$Y_t = \rho Y_{t-1} + U_t \dots\dots\dots (4.7)$$

$$-1 \leq \rho \leq 1$$

Where:

$Y_t$  = random walk,  $\rho$  = correlation coefficient,  $U_t$  = white noise error term

From the above equation, if  $\rho=1$ , it implies a random walk model without a drift leading to an issue of unit root in the model. Hence the stochastic process will be nonstationary. Nevertheless, the time series  $Y_t$  becomes stationary if  $|\rho| \leq 1$

Therefore, it is essential to first determine the stationarity and the order of the integration of the data series when testing for the long and short-run relationship among variables. To determine this relationship, it is ideal that the variables involved are integrated in the same order but not beyond I(1). Hence, a need to test for unit root to establish the stationarity of the data. A stochastic process  $Y_t$  is expected to have a unit root if it is not stationary at levels and only attains stationarity at the first difference, i.e.,  $Y_t - Y_{t-1} = \Delta Y_t = U_t$ . A series with a unit root suffers long-term effects from random shocks, demonstrating a random walk. Consequently, it yields a misleading result if used for regression analysis.

There are several tests established for testing unit roots of time series. However, following the study by Mapanda et.al. (2019), this study uses the Augmented Dickey-Fuller (ADF) for testing unit roots in time series and further employs the Phillips-Perron test to check the validity of the ADF output. According to Mapanda et.al (2019, p.55), Augmented Dickey-Fuller is used due to its quality of relaxing the postulation of serial correlation across residuals which is the main issue in ADF and DF. ADF test enhances the challenges within the DF test. The Philips-Perron test enhances the validity of the ADF results by ensuring that shocks are only short-lived and will disappear and revert to their long-run means. Hence, the specification of the ADF is as follows:

$$\Delta Y_t = \alpha_0 + \delta Y_{t-1} + \sum_{i=1}^{\rho} \beta_i + Y_{t-1} + \varepsilon_t \dots\dots\dots (4.8)$$

Where:

$\Delta$ = first difference operator,  $Y_t$  = the time series to be tested

$\alpha_0$  = intercept,  $\beta_i$  = the coefficient of interest in analyzing the unit root,  $\rho$  = order of the autoregressive process, and  $\delta = \rho-1$

$\varepsilon_t$  = white noise error term.

The null and alternative hypotheses are given as follows:

$H_0$ :  $\rho=1$  (unit root)

$H_1$ :  $\rho=0$  (no unit root)

If p-values  $< 5\%$  and t-statistics  $> t$ -critical, reject the  $H_0$  and conclude that there is no unit root. Hence it is stationary. Alternatively, if p-values  $> 5\%$  and t-statistic  $< t$ -critical, we fail to reject  $H_0$ , and conclude that the series has a unit root. Hence, it is nonstationary.

There is a high probability of generating a nonsense regression if the series is nonstationary yielding a high  $R^2$ . The criticism which is principal to the Dickey-Fuller and Phillips-Perron tests is that, if the process is stationary, then the power of the tests is low however with a root close to the boundary of the nonstationary. Even though the Dickey-Fuller, Augmented Dickey-Fuller, and Phillips-Perron unit root tests are efficient in time series data, they potentially suffer severe finite sample size and power issues (Gujarati and Porter, 2009). For this reason, panel unit root tests adopted from the study by (Levin and Lin, 1992,1993; Maddala and Wu, 1999; Levin et.al., 2002; Hsu et.al., 2011) shall be employed to analyze the second objective of this study. According to Maddala et.al. (1999), utilizing panel data unit root tests is a method of augmenting the power of unit root tests based on a single time series.

There are two tests for panel unit root. These are the first-generation panel unit root test and the second-generation panel unit root. Hurlin and Mignon, (2006) suggest that the cross-sectional units are cross-sectionally independent in the first-generation panel unit root tests whereas, in the second-generation panel unit root tests, this assumption is relaxed and permits cross-sectional dependency. Previous studies conducted using first-generation like (Levin et.al, 1992,1993; Maddala and Wu, 1999; Hadri, 2000; Levin et. Al., 2002) tests suggest that cross-sections are homogenous among cross-section units. In contrast, Choi (2002) tests hypothesize a heterogenous cross-section formation. Therefore, the second-generation panel unit root test which is based on the heterogeneity assumption aimed to tackle the drawbacks of cross-sectional dependence in the first-generation tests. However, this study will employ the first-generation panel unit root test due to the unavailability of the second-generation unit root test on Econometrics Views Software to test for the panel unit root.

#### **4.3.4.2 Cointegration Test**

Two variables are said to be cointegrated if there exists a long-term relationship between them. This idea was pioneered by Granger (1981), and Engle and Granger (1987) giving tests and estimation techniques to measure the existence of a long-run relationship between the stock market and the business cycle in South Africa. That is testing for cointegration is assumed to be a pre-test to prevent spurious regression problems. Nkoro and Uko (2016) suggest that cointegration entails a certain stationary linear combination of variables that are individually nonstationary but integrated into an order,  $I(1)$ . This establishes robust statistical and economic grounds for the empirical error correction model which merges short and long-run information in modelling variables. Establishing a cointegration among variables is a crucial step to determine if a model empirically portrays meaningful long-run relationships. Failure to establish co-integration across underlying variables makes it necessary to work with variables in differences instead. Nevertheless, the long-run information will be missing.

- **Panel Cointegration Test**

Panel cointegration test procedure permits researchers to selectively pool information concerning common long-run relationships from across the panel while allowing the connected short-run dynamics and fixed effects to be heterogeneous among non-identical members of the panel (Pedroni, 1999). The null hypothesis in this context is that each member of the panel variables of interest are not cointegrated and the alternative hypothesis is specified as for each member of the panel there exists a single cointegrating vector, even though this cointegrating vector need not be constant for each member (Pedroni, 1999, p.655).

#### **4.3.4.3 Optimal Lag Length**

It is very crucial to determine the appropriate lag length before estimating an ARDL model. This ensures that we have standard normal error terms that are not subjected to non-normality, autocorrelation, or heteroskedasticity. Brooks (2014) states that the appropriate lag length for

variables is determined by the vector autoregression (VAR) lag order selection/information criteria procedure. There are several model order selection criteria like the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), or Hannan-Quinn Criterion (HQC). According to Nkoro and Uko (2016), regarding model selection criteria, the model with the smallest AIC, SBC, HQC estimates or small standard errors and high  $R^2$  performs relatively better. Hence, the estimates from the best performed become the long-run coefficients. This is necessary to undertake if there exists a long-run relationship among underlying variables to prevent spurious regression.

#### 4.3.4.4 Error Correction Model (ECM)

Error correction model is used to determine the speed of adjustment back to equilibrium when cointegration is established among variables (Mapanda et.al., 2019). The ECM model is specified as follows:

$$\Delta CBCI_{it} = \varphi_i(CBCI_{i,t-1} - \alpha_{0i} - \alpha_i^1 X_{it}) + \sum_{j=1}^{\rho-1} \lambda^* \Delta CBCI_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^* \Delta X_{i,t-j} + \varepsilon_{it} \dots\dots (4.9)$$

Where:

$$\varphi_i = -(1 - \sum_{j=1}^{\rho} \lambda_{ij}), \alpha_i = -\left(\sum_{j=0}^q \frac{\delta_{ij}}{\varphi_i}\right), \lambda_{ij}^* = -\sum_{m=j+1}^{\rho} \lambda_{im},$$

$$j=1, 2, \dots, p-1 \text{ and } \delta_{ij}^* = -\sum_{m=j+1}^{\rho} \delta_{im}, j=1, 2, \dots, p-1$$

This technique allows the intercepts, short-run coefficients, and error variables to differ among the cross sections whilst ascertaining the long-run parameters and the speed of adjustment to equilibrium. The error correction term is expected to be a negative figure and significant.

### **4.3.5 Diagnostic Tests**

A diagnostic test such as normality, autocorrelation, heteroscedasticity, and stability tests will be conducted on the ARDL model employed for testing the short and long-run relationship and coefficients.

#### **4.3.5.1 Normality Test**

A normality test is employed to examine whether the data for the study is normally distributed or not based on the descriptive statistic result run on the variables. Hence, this study adopts the study by Jarque and Bera (1987) and deduce the null hypothesis and the alternative hypothesis as follows:

H<sub>0</sub>: Error term is normally distributed

H<sub>1</sub>: Error term is not normally distributed

If P-value < 5%, reject the null hypothesis and conclude that the error terms are not normally distributed. Alternatively, if the P-value > 5%, we fail to reject the null hypothesis and conclude that error terms are normally distributed.

#### **4.3.5.2 Serial Correlation**

Serial correlation or autocorrelation refers to the correlation between members of an ordered observational series in time or space. In other words, a serial correlation exists when residuals are correlated with each other or there is dependency among residuals across observations (Gujarati and Porter, 2009). There are several tests established for the detection of autocorrelation and these include the Breusch-Godfrey LM test, Durbin-Waston test, and Durbin's h test, among others. According to Brooks (2014), the existence of serial correlation, and estimation of standard errors will be inaccurately determined, though the estimation of the coefficient will be unbiased, but will

still be inefficient. Hence the t and F tests will be invalid. Furthermore, the existence of serial correlation can lead to the probability of  $R^2$  being high relative to its correct value. This study will utilize the Breusch-Godfrey LM to detect the existence of autocorrelation as employed in the study by Mapanda et.al. (2019).

$H_0: \rho = 0$  (no serial correlation)

$H_1: \rho \neq 0$  (serial correlation)

If the P-value  $< 5\%$ , we reject  $H_0$  and conclude that the data contains serial correlation. If the P-value  $> 5\%$ , we fail to reject  $H_0$  and conclude that the data has no serial correlation.

#### **4.3.5.3 Heteroscedasticity**

According to Brooks (2014, p.181), heteroscedasticity results when the error terms do not have a constant variance. The presence of heteroscedasticity will cause the standard errors to be inaccurately determined which will still result in the coefficient estimates being unbiased, but they will be inefficient. For this reason, the t and F tests will be inaccurate. Detection of heteroscedasticity can be determined through many tests like Harvey, Glejser, ARCH, Breusch-Pagan-Godfrey, White test, etc. For this study, the Harvey test will be used. The study will follow the hypothesis used by Mapanda et.al. (2019) to examine the heteroscedasticity or homoscedasticity of the residuals.

$H_0: \text{Var}(U_t) = \sigma^2$  (residuals are homoscedastic)

$H_1: \text{Var}(U_t) \neq \sigma^2$  (residuals are heteroscedastic)

If p-value  $< \alpha = 5\%$ , we reject  $H_0$ , and conclude that residuals are heteroscedastic. If P-values  $> \alpha = 5\%$ , we fail to reject  $H_0$  and conclude that residuals are homoscedastic.

#### 4.3.5.4 Stability Tests

The CUSUM and CUSUM-SQ which are deduced from the residuals of the recursive estimation are used to identify the stability of the model and coefficients. The graphs of the recursive coefficients are used to determine the stability of the coefficients (Brooks, 2014).

- **The CUSUM**

According to Brown et.al. (1975), the pioneers of the cumulative sum of recursive residuals (CUSUM), the test plots the cumulative sum of the residual's values against the lower and upper bounds of the 95% confidence interval at each point. If the cumulative sum lies outside the bands, then it shows evidence of parameter instability (Brooks, 2014). Adopting the study by Mapanda et.al. (2019), the CUSUM test is estimated as:

$$CUSUM_t = W_t = \sum_{r=k+1}^t \frac{W_r}{S_r} \dots\dots\dots (4.10)$$

Where:

W= the recursive residual, S = standard error of the regression fitted to all T sample size,  $t = k+1 \dots, T$ . When the vector is constant, it implies that it has zero means (i.e.,  $E(W_t) = 0$ ) and the variance which is equivalent to  $t-k-1$ . However, the  $CUSUM_t$  will diverge from the mean line if the  $\beta$  vector varies or is not constant.

- **The CUSUM-SQ**

The CUSUM of Squares test which examines the cumulative variance around the regression is used to strengthen the CUSUM test result (Brooks, 2014). Adopting the study by Mapanda et.al. (2019), the CUSUMSQ statistic is given below:

$$CUSUMQ_t = S_t = \frac{\sum_{r=k+1}^t W_r^2}{\sum_{r=k+1}^T W_r^2} \dots\dots\dots (4.11)$$

If the parameter remains the same, then the “S” expected value will be given as  $E(S_t) = \frac{(t-k)}{(T-K)}$  which starts from zero at  $t=k$  to one at  $t=T$ .

#### **4.4 Causality Test**

Both objectives will include testing for Granger-Causality, which is a statistical hypothesis test for ascertaining whether one variable helps forecast another variable (Granger, 1969). This study uses the Granger Causality test to determine the causal relationship between returns of the All-Share Index and the Coincident Business Cycle Indicator in South Africa. Again, the test will also be used to establish a causal relationship between the returns of the sub-indices and the Coincident Business Cycle Indicator. Comincioli (1996) highlighted the assumption that, in the general sense, Granger Causality may have more to do with precedence or forecasting, than with causation. Granger Causality assumes that the future cannot predict the past, but the past can cause or forecast the future.

Since “true causality” is contentious, it is therefore important to note that the Granger-Causality test does not test true causality: it rather deals with the prediction or precedence of multiple variables (Granger, 1969).

#### **4.5 Conclusion**

This chapter delineates the research methodology and data utilized by this research. It describes the source and collection of the data and the statistical and econometrics techniques that will be applied to achieve the main goal of examining the empirical relationship between the stock market and the business cycle in South Africa. Again, analyzing if the relationship between the stock market and the business cycle is homogeneous across the three sectors of the JSE. The next chapter discusses the results and findings of this study.

## **CHAPTER 5**

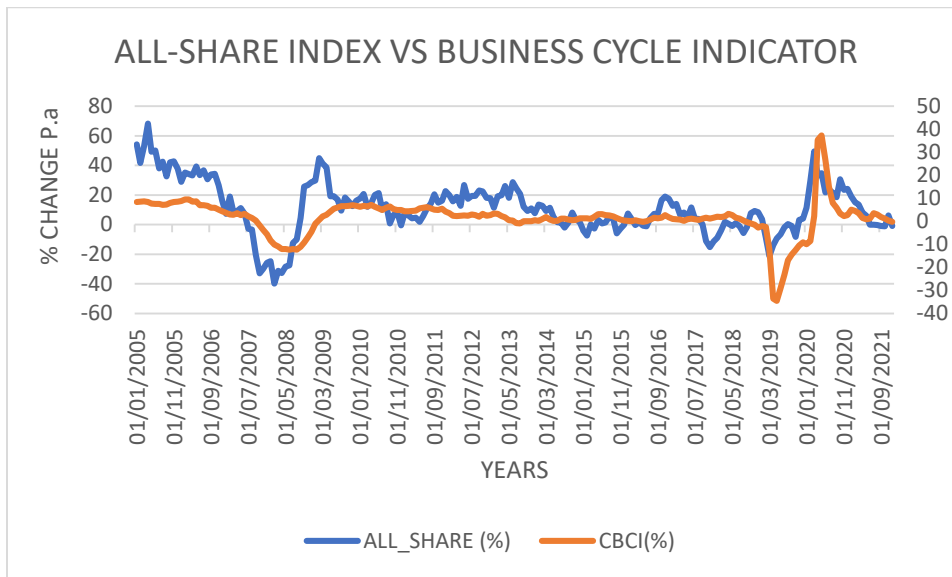
### **PRESENTATION AND DISCUSSION OF RESULTS**

#### **5.1 Introduction**

This chapter aims to examine the empirical relationship between the stock market and the business cycle in South Africa as the main objective of this study over the period 2005 to 2022 in monthly frequency. In addition, to determine if the relationship between the stock market and the business cycle is homogeneous across the three selected sectors of the JSE. The remaining of this chapter is outlined as follows: 5.2 For purposes of illustration and preliminary observation, the stock market indices will first be shown against the business cycle indicator in year-on-year percentage growth format, followed by the monthly compounded returns which are needed for the model estimation. 5.3 presents the descriptive statistics of the JSE All-Share Index and its sub-indices, the Coincident Business Cycle Indicator, and the other controlled variables such as the Rand/Dollar Exchange Rate, Consumer Price Index, JSE Market Capitalization, and the Yield Curve. This will be followed by 5.4 which presents the correlation analysis of the variables. 5.5 focuses on the discussion of the unit root and the co-integration results. 5.6 presents the optimal lag selection criteria. Then 5.7 and 5.8 discuss the Times Series ARDL and the Panel ARDL models and the diagnostic tests are presented in 5.9. The Causality test is discussed in 5.10. Finally, 5.11 will present the conclusion.

## 5.2 Trend Analysis

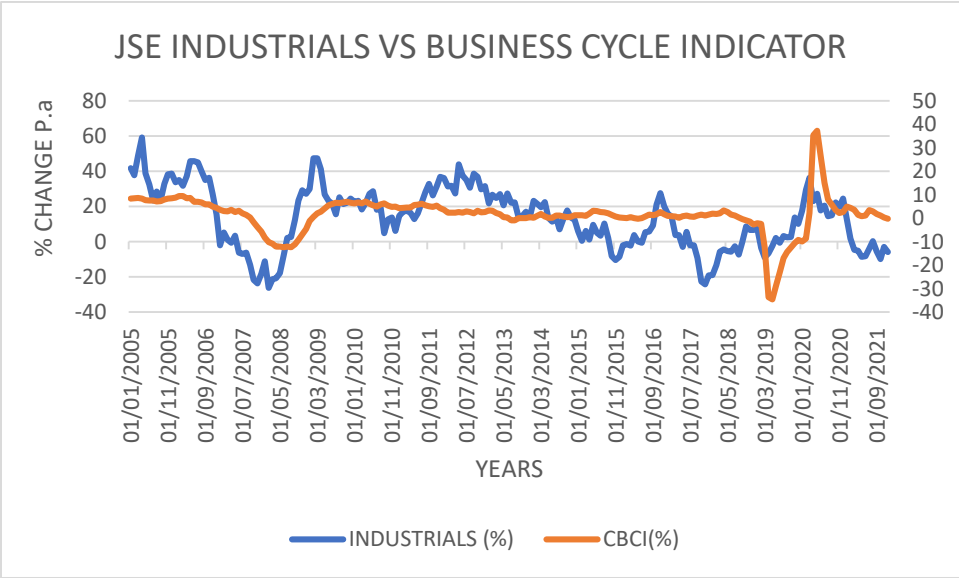
### 5.2.1 Illustration of the Stock Market Indices against the Business Cycle Indicator in Year-On-Year Percentage Growth Format, Followed by the Monthly Compounded Returns Analysis



**Figure 5.1: The JSE All-Share and the South African Coincident Business Cycle Indicator, 2005-2022**

**Source: Compiled by Author, data from IRESS and SARB**

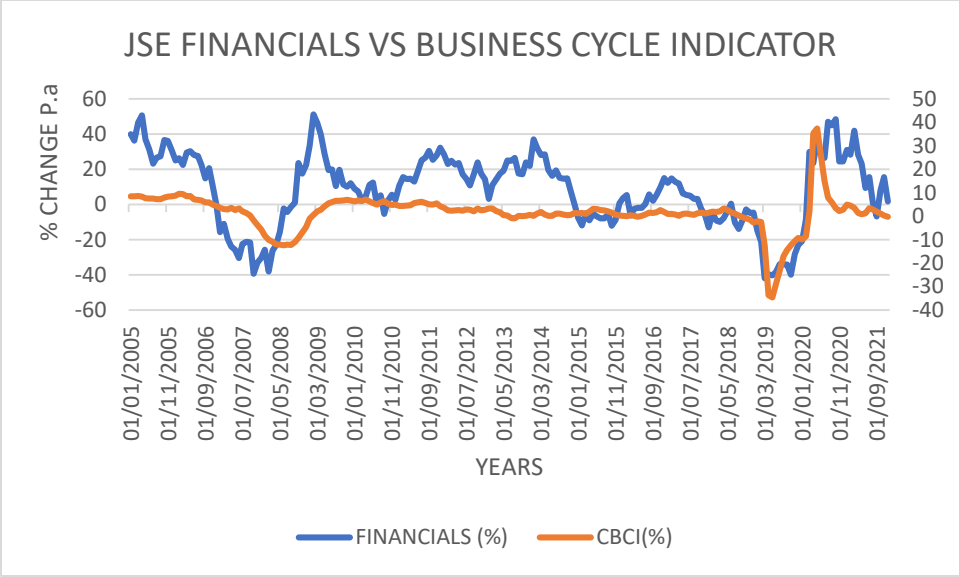
Figure 5.1, which is mainly for illustrative purposes, shows a fairly close visual relationship between the variables and hints at a positive correlation.



**Figure 5.2: JSE Industrials Index and the South African Coincident Business Cycle Indicator, 2005-2022**

**Source: Compiled by Author, data from IRESS and SARB**

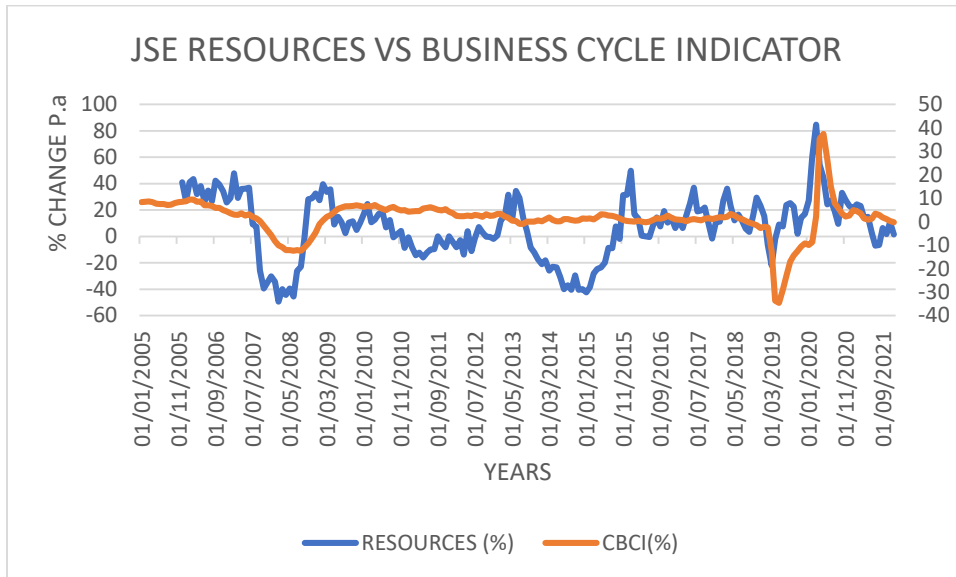
Figure 5.2 indicates a fairly close visual relationship between the JSE industrial index and the business cycle indicator and points at a positive correlation.



**Figure 5.3: JSE Financials Index and the South African Coincident Business Cycle Indicator, 2005-2022**

**Source: Compiled by Author, data from IRESS and SARB**

Figure 5.3 reveals a close visual relationship between the JSE financial index and the business cycle indicator and seemingly portrays a positive correlation.



**Figure 5.4: JSE Resources Index and the South African Coincident Business Cycle Indicator, 2005-2022**

**Source: Compiled by Author, data from IRESS and SARB**

Figure 5.4 depicts a close visual relationship between the variables and points at a positive correlation.

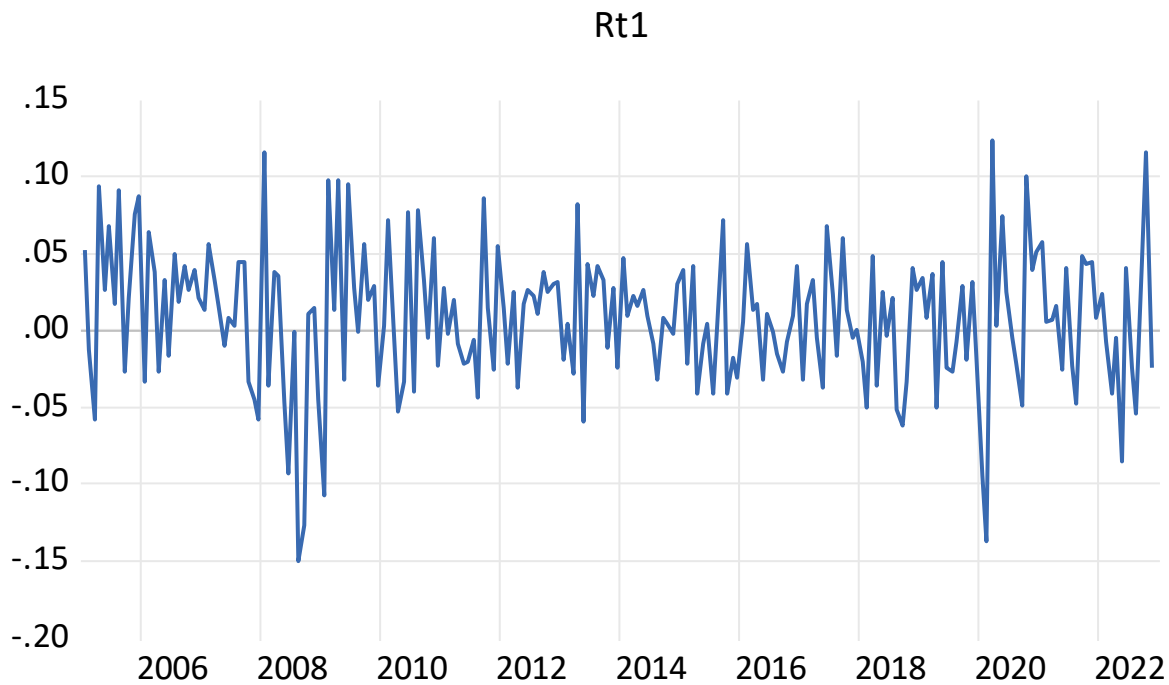
These relationships will further be analyzed in more detail below.

### 5.2.2 Compounded monthly stock return on JSE All-Share Price Index (ALSI)

Figure 5.5 illustrates the trend of the continuously compounded monthly stock return on the All-Share Price Index ( $R_{t1}$ ) from 2005 through 2022, which describes the sample period of the research. It is segmented into three phases. The first phase commenced in 2005 delineating the movement of  $R_{t1}$  during the Global Financial Crisis between 2007 and 2009. The second phase was between 2010 and 2018 depicting a calm period though the movement was fluctuating. The third phase

demonstrates another volatile period between the period 2019 to 2022 during the Global Health Crisis (COVID-19).

In the first phase (2005 to 2009), the continuously compounded monthly stock return on the All-Share Price Index ( $R_{t1}$ ) began at 0.05 in 2005 and was at 0.06 at the end of 2009. In 2008, there was a sharp decline in  $R_{t1}$  reaching -0.15; this was the lowest return rate of the first phase. From 2008 to 2009, the  $R_{t1}$  rose reaching 0.09, and then fluctuated through 2019 with the range (-0.05 to 0.08). Then in 2020, there was another sharp decline reaching the lowest return rate of -0.14, and rose sharply reaching a peak of 0.13, and remained volatile through 2022 ending with a return rate of 0.02. In summary, the continuously compounded monthly return on stock prices of the JSE All-Share Price Index depreciated by 0.03, that is from 0.05 to 0.02.

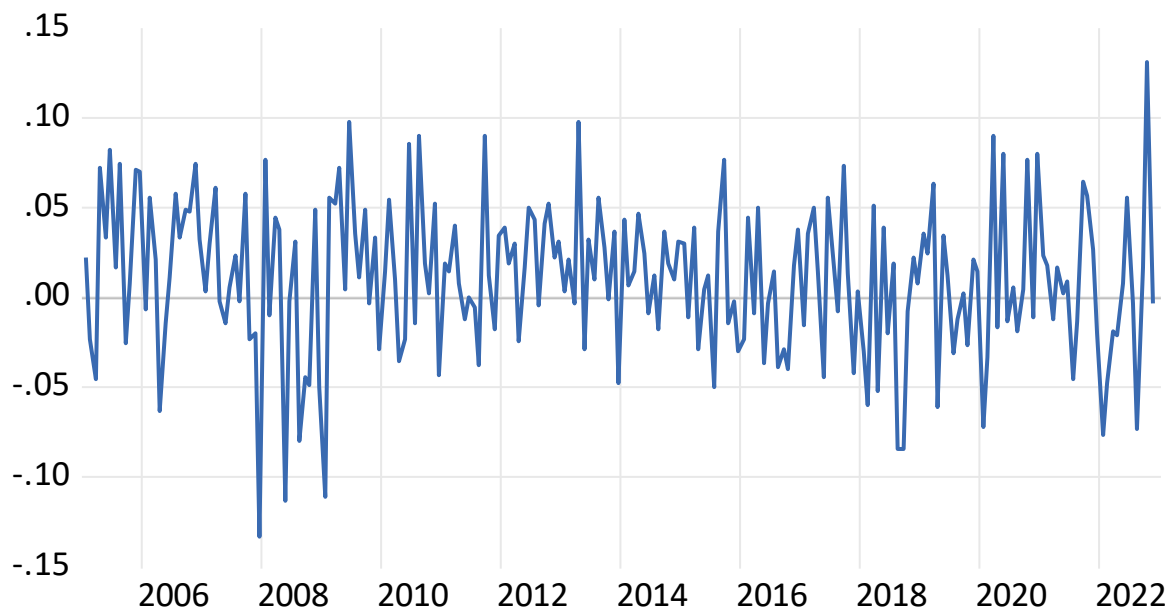


**Figure 5.5: Continuously Compounded monthly stock return on the All-Share Price Index of the JSE, 2005-2022**

**Source: EViews output, compiled by Authors, data from IRESS**

### 5.2.3 Compounded monthly return on JSE Industrials

$R_{t2}$



**Figure 5.6: Continuously Compounded Monthly Stock Return on JSE Industrials, 2005-2022**

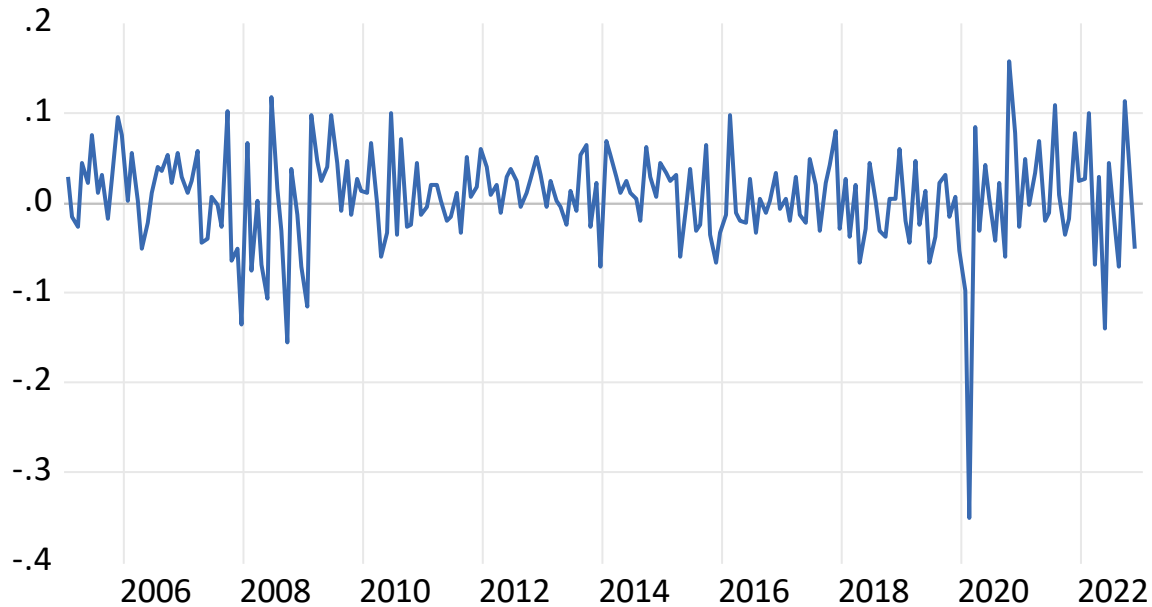
**Source: EViews output, compiled by Authors, data from IRESS**

Figure 5.6 demonstrates the trend of the continuously compounded monthly stock return of the JSE Industrials ( $R_{t2}$ ) from 2005 through 2022, which describes the sample period of the research. It is subdivided into three phases. The first phase started in 2005 and shows the movement of  $R_{t2}$  during the Global Financial Crisis between 2007 and 2009. The second phase was between 2010 and 2018 depicting a calm period though the movement was fluctuating. The third phase demonstrates another volatile period between the period 2019 to 2022 during the Global Health Crisis (COVID-19).

In the first phase (2005 to 2009), the continuously compounded monthly stock return on the JSE Industrials ( $R_{t2}$ ) began at 0.02 in 2005 and was at 0.07 at the end of 2009. In 2008, there was a sharp decline in  $R_{t2}$  reaching -0.14; this was the lowest return rate of the first phase. From 2008 to 2009, the  $R_{t2}$  rose slightly reaching 0.09, and then fluctuated through 2019 with the range (-0.08 to 0.09). Then from 2020, there was fluctuation reaching the lowest return rate of -0.08 and rose sharply reaching a peak of 0.14 in 2022 ending with a return rate of -0.01. In summary, the continuously compounded monthly return on stock prices of the JSE Industrials depreciated by 0.03 that is from 0.02 to -0.01.

## 5.2.4 Compounded monthly return on JSE Financials

$R_{t3}$



*Figure 5.7: Continuously Compounded monthly stock return on JSE Financials, 2005-2022*

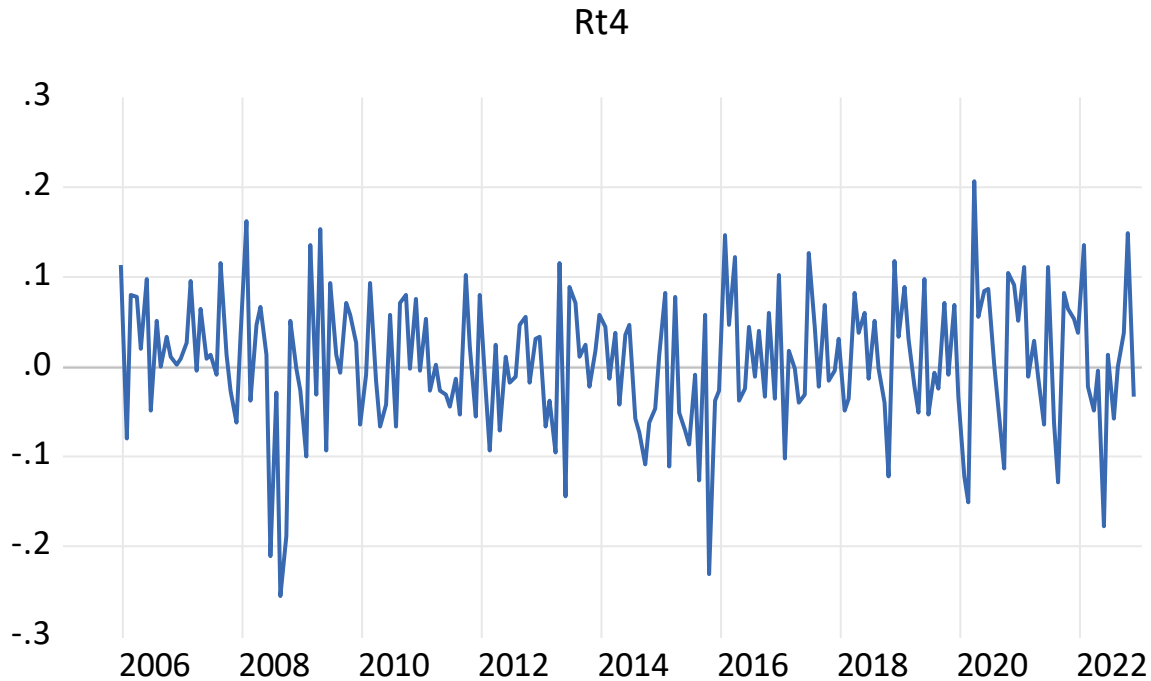
*Source: EViews output, compiled by Authors, data from IRESS*

Figure 5.7 demonstrates the trend of the continuously compounded monthly stock return of the JSE Financials ( $R_{t3}$ ) from 2005 through 2022, which describes the sample period of the research. It is divided into three periods. The first period starts in 2005 and shows the movement of  $R_{t3}$  during the Global Financial Crisis between 2007 and 2009. The second phase was between 2010 and 2018 illustrating a calm period though the movement was slightly fluctuating. The third phase demonstrates another volatile period between the period 2019 to 2022 during the Global Health Crisis (COVID-19).

In the first phase (2005 to 2009), the continuously compounded monthly stock return on the JSE Financials ( $R_{t3}$ ) began at 0.02 in 2005 and was at 0.09 at the end of 2009. In 2008, there was a sharp decline in  $R_{t3}$  reaching -0.16; this was the lowest return rate of the first phase. From 2008 to 2009, the  $R_{t3}$  rose slightly reaching 0.11, and then fluctuated through 2019 with the range (-0.16 to 0.11). Then in 2020, there was a sharp decline to -0.37, there was fluctuation reaching the lowest return rate of -0.13 and rose sharply reaching a peak of 0.16 in 2022 ending with a return rate of -

0.03. In summary, the continuously compounded monthly return on stock prices of the JSE Financials depreciated by 0.05 which is from 0.02 to -0.03.

### 5.2.5 Compounded monthly return on JSE Resources



**Figure 5.8: Continuously Compounded monthly stock return on JSE Resources, 2005-2022**

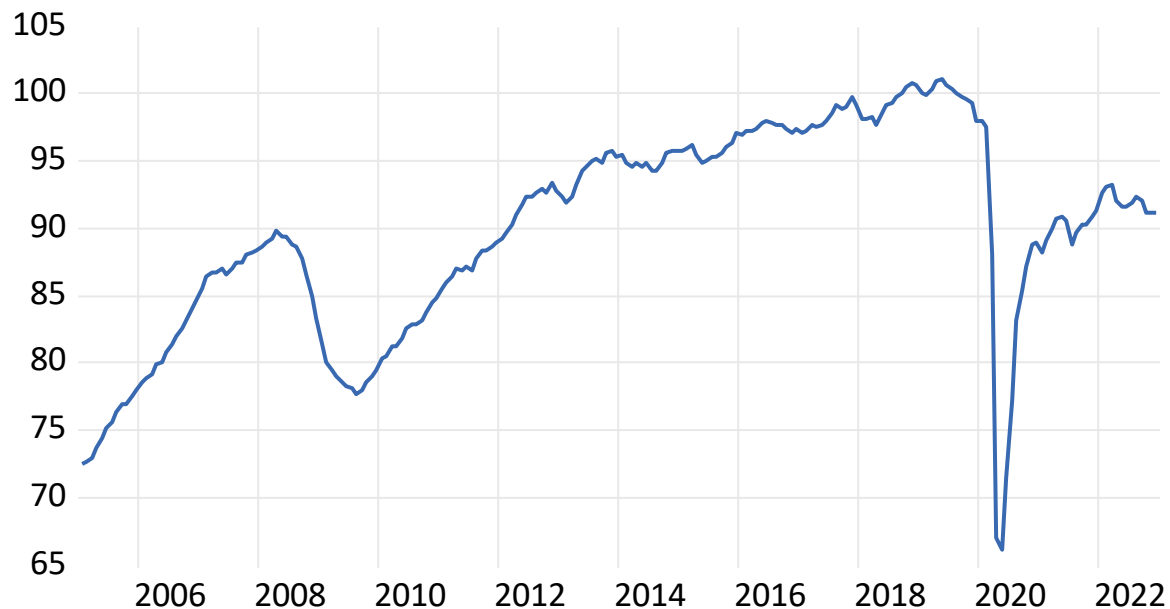
**Source: EViews output, compiled by Authors, data from IRESS**

Figure 5.8 demonstrates the trend of the continuously compounded monthly stock return of the JSE Resources ( $R_{t4}$ ) from 2005 through 2022, which describes the sample period of the research. It is divided into three stages. The first stage commenced in 2005 and shows the movement of  $R_{t4}$  during the Global Financial Crisis between 2007 and 2009. The second stage was between 2010 and 2018 illustrating a calm period though the movement was slightly fluctuating. The third stage demonstrates another volatile period between the period 2019 to 2022 during the Global Health Crisis (COVID-19).

In the first stage (2005 to 2009), the continuously compounded monthly stock return on JSE Resources ( $R_{t4}$ ) began at 0.11 in 2006 and was at 0.13 at the end of 2009. In 2008, there was a sharp decline in  $R_{t4}$  reaching -0.26; this was the lowest return rate of the first phase. From 2008 to

2009, the  $R_{t4}$  rose slightly reaching 0.13, and then fluctuated through 2019 with the range (-0.22 to 0.13). Then in 2020, there was a sharp decline to -0.13, and there was fluctuation reaching the lowest return rate of -0.14 in 2021 and rose slightly reaching 0.12 and ending with a return rate of -0.02. In summary, the continuously compounded monthly return on stock prices of the JSE Resources depreciated by 0.13 which is from 0.11 to -0.02.

## 5.2.6 The South African Coincident Business Cycle Indicator CBCI



**Figure 5.9: The South African Coincident Business Cycle Indicator, 2005-2022.**

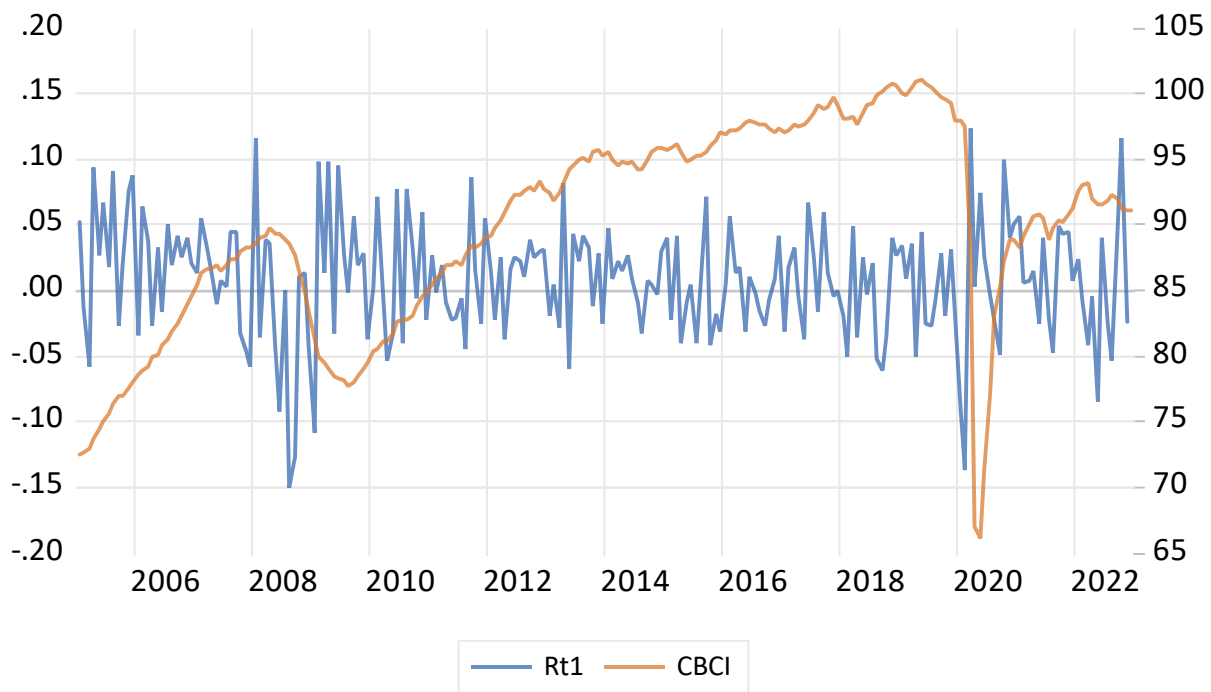
**Source: EViews output, data from the South African Reserve Bank (2022)**

Figure 5.9 demonstrates the trend of the Coincident Business Cycle Indicator of South Africa (CBCI) from 2005 through 2022, which describes the sample period of the research. It is divided into three phases. The first phase started in 2005 and shows the movement of CBCI during the Global Financial Crisis between 2007 and 2009. The second phase was between 2010 and 2018 illustrating an upward trend of a stable period. The third phase demonstrates another period between the period 2019 to 2022 during the Global Health Crisis (COVID-19).

In the first phase (2005 to 2009), the Coincident Business Cycle Indicator (CBCI) began at 72 in 2005 and rose sharply to a peak of 90 in 2008. In 2009, there was a plunge in CBCI reaching 78

indicating a recession, ending the first phase. From 2009 to 2010, the CBCI rose in an upward trend through 2019 reaching 102 exhibiting expansionary phase and the range (78 to 102). Then in 2020, there was a sharp decline to 67 showing another recession, followed by a sharp rise in 2021 reaching 91 and fluctuating slightly through 2022 ending with a rate of 92. In summary, there were two consecutive recessionary periods in 2009 and 2020.

### 5.2.7 Compounded monthly return on ALSI and the Business Cycle Indicator



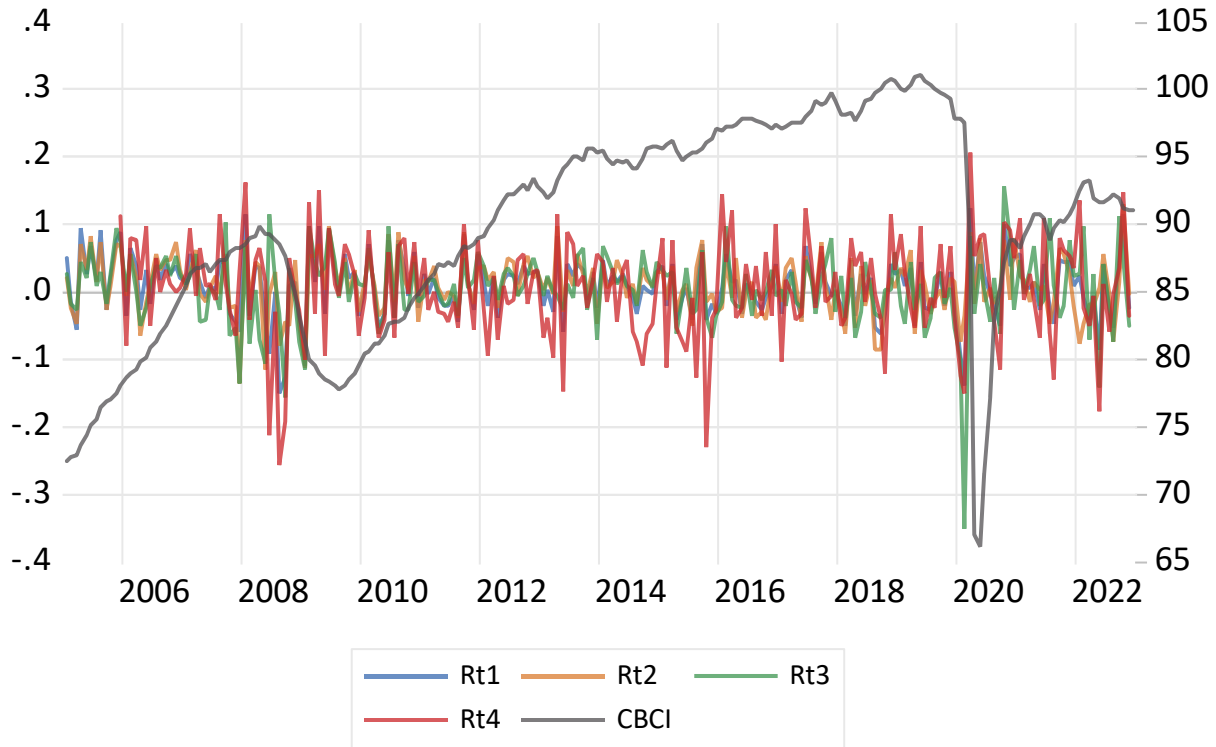
**Figure 5.10: Continuously Compounded monthly return of stock prices on JSE ALSI and the SA Coincident Business Cycle Indicator, 2005-2022.**

**Source: EViews output, data from IRESS and SARB (2022)**

Figure 5.10 illustrates the trend analysis between the continuously compounded monthly Stock return on the All-Share Price Index ( $R_{t1}$ ) and the Coincident Business Cycle Indicator from 2005 through 2022, which describes the sample period of the research. It is segmented into three phases. The first phase commenced in 2005 delineating the movement of  $R_{t1}$  and the CBCI during the Global Financial Crisis between 2007 and 2009. The second phase was between 2010 and 2018

depicting a calm period though the movement was fluctuating for  $R_{t1}$  and trending upward for CBCI. The third phase demonstrates another volatile period between the period 2019 to 2022 during the Global Health Crisis (COVID-19). In the first phase (2005 to 2009), the continuously compounded monthly stock return on the All-Share Price Index ( $R_{t1}$ ) began at 0.05 in 2005 and was at 0.06 at the end of 2009. In 2008, there was a sharp decline in  $R_{t1}$  reaching -0.15; this was the lowest return rate of the first phase of the  $R_{t1}$ . Whereas in the case of the Coincident Business Cycle Indicator (CBCI), it began at a rate of 72 in 2005 and rose sharply to a peak of 90 in 2008. In 2009, there was a plunge in CBCI reaching 78 indicating a recession, ending the first phase for the CBCI. From 2008 to 2009, the  $R_{t1}$  rose to reach 0.09 and then fluctuated through 2019 in the range (-0.05 to 0.08) whilst from 2009 to 2010, the CBCI rose in an upward trend through 2019 reaching 102 exhibiting an expansionary phase and the range (78 to 102). Then in 2020, there was another sharp decline reaching the lowest return rate of -0.14, and rose sharply reaching a peak of 0.13, and remained volatile through 2022 ending with a return rate of 0.02. In analogy to the CBCI, in 2020, there was a sharp decline to 67 showing another recession, followed by a sharp rise in 2021 reaching 91 and fluctuating slightly through 2022 ending with a rate of 92. In summary, the continuously compounded monthly return on stock prices of the JSE All-Share Price Index depreciated by 0.03 that is from 0.05 to 0.02, and there were two consecutive recessionary periods in 2009 and 2020. Hence from the above diagram, it is seen that the  $R_{t1}$  (ALSI) seems to be a leading indicator which is clear from the turning points of the  $R_{t1}$  (ALSI) being earlier than that of the business cycle. Hence the analysis hints at a positive correlation.

**5.2.8 Compounded monthly return on the All-Share Price Index, Industrials, Financials, Resources, and the Business Cycle Indicator**



**Figure 5.11: Continuously Compounded monthly return of stock prices on JSE ALSI, Industrials, Financials, and Resources versus the Coincident Business Cycle Indicator, 2005-2022.**

**Source: EViews output, data from IRESS and SARB (2022)**

Figure 5.11 depicts the trend analysis of the  $R_{t1}$  and CBCI and shows if the relationship is homogeneous across the three selected sectors of the JSE namely the Industrials, Financials, and Resources proxied by  $R_{t2}$ ,  $R_{t3}$ , and  $R_{t4}$  respectively. From the earlier discussions of all these sectors, it can be deduced from the above graph that, the relationship between the stock market and the business cycle is assumed to be homogeneous across the three selected sectors of the JSE.

### 5.3 Descriptive Statistics

This part of the chapter analyses the main summary statistics relative to the JSE All-Share Index and its sub-indices, the South African CBCI, the Yield Curve, the Consumer Price Index, the JSE Market Capitalization, and the Rand/Dollar Exchange Rate. Descriptive Statistics is very important due to the detailed information it gives about the sample data involved in the study over the period 2005 to 2022 in monthly frequency. The summary statistics reported in the tables below give information about the measures of central tendency (mean and median), the measures of spread (standard deviation), measures of normal distribution (skewness, kurtosis, Jarque-Bera), the range (maximum and minimum values) of the sample observations.

Skewness measures the shape of the distribution and defines the degree of asymmetry. Series that are symmetric (normally distributed) have their skewness to be zero. Where the series distribution is positively skewed, it means that the distribution has a long right-hand tail, and the values are greater than the sample mean. In contrast, a negatively skewed distribution shows a long left-hand tail implying smaller values than the sample mean. Kurtosis defines the fatness of the tails of the series distribution and the extent to which the series peaked at the mean. Kurtosis is classified into three categories (mesokurtic, leptokurtic, and platykurtic). Mesokurtic is a normal distribution with a kurtosis coefficient of three (3). Leptokurtic distribution indicates a high peak and fatter tails at the mean. Whereas a platykurtic distribution depicts a low peak and thinner tails at the mean. However, the most widely used test for normality is the Jarque-Bera test statistic. This test statistic estimates the difference between skewness and kurtosis of the series with those from the normal distribution. The null hypothesis of the Jarque-Bera test:

$H_0$ : normal distribution

$H_1$ : not normally distributed

If p-values < 5%, we reject the null hypothesis and conclude that the distribution of the series is not normal. Alternatively, if the p-values > 5%, we fail to reject the null hypothesis and conclude that the series are normally distributed. Following is the analysis of the tables (5.1, 5.2, 5.3) based on the above preamble.

**Table 5.1: Descriptive Statistics of the JSE All-Share Index, Industrials, Financials, and Resources from 2005 to 2022**

INDEX	ALSI	IND	FIN	RES
Mean	42485.01	53932.36	30084.61	26871.83
Median	45324.83	60601.12	30120.16	26319.79
Maximum	76090.51	102910.8	47449.52	48282.74
Minimum	12555.96	11210.04	13068.88	13397.41
Std. Dev.	16308.38	27775.08	10145.49	6749.301
Skewness	0.026655	-0.073701	0.014591	0.656760
Kurtosis	1.920810	1.431380	1.552164	3.333367
Jarque-Bera	10.50744	2234067	18.87373	15.68651
Probability	0.005228	0.000014	0.000080	0.000392
Sum	9176761	11649390	6498275	5508726
Sum Sq. Dev.	5.72E+10	1.66E+11	2.21E+10	9.29E+09
Observations	216	216	216	205

*Source: EViews output, data obtained from IRESS*

According to the report of the descriptive statistics in Table 5.1 over the period 2005 to 2022, it can be deduced that the Industrial Sector Index recorded the highest monthly average value of 53932.36. Followed by the All-Share Index, Financial Sector Index, and Resource Sector Index with values of 42485.01, 30084.61, and 26871.83 respectively. The maxima Index in general is generated by the Industrial Sector with a value of 102910.8. Next is the All-Share Index with a value of 76090.51 then the Resources Index with a value of 48282.74 and finally the Financials with a value of 47449.52. The minimum value denoting the minimum Index was produced by the Industrial Sector with a value of 11210.04. The ALSI, FIN, and RES generated minimum values of 12555.96, 13068.88, and 13397.41 respectively. The monthly median values of the JSE Indices (ALSI, IND, FIN, RES) are 45324.83, 60601.12, 30120.16, and 26319.79 respectively. Standard deviation in this case measures the risk associated with the type of Index. Hence, the Industrial Sector having the highest standard deviation of 27775.08 is assumed to be the riskiest sector among

the JSE sectors. This is followed by JSE ALSI, FIN, and then RES with their values of 16308.38, 10145.49, and 6749.301 respectively.

Concerning skewness, all the indices have their values closer to zero. Therefore, they mirror a normal distribution (symmetric).

Regarding Kurtosis, the ALSI, IND, and FIN have their values to be less than three (3) except RES which has a value of greater than 3. This implies that RES is leptokurtic and will have higher values above the sample mean. Whereas the rest of the variables are platykurtic, implying that they will have lower values below their sample means.

Interestingly, although all the Indices are symmetric, the Jarque-Bera statistic shows that all the Indices in Table 5.1 are not normally distributed since their p-values are less than 5%. Hence, we reject the null hypothesis of normal distribution.

**Table 5.2: Descriptive Statistics of the South African CBCI (Index)**

CBCI descriptive statistics	
Mean	89.83380
Median	90.90000
Maximum	101.1000
Minimum	66.10000
Std. Dev.	7.688779
Skewness	-0.629197
Kurtosis	2.700039
Jarque-Bera	15.06178
Probability	0.000536
Sum	19404.10
Sum Sq. Dev.	12710.22
Observations	216

**Source: EViews output, data obtained from SARB (2022)**

The CBCI descriptive statistics report in Table 5.2 reveals that the indicator had undergone significant fluctuation over the 2005 to 2022 period with a maximum value of 101.10 and a minimum value of 66.10. Again, the Table reports an average value (mean) of 89.83 whereas the median is 90.90. The standard deviation of 7.69 implies that the CBCI data is clustered closely around the sample mean. Something is fascinating about this data which is if the median > mean, then the CBCI data distribution should have been rightly skewed but in this case, it is symmetric because skewness is equal to -0.629 which is closer to zero. The Kurtosis value been  $2.7 < 3$  means that the distribution is platykurtic (has smaller values below the sample mean). The distribution of the CBCI data is not normally distributed since the probability of the Jarque-Bera test statistic is  $0.0005 < 5\%$ . Hence, we reject the null hypothesis.

**Table 5.3: Descriptive Statistics of the Other Controlled Variables**

Controlled Variables	YC (%)	CPI (Index)	JMCAP (Millions)	ZAR_USD (R1=100cents)
Mean	2.202315	69.80417	2013837	1090.002
Median	2.110000	68.45000	1935785	1038.270
Maximum	7.070000	107.2000	4123793	1857.600
Minimum	-3.040000	40.10000	640721.0	596.9800
Std. Dev.	2.081899	19.05564	1046036	356.0988
Skewness	0.191228	0.135142	0.399240	0.251652
Kurtosis	3.288888	1.855517	2.024724	1.651762
Jarque-Bera	2.067563	12.44604	14.03381	18.63954
Probability	0.355660	0.001983	0.000897	0.000090
Sum	475.7000	15077.70	4.27E+08	235440.4
Sum Sq. Dev.	931.8754	78070.21	2.31E+14	27263364
Observations	216	216	212	216

**Source: EViews output, data obtained from SARB, and Thompson's Reuters DataStream**

Table 5.3 shows a positive mean for all the variables with the JSE market capitalization having the highest average value of 2013837. This is followed by the rand/dollar exchange rate of 1090.002, then the CPI with a value of 69.80, and lastly, the yield curve with a mean of 2.20%. The JMCAP recorded the highest median while the yield curve recorded the lowest median value. All variables recorded positive maximum and minimum values with the exception of the yield curve only recording a negative minimum value. In terms of the standard deviation, the JMCAP reported the highest value of 1046036 whereas the yield curve recorded the lowest value of 2.08. All the variables are symmetric due to their skewness values getting closer to zero. In addition, all the variables in Table 5.3 are platykurtic except the yield curve which is leptokurtic with a Kurtosis of  $3.28 > 3$ . The probability value of the Jarque-Bera test statistic indicates that only the yield curve is normally distributed with  $p\text{-value} = 0.355 > 5\%$ . Hence, we fail to reject the null hypothesis in terms of the yield curve. The rest of the variables are not normally distributed because of the  $P\text{-values} < 5\%$ . Hence, the null hypothesis is rejected for the other variables in Table 5.3.

#### **5.4 Correlation Analysis**

Correlation analysis is done to establish the linear relationship between the independent variables (CPI, JMCAP, RETURN, YC, and ZAR\_USD) and the dependent variable (CBCI) for the Panel Regression. The correlation coefficient is measured on a scale of -1 to +1. If the correlation coefficient is closer to +1, it indicates the existence of a strong positive relationship between two differing variables. While -1 shows a strong negative relationship. All the variables share a positive correlation with the CBCI except RETRUN which shares a negative correlation with the CBCI. The correlation coefficient of CPI, JMCAP, and ZAR\_USD with the CBCI indicates a moderate positive correlation as shown in Table 5.4 below. Moreover, the correlation coefficient of YC and CBCI exhibits a weak positive correlation. Whereas RETURN and CBCI have a weak negative correlation. A negative relationship implies when there is an increase in the independent variables, the CBCI decreases. When the independent variables increase, and CBCI increases, then there exists a positive relationship between the differing variables. The correlation analysis among all

the variables can be found in Appendix table 5.1. From Appendix 5.1, it is indicated that RETURN and JSE market capitalization (JMCAP) are negatively correlated.

**Table 5.4: Correlation Analysis of the Independent Variables and the Dependent Variables (CBCI)**

Variables	CBCI
CPI	0.566070
JMCAP	0.522689
RETURN	-0.133945
ZAR_USD	0.503360
YC	0.058982

*Source: EViews output, data obtained from SARB, IRESS, and Thompson's Reuters DataStream*

## 5.5 Unit Root and Cointegration Tests

### 5.5.1 Time Series Unit Root Test

As explained in Chapter 4, conventionally the unit root test is carried out before estimating the model and this is consistent with the methodology for handling time series data. This is essential for examining the stationarity and the order of the integration of the data series when estimating the long and short-run relationship among variables. Therefore, the ADF and PP test results reported in Tables 5.5 and 5.6 below show that only the RETURN of the JSE All-Share Index and the three sub-indices were stationary at levels at 1% level of significance in both Tables and the rest became stationary at first difference at 1% significance level. The Tables confirm that all the variables are at least integrated of order I (0) and I (1) and none at I (2). Hence, we reject the null hypothesis of the presence of a unit root and conclude that there is no unit root in all variables. For this reason, we proceed with the Times Series ARDL cointegration test which will be shown in

section 5.7.1. However, prior to this, we first determine the optimal lag selection which is reported in section 5.6.1.

**Table 5.5: Augmented Dickey-Fuller Test Results**

Variables	Level		First Difference		Conclusion
	Intercept	Intercept & trend	Intercept	Intercept & trend	
R <sub>t1</sub>	-15.26004*** (0.0000)	-15.33000*** (0.0000)	X	X	I (0)
R <sub>t2</sub>	-14.86129*** (0.0000)	-15.01784*** (0.0000)	X	X	I (0)
R <sub>t3</sub>	-14.91626*** (0.0000)	-14.94231*** (0.0000)	X	X	I (0)
R <sub>t4</sub>	-15.00700*** (0.0000)	-14.97385*** (0.0000)	X	X	I (0)
CBCI	-2.780075* (0.0628)	-2.830742 (0.1879)	-10.44373*** (0.0000)	-10.47446*** (0.0000)	I (1)
ZAR_USD	-0.866182 (0.7974)	-3.243252 (0.0789)	-11.47098*** (0.0000)	-11.44985*** (0.0000)	I (1)
YC	-1.550315 (0.5063)	-2.568281 (0.2954)	-10.88128*** (0.0000)	-10.87464*** (0.0000)	I (1)
CPI	2.958142 (1.0000)	-0.403308 (0.9869)	-9.755236*** (0.0000)	-10.37690*** (0.0000)	I (1)
JMCAP	1.967327 (0.9999)	-1.912377 (0.6445)	-15.69242*** (0.0000)	-16.08120*** (0.0000)	I (1)

*Note: level of significance is denoted by 10% level (\*), 5% level (\*\*), and 1% level (\*\*\*)*

*Null Hypothesis: there is a unit root in all cases*

*Source: EViews output, data from IRESS, SARB (2022), and Thompson's Reuters DataStream*

**Table 5.6: Phillips Perron Test Results**

Variables	Level		First Difference		Conclusion
	Intercept	Intercept & trend	Intercept	Intercept & trend	
R <sub>t1</sub>	-15.24886*** (0.0000)	-15.31270*** (0.0000)	X	X	I (0)
R <sub>t2</sub>	-14.86030*** (0.0000)	-15.01784*** (0.0000)	X	X	I (0)
R <sub>t3</sub>	-14.91461*** (0.0000)	-14.93945*** (0.0000)	X	X	I (0)
R <sub>t4</sub>	-15.00131*** (0.0000)	-14.96840*** (0.0000)	X	X	I (0)
CBCI	-2.685059 (0.0783)	-2.705960 (0.2353)	-7.620400*** (0.0000)	-7.626357*** (0.0000)	I (1)
ZAR_USD	-0.691235 (0.8454)	-2.790115 (0.2026)	-11.22365*** (0.0000)	-11.19656*** (0.0000)	I (1)
YC	-1.337543 (0.6121)	-2.400963 (0.3780)	-11.82651*** (0.0000)	-11.80377*** (0.0000)	I (1)
CPI	3.391409 (1.0000)	-0.201203 (0.9927)	-9.691915*** (0.0000)	-10.42706*** (0.0000)	I (1)
JMCAP	2.523039 (1.0000)	-1.792782 (0.7050)	-15.75816*** (0.0000)	-16.29779*** (0.0000)	I (1)

*Note: level of significance is denoted by 10% level (\*), 5% level (\*\*), and 1% level (\*\*\*)*

*Null Hypothesis: there is a unit root in all cases*

*Source: EViews output, data from IRESS, SARB (2022), and Thompson's Reuters DataStream*

### 5.5.2 Panel Unit Root Test

*Table 5.7: First Generation Panel Unit Root Test*

Variables	Test	Level		First Difference		Conclusion
		Intercept	Intercept & Trend	Intercept	Intercept & Trend	
CBCI	LLC	-1.19977 (0.1151)	0.50125 (0.6919)	-10.3413*** (0.0000)	-12.0716*** (0.0000)	I (1)
	IPS	-2.21843** (0.0133)	-1.05957 (0.1447)	-10.8217*** (0.0000)	-10.6893*** (0.0000)	
	ADF Fisher Chi-Square	14.4094** (0.0254)	7.81525 (0.2520)	118.522*** (0.0000)	105.649*** (0.0000)	
CPI	LLC	6.59415 (1.0000)	4.89090 (1.0000)	-7.19321*** (0.0000)	-9.35948*** (0.0000)	I (1)
	IPS	8.22444 (1.0000)	4.23385 (1.0000)	-6.91861*** (0.0000)	-7.46852*** (0.0000)	
	ADF Fisher Chi-Square	4.2E-05 (1.0000)	0.04340 (1.0000)	61.6878*** (0.0000)	62.9077*** (0.0000)	
JMCAP	LLC	6.33244 (1.0000)	-0.55724 (0.2887)	-4.84388*** (0.0000)	-5.72291*** (0.0000)	I (1)
	IPS	7.76211 (1.0000)	1.34332 (0.9104)	-9.35202*** (0.0000)	-10.2840*** (0.0000)	

	ADF Fisher Chi- Square	0.00012 (1.0000)	1.19150 (0.9773)	95.7721*** (0.0000)	99.7134*** (0.0000)	
RETURN	LLC	-6.06691*** (0.0000)	-6.74833*** (0.0000)	X	X	I (0)
	IPS	-9.54221*** (0.0000)	-9.36738*** (0.0000)	X	X	
	ADF Fisher Chi- Square	99.1396*** (0.0000)	87.7397*** (0.0000)	X	X	
YC	LLC	0.58739 (0.7215)	-0.50789 (0.3058)	-2.47474*** (0.00067)	-2.07308** (0.0191)	I (1)
	IPS	0.37437 (0.6459)	-1.08008 (0.1401)	-10.0366*** (0.0000)	-9.74527*** (0.0000)	
	ADF Fisher Chi- Square	2.79803 (0.8337)	7.90757 (0.2450)	106.304*** (0.0000)	92.4366*** (0.0000)	
ZAR_USD	LLC	0.96746 (0.8333)	0.45429 (0.6752)	-9.63815*** (0.0000)	-11.2721*** (0.0000)	I (1)
	IPS	1.72983 (0.9582)	-1.85380** (0.0319)	-9.63074*** (0.0000)	-9.28413*** (0.0000)	
	ADF Fisher	0.88646 (0.9896)	11.8287* (0.0659)	100.109*** (0.0000)	86.1652*** (0.0000)	

	r Chi-Square					
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*Note: level of significance is denoted by 10% level (\*), 5% level (\*\*), and 1% level (\*\*\*)*

*Null Hypothesis: there is a unit root in all cases*

*Source: EViews output, data from IRESS, SARB (2022), and Thompson’s Reuters DataStream*

Notes:

LLC – Levin, Lin & Chu

IPS -Im, Pesaran and Shin

ADF- Augmented Dickey-Fuller Fisher Chi-Square

Table 5.7 presents the first-generation panel unit root test based on the tests in the studies of Levin et al. (2002); Im et al. (2003), and Maddala and Wu (1999)- ADF Fisher Chi-Square. The null hypothesis for the tests is there is a unit root in all the series. According to the LLC test, all the series are statistically significant at 1% level with or without trend in their first difference except RETURN which is significant at 1% at levels (with and without trend). Hence, we reject the null hypothesis and conclude that CBCI, CPI, JMCAP, RETURN, YC, and ZAR\_USD have no unit root. Therefore, they are stationary. Regarding the IPS test results, CBCI was significant at 5% at levels with intercept only but insignificant at levels with intercept and trend. However, the series became stationary at first difference with and without trend at 1% level. In addition, CPI, JMCAP, and YC are all significant at the 1% level in the first difference but insignificant at levels in all levels of significance. Regarding ZAR\_USD, it was insignificant at levels with intercept only but significant at the 5% level with intercept and trend. Moreover, it was statistically significant at the 1% level at the first difference. Hence, we fail to reject the null hypothesis under the IPS test and conclude that all the variables have no unit root. Analyzing the ADF Fisher Chi-Square indicates that CPI, JMCAP, and YC became stationary at the 1% level at the first difference (with and without trend) and RETURN was stationary at 1% level of significance at level (with and without trend). CBCI was significant at 5% level at level with intercept only and insignificant with intercept and trend. In addition, ZAR\_USD was insignificant with intercept only but significant with trend and intercept at the 10% level at the level. However, CBCI and ZAR\_USD all became statistically significant at the 1% level at the first difference.

On balance, the results shown in Table 5.7 above show that all the series (CBCI, CPI, RETURN, YC, JMCAP, and ZAR\_USD) do not have a unit root even though they are stationary at different significance levels. In spite of this fact, the table above shows that for all tested models (with and without trend), all the variables are significant at the 1% level. Hence, we reject the null hypothesis

of the unit root and conclude that the variables are stationary. Therefore, it can be stated that there is cointegration among the tested variables. Again, none of the variables emerge to be I(2). We therefore proceed to conduct a panel cointegration test which agrees with the study by Humpe and McMillan (2020). They suggested that following the panel results of I(0) and I(1), a cointegration test must be done. The results will be presented in Table 5.12 below.

## 5.6 Optimal Lag Selection

### 5.6.1 Time Series Optimal Lag Selection

Table 5.8 presents the outcome of the lag order selection criteria for the sample period based on the Akaike Information Criterion (AIC) due to its lowest value as compared to that of the Schwarz Criterion from the Vector Autoregression estimates. Hence, the optimal lag length as generated by AIC on EViews is 2.

**Table 5.8: Lag length criteria for the sample period in monthly frequency.**

Variables	Lag order selection criteria				
	LR	FPE	AIC	SC	HQ
CBCI	7	2	2	2	2
R <sub>T1</sub>	7	2	2	2	2
CPI	7	2	2	2	2
JMCAP	7	2	2	2	2
YC	7	2	2	2	2
ZAR_USD	7	2	2	2	2

**Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream**

Notes:

LR: sequential modified LR test statistic (each test at 5% level).

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

### 5.6.2 Panel Data Optimal Lag Selection

Table 5.9 presents the outcome of the lag order selection criteria for the sample period based on the Akaike Information Criterion (AIC) due to its lowest value as compared to that of the Schwarz Criterion from the Vector Autoregression estimates. Hence, the optimal lag length as generated by AIC on EViews is 8.

**Table 5.9: Lag length criteria for the Panel data sample period in monthly frequency.**

Variables	Lag order selection criteria				
	LR	FPE	AIC	SC	HQ
CBCI	8	8	8	2	3
CPI	8	8	8	2	3
JMCAP	8	8	8	2	3
RETURN	8	8	8	2	3
YC	8	8	8	2	3
ZAR_USD	8	8	8	2	3

**Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream**

Notes:

LR: sequential modified LR test statistic (each test at 5% level).

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

## 5.7 Times Series ARDL Estimation

### 5.7.1 Times Series Cointegration Test

**Table 5.10: Bound Test Results to Cointegration**

Model	F-statistic	Conclusion	Obs	Specification
1	6.258468***	Cointegrated	209	ARDL (2,2,2,2,2,2)

#### Bounds Critical Values

Significance level	I (0) Bound	I (1) Bound
10%	2.750	3.790
5%	3.120	4.250
1%	3.930	5.230

*Notes: Level of significance: 10% (\*), 5% (\*\*), and 1% (\*\*\*)*

*Null hypothesis: No levels of relationship*

*Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream*

If F-Statistic is greater than the lower and upper bounds statistics for the given confidence interval, then there is cointegration among the variables. Hence, we reject the null hypothesis of no cointegration.

Therefore, the results of the bound test as presented in Table 5.10 indicates that there exists cointegration among the variables. The F-Statistic is greater than the lower and upper bound

critical values, hence confirming the presence of cointegration, given that the confidence interval is 99%.

**Table 5.11: Time Series ARDL Long-Run and Short-Run Results**

Variable	Coefficients	Std. Error	Probability
Long-Run Equation (ECT)			
R <sub>T1</sub>	11.24271***	4.219552	0.0084
CPI	-0.303994***	0.113863	0.0082
JMCAP	-0.372E-07	6.14E-07	0.5458
YC	-0.407379***	0.120143	0.0008
ZAR_USD	-0.000800	0.000826	0.3343
Short-Run Equation			
ECT	-0.141427***	0.022781	0.0000
D(RT1)	-1.622911	1.787221	0.3650
D(CPI)	0.963551**	0.438685	0.0292
D(JMCAP)	1.10E-07	2.65E-06	0.9671
D(YC)	-1.657433***	0.300385	0.0000
D(ZAR_USD)	-0.000967	0.002412	0.6889
C	22.78275***	3.678888	0.0000

**Notes:** Statistically significant at the 10% level (\*), 5% level (\*\*), 1% level (\*\*\*)

**Source:** EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream

This research employed the Bound test approach for time series ARDL cointegration to ascertain the type of relationship between the continuously compounded monthly return of the JSE All-Share Index (R<sub>T1</sub>) and the Coincident Business Cycle Indicator (CBCI) over the period 2005 to 2022. The results for the time series ARDL model are shown in Table 5.11, the included number of observations for the model is 209 with a maximum selected dependent lag of two based on the AIC. The selected model is ARDL (2,2,2,2,2,2). The visual illustration can be found in Appendix

5.5. Deducing from Table 5.11,  $R_{t1}$ , Consumer Price Index (CPI), and Yield Curve are all statistically significant at a 1% level. Nevertheless, the JSE Market Capitalization (JMCAP) and the Rand/Dollar Exchange Rate (ZAR\_USD) are statistically insignificant. The coefficient of all the variables (CPI, JMCAP, YC, and ZAR\_USD) are negative except  $R_{t1}$  which is positive. This implies that a 1% increase in CPI decreases economic activity by 0.30% on average in the long run. If the Yield Curve increases by 1%, it causes a decline in the business cycle by 0.40% on average in the long run. Again, a 1% increase in the  $R_{t1}$ , increases economic activity by 11.24% in the long run. However, since the coefficients of JMCAP and ZAR\_USD are statistically insignificant, it implies that they do not affect economic activity in the long run.

In the short run, the error correction term (ECT) is negative and statistically significant which is consistent with the explanation in Chapter 4. This means that if the variables under consideration digress from equilibrium in the short run, it is highly possible to come back to equilibrium in the long run. Given the coefficient of ECT to be -0.141427 which represents the speed of adjustment, it implies that about 14.14% of the discrepancies in economic activity in the previous year are explained or corrected in the current year. In the short run, CPI is statistically significant at the 5% level whereas the YC is statistically significant at the 1% level. However, the  $R_{t1}$ , YC, and ZAR\_USD are all negative in the short run whilst the CPI and the JMCAP are positive in the short run. This means that a 1% increase in the YC will cause a decline in economic activity by 1.65%. Whereas a percentage increase in the CPI will lead to an increase in economic activity by 0.96% in the short run. However, since the coefficients of  $R_{t1}$ , JMCAP, and ZAR\_USD are statistically insignificant, they do not have an impact on the CBCI in the short run.

In summary, a higher increase in the yield curve leads to a decrease in economic activity in both the long and short run. A higher increase in CPI reduces economic activity in the long run but increases economic activity in the short run. Again, a higher increase in Return on the JSE All-Share Index increases economic activity in the long run but the reverse is not true in the short run (an increase in return on the JSE All-Share Index has no impact on economic activity in the short run). Hence, this change associated with the return on the JSE All-share Index, and the Coincident Business Cycle Indicator is the major finding of Objective One of this research.

## 5.8 Panel ARDL Estimation

### 5.8.1 Panel Cointegration Test

*Table 5.12: Panel Cointegration Test (intercept & trend /intercept)*

<b>1) Pedroni Residual Tests</b>	<b>t-statistic</b>	<b>Probability</b>	<b>Weighted t-statistic</b>	<b>Probability</b>
Panel v-statistic	1.458010*	0.0724	1.458261*	0.0724
Panel rho-statistic	-0.580740	0.2807	-0.580201	0.2809
Panel PP-statistic	-0.739712	0.2297	-0.739143	0.2299
Panel ADF-statistic	-4.714933***	0.0000	-4.717151***	0.0000
Group rho-statistic	-0.008092	0.4968		
Group pp-statistic	-0.387649	0.3491		
Group ADF-statistic	-4.905739***	0.0000		
<b>2) Kao Residual Test</b>				
ADF	-5.584906***	0.0000		

*Notes: Statistically significant at the 10% level (\*), 5% level (\*\*), 1% level (\*\*\*)*

*Null hypothesis: No panel cointegration*

*Source: EViews output, data from SARB, IRESS, and Thompson's Reuters DataStream*

This study relies on the Pedroni and Kao residual panel cointegration tests. The null hypothesis is that there is no cointegration. Therefore, Table 5.12, shows that the Panel  $v$ -statistic, Panel ADF-statistic, and Group ADF-statistic null hypothesis of no cointegration can be rejected. Conversely, we fail to reject the null hypothesis of Panel rho-statistic, Panel PP-statistic, Group rho-statistic, and Group PP-statistic. From the above table, a total of two panel statistics, two weighted statistics are statistically significant at 1% and 10% levels and one Group statistic is statistically significant at 1% level. Hence, the null hypothesis of no cointegration is rejected. Moreover, the Kao residual cointegration test shows that the ADF test is statistically significant at the 1% level, therefore, we reject the null hypothesis. In summary, the two panel cointegration tests indicate that there is a long-run relationship among the variables (CBCI, CPI, JMCAP, YC, RETURN, and ZAR\_USD).

### **5.8.2 Hausman Test Panel ARDL Estimation**

Due to the establishment of cointegration among the variables in Table 5.12, a Hausman (1978) test is conducted to determine the best estimator between the Mean Group (MG) and the Pooled Mean Group (PMG) for this study. The Hausman test shows that the probability value is greater than the 5% significance level. Hence, the null hypothesis of the PMG is efficient. Therefore, we fail to reject the null hypothesis of homogeneity and conclude that the Pooled Mean Group model is ideal for this research. However, detailed explanation of both estimators' results is given below to strengthen the outcome of the Hausman test. The results of the Hausman specification test and the Mean Group are reported in the Appendix (5.2, 5.3, and 5.4).

**Table 5.13: Pooled Mean Group Panel ARDL Estimations of the three Sub-indices of the JSE**

Variable	Coefficients	Std. Error	Probability
Long Run Equation (ECT)			
CPI	1.366391***	0.1286817	0.000
JMCAP	-0.0000137***	2.45e-06	0.000
YC	-0.2783829	0.353249	0.431
RETURN	8.884439	6.600548	0.178
ZAR_USD	-0.0207348***	0.0033621	0.000
Short Run Equation			
ECT	-0.5353897***	0.003501	0.000
D(CPI)	0.1744347***	0.0135109	0.000
D(JMCAP)	3.26e-06***	1.24e-07	0.000
D(YC)	-2.817524***	0.002622	0.000
D(RETURN)	-5.300005***	1.306381	0.000
D(ZAR_USD)	0.0002222***	0.0000737	0.003
C	24.5252***	0.1983892	0.000

*Notes: Statistically significant at the 10% level (\*), 5% level (\*\*), 1% level (\*\*\*)*

*Source: Stata output, data from SARB, IRESS, and Thompson's Reuters DataStream*

The Pooled Mean Group estimator for the panel ARDL cointegration is used for this study to determine the type of relationship among the variables over the period 2005 to 2022. Table 5.13 shows the outcome of the ARDL model with 602 number of observations. The long-run results indicate that the Consumer Price Index (CPI), JSE Market Capitalization (JMCAP), and the Rand/Dollar Exchange Rate (ZAR\_USD) are all statistically significant at the 1% level. Nevertheless, the Yield Curve (YC) and the return of the 3 sub-indices (RETURN) are not significant. The coefficients of the CPI and RETURN are positive whereas the coefficients of the JMCAP, YC, and the ZAR\_USD are negative. A 1% increase in CPI increases economic activity by 1.36% on average in the long run. Whereas a 1% increase in RETURN has no impact on the

business cycle in the long run since its coefficient is statistically insignificant. If the JMCAP increases by 1%, economic activity declines by 0.000137 on average in the long run. Moreover, a 1% increase in the ZAR\_USD reduces economic activity by 0.02 on average in the long run. However, if YC increases by 1%, it has no impact on the business cycle in the long run due to its coefficient being insignificant.

In the short run, the coefficient of the error correction term (ECT) is negative and statistically significant. The ECT shows the speed of adjustments of the variables back to equilibrium in the case of disequilibrium in the short run. The coefficient of the ECT shows that 53.53% of the discrepancies in the previous year's disequilibrium in the business cycle are corrected in the current year. Hence, indicating that the speed of adjustment is very fast. In the short run, all the variables are statistically significant at the 1% level. If CPI increases by 1% in the short run, it has a positive impact on the business cycle by 0.17%. Also, a 1% increase in JMCAP increases economic activity by 0.000003. While a 1% increase in the YC declines economic activity by 2.82%. Moreover, an increase in RETURN of 1% reduces economic activity by 5.3 in the short run. Whilst a 1% increase in the ZAR\_USD, positively affect the business cycle by 0.0002222.

On balance, a higher increase in CPI increases economic activity in both the long and short run. Furthermore, a higher increase in the ZAR\_USD and the JMCAP decreases economic activity in the long run but increases economic activity in the short run. However, a higher increase in the YC and the RETURN have no impact on the business cycle in the long run for the sub-indices but rather affect the business cycle negatively in the short run. Hence, the PMG assumes homogeneity among the sectors.

### **5.8.3 Mean Group Analysis for the combined Selected Sectors and by Individual Sectors**

This section is based on Tables Appendix 5.2 and Appendix 5.3. In as much as the Pooled Mean Group was identified to be best estimator for this panel analysis, we still performed the Mean Group estimation to know the kind of information it carries for comparison with the PMG.

### **5.8.3.1 Analysis for the combined Selected Sectors**

The Mean Group estimation results of the ARDL model shows that, in the long-run, CPI, JMCAP, YC, and ZAR\_USD are all statistically significant at 1% level of significance and RETURN only is significant at 5% significance level. The coefficients of the CPI and RETURN are positive whilst that of the JMCAP, YC, and ZAR\_USD are negative. A 1% increase in CPI, and RETURN increases economic activity by 1.38%, and 11.32% respectively on average in the long run. Whereas a 1% increase in JMCAP, YC, and ZAR\_USD respectively, declines economic activity by 0.0000139, 0.31%, and 0.02% respectively on average in the long run.

In the short run, the coefficient of the error correction term (ECT) is negative and statistically significant. The ECT coefficient indicates that 53.70% of the disequilibrium in the previous year's disequilibrium in the economic activity are corrected in the current year. Hence, showing that the speed of adjustment is rapid. In the short run, all the variables are statistically significant at 1% level except RETURN and ZAR\_USD which are significant at 5%. The coefficients of CPI, JMCAP, and ZAR\_USD are positive whereas that of the YC and RETURN are negative. A 1% increase in CPI, JMCAP, and ZAR\_USD respectively, have a positive impact on economic activity. Whereas a 1% increase in YC and RETURN decreases economic activity by 2.80% and 6.01% respectively in the short run.

### **5.8.3.2 Mean Group Estimation by Sectors**

According to the analysis by individual sectors, only CPI, JMCAP, and ZAR\_USD are statistically significant at 1% level in the long run for all selected sectors. Whilst YC and RETURN are statistically insignificant. For all three sectors in the long run, if there is 1% increase in CPI, it increases economic activity by 1.33% and 1.32% respectively for the case of Industrial Sector whereas it reduces economic activity by 1.50% for the case of Resources Sector. Regarding JMCAP, a 1% increase declines economic activity by the same magnitude (0.0000132) for both Industrial and Financial Sectors and 0.0000153 in the case of Resource Sector. For the ZAR\_USD,

a 1% increase reduces economic activity by almost the same magnitude (0.02%) for all selected sectors. However, if YC and RETURN increases by 1% in the long run, it has no impact on economic activity due to its coefficient being insignificant for all selected sectors.

In the short run, the coefficient of the ECT for all selected sectors are negative and statistically significant. The ECT for all the selected sectors are negative and statistically significant. The ECT shows that 54.36%, 54.27%, and 52.46% of the discrepancies in the previous year's disequilibrium in economic activity are corrected in the current year for all three sectors (Industrials, Financials, Resources) respectively. In the short run, only YC is statistically significant at 1% level in all the three sector cases and RETURN statistically significant at 10% level for only Industrial sector. All other variables are insignificant. Hence, a 1% increase in YC reduces economic activity by 2.77%, 2.78%, and 2.86% for the case of Industrial, Financial, and Resource Sectors respectively.

In summary, the Mean Group analysis does not confirm heterogeneity. Hence, it is assumed that the cross-sections are homogeneous which is in line with the results of the PMG. This required the Hausman Test to be conducted to determine the best estimator for the panel analysis of this Study. The Hausman test showed that the probability value is greater than the 5% significance level. Hence, we fail to reject the null hypothesis of homogeneity and concluded that the Pooled Mean Group model is the best estimator for the panel analysis of this study. Therefore, based on the PMG analysis, the relationship between the selected sectors of the JSE and the business cycle is assumed to be homogeneous. This is a key finding for objective two of this study.

## **5.9 Diagnostic Tests – Time Series**

Although the model suffered from serial correlation and heteroskedasticity, it was corrected by adding the lag of the dependent variable [CBCI (-1)] to the model equation to correct autocorrelation. Whereas in the case of heteroskedasticity, the correction was done based on taking the logarithm of (CBCI, CPI, JMCAP, and ZAR\_USD) and leaving  $R_{t1}$  and YC unlogged because they contain negative values.

### 5.9.1 Serial Correlation

*Table 5.14: Serial Correlation Results*

<b>Serial Correlation LM test</b>	<b>Statistic</b>	<b>Prob. Values</b>
F-Statistic	3.221967	0.0421
Obs* R-Squared	6.926327	0.0313
<b>Correction</b>		
F-Statistic	0.528985	0.5901
Obs* R-Squared	1.175785	0.5555

*Null hypothesis: No serial correlation*

*Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream*

If the P-value of the Obs\* R-Squared  $< 5\%$ , we reject the null hypothesis and conclude that there is a serial correlation in the model.

If the P-value of the Obs\* R-Squared  $> 5\%$ , we fail to reject the null hypothesis and conclude that the model has no serial correlation.

For the autocorrelation correction result in Table 5.14, we fail to reject the null hypothesis and conclude that the model has no serial correlation.

## 5.9.2 Heteroskedasticity

*Table 5.15: Heteroskedasticity Test Results*

<b>Heteroskedasticity Test:</b>	<b>Statistic</b>	<b>Prob. Values</b>
<b>Harvey</b>		
F-Statistic	1.939366	0.0151
Obs* R-Squared	32.43938	0.0195
<b>Correction</b>		
F-Statistic	1.638939	0.0541
Obs* R-Squared	28.08958	0.0607

*Null hypothesis: Homoskedasticity*

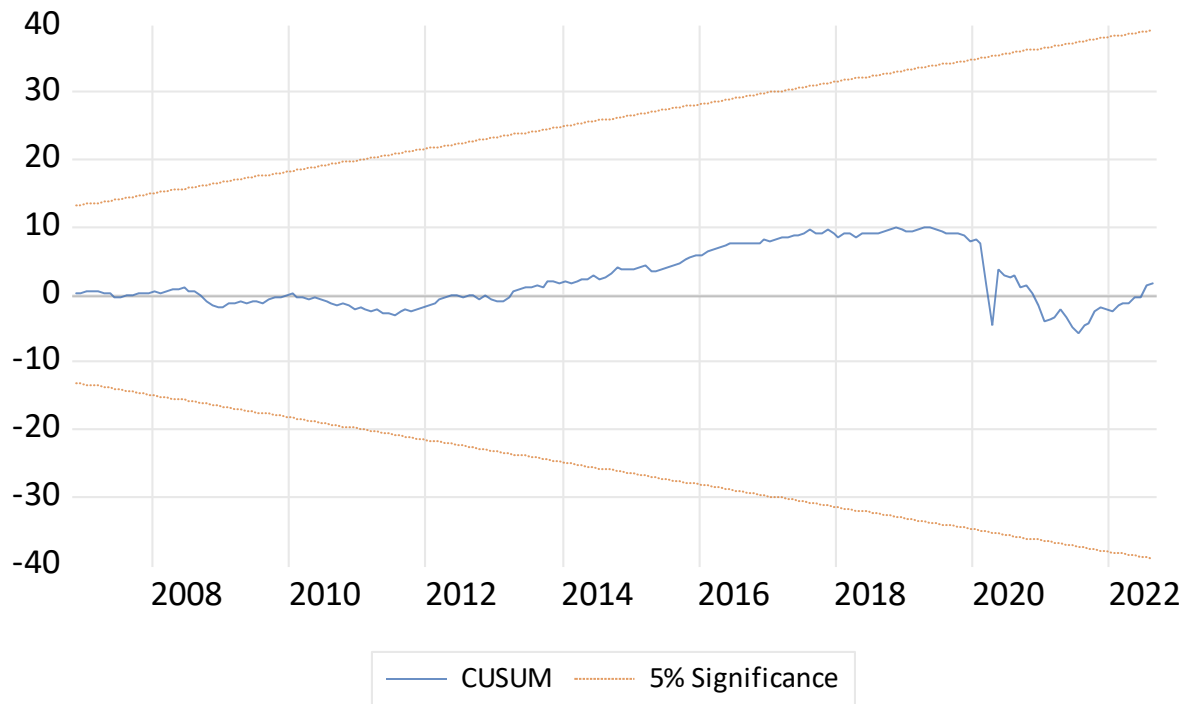
*Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream*

If the P-value of the Obs\* R-Squared  $< 5\%$ , we reject the null hypothesis and conclude that there is heteroskedasticity in the model.

If the P-value of the Obs\* R-Squared  $> 5\%$ , we fail to reject the null hypothesis and conclude that the model is homoscedastic.

For the heteroskedasticity correction result in Table 5.15, we fail to reject the null hypothesis and conclude that the model is homoscedastic.

### 5.9.3 Stability Test



**Figure 5.12: The CUSUM**

**Source: EViews (13) output, data from SARB, IRESS, and Thompson's Reuters DataStream**

Regarding the stability test for the time series model, the CUSUM test judges the model to be stable whereas the CUSUMSQ test judges it to be unstable. Hence, we judge the stability of the time series model based on the CUSUM test only in Figure 5.12 which is justified by the study of Ploberger and Kramer (1990) who conducted the power of the CUSUM and CUSUM of Squares tests in a linear regression model for the identification of a one-time change in the parameters. Their findings showed that the CUSUM test is comparatively more powerful than the CUSUMSQ test hence confirming our preferred choice of stability.

## 5.10 Causality Test

Granger Causality is conducted to delineate whether the continuously compounded monthly return on stock prices of All-Share Price Index ( $R_{t1}$ ) causes or lead the Coincident Business Cycle Indicator (CBCI) of South Africa or the Coincident Business Cycle Indicator causes the continuously compounded monthly return on stock prices of All-Share Price Index. In addition, to know if the three sub-indices of the JSE cause the CBCI or vice versa. The null hypothesis of the Granger causality test for the JSE All-Share Index specifies that  $R_{t1}$  does not granger cause CBCI. Conversely, the alternative hypothesis is that continuously compounded monthly return on stock prices of the All-Share Price Index ( $R_{t1}$ ) does granger cause the Coincident Business Cycle Indicator (CBCI).

The null hypothesis for the Industrial Sector is that  $R_{t2}$  does not granger cause the CBCI. The alternative hypothesis is that the  $R_{t2}$  does granger cause the CBCI.

Furthermore, regarding the Financial Sector, the null hypothesis is that  $R_{t3}$  does not granger cause the CBCI. In contrast, the alternative hypothesis is that the  $R_{t3}$  does granger cause the CBCI.

Finally, regarding the Resource Sector, the null hypothesis is that  $R_{t4}$  does not granger cause the CBCI. The Alternative hypothesis is that the  $R_{t4}$  does granger cause the CBCI.

In general, if the p-value is greater than 5%, we fail to reject the null hypothesis, and if the p-value is lower than 5%, we reject the null hypothesis.

**Table 5.16: Granger Causality test result of Continuously compounded stock returns of JSE All-Share Price Index ( $R_{t1}$ ) and its sub-indices against the Coincident Business Cycle Indicator (CBCI).**

Null Hypothesis:	F-Statistic	Prob.
<b>JSE All-Share</b>		
RT1 does not Granger Cause CBCI	7.77460***	0.0006
CBCI does not Granger Cause RT1	2.22237	0.1109
<b>Industrial Sector</b>		
RT2 does not Granger Cause CBCI	3.28547**	0.0394
CBCI does not Granger Cause RT2	1.18748	0.3071
<b>Financial Sector</b>		
RT3 does not Granger Cause CBCI	16.5507***	2.E-07
CBCI does not Granger Cause RT3	4.50947***	0.0121
<b>Resource Sector</b>		
RT4 does not Granger Cause CBCI	4.73719***	0.0098
CBCI does not Granger Cause RT4	5.04508***	0.0073

*Notes: the levels of statistical significance are: 10% level (\*), 5% level (\*\*), and 1% level (\*\*\*).*

*Source: EViews output, data obtained from IRESS and SARB (2022).*

The result above shows the outcome of the Pairwise Granger Causality Tests between the continuously compounded monthly return on stock prices of the All-Share Price Index ( $R_{t1}$ ) and the Coincident Business Cycle Indicator (CBCI) of South Africa. The results depict that a unidirectional relationship exists between the  $R_{t1}$  and the CBCI. At a 5% level of significance, we reject the null hypothesis and conclude that continuously compounded monthly return on stock prices of the All-Share Price Index leads the Coincident Business Cycle Indicator; but the business cycle does not cause the return on stock prices of the All-Share Price Index. The figure of the F-Statistic also confirms this conclusion.

In the case of the Industrial sector, the result again shows that a unidirectional relationship exists between the continuously compounded monthly return of the Industrial Sector Index ( $R_{t2}$ ) and the Coincident Business Cycle Indicator. At a 5% significance level, we reject the null hypothesis and conclude that the  $R_{t2}$  causes the CBCI, but the reverse is not true. This is further confirmed by its corresponding F-Statistic.

However, when it comes to the Financial and Resource Sectors, the outcome depicts a bidirectional relationship between the continuously compounded monthly return of the Financial Index and Resource Index respectively with the CBCI. At a 5% level of significance, we reject the null

hypotheses of both sectors and conclude that  $R_{t3}$  does granger cause the CBCI, and the reverse is also true. Again,  $R_{t4}$  does granger cause the CBCI, and the CBCI also granger causes the  $R_{t4}$ . These conclusions are affirmed by their corresponding F-Statistics.

## 5.11 Conclusion

This Chapter presented and discussed the empirical results following the empirical goals of this research. The Chapter commenced with the illustration and preliminary observation of the stock market indices against the business cycle indicator in year-on-year percentage growth format, followed by the monthly compounded returns of the indices against the business cycle. This was followed by descriptive statistics of the JSE All-Share Index and its sub-indices, the Coincident Business Cycle Indicator, and the other controlled variables such as the rand/dollar exchange rate, consumer price index, JSE market capitalization, and the yield curve. The Jarque-Bera test statistic p-values showed that all the indices, CBCI, CPI, JMCAP, and ZAR\_USD are not normally distributed except the yield curve which was normally distributed. The correlation analysis indicated that all the variables share a positive correlation with the CBCI except RETURN which shares a negative correlation with the CBCI.

A time series unit root and panel unit root were conducted. The result of the time series revealed that only the return of the JSE All-Share Index and the three sub-indices were stationary at levels at 1% significance level and the rest became stationary at first difference at 1% significance level. The Panel unit root result also revealed that all the variables were stationary at first difference at 1% significant level except RETURN which was stationary at levels at 1% level of significance.

The outcome of the time series cointegration indicates that there exists cointegration among the variables since the F-statistic was greater than the lower and upper bound critical values. The results of the panel cointegration also revealed a cointegration among the variables. Hence confirming a long-run relationship among the panel variables.

A time series ARDL was performed, and the results revealed that the return on JSE All-Share Index affects economic activity positively in the long run but has no impact on economic activity in the

short run. A Hausman test was conducted, and it confirmed that the Pooled Mean Group is efficient and ideal for this study. The Pooled Mean Group Panel ARDL estimation results showed that in the long run, RETURN has no impact on the business cycle but negatively affects the business cycle in the short run.

Lastly, the causality test results showed a unidirectional relationship between the JSE All-Share Index and the Business Cycle Indicator in South Africa which agrees with the expectation of this study. The Industrial Index and the Business Cycle Indicator also showed a unidirectional relationship. However, when it comes to the Financial and Resource Sectors, the outcome depicts a bidirectional relationship between the Financial and Resource Indices with the Business Cycle Indicator.

## **CHAPTER 6**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **6.1 Introduction**

This Chapter aims to summarize and give a conclusion to all the Chapters as a whole. It also aims to give recommendations and limitations of the Study and Areas for further research. The Chapter is outlined as follows: 6.2 presents the summary of conclusions, 6.3 provides recommendations, and the limitations of the Study and Areas for further research is presented in 6.4.

#### **6.2 Summary of Conclusions**

This thesis aims to determine the relationship between the stock market and the business cycle in South Africa as its main goal and its sub-goal to determine if the relationship between the stock market and the business cycle is homogenous across the three selected sectors of the JSE (namely, the Resources, Industrials, and Financials). Following a plethora of studies done on this topic in both advanced and emerging economies, some found evidence of the stock market to be a predictor of the business cycle and others found evidence to be the reversal which makes the outcome inconclusive.

There are underpinning theories developed regarding the stock market and the business cycle. Before the discussion of the theories, a background overview of the Classical Economic theory was given which affirms that some renowned people from academia argue that financial intermediaries actively play a significant role in economic growth by allocating bank credit and savings to entrepreneurs for the most productive investment products. The other School of thought also argues that economic growth drives the financial sector. However, Patrick combined these

differing views and categorized them as supply-leading and demand-following phenomena. The theories of the stock market and the business cycle includes the financial accelerator theory, the wealth effect theory, the traditional valuation model of stock prices, stock prices as aggregators of expectations and the cost of raising equity capital. According to the financial accelerator theory, the wealth effect theory, and the cost of raising equity capital, fluctuations in stock prices cause changes in the real economy. Whereas, according to the traditional valuation model of stock prices and the theory of stock prices as aggregators of expectations, stock prices reflect expectations about the future economy. That is, stock prices depend on the future economy's expectations. As a consequence, expected variations in the real economy cause stock price values. However, it is noteworthy to indicate that whereas the causation in all the theories varies, all the theories suggest that the stock market contains useful information about future economic activity. Hence, it can predict real economic activity and therefore the cyclical pattern of the business cycle.

To empirically analyze this topic and achieve the goals of the study, both time series and panel ARDL cointegration techniques were employed. The data for the research was sourced from SARB, IRESS, and Thompson's Reuters DataStream. The Statistical and Econometrics tools used in achieving the objectives were EViews and Stata. For purposes of illustration and preliminary observation, the stock market indices were first shown against the business cycle indicator in year-on-year percentage growth format, followed by the monthly compounded returns. This was followed by descriptive statistics of the JSE All-Share Index, and its Sub-indices, the Coincident Business Cycle Indicator, and the other controlled variables such as the rand/dollar exchange rate, consumer price index, JSE market capitalization, and the yield curve. The Jarque-Bera test statistic p-values showed that all the Indices, CBCI, CPI, JMCAP, and ZAR\_USD are not normally distributed except the yield curve which was normally distributed. The correlation analysis revealed a positive correlation among all the variables with the CBCI except RETURN which showed a negative correlation with the CBCI.

Unit roots for both time series and panel data were conducted. It was confirmed from the time series unit root results that only the return of the JSE All-Share Index and the three sub-indices were stationary at levels at 1% significance level and the rest became stationary at levels at 1% significance level at first difference. The result of the panel unit root indicated that all the variables

were stationary at first difference at 1% significance level except RETURN which was stationary at levels at 1% level of significance.

Cointegration results of the time series revealed that a long-run relationship existed among the variables. The panel cointegration outcome also confirm that there exists a cointegration among the panel variables.

Both time series and panel ARDL were performed. The results of the time series showed that the return on JSE All-Share Index impacts economic activity in the long run but has no impact on economic activity in the short run. A Hausman test was conducted, and it revealed that the Pooled Mean Group Panel ARDL estimation results confirmed that in the long run, RETURN has no impact on the business cycle but negatively affects the business cycle in the short run.

Finally, the Granger Causality test was done, and the results showed a unidirectional relationship between the JSE All-Share Index and the Business Cycle Indicator in South Africa which agrees with the expectation of this study. The Industrial Index and the Business Cycle Indicator also revealed a unidirectional relationship. However, when it comes to the Financial and Resources Sectors, the result depicts a bidirectional relationship between the Financials and Resources Indices with the Business Cycle Indicator.

In summary, a long run relationship exists between the stock market and the business cycle in South Africa. The findings of this Study support the notion that the stock market predicts the business cycle, and this relationship is assumed to be homogenous across the selected sectors of the JSE (namely, Resources, Financials, and Industrials).

## **6.3 Recommendations**

### **6.3.1 Policy**

According to findings of this study, the JSE All-Share Index affects South African economic activity positively in the long run. This is bolstered by the findings of Naidoo and Moores-Pitt

(2021) which revealed that South Africa's economic growth is extremely sensitive to fluctuations in the South African Stock Market. Therefore, since it is the role of the Central Bank of South Africa (SARB) to ensure financial system stability and sustainable economic growth, the stock market being a leading indicator of the business cycle is actually something different. As a recommendation we need to look at ways for the prediction ability to be used in a business setting.

### **6.3.2 Investors and Portfolio Managers**

Due to the predictive ability of the stock market to the business cycle, Investors and Portfolio Managers can follow trends of the stock market to forecast the directions of the future economy to enable them make informed decisions to hedge their investments. Again, it will help them to diversify their portfolios against huge losses in crises such as the Financial Crisis and the Global Health Crisis (COVID-19). However, there is caveat which is the stock market does not always accurately predict the business cycle (Pearce, 1983). Knowledge of the prediction ability of the stock market requires business leadership to stay informed of stock market trends, adopting long-term perspectives to navigate through market up and downswings, etc.

## **6.4 Limitations of the Study and Areas for Further Research**

### **6.4.1 Limitations of the Study**

There is limited literature on the relationship between the stock market and the business cycle in the context of South Africa. Hence hindering the analogy of the findings of this research to other South African Studies on this topic.

The study only included four Sectors of the JSE (All-Share, Industrials, Financials, and Resources). That is, other Sectors of the JSE were not included to also know the kind of relationship that exist between them and the business cycle.

#### **6.4.2 Areas for Further Research**

Further research could be extension of this study is to examine the relationship between other Sectors of the JSE and the business cycle in South Africa. Another interesting study to extend this paper is to investigate the relationship between the stock market and the business cycle in South Africa, Ghana, U.S.A., U.K., and China.

## REFERENCES

- ABU-BADER, S., and ABU-QARN, A.S., 2007. Financial development and economic growth: The Egyptian experience. *Journal of policy modeling*. Vol. 30, pp.887-898.
- ALAJEKWU, U.B., and ACHUGBU, A., 2011. The role of the stock market development on economic growth in Nigeria: A time series analysis. *African Research Review*. Vol. 5(6), No. 23, pp. 213-230.
- ANDO, A., and MODIGLIANI, F., 1963. The life cycle hypothesis of saving: Aggregate implications and tests. *American Economic Review*. Vol. 55, No.1, pp. 55–84.
- ATJE, R., and JOVANOVIC, B., 1993. Stock markets and development. *European Economic Review*. Vol. 37, pp. 632-640.
- AURET, C., and GOLDING, J., 2012. Stock prices as a leading indicator of economic activity in South Africa: Evidence from the JSE. *Investment Analysts Journal*. Vol. 41, No. 76, pp. 39-50.
- AZAM, M., HASEEB, M., SAMSI, A.B., and RAJI, J.O., 2016. Stock market development and economic growth: Evidence from Asia -4 Countries. *International Journal of Economics and Financial Issues*. Vol. 6, No.3, pp. 1200-1208.
- AZIAKPONO, M.J., and KHOMO, M.M., 2007. Forecasting recession in South Africa: A comparison of the yield curve and other economic indicators. *South African Journal of Economics*. Vol. 75, No. 2, pp. 194 – 212.
- BAHADUR, S., and NEUPANE, S., 2006. Stock market and economic development: A causality test. *The Journal of Nepalese Business Studies*, Vol. 3, No. 1, pp. 36-44.
- BAKER, M., and WURGLER, J., 2000. The equity shares in new issues and aggregate stock returns. *Journal of Finance*, Vol. 55, pp. 2219-2257.
- BARBERIS, N., 2011. Psychology and the financial crisis of 2007-2008.
- BASDAS, U., and SOYTAS, U., 2009. Do stock returns trigger economic growth? Evidence from Turkey.

- BECK, T., and LEVINE, R., 2002. Stock markets, banks, and growth: Panel evidence. *Journal of Banking & Finance*. Vol. 28, pp. 423 – 442.
- BERNANKE, B., and GERTLER, M., 1995. Inside the black box: The credit channel of Monetary Policy Transmission. *Journal of Economic Perspectives*, Vol. 9 (Fall), pp.27-48.
- BERNANKE, B., GERTLER, M., and GILCHRIST, S., 1996. The financial accelerator and the flight to quality. *The Review of Economics and Statistics*, Vol.78, No. 1, pp. 1-15.
- BILS, M.J., 1985. Real wages over the business cycle: Evidence from panel data. *Journal of Political Economy*. Vol. 93, No. 4. pp. 666-689.
- BINSWANGER, M., 2000. Stock returns and real activity: Is there still a connection? *Applied Financial Economics*, Vol. 10, No. 4, pp. 379-387, DOI: 10.1080/09603100050031507
- BOM, S.A., and KHUMALO S.A., 2021. Monetary policy credibility and inflation expectations: Exploring an unconventional channel in South Africa. *African Journal of Business and Economic Research (AJBER)*. Vol. 16, pp. 305 -325.
- BREALEY, R.A., MAYERS, S.C., and ALLEN, F., 2020. Thirteenth Edition. Principles of corporate finance. pp. 85 – 100.
- BROOKS, C.,2014. Introductory econometrics for finance, Third Edition. *Cambridge University Press*.
- BROWN, R.L., DURBIN, J., and EVANS, J.M., 1975. Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, Vol.37, No.2, pp. 149 – 163.
- BURGSTALLER, J., 2002. Are stock returns a leading indicator for real macroeconomic developments? *Johannes Kepler University of Linz*, working paper no. 0207.
- BURMEISTER, E., and WALL, K., 1986. The arbitrage pricing theory and macroeconomic factor measures. *The Financial Review*, 21, pp 1-20

- CASTILLO-PONCE, R.A., RODRIGUEZ-ESPINOSA, M.D.L., and GAYTAN-ALFARO, E.D., 2015. Stock market development and economic performance: The case of Mexico. *Revista de Analisis Economico*. Vol. 30, No. 1, pp. 41-56.
- CHAUVET, M., 1999. Stock market fluctuations and the business cycle.
- CHILISA, B., and KAWULICH, B., 2015. Selecting a research approach: paradigm, methodology, and methods. pp. 51 – 61.
- CHOGA, I., and MUCHAONYERWA, F., 2015. Business cycles and stock market performance in South Africa. *Corporate Ownership & Control*. Vol. 12, No. 3, pp. 84-93.
- CHOI, I., 2002. Combination unit root tests for cross-sectionally correlated panels. *Mimeo, Hong Kong University of Science and Technology*.
- CHOUDHRY, T., PAPADIMITRIOU, F.I., and SHABI, S., 2016. Stock market volatility and business cycle: Evidence from linear and nonlinear causality tests. *Journal of Banking and Finance*. Vol. 66, pp. 89 – 101.
- COMINCIOLI, B., 1996. The stock market as a leading indicator: An application of Granger-Causality. *The University Avenue Undergraduate Journal of Economics*. Vol. 1: Iss. 1, Article 1.
- DARBY, MICHAEL, R., 1987. Wealth effect. *The New Palgrave: A Dictionary of Economics*.
- DEBONDT, WERNER, F. M. and THALER, R., 1985. Does the stock market overreact? *Journal of Finance*, pp.793-805.
- DEVEREUX, M. B., and SMITH, G.W., 1994. International risk sharing and economic growth. *International Economic Review*. Vol. 35, pp. 535-550.
- ENGLE, R., and GRANGER, C.W.J., 1987. Cointegration and error correction: Representation, Estimation, and Testing. *Econometrica*. Vol.55, pp. 251-276.
- FAZZARI, S., HUBBARD, R., and PETERSON, B., 1988. Financial constraints and corporate investment. *Brookings Papers on Economic Activity*, pp.141-195.

- FERREIRA, T.R.T., 2018. Stock market cross-sectional skewness and business cycle fluctuations. *Board of Governors of the Federal Reserve System*.
- FISCHER, F., 1998. Beyond Empiricism: Policy inquiry in postpositivist perspective. *Policy Studies Journal*, Vol. 26, No.1 pp. 129-146.
- FORESTI, P., 2007. Testing for granger causality between stock prices and economic growth.
- FOURIE, F., and BURGER, P., 2017. How to think and reason in macroeconomics. Cape Town: Juta and Company.
- FUNKE, N., 2004. Is there a stock market wealth effect in emerging markets? *International Monetary Fund*, doi: 10.1016/j.econlet.2003.12.002.
- GORDON, M.J., 1959. Dividends, earnings, and stock prices. *Review of Economics and Statistics*, 41, pp.99-105.
- GRANGER, C.W.J., 1981. Some properties of time series data and their use in econometric model specification. *Journal of Econometrics*. Vol.28, pp. 121-130.
- GRANGER, C.W.J., 1969. Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*. Vol. 37, No. 3, pp. 424-438. Doi:10.2307/1912791. JSTOR 1912791.
- GREENWOOD, J., and JOVANOVIC, B., 1990. Financial development, growth, and the distribution of income. *Journal of Political Economy*. Vol. 98, No. 5, pp.1076-1107. <https://doi.org/10.1086/261720>.
- GUBA, E., 1990. The alternative paradigm dialogs. In the paradigm dialog In: Guba E.ed., Sage, Newbury Park, California, pp. 17 – 27.
- GUJARATI, D.N., and PORTER, D.C., 2009. Basic Econometrics, 5<sup>th</sup> Edition. ISBN: 978-0-07-337577-9.
- GUO, H., 2002. Why are stock market returns correlated with future economic activities? *The Federal Reserve Bank of St. Louis*. Pp. 19-34.

- HACKLAND, C., 2016. The impact of selected macroeconomic variables on sectors of the JSE. *Gordon Institute of Business Science, University of Pretoria.*
- HADRI, K., 2000. Testing for unit roots in heterogeneous panel data. *Econometrics Journal*. Vol. 3, No. 148-161.
- HARVEY, C.R., 1989. Forecasts of economic growth from the bond and stock markets. *Financial Analysts Journal*, September/October, pp. 38-45.
- HAUSMAN, J.A., 1978. Specification tests in econometrics. *Journal of Econometric Society*. Vol. 46, No. 6, pp. 1251-1271.
- HSU, C., WU, J., and YAU, R., 2011. Foreign direct investment and business cycle co-movements: The panel data evidence. *Journal of Macroeconomics*. Vol. 33. pp. 770-783.
- HUMPE, A., and MCMILLAN, D.G., 2020. Macroeconomic variables and long-term stock market performance. A panel ARDL Cointegration approach for G7 Countries. *Cogent Economics and Finance.*, 8:1, 1816257, DOI: 10.1080/23322039.2020.1816257.
- HURLIN, C., and MIGNON, V., 2007. Second-generation panel unit root tests. No. 1-24.
- IHENDINIHU, J.U., and ONWUCHEKWA, J.C., 2011. Stock market performance and economic growth in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences*, Vol 3, No. 6, pp. 971 -977.
- IKOKU, A.E., 2010. Is the stock market a leading indicator of economic activity in Nigeria? *CBN Journal of Applied Statistics*, Vol.1, No. 1, pp. 17-22.
- IM, K., PESARAN, H., and SHIN, Y., 2003. Testing for unit roots in heterogenous panels. *Journal of Econometrics*. Vol. 115, pp. 53-74.
- INDUSTRY CLASSIFICATION BENCHMARK., 2009. Industry Classification Benchmark (ICB): changes effective 30 November 2009. [Online] Available: [https://www.jse.co.za/content/JSEIndexClassificationandCodesItems/Industry%20Classification%20Benchmark%20\(ICB\).Pdf](https://www.jse.co.za/content/JSEIndexClassificationandCodesItems/Industry%20Classification%20Benchmark%20(ICB).Pdf) [Accessed 30 March 2019].

- JANOR, H., HALID, N., and RAHMAN, A., 2005. Stock market and economic activity in Malaysia. *Investment Management and Financial Innovations*.
- JARQUE, C.M., and BERA, A.K., 1987. A test for normality of observations and regression residuals. *International Statistical Review*. Vol. 55, No. 2, pp. 163 – 172.
- KENNEDY, P.E., and PRAG, J., 2017. Macroeconomic Essentials, fourth edition: Understanding economics in the news, pp. 59.
- KEYNES, J.M., 1936. The general theory of employment, interest, and money. *London Macmillan*. pp. 161- 162.
- KHOMO, M.M., and AZIAKPONO, M.J., 2020. The behavior of the real effective exchange rate of South Africa: Is there a misalignment? *Cogent Economics and Finance*. Vol. 8, No.1, pp. 1-16.
- KIVUNJA, C., and KUYINI, A.B., 2017. Understanding and applying research paradigms in educational contexts. *International Journal of Higher Education*, Vol. 6, No. 5 pp. 26-41.
- LAHURA, E., and VEGA, M., 2014. Stock market development and real economic activity in Peru. *Banco Central de Reserva del Peru. Serie de Documentos de Trabajo. Working Paper Series*. December
- LEIGH, L., 1997. Stock market equilibrium and macroeconomic fundamentals. *IMF Working Paper WP/97/15*.
- LEVIN, A., and LIN, C.F., 1992. Unit root test in panel data: Asymptotic and finite sample properties. *University of California at San Diego*. Discussion paper 92-93.
- LEVIN, A., and LIN, C.F., 1993. Unit root test in panel data: New results. *University of California at San Diego*. Discussion paper 93-56.
- LEVIN, A., LIN, C.F., and CHU, C.S.J., 2002. Unit root test in panel data: Asymptotic and finite sample properties. *Journal of Econometrics*. Vol. 108, No. 1-24.
- LEVINE, R., and ZERVOS, S., 1996. Stock market development and long-run growth. *The World Bank Economic Review*, Vol. 10, No. 2, pp 323-339.

- LI, X., LI, Y., and BAI, L., 2019. Stock market cycle and business cycle in China: Evidence from a bootstrap rolling window approach. *Review of Economics and Finance*.
- MADDALA, G.S., and WU, S., 1999. A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, special issue, No. 631-652.
- MAIO, P. and PHILIP, D., 2013. Does the stock market lead the economy? *Durham University Working Paper*.
- MAPANDA, T. C., KEETON, G., and KHUMALO, A., 2019. Analysis of the relationship between changes in macroeconomic variables and various sector price indices of JSE. *Department of Economics and Economic History, Rhodes University*.
- MAURO, P., 2003. Stock returns and output growth in emerging and advanced economies. *Journal of Development Economics*. Vol.71, No.1, pp. 129-153.
- MAYER, C., 1988. New issues in corporate finance. *European Economic Review*, 32:1167-88.
- MCKINNON, R.I., 1973. Money and capital in economic development. The Brooking Institution.
- MEYER, D.F., and HABANABAKIZE, T., 2018. Analysis of relationships and causality between the consumer price index (CPI), the producer price index (PPI), and the purchasing manager's index (PMI) in South Africa. *Journal of Economics and Behavioral Studies*. Vol. 10, No.6, pp. 25 – 32.
- MOHR, P., 2001. Economic Indicators. Pretoria: University Press.
- MOOLMAN, E., 2002. The term structure as a predictor of recessions. *Journal for Studies in Economics and Econometrics*. Vol. 26, No. 3, pp. 43 -51
- MOOLMAN, E., and JORDAAN, J., 2005. Can leading business cycle indicators predict the direction of the South African Commercial Share Price Index, *South African Journal of Economics*, Vol. 73, No. 1, pp. 68-78.
- MUN, H.W., SIONG, E. C., and THING, T.C., 2008. Stock market and economic growth in Malaysia: Causality Test. *Asian Social Science*. Vol. 4, No. 4, pp. 86-92.

- NAIDOO, T., and MOORES-PITT, P.B.D., 2021. An analysis of share prices and economic activity in South Africa: a NARDL approach. Unpublished Master's Thesis, University of Kwazulu-Natal.
- NDAKO, U.B., 2010. Financial development, economic growth, and stock market volatility: Evidence from Nigeria and South Africa. *Department of Economics, University of Leicester*.
- NEL, H., 1996. The term structure of interest rates and economic activity in South Africa. *The South African Journal of Economics*. Vol. 26, No. 2, pp. 161 – 174.
- NGUYEN, H.T., and PHAM, H.V.D., 2014. Relationship between stock market development and economic growth: Evidence from Canada and Australia. *International Journal of Economics and Finance*. Vol. 6, No. 7.
- NISHAT, M., and SHAHEEN, R., 2004. Macroeconomic factors and the Pakistani equity market. *Pakistan Development Review*. Vol. 43, No. 4, pp. 619-637.
- NKORO, E., and UKO, A.K., 2016. Autoregressive Distributed Lag (ARDL) cointegration techniques: Application and interpretation. *Journal of Statistical and Econometric Methods*. Vol.5, No.4, pp. 63-91.
- NURUDEEN, A., 2009. Does stock market development raise economic growth? Evidence from Nigeria. *The Review of Finance and Banking*.
- OTOO, M.W., 1999. Consumer sentiment and the stock market. *Board of Governors of the Federal Reserve System Paper*.
- PAIELLA, M., 2007. Does wealth affect consumption? Evidence for Italy. *Journal of Macroeconomics*, 29, pp. 189-205.
- PAIELLA, M., 2009. The stock market, housing and consumer spending: A survey of the evidence on wealth effects. *Journal of Economics Surveys*. Vol. 23, No. 5, pp. 947-973.
- PANHWAR, A.H., ANSARI, S., and SHAH, A.A., 2017. Post-positivism: An effective paradigm for social and educational research. *International Research Journal of Arts and Humanities*, Vol. 45, No. 45, pp. 253 – 259.

- PARAMATI, S.R., and GUPTA, R., 2011. An empirical analysis of stock market performance and economic growth: Evidence from India. *International Research Journal of Finance and Economics*. Issue 73.
- PATRICK, H., 1966. Financial development and economic growth in underdeveloped Countries: Economic development cultural change, Vol.14, No.2, pp. 174-189.
- PEARCE, D.K., 1983. Stock prices and the economy. *Federal Reserve Bank of Kansas City Economic Review*, November: 7-22.
- PEARCE, D.K., and ROLEY, V.V., 1985. Stock prices and economic news. *Journal of Business*, January, pp. 49-67.
- PEDRONI, P., 1999. Critical values for co-integration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics, special issue*. pp. 653-670.
- PHILLIPS, D.C., and BURBULES, N.C., 2000. Post positivism and educational research. Lanham, MD: Rowman and Littlefield.
- PILINKUS, D., 2009. Stock market and macroeconomic variables: Evidence from Lithuania. *Economics and Management*, Vol. 14, pp. 884-891.
- PLOBERGER, W., and KRAMER, W., 1990. The local power of the CUSUM and CUSUM of Squares tests. *Econometric Theory*. Cambridge University Press. Vol. 6, No. 3, pp. 335-347.
- POTERBA, J.M., 2000. Stock market wealth and consumption. *Journal of Economic Perspectives*, Vol. 14, No. 2, pp. 99-118.
- RAFINDADI, A. A., and YOSUF, Z., 2013. An application of Panel ARDL in analyzing the dynamics of financial development and economic growth in 38 Sub-Saharan African continents. Vol. 2.
- RITTER, J.R., 1991. The long-run performance of initial public offerings. *Journal of Finance*, Vol. 46, pp. 1-46.
- ROBINSON, J., 1952. The generalization of the general theory. In: The rate of interest and other essays, MacMillan.

- ROUSSEAU, P.L., and WACHTEL, P., 1998. Financial intermediation and economic performance: Historical evidence from five industrialized countries. Vol. 30, No. 4, pp. 657 -678.
- SAYED, A., and PAGE, D., 2016. The stock market as a leading indicator of economic activity: Times-Series evidence from South Africa. Unpublished Master's Thesis, University of Witwatersrand.
- SCHUMPETER, J., 1934. The theory of economic development. *Harvard University Press*.
- SHAW, E.S., 1973. Financial deepening in economic development. *Oxford University Press*.
- SMIT, D.J., and VAN DER WALT, B.E., 1970. Business cycles in South Africa during the post-war period, 1946 to 1968. Quarterly Bulletin, September. Pretoria: South African Reserve Bank.
- STOCK, J.H., and WATSON M.W., 2003a. Forecasting output and inflation: The role of asset prices. *Journal of Economic Literature*, Vol. 41, No.3, pp. 788-829.
- STOCK, J.H., and WATSON M.W., 2003b. How did leading indicator forecasts do during the 2001 recession? *National Bureau of Economic Research Working Paper*.
- VENTER, J.C., "n.d". A brief history of business cycle analysis in South Africa.
- WANG, B., and AJIT, D., 2013. Stock market and economic growth in China. Unpublished manuscript, University of Northern British Columbia, Canada.

## APPENDIX

### Appendix 4.1: Data, Source and Codes

Variables	Codes	Sources
CBCI	KBP7091N	SARB
ALSI	J203	IRESS
IND	J257	IRESS
FIN	J580	IRESS
RES	J258	IRESS
CPI	KBP7170N	SARB
JMCAP	KBP2025M	SARB
ZAR_USD	KBP5339M	SARB
BOND (10 YEARS)	SACAP10G	Thompsons DataStream Reuter's
T-BILL	SATBL3M	Thompsons DataStream Reuter's

*Source: Compiled by Authors*

### Appendix 5.1: Correlation Analysis

	CBCI	CPI	JMCAP	RETURN	YC	ZAR_USD
CBCI	1.000000	0.566070	0.522689	-0.133945	0.058982	0.503360
CPI	0.566070	1.000000	0.986899	-0.064017	0.720132	0.930817
JMCAP	0.522689	0.986899	1.000000	-0.042093	0.754231	0.914936
RETURN	-0.133945	-0.064017	-0.042093	1.000000	0.059034	-0.067392
YC	0.058982	0.720132	0.754231	0.059034	1.000000	0.594756
ZAR_USD	0.503360	0.930817	0.914936	-0.067392	0.594756	1.000000

## Appendix 5.2: Mean Group Estimation

Variable	Coefficients	Std. Error	Probability
Long Run Equation (ECT)			
CPI	1.387334	0.0590389	0.000
JMCAP	-0.0000139	7.02e-07	0.000
YC	-0.3126429	0.0575352	0.000
RETURN	11.32956	4.831655	0.019
ZAR_USD	-0.0208136	0.001055	0.000
Short Run Equation			
ECT	-0.5370416	0.0062019	0.000
D(CPI)	0.1662942	0.0124041	0.000
D(JMCAP)	3.33e-06	1.94e-07	0.000
D(YC)	-2.808354	0.0273114	0.000
D(RETURN)	-6.015683	2.377518	0.011
D(ZAR_USD)	0.000249	0.0001178	0.034
C	24.16963	1.192147	0.000

*Notes: Statistically significant at the 10% level (\*), 5% level (\*\*), 1% level (\*\*\*)*

*Source: Stata output, data from SARB, IRESS, and Thompson's Reuters DataStream*

## Appendix 5.3: Mean Group Estimation by Sectors

Industrial Sector			
Variable	Coefficients	Std. Error	Probability
Long Run Equation (ECT)			
CPI	1.335569	0.2122494	0.000
JMCAP	-0.0000132	4.17e-06	0.002
YC	-0.3847668	0.6097021	0.528
RETURN	16.82587	15.46804	0.277

ZAR_USD	-0.0201195	0.0057494	0.000
Short Run Equation			
ECT	-0.5436955	0.0647225	0.000
D(CPI)	0.157292	0.1448771	0.278
D(JMCAP)	3.34e-06	2.26e-06	0.139
D(YC)	-2.776345	0.267524	0.000
D(RETURN)	-10.06858	6.033308	0.095
D(ZAR_USD)	0.000276	0.0024264	0.909
C	25.26686	4.733184	0.000
<b>Financial Sector</b>			
Variable	Coefficients	Std. Error	Probability
Long Run Equation (ECT)			
CPI	1.321309	0.2123846	0.000
JMCAP	-0.0000132	4.19e-06	0.002
YC	-0.3542308	0.6096232	0.561
RETURN	15.46455	11.82498	0.191
ZAR_USD	-0.0194349	0.0057647	0.001
Short Run Equation			
ECT	-0.5427804	0.0647927	0.000
D(CPI)	0.1507751	0.1473247	0.306
D(JMCAP)	3.66e-06	2.32e-06	0.115
D(YC)	-2.786026	0.2680078	0.000
D(RETURN)	-6.142909	4.717975	0.193
D(ZAR_USD)	0.0000329	0.0024349	0.989
C	25.45424	4.736247	0.000
<b>Resources Sector</b>			
Variable	Coefficients	Std. Error	Probability
Long Run Equation (ECT)			
CPI	-1.505125	0.2807392	0.000

JMCAP	-0.0000153	5.04e-06	0.002
YC	-0.1989312	0.674478	0.768
RETURN	1.698268	9.996365	0.865
ZAR_USD	-0.0228862	0.0065737	0.000
Short Run Equation			
ECT	-0.5246491	0.0693156	0.000
D(CPI)	0.1908155	0.1631043	0.242
D(JMCAP)	2.98e-06	2.39e-06	0.213
D(YC)	-2.86269	0.28291	0.000
D(RETURN)	-1.835563	3.695668	0.619
D(ZAR_USD)	0.0004382	0.0025709	0.865
C	21.7878	5.823554	0.000

*Notes: Statistically significant at the 10% level (\*), 5% level (\*\*), 1% level (\*\*\*)*

*Source: Stata output, data from SARB, IRESS, and Thompson's Reuters DataStream*

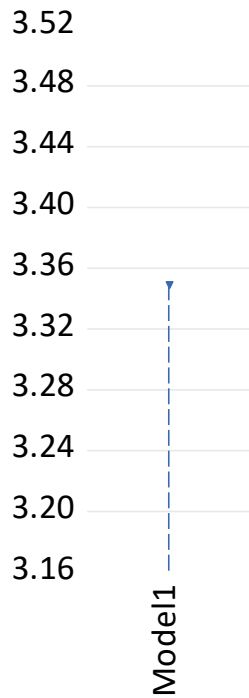
#### Appendix 5.4: Hausman Test

<b>Hausman Test (pmg mg, sigma more)</b>
chi2(4) = 0.59
Prob>chi2 = 0.9637

*Source: Stata output, data from SARB, IRESS, and Thompson's Reuters DataStream*

## Appendix 5.5: Times Series ARDL Model

### Akaike Information Criteria



Model1: ARDL(2, 2, 2, 2, 2, 2)

*Source: EViews output, data from SARB, IRESS, and Thompson's Reuters DataStream*