# BUSINESS CYCLES AND STOCK MARKET PERFORMANCE IN SOUTH AFRICA

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**Abstract**

The stock market is an important indicator of an economy's financial health. It checks the mood of investors in a country. Stock market performance is a vital component of business cycle growth. Thus, this study investigates the relationship between stock market performance and business cycles in South Africa for the period 2002-2009 using monthly data. This is done by constructing a Vector Error Correction Model (VECM). The study specifies a business cycle model with the business cycle coincident indicator of South Africa being the independent variable explained by the All Share Price index (ALSI), Real Effective Exchange Rate (REER), Money Supply (M1), Inflation (CPIX) and the Prime Overdraft Rate (POR). The ALSI represents stock market performance whilst the rest of the variables are to enhance model specification. The study found a positive association between stock market performance and business cycles and this match with most of the results from the empirical literature provided.

**Keywords:** Business Cycle, Stock Market, Vector Error Correction South Africa

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## 1 Introduction

Trends in business cycles and stock market performance have long been a subject of immense interest by researchers and the debate has generated many, but, diverse conclusions. This study, in turn, seeks to investigate the dynamic relationship between stock market performance and business cycles in South Africa. The rationale behind the selection of this topic is that, business cycles of South Africa have undergone numerous fluctuations, in the recent past, from booms to busts, whilst, on several occasions, stock markets were bullish or bearish. The lack of stability in the business cycles makes it necessary to study the relationships between stock performance and economic activity, as this influences investors and other stakeholders of the economy.

Generally, business cycles refer to economy-wide fluctuations in production or economic activity over several months or years. These fluctuations occur around a long-term growth trend, and typically involve shifts over time, between periods of relatively rapid economic growth (expansion or boom), and periods of relative stagnation or decline (contraction or recession).

Business cycle indicators are key measures of turning points in the economic cycles of South Africa. These business cycle indicators are classified as; coincident, leading and lagging. Firstly, the coincident business cycle indicator is a combination of constituents that move in the same direction with economic cycles. During the late 1990s the coincident indicator went into a recession due to a collapse of the financial sector in Asia. The Asian crisis affected businesses in South Africa (Pretorius & Venter, 2004). However, the composite indicator recovered in 2000 and it persisted with an upward trend until 2007 (DTI, 2010). The rising trend was due to various economic reforms, for instance, the various charters that were introduced in several sectors of the economy between 2000 and 2005 (SouthAfrica.info, 2009). Although there was an upward trend until 2007, once again, the composite indicator went into a recession in 2008 when the global recession emerged as a result of the crash of the housing market of the United States of America (USA) (Statistics South Africa, 2010).

The constituents of the composite indicator are: new vehicle sales, retail sales, wholesale sales, manufacturing volume and employment. These indices rose from 2000 to 2007 except for new vehicle sales index, which fell in 2006 (NAAMSA, 2010). Manufacturing had the largest share of the production sector between 2000 and 2009. Capacity utilization in manufacturing was over 80% between 2000 and 2009

(Statistics South Africa, 2005, 2006, & 2007). The retail sector experienced growth from the early to mid-2006. However, retail sales were almost constant between year 2007 and 2008 due to recession. South African retail had a fairly stronger growth in 2009 compared to the previous year (Statistics South Africa, 2010).

Wholesale sales also increased from year 2002 to 2007 and dropped in 2008. Wholesale trade sales for July 2009 fell by 13.8% year on year. The fall was due to low confidence in the economy after the world economic recession of 2008/09. Employment had been a major challenge to the South African economy due to lacking education and high population growth. In any case, from 2000 to 2007, employment in non-agriculture sector rose steadily (Statistics South Africa, 2010). However, during the economic recession of 2008/09 the economy of South Africa lost approximately a million jobs. The National Association of Automobile Manufacturers of South Africa (NAAMSA) releases statistics for new vehicle sales. Statistics for new vehicle sales also show an upward trend from 2000 to a peak in 2006. However, there was a decline of sales from the end of 2006 to 2008/09 owing to global economic recession (NAAMSA, 2010).

Secondly, the leading business cycle indicator of South Africa comprises of a series of constituents that forecast and signal the future shape of business cycle turning points. The leading indicator is compiled by combining prices of all shares, real money supply (M1), labour productivity in manufacturing, job advertisements in the *Sunday Times* newspaper, commodity prices in US dollars for a basket of South Africa's export commodities and opinion survey of business confidence among other components. The leading indicator has been rising since 2000 until it started to fall in 2007, signaling the beginning of the 2008/09 economic recession.

According to the data released by the South African reserve bank (SARB), the money supply M1 has been increasing since 2000. M1 increased by 148.07% between January 2000 and December 2009 due to growth in economic activity in the country (SARB, 2010). The Real Effective Exchange rate (REER) has been fluctuating since 2002, with the lowest rate of 74.68 reached in January 2002 and a highest rate of 119.67 in February 2006. The December 2009 REER stood at 108.13 (SARB, 2010). The variations in the REER have been a result of a number of economic and trade relations changes between South Africa and its main trading partners through the period 2000-2009.

Lastly, the lagging business cycle indicator comprises of constituents that change after the business cycles have already shown a certain trend. The constituents of the lagging business cycle index of South Africa are inflation, inventories and inventories to sales ratio, unit labour costs, short-term and long term interest rates, commercial and industrial loans and consumer installment credit among others (Venter, 2004). These will be explained later, however, the lagging business cycle indicator has been on an upward trend from 2000 to 2009. Inflation and interest rates will be assessed in more detail. The SARB pursues inflation targeting to achieve a rate of between 3% and 6%. The year on inflation figures released by SARB were 2000 (5.4%), 2001 (5.8%), 2002 (9.1%), 2003 (5.8%), 2004 (1.4%), 2005 (3.4%), 2006 (4.6%), 2007 (7.2%), 2008 (11.5%) and 2009 (7.2%) (SARB, 2010).

The prime interest rate is the rate commercial banks apply when issuing loans to the general public. The prime overdraft rate varies with time and generally in connection with the REPO rate. The REPO rate is the rate at which the commercial banks can borrow money from the SARB. The average annual prime rates for South Africa were 15.75% (2002), 14.96% (2003), 11.29% (2004), 10.63% (2005), 11.17% (2006), 13.17% (2007), 15.13% (2008) and 11.71% (2009) (SARB, 2010). The price of borrowing from commercial banks has been lower in 2004, 2005, 2006 and 2009 compared to the rest of the years. In 2008 due to the economic recession the prime rate reached 15.5% in July. Nonetheless, the prime rate improved from May 2009 at 11% and then 10.5% in August 2009 (SARB, 2010).

Investors and various other stakeholders of the South African business environment may not accomplish valuable decisions by focusing on business cycles trend analysis alone. It is apparent, for investors to find out how the stock markets are performing, since this is one of the important sources of finance to the businesses. By taking into account business cycles fluctuations and stock market variation, investors have high chances to come up with lucrative business decisions, hence, the inclusion of stock market performance in the study.

Stock market performance is crucial to businesses in South Africa. Studying stock market performance requires assessing constituents such as market capitalization and the price index among others. It is therefore important to examine the Johannesburg Stock Exchange (JSE). The JSE facilitates trades in listed shares of companies. Domestic market capitalisation of the JSE has been rising from year 2001 to 2007 and it fell sharply from over US$800b in 2007 to just below US$500b in 2008 (WFE, 2009). The rising trend was a result of increased purchase of shares and competitive share prices. However, at the end of 2007, the market cap fell due to falling share prices and this was a signal of a recession. The share prices started to rise in the last quarter of 2009 and this was a sign that the world recession was easing. The All Share Price Index (ALSI) is an equity index which mirrors the performance of the South African ordinary share market. A large quantity of the number of securities listed on the JSE is incorporated into the index. The ALSI is benchmarked against global methodologies

and is basically an indicator of the general mood of the market.

Although stock markets globally faced extraordinary tests in the year 2008, the JSE performed reasonably well (JSE, 2010). The JSE equities division improved trading systems by adopting and applying the version used by the London Stock exchange (LSE). In 2008 revenues from operations increased by 22% compared to year 2007. Profit before net financing rose by 41% while operation costs increased by 1% in year 2008 (Louber, 2009). The number of share trades in the first quarter of 2009 increased by 24% relative to the first quarter of 2008. During 2009 the JSE showed a supple performance as shown by rising trade volumes in the cash equity markets and strong performance from other divisions. Despite the harsh economic environment in 2009, revenue from the JSE rose by 8% compared to year 2008. The rise in the revenue has been due to strategic initiative such as the Africa Board amongst other things (Loubser, 2010). However, in 2009, JSE's equity derivatives fell because of investor uncertainty after the global financial crisis. Investor confidence however started to show signs of revival in November 2009.

The economy of South Africa is the biggest in Africa, but still, theoretical and empirical research have given less emphasis on the nature of the relationship between stock market performance and business cycles. This presumed relationship has generated a lot of controversy in the field of economics and further research needs to be carried out in order to understand this link. This is due to the assumption that, most investors are dependent on the performance of the stock market for decision making. Furthermore, business cycles depend directly on the performance of businesses in the economy, whilst, business performance is dependent on the decisions made by investors when faced with different opportunities and threats. The relationships that exist between stock performance and business cycles affects the large business population who need to understand this link in order to make decisions that will enable them to get a desirable return from their investments. The major research question, therefore is, what is the nature of the relationship between stock performance and business cycles?

## 2 Literature review

The theoretical section conducts a review of the literature on the Austrian Business Cycle (ABC) theory, Elliot Wave Principle and the Efficient Market Hypothesis. The ABC theory was developed by Mises (1912) and supported by Mises (1949), Hayek (1935) and various other proponents such as Garrison (1997, 2001). The general thrust of the theory is its use of conservative macroeconomic variables of savings, money supply, interest rates and investment (Mises, 1912). The fundamental element of the ABC theory is that, the monetary authority's ability to expand money supply creates credit for lending. This growth of money supply will therefore have effect on interest rates, savings and investment which causes business cycles. Mises (1912) revealed that the most essential determinant of business cycle is the impact of monetary expansion which in turn lowers interest rates. When money is available in the economy it becomes cheaper for investors to borrow. Investors will therefore use the opportunity to expand their investments and choose to invest in long production processes thereby shifting consumption from present to the future. This will result in business cycle growth and booms.

Elliott (1871-1948) developed the Elliot wave theory in the late 1920s into the 1930s and published it in 1938 (Elliott, 1938). The theory is an in depth explanation of how financial markets are traded in recurring cycles. Elliot reiterated that financial markets cycles resulted from investors' responses to external influences known as psychology of the masses. The theory found that upward and downward swings of mass psychology always showed up in the same repetitive patterns called waves. Elliot's theory is almost based on the Dow Theory in that, stock prices move in waves. In this theory, Elliot also pointed out that stock markets are presented in the detailed wave principle.

Fama (1965) developed the theory of efficient market hypothesis (EMH). This theory stresses that financial markets have efficient information such that prices on traded assets like bonds or stocks, already imitate all known information and they instantly respond to new information on the market. The concept is based on the reflection of relevant information in market prices of the securities. Incidentally, no participant on the market can always surpass it by using any information that the market already knows. EMH stand on the notion that individuals in the market have rational expectations, meaning on average that the populace is correct and every time when new significant information appears, all the agents adjust and update their expectations accordingly. When there is new information investors react differently, some overreact and others under react randomly in a normal distribution pattern. Investors' reactions are always based on rational expectations.

Previous researchers conducted several studies regarding the relationship between fiscal policy and unemployment. However, assorted results were observed due to the countries researched, methods used and the data employed. Research conducted in developed countries includes the work of Kaplan (2008), Kearney & Daly (1998), Brailsford & Faff (1993) and Kearns & Pagan (1993), Koutoulas & Kryzanowski (1996), Nawroski & Carter (1995), Silvapulle *et al* (1999), Rahman *et al* (2009), Gallegati (2005), McQueen & Roley (1993), Canova & De Nicolo (1995), Bowden & Martin (1995), Siliverstovs & Duong (2006), Antonios (2010), Naes, *et al* (2010),

Liljeblom & Stenius (1997), Asai & Shiba (1995). To examine the relationship between fiscal policy and the behaviour of unemployment in developing countries, various researches have also been conducted. These include studies by Wang (2010), Shyu & Hsia (2008), Sehgal & Tripath (2005), Azarmi *et al* (2005), Nowbutsing & Odit (2009), Enisan & Olufisayo (2009), Arango *et al* (2002), Oskooe (2010), Sabur (2009), Tachiwou (2010), Hernandez Perales & Robinns (2001), Shahbaz *et al* (2008),

Bahadur & Neupane (2006). Notable researchers who contributed to the South African literature include but are not limited to Odhiambo (2010), Moolman (2004), Moolman & Jordaan (2005), Jefferis & Okeahalam (2000), Van Rensburg (2000). A large body of evidence comes from developed countries and African Literature is scarce

## 3 Methodology

### *3.1 Theoretical framework*

The theoretical framework used to specify a model in the study stems from augmentation of the Austrian Business Cycle (ABC) theory. The theory states that business cycles are influenced by savings, money supply and demand, interest rates, production and investment (Mises, 1912; Hayek, 1935; Garrison, 2001). The following linear function is set;

$$Y = F(X_1, X_2, X_3, ...X_n) + \varepsilon_t \quad (1)$$

Where, $Y$ is an endogenous variable, $X_1$ to $X_n$ are the explanatory variables and $\varepsilon_t$ is an error term. This means $Y$ is explained by the variables in $X_n$ plus an error term. Applying the same geometric set up to the ABC theory the following business cycle model is specified:

$$BC = F(S, M_s, M_d, Int, Inv) + \varepsilon_t \quad (2)$$

Where, $BC$ is a business cycle indicator, $S$ are Savings, $Int$ is interest rate, $Inv$ is investment, $M_d$ is money demand and $M_s$ is money supply.

### *3.2 Model specification*

In the study, the business cycle coincident indicator will be modelled as a function of the All Share Price Index (ALSI), Real Effective Exchange Rate (REER), Prime Overdraft Rate (POR), Inflation (CPI) and Money Supply (MS). A business cycle model can therefore be specified as follows:

$$BC = \beta_0 + \beta_1 ALSI_t + \beta_2 REER_t + \beta_3 POR_t + \beta_4 CPIX_t + \beta_5 MS_t + \mu_t \quad (3)$$

In order to avoid any misinterpretation of empirical results, this section provides the description of all variables appearing in the specified equation. All the variables are converted to logarithms in order to obtain elasticity coefficients on these variables and minimising the impact of outliers. The business cycle model is hence in the form:

$$LBC = \beta_0^* + \beta_1^* LALSI_t + \beta_2^* LREER_t + \beta_3^* LPOR_t + \beta_4^* CPIX_t + \beta_5^* LMS_t + \mu_t^* \quad (4)$$

Where: *LBC* is the natural logarithm of the business cycle coincident indicator. The coincident indicators reflect the intensity of economic activity and combine all the information about the economy.

*LALSI* is the natural logarithm of the composite stock market price index (ALSI) which is the proxy for stock market performance in the study. This index represents prices of all classes of shares at the Johannesburg Stock Exchange (JSE).

*LREER* is the natural logarithm of the real effective exchange rate of the rand, measured in foreign currency terms.

*LPOR* is the natural logarithm of the prime overdraft rate, the rate at which banks are willing to lend money to the general public.

*CPIX* is the natural logarithm of consumer price index excluding mortgage costs and it measures price change for a constant market basket of goods and services from one period to another in South Africa's metropolitan and urban areas.

*LMS* is the natural logarithm of the total amount of money available in an economy at a particular point in time and in this study we use M1 which is the currency in circulation and demand deposits.

$\mu_t$ is the error/disturbance term

## 4 Results

To avoid the possibility of drawing up conclusions based on statistically spurious relationships, all data series were tested for stationarity. This study employs the ADF and PP unit root tests. Table 1 and Table 2 shows the results for the ADF and PP unit root tests respectively. Results shown are for the test on level and after differencing once. Unit root tests are also carried out to a series when there is; no constant and trend; a constant and no trend; and both a constant and a trend.

**Table 1.** Dickey Fuller Stationarity test

| Augmented Dickey Fuller (ADF) unit root test | | | | | | |
|---|---|---|---|---|---|---|
| | Level | | | First Difference | | |
| Variables | None | Constant | Constant and Trend | None | Constant | Constant and Trend |
| **LBC** | 1.23 | -1.58 | -0.66 | -3.91*** | -4.12*** | -4.39*** |
| **LALSI** | 1.83 | -0.49 | -1.38 | -8.85*** | -9.08*** | -9.04*** |
| **LM1** | 3.61 | -0.49 | -2.05 | -9.75*** | -11.10*** | -11.03*** |
| **LREER** | 0.93 | -2.93 | -2.73 | -8.08*** | -8.15*** | -8.15*** |
| **CPIX** | -0.36 | -1.06 | -1.01 | -5.60*** | -5.69*** | -5.53*** |
| **LPOR** | 0.80 | -2.71 | -2.68 | -2.72*** | -2.77 | -2.72 |
| **CV (5%)** | -1.94 | -2.89 | -3.46 | -1.94 | -2.89 | -3.46 |
| **CV (1%)** | -2.59 | -3.50 | -4.06 | -2.59 | -3.50 | -4.06 |

Note: The null hypothesis, $H_0$ = Variables have a unit root.
*, ** and *** represent a stationary variable at 10%, 5% and 1% level respectively.

For the ADF, at their first difference, all the series were stationary with or without constants and trends save for DLPOR which was only stationary without both constant and trend.

To be certain that series enters the model to be estimated in non-explosive form and to address the issue of tests with low power the PP test is also carried out as shown in Table 2. Results of the PP test almost confirm those of the ADF test. When all the variables are differenced ones, they become stationary. The only difference on the results is that DLPOR is stationary with or without a constant and trend under the PP test, unlike in the ADF where it was stationary only without both a constant and a trend. It is then concluded that, all the series are integrated of the same order, therefore, we advance with all variables for contegration tests.

**Table 2.** Phillips-Perron stationarity test

| Phillips-Perron (PP) Unit root test | | | | | | |
|---|---|---|---|---|---|---|
| | | | Level | | First Difference | |
| Variables | None | Constant | Constant and Trend | None | Constant | Constant and Trend |
| **LBC** | 1.51 | -1.54 | -0.21 | -3.78*** | -3.97*** | -4.22*** |
| **LALSI** | 1.78 | -0.51 | -1.43 | -8.85*** | -9.08*** | -9.04*** |
| **LM1** | 4.33 | -0.43 | -1.92 | -9.75*** | -11.10*** | -11.03*** |
| **LREER** | 0.92 | -2.94 | -2.74 | -8.25*** | -8.27*** | -8.29*** |
| **CPIX** | -0.75 | -1.80 | -1.81 | -5.55*** | -5.52*** | -5.48*** |
| **LPOR** | -0.76 | -1.02 | -1.15 | -8.07*** | -8.08*** | -8.06*** |
| **CV (5%)** | -1.94 | -2.89 | -3.46 | -1.94 | -2.89 | -3.46 |
| **CV (1%)** | -2.59 | -3.50 | -4.06 | -2.59 | -3.50 | -4.06 |

Note: The null hypothesis, $H_0$ = Variables have a unit root.
*, ** and *** represent a stationary variable at 10%, 5% and 1% level of significance

Given that variables in this study are integrated in the same order, cointegration tests are performed to determine the existence of a long run equilibrium relationship amongst the variables. This study will employ the Johansen maximum likelihood approach to test for cointegration.

To reduce the danger of an omitted variables bias, the focal point should initial be of finding a model that concurrently generates significant results and includes as many variables as recommended by economic theory. Subsequent to the remark that all the variables are correlated with the LBC and that there is no one specific variable which is correlated to all the variables, there is, thus, less likelihood of multicollineality problem. Therefore, the business cycle model is estimated with the following explanatory variable: LALSI, LCPIX, LPOR, LM1 and LREER.

**Table 3.** Pairwise Correlation matrix

| | LBC | LALSI | CPIX | LM1 | LPOR | LREER |
|---|---|---|---|---|---|---|
| LBC | 1.00 | 0.96 | 0.34 | 0.92 | -0.18 | 0.22 |
| LALSI | 0.96 | 1.00 | 0.37 | 0.94 | -0.21 | 0.15 |
| LCPI | 0.34 | 0.37 | 1.00 | 0.37 | 0.56 | -0.47 |
| LM1 | 0.92 | 0.94 | 0.37 | 1.00 | -0.17 | 0.13 |
| LPOR | -0.18 | -0.21 | 0.56 | -0.17 | 1.00 | -0.73 |
| LREER | 0.22 | 0.15 | -0.47 | 0.13 | -0.73 | 1.00 |

The following observations are made from the pairwise correlations in column 2 of Table 3:

- LALSI and LM1 are the only variables that are highly correlated with the LBC.
- LCPI, LPOR and LREER have very low correlations with the LBC.
- LALSI which is the study's stock market performance indicator is positively correlated to LBC which is the study's business cycle indicator.

Table 4 confirms the lag lengths selected by different information criteria. The selection is made using a maximum of 8 lags in order to permit adjustment in the model and to accomplish well behaved residuals. Table 4 shows that LR, FPE and the AIC have selected 2 lags while the HQ chose 1 lag and the SC selected no lag for the VAR. The information criteria approach has therefore produced disagreeing results and no conclusion can be arrived at using this approach only. This could arise as a result of small sample bias (Brooks, 2002: 427). In order to proceed, we should consider the presentation of the model under the suggested lag orders.

**Table 4.** VAR lag order selection criteria

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 1358.786 | NA | 1.26e-21 | -31.09852 | -30.92846* | -31.03005 |
| 1 | 1414.726 | 102.8788 | 7.96e-22 | -31.55692 | -30.36648 | -31.07757* |
| 2 | 1455.007 | 68.52347* | 7.30e-22* | -31.65533* | -29.44452 | -30.76510 |
| 3 | 1483.130 | 43.96221 | 9.01e-22 | -31.47425 | -28.24306 | -30.17315 |
| 4 | 1514.423 | 44.60150 | 1.06e-21 | -31.36604 | -27.11447 | -29.65406 |
| 5 | 1539.557 | 32.35628 | 1.50e-21 | -31.11624 | -25.84430 | -28.99340 |
| 6 | 1572.766 | 38.17130 | 1.86e-21 | -31.05208 | -24.75977 | -28.51836 |
| 7 | 1609.469 | 37.12528 | 2.29e-21 | -31.06825 | -23.75556 | -28.12366 |
| 8 | 1657.229 | 41.72164 | 2.41e-21 | -31.33860 | -23.00554 | -27.98314 |

Note: *indicates lag order selected by the criterion
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

The Johansen cointegration test is, therefore, conducted using the assumption of no trend but a constant in the series and 2 lags for the VAR. Table 5 presents the cointegration test results for the specified business cycle model applying the trace and maximum eigenvalue test statistics. The upper part of Table 5 presents the Johansen cointegration test based on the trace test, while the bottom part presents the results of this test based on the maximum eigenvalue test. The trace statistic tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating relations. The null hypothesis of no cointegrating vectors is rejected, since the test statistic of about 115.46 is greater than the 5% critical value of approximately 95.75. Using the same interpretation, the null hypothesis that there is at most 1 cointegrating vector is rejected, however the null hypothesis that that there are at most 2 cointegrating vectors cannot be rejected since the test statistic of approximately 42.61 is now less than the 5% critical value of about 47.86. Overly, the trace statistics specify 2 cointegrating relationships at 5% level of significance.

**Table 5.** Johansen cointegration rank test results

Trend assumption: Linear deterministic trend
Lag intervals (in first difference): 1 to 2
Unrestricted Cointegration Rank Test (Trace)

| **Hypothesized** | | **Trace** | **5%** | |
|---|---|---|---|---|
| **No. of CE(s)** | **Eigenvalue** | **Statistic** | **Critical Value** | **Prob.**** |
| None * | 0.384 | 115.460 | 95.754 | 0.001 |
| At most 1 * | 0.258 | 70.382 | 69.819 | 0.045 |
| At most 2 | 0.196 | 42.614 | 47.856 | 0.142 |
| At most 3 | 0.128 | 22.379 | 29.797 | 0.278 |
| At most 4 | 0.093 | 9.691 | 15.495 | 0.305 |
| At most 5 | 0.0063 | 0.586 | 3.841 | 0.444 |

Notes: Trace test indicates 2 cointergrating equations at the 5% level of significance
The trace test tests the null hypothesis of r cointergrating vectors
* denotes rejection of the hypothesis at 5% level of significance
** MacKinnon-Haug-Michelis (1999) p-values

**Table 5.** Johansen cointegration rank test results (continued)

Unrestricted Cointergration Rank Test (Maximum Eigenvalue)

| Hypothesized | | Max-Eigen | 5% | |
|---|---|---|---|---|
| **No. of CE(s)** | **Eigenvalue** | **Statistic** | **Critical Value** | **Prob.**** |
| None * | 0.384128 | 45.07866 | 40.07757 | 0.0126 |
| At most 1 | 0.258127 | 27.76769 | 33.87687 | 0.2244 |
| At most 2 | 0.195535 | 20.23478 | 27.58434 | 0.3251 |
| At most 3 | 0.127532 | 12.68797 | 21.13162 | 0.4814 |
| At most 4 | 0.093262 | 9.104822 | 14.26460 | 0.2775 |
| At most 5 | 0.006285 | 0.586305 | 3.841466 | 0.4439 |

Notes: Max-eigenvalue test indicates 1 cointegrating equation at the 5% level
Max-eigenvalue test the null hypothesis of r cointegrating vectors
* denotes rejection of the hypothesis at 5% level of significance
** MacKinnon-Haug-Michelis (1999) p-values

The maximum eigenvalue tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r+1 cointegrating relations. The maximum eigenvalue test also rejects the null hypothesis of no cointegration, but fails to reject that at most 1 cointegrating vectors, since the test statistic of about 27.78 is now less than the 5% critical value of about 40.08. Therefore, the maximum eigenvalue test put forward that there is only 1 cointegrating relationship in the business cycle model.

We estimated the VECMs limited to 1 and 2 cointegrating vectors independently, as selected by the maximum eigenvalue and trace test, in that order. Through the estimation of a VECM it is necessary to differentiate between the long and short run determinants of the business cycle model. There is need to initially find out the true two cointegrating relations that were recommended by the cointegration test. The outcome of the estimated VECM without any restrictions is presented in Table 6 for the two cointegrating relations identified by the trace test and maximum eigenvalue test.

**Table 6.** VECM results for the two cointegrating relationships

| Cointegrating Eq: | LBC(-1) | LPOR(-1) | LM1(-1) | LALSI(-1) | CPIX(-1) | LREER(-1) | C |
|---|---|---|---|---|---|---|---|
| **CointEq1** | 1.000 | 0.000 | 0.671 | -0.731 | 0.0216 | -0.016 | -2.849 |
| | | | (0.134) | (0.093) | (0.013) | (0.105) | |
| | | | [ 5.025] | [-7.854] | [ 1.631] | [-0.150] | |
| **CointEq2** | 0.000 | 1.000 | 1.304 | -0.972 | -0.071 | -0.274 | -3.858 |
| | | | (0.471) | (0.328) | (0.047) | (0.370) | |
| | | | [ 2.769] | [-2.962] | [-1.516] | [-0.740] | |

| Error Correction: | D(LBC) | D(LPOR) | D(LM1) | D(LALSI) | D(CPIX) | D(LREER) |
|---|---|---|---|---|---|---|
| **CointEq1** | -0.032 | -0.099 | -0.059 | 0.234 | 1.271 | -0.140 |
| | (0.014) | (0.068) | (0.054) | (0.120) | (0.747) | (0.083) |
| | [-2.227] | [-1.463] | [-1.088] | [ 1.942] | [ 1.702] | [-1.676] |
| **CointEq2** | -0.003 | -0.033 | -0.044 | -0.066 | 0.147 | 0.066 |
| | (0.004) | (0.019) | (0.015) | (0.033) | (0.206) | (0.023) |
| | [-0.752] | [-1.745] | [-2.913] | [-1.994] | [ 0.715] | [ 2.858] |

It is significant that we normalise each of the vectors on the variables with which clear evidence of error correction is observed. From Table 6, it is noted that four series namely LBC, LM1, LPOR and REER show evidence of error correction, on cointEq1 at the bottom of the table, as shown by the negative coefficients whilst LALSI and LCPI does not. However, only LBC has the most significant coefficient with a t-value of approximately -2.23. The other series with the correct signs have very low t-values which are less significant.

In the second cointegrating equation, there are also four series for the correct negative coefficients but three of them possess a true relationship. LPOR, LM1 and LALSI have correct signed adjustment coefficients and their t-values of -1.74, -2.91 and -1.99 respectively, are relatively high. It can be concluded that the business cycle equation constitutes the true cointegration relationship in the first cointegrating vector as there is evidence of less error correction in the variables.

**Table 7.** Single equation equilibrium correction model for the business cycle

| Depended variable: DLBC | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Coefficient of Error Correction terms** | | | | | | | |
| **$DLBC_{t-1}$** | **DLALSI** | **DCPIX** | **DLM1** | **$DLPOR_{t-1}$** | **DLREER** | **DUMMY** | **$ECT_{t-1}$** |
| 0.531 | 0.037 | 0.001 | 0.015 | -0.028 | -0.030 | -0.002 | -0.114 |
| (0.086) | (0.012) | (0.000) | (0.025) | (0.021) | (0.017) | (0.001) | (0.045) |
| [6.31]*** | [3.06]*** | [1.85]* | [0.58] | [-1.216] | [-1.79]* | [-2.90]*** | [-2.54]** |

Note: *, ** and *** represent 10%, 5% and 1% significant levels. Standard errors and t-statistics are in parentheses and brackets respectively

R-Squared = 58%
Adjusted R-Squared = 55%
Durbin Watson Statistic = 2.12
Serial Correlation LM test = 1.095 [0.295]
Nomality (Jarque-Bera) = 3.290 [0.193]
Heteroskedasticity (White Test) = 40.287 [0.286]

The error correction term (ECT) for the business cycle model shows the equilibrium error which is rectified in the previous month ($ECT_{t-1}$). In other words, the size of the coefficient means that the speed of adjustment in the business cycle model is 11.4% within a month. The sign of $ECT_{t-1}$ is negative and this conforms to economic theory. The coefficient of the error term has a high *t*-statistic which is significant at 5% level of significance. This error term agrees well with the authenticity of an equilibrium relationship among the variable in the cointegrating equation. This means that neglecting the cointegratedness of the variables would have established a misspecified model.

The diagnostic checks are very important to the business cycle model because they validate the parameter evaluation outcomes achieved by the estimated model. This arises because, if there is a problem in the residuals from the estimated model; it means the model is not efficient and the estimated parameters will be biased. The diagnostic test results are presented at the bottom of Table 7 and these assist in checking for serial correlation, normality and heteroskedasticity. These diagnostic checks are based on the null hypothesis that: there is no serial correlation for the LM test; there is normality for the Jarque-Bera test and there is no heteroskedasticity for the White heteroskedasticity test. The estimated model fits satisfactorily well with an adjusted $R^2$ of 55%. In addition, the DW test of 2.12 shows that there is no serial correlation among the residuals. Furthermore, the LM test, which is a stricter test for correlation is also applied in the analysis. The results for the diagnostic checks for serial correlation, normality and heteroskedasticity show that the data is fairly well behaved.

## 5 Conclusion

This study sought to investigate the link between business cycles and stock market performance in South Africa. In this study, the business cycle indicators namely the coincident, leading and lagging indicators were explained using trend analysis. The coincident indicator moves simultaneously with economic cycles whereas the leading indicator signals future turning points of business cycles while the lagging indicator lags behind turning points of business cycles. The coincident indicator was observed to follow an upward trend from 2000 until 2008 when it fell due to the economic recession of 2008/09. The leading indicator also followed an upward trend from 2000 and fell in 2007 signalling the economic recession of 2008/09. The lagging indicator has been rising from 2000 and it fell during end of 2009 lagging behind the recession of 2008/09. The constituents of the business cycle indicators were also assessed using trend analysis; hence, phases and business cycle turning points were identified.

The outcomes from this study raise various policy issues and recommendations, which will strengthen the connection between the stock market and business cycles in South Africa.

Since the stock market functions in a macroeconomic environment, it is therefore essential that the atmosphere must be an enabling one so as to be acquainted with its full potential. The demand for services of the stock market is a derived demand. With the certainty of a positive relationship between stock market performance and business cycles, it is noteworthy to advise that there should be continued effort to kindle productivity in both the public and private sectors of the economy of South Africa.

The management of stock prices should be de-regulated. Market forces of demand and supply should be allowed to function devoid of any interference. Meddling in the security pricing is detrimental to the expansion of the stock market.

The stock market is identified as a comparatively low-cost source of funds when contrasted to the money market and other sources. The cost of raising funds in South Africa is however, assumed to be somewhat high. There ought to be a downward revision, of the cost, so as to improve its competitiveness and improve the attractiveness as a source of raising funds.

All the tiers of government should be supported to fund their prudent developmental programmes through the stock market. This will serve as a leeway to freeing the resources that may be used in other spheres of the economy.

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