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-RESEARCH ARTICLE-

MACROECONOMIC DETERMINANTS OF STOCK MARKET CAPITALIZATION IN AFRICA'S MOST DEVELOPED FINANCIAL SECTOR: A BAYESIAN APPROACH

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─Abstract─

This research investigates the macroeconomic determinants of market capitalization within South Africa, the most developed financial sector in Africa, over the period from 1985 to 2022. The study is pertinent as it evaluates various models to identify the variable combinations that most significantly impact stock market performance in South Africa. The Bayesian information criterion was employed for determining the prior distribution for regression coefficients, while a Bernoulli distribution (p = 0.5)

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Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

technique was implemented for further evaluation. Empirical results from the Bayesian analysis indicate that the model including gross domestic product (GDP) and the repo rate most effectively influences the market capitalization of listed domestic companies in South Africa. Conversely, the Cochrane-Orcutt AR (1) regression reveals that broad money growth and GDP positively and significantly impact market capitalization, whereas repo rates and trade openness have a significant negative effect. The study concludes that effective management of the real and monetary sectors is crucial for market capitalization. It is recommended that the government create a macroeconomic environment conducive to minimizing business activity costs. Simultaneously, the South African Reserve Bank (SARB) should foster an effective transmission mechanism for repo rates that aligns with reduced capital costs and enhanced productivity.

JEL Classification: E0, E3, E5

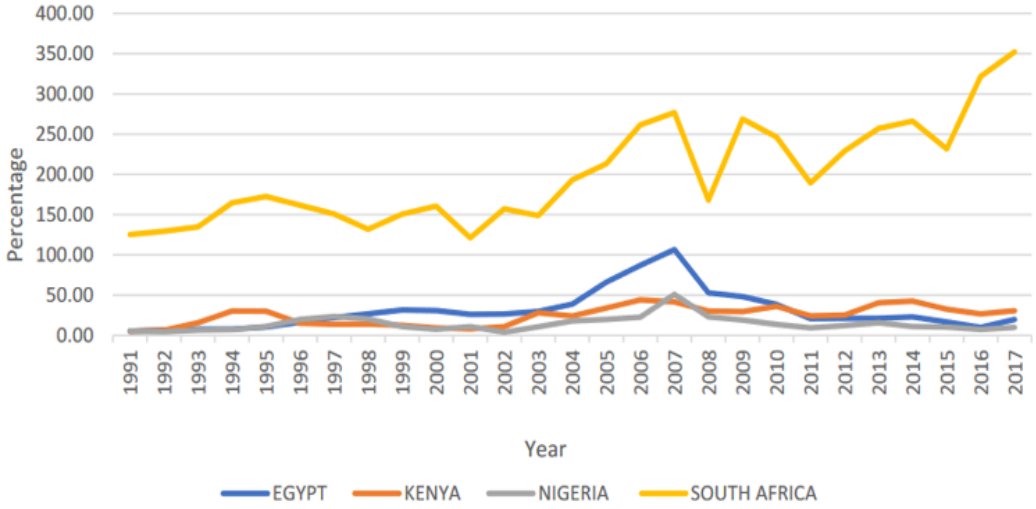
Keywords: Market Capitalization, Gross Domestic Product, Repo Rates, Bayes Model

INTRODUCTION

Stock market performance serves as a pivotal gauge for evaluating economic performance. Ho (2019) contends that the stock market plays a vital role in driving economic growth by enhancing corporate governance, facilitating improved liquidity, lowering the costs associated with savings mobilization, and promoting international risk-sharing. The stock market offers an attractive avenue for investment due to its low transaction costs, high liquidity, and transparent information dissemination (Lin & Fuerst, 2014; Lin & Lin, 2011). Moreover, it provides listed companies with access to capital and facilitates risk diversification (Brown, 2013). The magnitude of the stock market is assessed by considering the stock market capitalization of listed firms relative to GDP (Kuvshinov & Zimmermann, 2022; Vithessonthi, 2014; Zeqiraj et al., 2020).

Focusing on the South African economy in this study is critical due to its prominent financial sector in Africa. Ayadi and Williams (2023) illustrate that, among the economies of Egypt, Kenya, Nigeria, and South Africa, the latter exhibits the strongest performance in terms of market capitalization to GDP (%), as depicted in Figure 1. The maximum values of market capitalization to GDP are 352.29% for South Africa and 106.74% for Egypt, whereas Kenya and Nigeria have respective maximum values of 44.06% and 51%.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108



Source(s): World Bank (World Development Indicators), CEIC, Nairobi Stock Exchange

Figure 1: Market capitalization to GDP (%)

Furthermore, Javangwe and Takawira (2022) and Ceicdata (2021) indicating that as of December 2020, South Africa's market capitalization amounted to 358.9% of its nominal GDP, an increase from 343.5% in the previous year. De Beer et al. (2015) Provide a historical overview of the Johannesburg Stock Exchange, delineating its development into three sub-periods: 1887–1910, 1911–1932, and 1933–1945. The period from 1945 to the 1960s was marked by rapid industrialization and significant economic prosperity. The years from 1960 to 1994 were characterized by economic isolation, followed by a reintegration into the international market from 1994 onwards. In sub-Saharan Africa, as of 2020, the Johannesburg Stock Exchange, the Nigerian Stock Exchange, and the Nairobi Stock Exchange are identified as the largest markets based on GDP and market capitalization (Imhanzenobe, 2023). However, there has been a notable decline in the number of listed firms and initial public offerings over time (Okumu et al., 2022; Stangroom, 2021).

For instance, Imhanzenobe (2023) reports that from 1998 to 2020, the Johannesburg Stock Exchange saw a 59.38% reduction in the number of listed firms, decreasing from 650 to 264. In the same period, the Nigerian Stock Exchange experienced a 4.84% decline, from 186 to 177. Meanwhile, the Nairobi Stock Exchange has consistently had a small number of listed firms, peaking at 65 since its inception in 1954.

Stock market performance is significantly shaped by the macroeconomic policy environment of an economy. Numerous studies have demonstrated the impact of macroeconomic variables on the stock market. For example, Khumalo (2013) analysed the relationship between inflation and stock prices in South Africa from 1980 Q1 to

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

2010 Q4, finding that inflation had a significantly negative effect on stock prices. Similarly, Ntshangase et al. (2016) investigated the relationship between macroeconomic variables and the stock market in South Africa during 1994–2012, noting that inflation influences the stock market. Key macroeconomic determinants affecting stock market development include the inflation rate, economic development, exchange rate, banking sector development, trade openness, private capital flows, and interest rate (Boyd et al., 1996; Boyd et al., 2001; Dornbusch & Fischer, 1980; Gordon & Shapiro, 1956; Greenwood & Smith, 1997; Jeffus, 2005; Levine, 1997; Niroomand et al., 2014).

The global economy, and by extension the South African context, continuously experiences fluctuations in macroeconomic performance due to various internal and external events, such as pandemics and geopolitical crises like the Russian-Ukraine conflict and the recent Israel-Hamas crisis. These events can significantly influence macroeconomic variables and, consequently, the stock market. As a major financial hub in Africa, the South African economy is also subject to changes in its macroeconomic environment. This study seeks to explore the extent to which major macroeconomic factors affect the market capitalization of listed domestic companies, deviating from traditional classical approaches.

The arbitrage pricing theory establishes a classic relationship between the stock market and major macroeconomic determinants. While empirical studies have focused on this nexus, this study extends the literature by using the Bayesian Monte Carlo Algorithm to evaluate the time-varying macroeconomic determinants of Africa's largest stock market.

The study is divided into five sections. Sections one and two cover the introduction and literature review. Section three details the methodology, while sections four and five focus on the analysis and interpretation of results, and the conclusion and policy recommendations, respectively.

LITERATURE REVIEW

Arbitrage Price Theory (APT)

As per Mark-Egart (2020), the Arbitrage Pricing Theory, formulated by Ross in 1976, posits that within an economy, there exist multiple sources of risk that cannot be diversified away. These sources are believed to be linked to macroeconomic factors such as inflation and fluctuations in aggregate output. The fundamental assumptions of the theory entail the explanation of asset returns through systematic factors. Investors can construct portfolios of assets in a manner that eliminates certain risks through diversification. Moreover, the theory contends that arbitrage opportunities do not exist

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

among well-diversified portfolios, as any such opportunities would be swiftly exploited by investors.

Arbitrage Price Theory considers various macroeconomic indicators such as inflation rates, energy prices, and interest rates, among others, and their impact on security returns, including bond and stock market returns (Obalade et al., 2023). According to insights from Ayu et al. (2023), macroeconomic indicators represent systematic risks that influence stock returns in line with the APT Theory. The theory posits that market price movements are influenced by macroeconomic factors (Fahmi, 2014).

This study investigates the time-varying macroeconomic determinants of stock market capitalization in South Africa, with particular emphasis on the insights provided by the Arbitrage Pricing Theory (APT), highlighting the necessity to assess the impact of these macroeconomic factors. The macroeconomic variables under scrutiny encompass broad money supply, inflation rate, nominal exchange rate, repo rate, and gross domestic product. For instance, Sprinkel (1964) advocated for scrutinizing the relationship between money supply and stock prices, observing that changes in the growth rate of money supply precede variations in stock prices.

Similarly, the assessment of the inflation rate holds significance due to its influence on investors' decisions. Modigliani and Cohn (1979) Postulated the concept of the inflation illusion, suggesting that stock prices demonstrate lower value during periods of higher inflation rates but command greater value during periods of low inflation, thus establishing an inverse relationship between inflation and stock returns.

Empirical Review

Scholars have dedicated considerable attention to scrutinizing the dynamics of the stock market over time, yielding varied empirical outcomes. In a study spanning from 2004 to 2010, Gambhir and Bhandari (2011) employed Johansen-Juselius cointegration and Granger causality tests to analyse the BRIC stock markets. Their findings indicated the presence of cointegration, suggesting that no market exhibited a more pronounced influence than the others.

Similarly, Abu and Ibekwe (2023) investigated the impact of macroeconomic variables on the performance of the Nigerian stock market from 1999 to 2021, using the All-Share Index as the dependent variable. The explanatory variables included interest rate, exchange rate, gross domestic product growth rate, and inflation rate. Employing the autoregressive distributed lag (ARDL) technique, the authors concluded the non-significant statistical influence of interest and exchange rates on the short- and long-term performance of the Nigerian stock market. However, they found that both the inflation rate and gross domestic product growth rate significantly and negatively influenced the short- and long-term performance of the Nigerian Stock Exchange.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Wei et al. (2023) conducted an analysis of macroeconomic determinants concerning Malaysian stock market performance, utilizing quarterly secondary data from various sources spanning the years 2011 to 2020. The explanatory variables included crude oil prices, unemployment rates, inflation rates, foreign direct investment, and exchange rates, while the dependent variable was the performance of the Malaysian stock market. The study revealed significant relationships between crude oil prices and exchange rates with respect to Malaysian stock market performance. Additionally, it was noted that foreign direct investment, inflation rates, and unemployment rates exhibited relatively minimal effects on the Malaysian stock market performance.

Jamaludin et al. (2017) investigated the impact of macroeconomic variables, including exchange rates, inflation, and money supply, on Islamic and conventional stock market returns across Singapore, Indonesia, and Malaysia from January 2005 to December 2015. Utilizing panel least squares analysis, they found that inflation rates and exchange rates significantly influenced stock market returns, while money supply did not demonstrate statistical significance. Furthermore, inflation was observed to exert a greater negative impact on stock market returns.

Kirui et al. (2014) analysed the influence of macroeconomic variables on stock market returns in Kenya from the first quarter of 2001 to the fourth quarter of 2012, employing the technique of Threshold Generalized Autoregressive Conditional Heteroscedasticity. The macroeconomic variables examined included T-bill rates, inflation rates, GDP growth rates, exchange rates, and stock market returns. The study indicated a negative relationship between stock returns and exchange rates, while the other variables did not significantly explain stock returns.

Ligocká et al. (2016) investigated the relationship between selected Swiss real estate companies' stock prices and macroeconomic fundamentals from 2005 to 2014. They examined variables such as interest rates, stock prices, GDP, and price levels, employing Vector Error Correction and Granger causality techniques. The findings suggested a long-run relationship between macroeconomic variables, particularly interest rates, and the behaviour of stock prices in Switzerland.

Azeez and Obalade (2018) explored the relationship between stock market development and macroeconomic determinants in both the short and long term. They examined variables including stock market liquidity, foreign direct investment, GDP, banking sector development, and inflation rates. The study revealed that all variables, except the savings rate, significantly influenced stock market development.

Ebrahimi et al. (2016) and Hayati and Sedaghat (2016) analysed the Tehran Stock Exchange, focusing on crucial market development factors such as the performance and size of national companies listed on the exchange, and return on investment.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Choi and Yoon (2015) employed co-integration and vector error correction models, alongside causality tests, to investigate economic activities in South Korea. Their study revealed that macroeconomic variables, including money supply, exchange rates, production indices, and trade balances, were reflected in stock prices in the Korean stock market, indicating a long-run relationship.

Banda et al. (2019) evaluated the relationship between macroeconomic variables and industrial shares in developing economies, particularly focusing on the Johannesburg Stock Exchange's Industrial Index (INDI 25) from 1995 to 2017. They found that inflation directly and significantly affected stock prices, while interest rates exhibited a negative relationship with stock prices. Additionally, exchange rates positively influenced industrial shares. However, gross domestic product did not demonstrate a significant relationship with industrial shares.

Javangwe and Takawira (2022) conducted an analysis of the relationship between the stock market and exchange rates in South Africa from 1980 to 2020. Employing the Autoregressive Distributed Lag technique with quarterly data frequency, the authors identified a long-run relationship between the variables. They observed a negative association between the movements of the stock market and exchange rates, as well as between the stock market and both interest rates and inflation.

Bui (2023) examined the factors influencing stock market capitalization in emerging markets and developing countries, encompassing the period from 2008 to 2020 and including Vietnam, the Philippines, Sri Lanka, China, Malaysia, India, Thailand, and Indonesia. Using the Generalized Method of Moments (GMM), the study investigated how anti-corruption efforts in these economies affected stock market capitalization and associated factors. The findings revealed a negative influence of inflation on stock market capitalization, while a positive relationship was observed with the corruption control index and other factors such as GDP per capita, trade, and domestic credit.

Enisan and Olufisayo (2009) examined the relationship between stock market development and economic growth across seven sub-Saharan African economies. Hajilee and Al Nasser (2014) analysed the relationship between stock market development and exchange rates in 12 emerging economies from 1980 to 2010. They found significant long-run relationships in six countries, with exchange rate volatility negatively impacting stock market development in Pakistan, Mexico, China, and Venezuela, while direct effects were observed in the Philippines and South Africa.

Pilinkus and Boguslauskas (2009) investigated the short-run relationships between the stock market index in Lithuania and macroeconomic variables from 2000 to 2009. They observed that increases in GDP and money supply stimulated the stock market index, while rises in unemployment, interest rates, and exchange rates decreased the index

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

value.

Emmanuel et al. (2024) analysed the factors influencing the growth of financial markets in 41 African economies from 1996 to 2017. Utilizing the generalized method of moments on the International Monetary Fund's financial markets index, the authors found that foreign direct investment, interest rates, GDP per capita, domestic credit to the private sector, information and communication technology, human capital, and natural resource rents had a direct and significant impact on financial market growth in Africa. However, savings rates, the consumer price index, investment levels, and trade openness, although significant, exhibited a negative influence. The study also noted that the impact of these factors varied depending on the sub-region where the financial markets were located.

Gap in the Literature

The compilation of preceding research outlined above offers insights into both contemporary and historical studies concerning the macroeconomic determinants of the stock market, predominantly employing conventional methodologies. However, this study makes a novel contribution to the existing literature by employing a form of conditional modelling, namely Bayesian linear regression, to assess the macroeconomic determinants influencing the market capitalization of listed domestic companies in South Africa.

METHODOLOGY

The Data Set

The data utilized in this study is sourced from the World Development Indicators (WDI), last updated on December 18th, 2023. Additionally, data from Bruegel and the SARB are incorporated. The dataset spans from 1985 to 2022, encompassing a total of 38 records. Table 1 provides a summary of the dataset.

The dependent variable in this study is denoted as lmcd, while the independent variables comprise top, bmg, inf, peqg, lgdp, fdig, neer, and repo. Previous research employing similar proxies includes studies by Edirisingha et al. (2023) on the "Macroeconomic Determinants of Stock Market Performance in Sri Lanka" and (Rafay et al., 2023) investigating "Stock Market Capitalization and its Macroeconomic Determinants: An Empirical Investigation from an Emerging Economy." Another study by Okolie and Ehiedu (2023) established a direct but statistically insignificant impact of equity foreign portfolio investment on total market capitalization in Nigeria. These studies aim to demonstrate the comparability of our variables with those used in prior research.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Table 1: Summary of the Data Set

Variables	Description	Source
op	Trade openness (% of GDP)	Word Development Indicators
peq	Portfolio equity, net inflows (BoP, current US$)	Word Development Indicators
gdp	GDP (current US$)	Word Development Indicators
bmg	Broad money (% of GDP)	Word Development Indicators
inf	Inflation, consumer prices (annual %)	Word Development Indicators
mcd	Market capitalization of listed domestic companies (current US$)	Word Development Indicators
fdi	Foreign direct investment, net inflows (BoP, current US$)	Word Development Indicators
neer	Nominal effective exchange rate	Bruegel data
repo	Repo rates- Annualized from the monthly data set	SARB
peqg	peq/gdp	
lgdp	log of gdp	
lmcd	log of mcd	
fdig	fdi/gdp	

Source: Author's Compilation.

Bayesian linear regression is employed to examine the dynamic relationship between lmcd and the key variables (top, bmg, inf, peqg, lgdp, fdig, neer, and repo) within the stock market context. The model is specified as follows:

$$y_{lmcd,\ i} = \beta_0 + \beta_1 x_{top,\ i} + \beta_2 x_{bmg,\ i} + \beta_3 x_{inf,\ i} + \beta_4 x_{peqg,\ i} + \beta_5 x_{lgdp,\ i} + \beta_6 x_{fdig,\ i} + \beta_7 x_{neer,\ i} + \beta_8 x_{repo,\ i} + \varepsilon_i \qquad i = 1, 2, \ldots, n \quad \ldots (1)$$

Where $y_{lmcd,\ i}$ is the ith value of the lmcd variable, and $x_{top,\ i}$, $x_{bmg,\ i}$, $x_{inf,\ i}$, $x_{peqg,\ i}$, $x_{lgdp,\ i}$, $x_{fdig,\ i}$, $x_{neer,\ i}$, $x_{repo\ i}$ are the i^{th} value of the top, bmg, inf, peqg, lgdp, fdig, neer, and repo variable respectlively. ε_i is the i^{th} error term and n is the number of observations in the data set.

Utilizing a matrix of feature vectors, equation (1) transforms into:

$$y_i = \beta^T X + \varepsilon \qquad (2)$$

We posit that ϵ_(i) is independent and identically distributed according to a normal distribution, as each y_(lmcd, i) is continuous in nature, thus serving as a prior distribution. This implies that,

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

$$\varepsilon_i \sim N(0,\ \sigma^2) \qquad \ldots. \ (3)$$

Given the assumption in equation (2), the random variable of each response y_(lmcd, i) conditioned on the observed data x_i and the parameters β_0, β_i, and σ^2 follows a normal distribution.

$$y_{lmcd,\ i} \sim N(\beta^T X,\ \sigma^2 I) \qquad \ldots. \ (4)$$

Here, I represents the identity matrix, accounting for the multivariate nature of the distribution. Thus, the likelihood of each y_(lmcd, i) given x_i, β_0, β_i, and σ^2 is expressed as:

$$p(y_i \mid x_i,\ \beta_0,\ \beta_i\ ,\ \sigma^2) = \frac{1}{\sqrt{2\,\pi\,\sigma^2}}\ e^{\left(-\frac{\left(y_i-\left(\beta_0+\sum_{j=1}^{p}\beta_j\,x_{ij}\right)\right)^2}{2\sigma^2}\right)} \ \ldots(5)$$

Therefore, the likelihood of y_(i) is the multiplication of each likelihood p(y_i | x_i, β_0, β_i, σ^2), as we assume that each response y_(i) is independent of one another.

Bayesian linear regression applies Bayes' principle, which involves the application of Bayes' theorem to update the prior probability. Bayes' theorem is presented as:

$$p(x_i,\ \beta_0,\ \beta_i,\ \sigma^2 \mid\ y_i) = \frac{p(y_i \mid x_i,\ \beta_0,\ \beta_i\ ,\ \sigma^2)\ \times\ p(x_i,\ \beta_0,\ \beta_i\ ,\ \sigma^2)}{p(y_i)} \quad \ldots(6)$$

Where p(x_i, β_0, β_i, σ^2) represents the prior probability, p(x_i, β_0, β_i, σ^2 | y_i) denotes the posterior probability, and p(y_i) are constants relative to the parameters and may be disregarded. Thus, equation (6) simplifies to:

$$p(x_i,\ \beta_0,\ \beta_i,\ \sigma^2 \mid\ y_i) \ \propto\ p(y_i \mid x_i,\ \beta_0,\ \beta_i,\ \sigma^2)\ \times\ p(x_i,\ \beta_0,\ \beta_i,\ \sigma^2) \ \ldots\ (7)$$

By substituting equation (5) into (7), we obtain:

$$p(x_i,\ \beta_0,\ \beta_i,\ \sigma^2 \mid\ y_i) \propto \frac{1}{\sqrt{2\,\pi\,\sigma^2}}\ e^{\left(-\frac{\left(y_i-\left(\beta_0+\sum_{j=1}^{p}\beta_j\,x_{ij}\right)\right)^2}{2\sigma^2}\right)} \times\ p(x_i,\ \beta_0,\ \beta_i,\ \sigma^2) \quad \ldots\ (8)$$

The iterative updating of the prior probability with the posterior probability continues until convergence is achieved. Bayesian information criterion (BIC) was employed to establish the prior distribution for regression coefficients, whereas the Bernoulli distribution (p = 0.5) was applied for the prior distribution on the models. The Markov Chain Monte Carlo (MCMC) algorithm served as the sampling method to perform the posterior Bayesian inference on the parameters.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

ANALYSIS AND INTERPRETATION OF RESULTS

This section presents our empirical findings and diagnostic assessments. The study employed Bayesian linear regression and Cochrane–Orcutt AR (1) regression with iterated estimates to examine the macroeconomic determinants of stock market capitalization in South Africa. Before delving into empirical findings, it is crucial to assess the stationarity of the variables comprising the study. Therefore, Table 2 provides information on the time stationarity of these variables. Additionally, prior to testing stationarity, the lag length of all variables, as indicated in Table 3, was examined and considered solely in the determination of the lag length to be included during the unit root verification process.

Table 2: Time Series Unit Root Test

Variables	Model	Levels	First Difference
lmcd	ADF PP		-5.348***(0.000) -7.059***(0.000)
top	ADF PP		-4.292***(0.000) -5.820***(0.000)
peqg	ADF PP	-2.890***(0.003) -3.411**(0.011)	
fdig	ADF PP	-5.076***(0.000) -5.076***(0.000)	
bmg	ADF PP		-3.662***(0.000) -5.203***(0.000)
inf	ADF PP	-2.900***(0.003)	 -5.744***(0.000)
neer	ADF PP	-3.163***(0.002) -4.372***(0.000)	
repo	ADF PP		-3.634***(0.001) -5.146***(0.000)
lgdp	ADF PP	-1.839**(0.038)	 -4.587***(0.000)

Notes: ***p<0.01, **p<0.05,*p<0.1 are respectively the levels of significance.
Source: Authors' computation from Stata 18, 2024.

Stationarity was assessed using the Augmented Dickey-Fuller and Philips-Perron statistics. Our findings indicate that in both models of unit root testing, the variables exhibited a mixed order of integration, comprising I (1) and I(0). This rules out the possibility of spurious relationships. Table 2 reveals that while lmcd, top, peqg, bmg, inf, neer, and lgdp display an optimal lag order of 1, fdig and repo have lag orders of 0 and 4, respectively.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Table 3: Lag Length Criteria

Variable	Lag	FPE	AIC	HQIC	SBIC
lmcd	1	.013*	-1.529*	-1.498*	-1.439*
top	1	23.068*	5.976*	6.007*	6.066*
peqg	1	.000*	-4.889*	-4.858*	-4.799*
fdig	0	.000*	-5.119*	-5.104*	-5.074*
bmg	1	8.074*	4.926*	4.957*	5.016*
Inf	1	4.963*	4.439*	4.470*	4.529*
neer	1	87.049*	7.304*	7.335*	7.394*
repo	4	2.970*	3.924*	4.001*	4.149*
lgdp	1	.003*	-2.999*	-2.969*	-2.909*

*Optimal Lag

Source: Authors' computation from Stata 18, 2024.

The Bayesian Linear Regression

The Bayesian model, categorized as a second-generation model, offers valuable insights into the macroeconomic variables that significantly influence stock market capitalization in South Africa. This is accomplished by assessing both prior and posterior model probabilities. Additionally, a key indicator within the Bayesian model is the Bayes factor of the respective model (BF_m), indicating a superior-performing model when it attains a higher value. The BF_{01} aids in quantifying evidence for the null hypothesis relative to the alternative hypothesis. The empirical estimation of the Bayesian model is presented in Table 4 and Table 5.

Table 4: Model Comparison - lmcd

Models	P(M)	P(M|data)	BF_M	BF_{01}	R^2
lgdp + repo	0.007	0.343	72.952	1.000	0.963
Lgdp	0.025	0.099	4.326	12.088	0.954
lgdp + fdig + repo	0.004	0.060	17.973	2.849	0.965
peqg + lgdp + repo	0.004	0.044	12.924	3.895	0.964
top + lgdp + repo	0.004	0.035	10.174	4.902	0.964
bmg + lgdp + repo	0.004	0.034	9.776	5.095	0.964
inf + lgdp + repo	0.004	0.033	9.453	5.263	0.964
lgdp + neer + repo	0.004	0.029	8.439	5.875	0.963
top + bmg + inf + peqg + lgdp + fdig + neer + repo	0.199	0.026	0.110	362.685	0.972
top + bmg + inf + peqg + lgdp + neer + repo	0.025	0.018	0.738	65.066	0.972

Source: Authors' computation from jasp 0.18.3, 2024.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Table 5: Posterior Summaries of Coefficients

									95% Credible Interval
Coefficient	**P(incl)**	**P(excl)**	**P(incl|data)**	**P(excl|data)**	**$BF_{inclusion}$**	**Mean**	**SD**	**Lower**	**Upper**
Intercept	1.000	0.000	1.000	0.000	1.000	11.578	0.012	11.553	11.603
top	0.503	0.497	0.210	0.790	0.264	-8.181×10^{-4}	0.002	-0.009	6.929×10^{-5}
bmg	0.553	0.447	0.206	0.794	0.209	7.725×10^{-4}	0.002	-3.190×10^{-4}	0.008
inf	0.511	0.489	0.189	0.811	0.224	0.001	0.004	-0.002	0.013
peqg	0.500	0.500	0.197	0.803	0.246	0.146	0.448	-0.058	1.699
lgdp	0.759	0.241	1.000	4.787×10^{-12}	$6.638\times10^{+10}$	1.307	0.137	1.036	1.590
fdig	0.496	0.504	0.205	0.795	0.262	-0.159	0.491	-1.951	0.035
neer	0.504	0.496	0.179	0.821	0.214	-7.317×10^{-5}	2.542×10^{-4}	-8.847×10^{-4}	9.281×10^{-5}
repo	0.592	0.408	0.852	0.148	3.950	-0.012	0.007	-0.023	0.000

Source: Authors' computation from jasp 0.18.3, 2024.

Table 4 presents data on ten distinct models, endeavouring to determine which models exert the most significant influence on stock market capitalization in South Africa. P(M) denotes the prior model probability, while P(M|data) signifies the posterior model probability of incorporating a specific variable. BF_m indicates the Bayes factor of the respective model, while BF_{01} quantifies the evidence supporting the null hypothesis compared to the alternative hypothesis. The final entry in the Table 4 is the coefficient of determination for each model listed.

The three most effective models are those incorporating combinations of lgdp + repo, lgdp + fdig + repo, and peqg + lgdp + repo, with corresponding Bayes factor values of 72.952, 17.973, and 12.924, respectively. Their respective posterior probabilities are 0.343, 0.060, and 0.044. However, the influence of all other models in determining stock market capitalization in the country is limited. The model lgdp + repo exhibits a BF_{01} of 1.000 when compared to itself. However, in comparison to other models, it is approximately three times more favourable than the lgdp + fdig + repo model and

approximately four times more favourable than the peqg + lgdp + repo model. Evaluating the BF_{01} against the Jeffreys' (1939) scale reveals that the lgdp + fdig + repo model has a BF_{01} of approximately three, falling within the range of 1-3 in the table, thereby providing anecdotal evidence for the adoption of the lgdp + repo model. Conversely, the peqg + lgdp + repo model, with a BF_{01} of approximately four, provides moderate evidence for the utilization of the lgdp + repo model.

The top model indicates that lgdp and SARB's repo rates strongly influence stock market capitalization. Increased productivity prompts investment, potentially boosting market capitalization, while declining output may have the opposite effect. For example, according to Robinson (1979) demand tracking hypothesis, growth in the real sector prompts firms to seek more financial services, impacting financial sector development. Managing repo rates alongside GDP is crucial for influencing stock market capitalization. Repo rates, utilized by the South African Reserve Bank to manage liquidity through commercial banks, are typically reduced during expansionary monetary policy periods. This reduction affects other rates and returns in the economy, including the stock market. Hence, a repo rate that stimulates liquidity and output can enhance stock market activities. This underscores the importance for the South African government to prioritize effective repo rate management and economic activity stimulation. GDP's role indicates that economic activity levels remain a key indicator of market capitalization trends. Therefore, the government must implement robust fiscal policies to enhance productivity and confidence in the stock market, aligning with SARB's repo rate policies for desired effects on market capitalization.

The second model incorporates gross domestic product, foreign direct investment, and repo rate, distinguishing it from the previous model by including foreign direct investment. The influx of foreign business investments can significantly impact stock market activity levels, influenced by the repo rate's effect on capital costs and interest rate differentials. According to theory, the repo rate's adjustment can affect the flow of foreign investments, economic activity levels, and subsequently, stock market performance.

Research on foreign direct investment includes studies such as Rhee and Wang (2009), suggesting that foreign ownership may decrease stock liquidity due to increased information asymmetry between domestic and foreign investors, potentially leading to reduced stock returns. Conversely, Sekhri and Haque (2015) observed that foreign direct investment can stimulate economic growth and offer opportunities for industries to improve technology, utilize human and natural resources optimally, access global managerial expertise, and gain competitive advantages with enhanced efficiency.

The third most effective model comprises gross domestic product, repo rate, and portfolio equities. Investors typically allocate funds to regions with promising returns.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

These returns, influenced by repo rates, indirectly impact portfolio equities, business activity levels, and consequently, stock market capitalization. During periods of high domestic interest rates compared to global rates, signalling higher investment returns, investors are inclined to invest in domestic portfolio equities. This influx of portfolio investments stimulates stock market capitalization. Conversely, declining domestic interest rates relative to global rates may lead to a reversal of this trend.

In summary, while the primary model influencing stock market capitalization consists of gross domestic product and repo rates, deviations from this model are contingent upon the economy's exposure to foreign investments.

Table 5 presents the posterior summaries of coefficients. P(incl|data) represents the probability of a variable being included in the model, while p(excl|data) denotes the probability of its exclusion. A higher P(incl|data) indicates better model performance when the variable is included. The probability of including GDP is 1.000, while that of the repo rate is 0.852. This reaffirms our earlier findings that a model combining gross domestic product and repo rates is paramount in determining stock market capitalization.

BF inclusion, the Bayes factor inclusion, indicates the necessity of including a variable in a model, with higher values suggesting greater importance. Consistent with the previous selection, GDP has the highest value of 6.638×10+10, followed by the repo rate at 3.950. The last two columns provide the 95% credible interval for each variable.

Regression Estimates

The model underwent re-estimation using The Cochrane–Orcutt AR (1) regression after excluding the inflation rate.

Table 6 presents the descriptive statistics of the variables. The variables lmcd, peqg, fdig, bmg, neer, repo, lgdp, and top exhibit average values of 11.578, 0.01, 0.12, 57.397, 139.757, 10.404, 11.337, and 48.896 respectively. Their values range from a minimum of -0.007 to a maximum of 351.5. The deviations from the mean are 0.375, 0.022, 0.018, 10.564, 82.802, 4.516, 0.244, and 8.02 respectively.
lmcd, peqg, and lgdp display negative and moderate skewness, while bmg, neer, repo, and top show positive moderate skewness. The kurtosis values for lmcd, repo, lgdp, and top are approximately 2, while that of neer is around 3. However, bmg exhibits a very low kurtosis value of around 1, while fdig deviates significantly from normality. Advanced econometric techniques and diagnostics are utilized to gain further insights into the behaviour of the macroeconomic variables.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Table 6: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max	p1	p99	Skew.	Kurt.
lmcd	38	11.578	.375	10.744	12.09	10.744	12.09	-.219	1.747
peqg	38	.01	.022	-.065	.059	-.065	.059	-.381	5.27
fdig	38	.012	.018	-.007	.097	-.007	.097	3.076	14.233
bmg	38	57.397	10.564	41.517	73.97	41.517	73.97	.079	1.383
neer	38	139.757	82.802	51.55	351.5	51.55	351.5	.951	2.786
repo	38	10.404	4.516	3.54	18.75	3.54	18.75	.32	1.836
lgdp	38	11.337	.244	10.809	11.661	10.809	11.661	-.326	1.892
top	38	48.896	8.02	34.321	65.975	34.321	65.975	.052	2.403

Source: Authors' computation from Stata 18, 2024.

The correlation matrix in Table 7 highlights associations between various variables. Portfolio equities, foreign direct investment, broad money growth, GDP, and trade openness are positively correlated with stock market capitalization, while the nominal effective exchange rate and repo rate show negative correlations. Additionally, foreign direct investment and portfolio equities exhibit a negative correlation, while broad money growth, trade openness, and nominal effective exchange rate are negatively correlated with portfolio equities. Conversely, repo rate and GDP show positive correlations with portfolio equities. Furthermore, nominal effective exchange rate and repo rate negatively correlate with foreign direct investment, whereas broad money growth, GDP, and trade openness exhibit positive correlations with foreign direct investment.

Table 7: Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) lmcd	1.000							
(2) peqg	0.035	1.000						
(3) fdig	0.356	-0.439	1.000					
(4) bmg	0.879	-0.092	0.407	1.000				
(5) neer	-0.859	-0.109	-0.469	-0.772	1.000			
(6) repo	-0.839	0.180	-0.379	-0.791	0.692	1.000		
(7) lgdp	0.977	0.043	0.389	0.876	-0.876	-0.800	1.000	
(8) top	0.677	-0.097	0.407	0.850	-0.671	-0.713	0.679	1.000

Source: Authors' computation from Stata 18, 2024.

In an alternative scenario, the nominal effective exchange rate and repo rate show negative associations with broad money growth, while displaying direct relationships with gross domestic product and trade openness. Similarly, the nominal effective exchange rate demonstrates a direct association with the repo rate, but an inverse relationship with gross domestic product and trade openness. Moreover, the repo rate exhibits negative correlations with both gross domestic product and trade openness,

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

while these two variables are positively related to each other. Subsequently, we visually represented these relationships through scatter plots, as illustrated in Figure 2.

Scatter Plot

The scatter plots indicate a weak positive relationship between stock market capitalization and portfolio equities, consistent with the correlation coefficient of 0.035 derived from the correlation matrix. Additionally, foreign direct investment, broad money growth, gross domestic product, and trade openness are positively associated with stock market capitalization. Conversely, the nominal effective exchange rate and repo rates display negative correlations with stock market capitalization. However, employing more sophisticated econometric techniques will offer deeper insights into the dynamics of these variables concerning stock market capitalization.

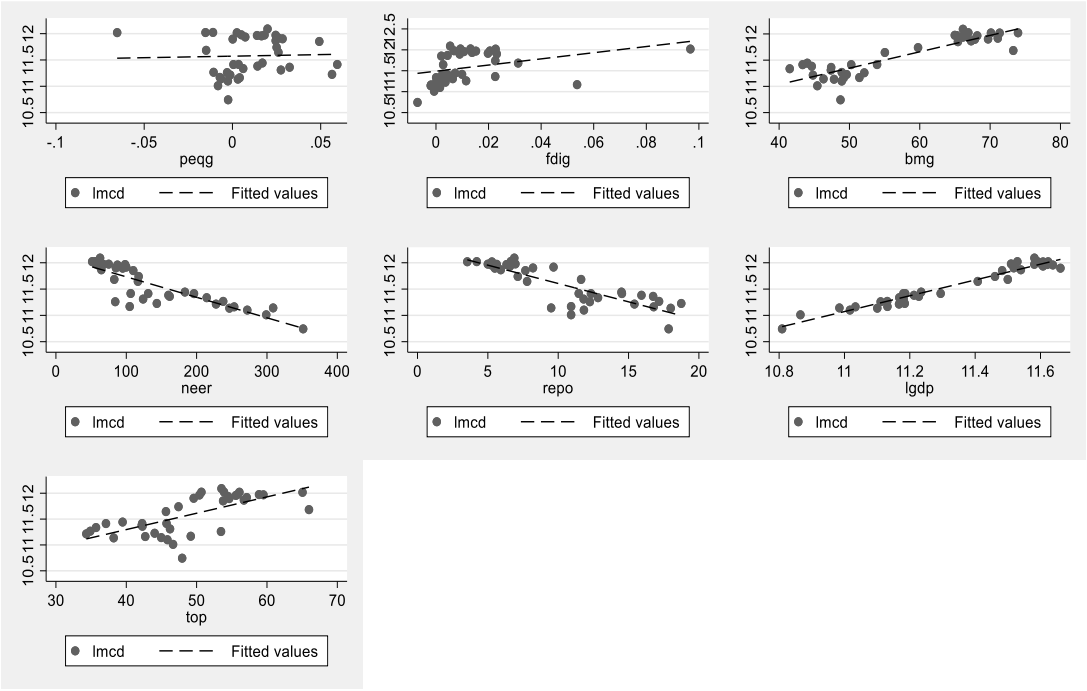


Figure 2: Scatter plot showing the relationship between stock market capitalization and the macroeconomic determinants.
Source: Authors' computation from Stata 18, 2024.

The Cochrane–Orcutt AR (1) Regression

Following the Bayesian estimation to identify the macroeconomic determinants affecting stock market capitalization in South Africa, we proceed to apply the Cochrane–Orcutt AR (1) regression to corroborate our results. The regression estimates are presented in Table 8.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

Table 8: Cochrane–Orcutt AR (1) regression with iterated estimates

lmcd	Coef.	Semirobust St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
peqg	.611	.702	0.87	.392	-.826	2.047	
fdig	-.692	.957	-0.72	.475	-2.648	1.264	
bmg	.007	.003	2.50	.018	.001	.013	**
neer	0	0	-0.76	.455	-.001	.001	
repo	-.017	.005	-3.73	.001	-.027	-.008	***
lgdp	.998	.188	5.31	0	.614	1.382	***
top	-.005	.002	-2.44	.021	-.01	-.001	**
Constant	.349	2.114	0.17	.87	-3.974	4.672	
Root MSE	0.073		Number of obs			37	
R-squared	0.942		Prob > F			0.000	
F(7, 29)	93.12		Durbin-Watson (Transformed)			1.999	
Durbin-Watson statistic(original)	1.582						
*** *p<.01*, ** *p<.05*, * *p<.1*							
Source: Authors' computation from Stata 18, 2024.							

The findings depicted in Table 8 highlight that among the variables examined, broad money growth, repo rates, gross domestic product, and trade openness emerge as statistically significant influencers of stock market capitalization in South Africa. The significance of broad money growth and repo rates underscores the pivotal role played by monetary policy in shaping stock market dynamics. Specifically, a one-unit increase in broad money stimulates stock market capitalization by 0.007 at a 5% significance level, while a corresponding increase in the repo rate leads to a decrease of 0.017 in stock market capitalization at a 1% significance level. This suggests that an expansion in broad money growth, augmenting liquidity in the economy, tends to foster business activities by reducing the cost of capital, thereby stimulating participation in the stock market. Conversely, an elevated repo rate, indicative of monetary tightening, elevates the cost of capital, diminishes returns on investment, and dampens business activities, ultimately curtailing stock market participation. These observations underscore the significant influence exerted by these monetary policy instruments on stock market capitalization in South Africa. The relevance of monetary policy in shaping stock prices is also corroborated by Nwaogwugwu (2018), who, utilizing ARDL bounds testing, found that government spending, interest rates, money supply, and taxation significantly influence the stock market in Nigeria, both in the short and long run.

The regression results further reveal that a one-unit increase in gross domestic product (GDP) leads to a significant increase in stock market capitalization by 0.998 at a 1% significance level. Conversely, an increase in trade openness is associated with a decrease in stock market capitalization by 0.005 at a 5% significance level. This underscores the imperative of robust macroeconomic policies aimed at driving

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

economic activities towards enhancing GDP, thereby positively impacting stock market capitalization. Previous studies by Cole et al. (2008), Beck and Levine (2004), Kim and In (2003), and Zhou et al. (2012) have consistently demonstrated a direct relationship between stock prices and economic growth. Since stock prices determine market capitalization, the findings suggest that economic activities, as proxied by GDP, significantly influence stock market capitalization. The adverse impact of trade openness may stem from increased imports relative to exports, undermining domestic productive activities and, consequently, reducing stock market capitalization. Such import-heavy trends tend to bolster foreign economic activities, leading to increased market capitalization abroad. This finding aligns with the study by Ho (2019) that established negative impacts of trade openness on stock market development in South Africa

The findings highlight the significance of BMG and repo rates in shaping stock market capitalization in South Africa. BMG's positive impact is in line with liquidity preference theory, where increased money supply reduces capital costs and boosts liquidity, fostering greater investment and trading in the stock market. This resonates with Keynesian principles, linking liquidity to heightened economic activities and investments. Conversely, higher repo rates, reflecting tighter monetary policy, decrease borrowing affordability, curtailing disposable income and corporate profits. This contractionary effect can dampen investment sentiments, leading to reduced stock market activities and capitalization. These results are consistent with similar observations made by (Onyele et al., 2020) regarding the influence of interest rates on Nigerian stock markets.

The robust positive correlation between GDP growth and stock market capitalization is extensively documented in economic literature. This connection can be elucidated through the lens of fundamental analysis, which asserts that stock prices, and consequently market capitalization, mirror both current and anticipated future earnings of companies within an economy. As GDP expands, signalling overall economic vitality, corporate earnings tend to rise, subsequently driving up stock prices and market capitalization. These findings are substantiated by research conducted by Beck and Levine (2004), Raza and Jawaid (2014), and Naik and Padhi (2015), all of which demonstrate a direct association between economic growth and stock market performance.

The adverse effect of trade openness on stock market capitalization presents an intriguing perspective, which can be analysed through the lenses of trade balance and market sentiment. In economies where imports exceed exports, the outflow of capital may undermine domestic business operations and diminish corporate profitability, thus exerting a negative influence on stock market capitalization. This viewpoint finds support in Alajekwu et al. (2013) study, which suggests that increased trade openness

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

in African economies may not consistently promote stock market development, but rather exacerbate economic fluctuations and negatively impact market capitalization. Moreover, these findings underscore the substantial influence of both monetary policy and macroeconomic variables on stock market capitalization in South Africa, emphasizing the need to consider broader economic conditions and monetary policy frameworks in comprehending stock market dynamics. The results further imply that policymakers should carefully tailor monetary policies and cultivate economic environments conducive to sustainable stock market growth, while acknowledging the intricate interplay of these economic indicators.

Diagnostics

The reliability of empirical outcomes derived from econometric procedures often hinges on specific indicators. In the case of the Cochrane–Orcutt AR (1) regression with iterated estimates, the Durbin-Watson statistic (original) stands at 1.582, while the transformed Durbin-Watson value is approximately 1.999, approaching the critical value of 2 as indicated in Table 8. This suggests that the null hypothesis, indicating the absence of serial autocorrelation in the model, cannot be rejected. According to Dielman (2009), the Cochrane–Orcutt technique is commonly employed to address autocorrelation issues by employing differencing transformations to eliminate autocorrelation between variables.

An attempt was made to assess the normality of the model. Table 9 presents the results of the skewness and kurtosis tests. The joint probability test yielded a value of 0.568, surpassing the significance level of 0.05. This suggests that there is insufficient evidence to reject the null hypothesis, indicating that the model is normally distributed.

Table 9: Skewness and Kurtosis Tests for Normality

Variable Test	Obs	Pr(Skewness)	Pr(Kurtosis)	-----	Joint
Prob>chi2				Adj chi2 (2)	
Residuals 0.568	38	0.767	0.321	1.13	

Source: Authors' computation.

Description of the Bayes Graphs

The posterior distributions for each variable are depicted in Figure 3 and Figure 4. These plots are consistent with the findings presented in Table 2. They illustrate the posterior probability distributions, each exhibiting varying point masses at zero. Notably, the distribution of the variable repo exhibits the smallest point mass at zero compared to the other variables. The sole exception is the distribution of lgdp, which shows no point mass at zero. This suggests a probability of one for including lgdp in the model, as

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

corroborated by the results in Table 2. Consequently, it is highly likely that lgdp should be incorporated into the model.

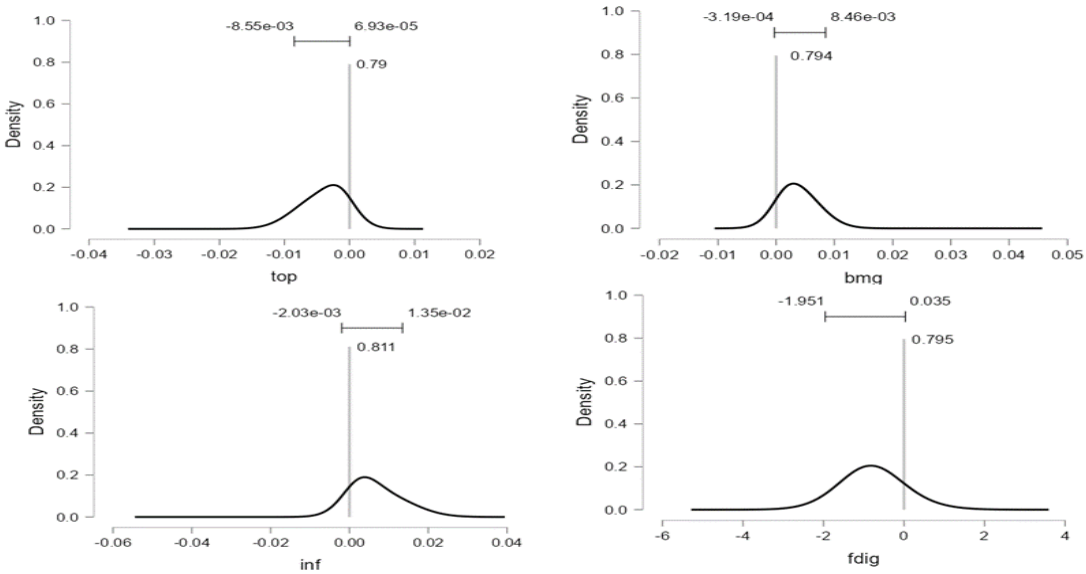


Figure 3: Density graph (A)
Source: Authors' computation from jasp 0.18.3, 2024.

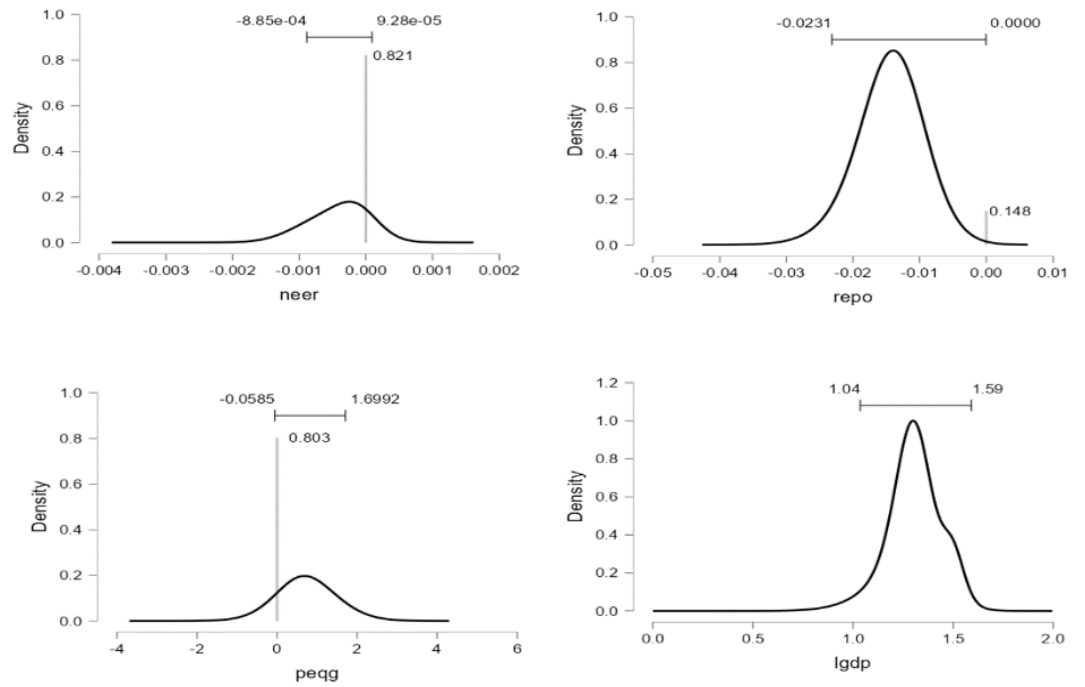


Figure 4: Density graph (B)
Source: Authors' computation from jasp 0.18.3, 2024.

Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

It's important to note that the larger the mass at zero (0) for each variable, the higher the likelihood of its exclusion from the analysis. For instance, the mass at zero (0) for the variable neer is larger than that of the variable inf, indicating a higher probability of exclusion for neer compared to inf. The probabilities of exclusion for each variable are explicitly shown on the distributions, as detailed in Table 2. These probabilities range from 0 to 1, with lower values indicating a higher likelihood of exclusion. Specifically, the probabilities of exclusion for the variables lgdp, repo, top, bmg, fdig, peqg, inf, and neer are 0, 0.148, 0.79, 0.794, 0.795, 0.803, 0.811, and 0.821, respectively. This order reflects their increasing probabilities of exclusion from the data, as observed within the 95% credible interval presented in Table 2 and depicted in the plots.

CONCLUSION AND POLICY RECOMMENDATIONS

The study focused on analysing the significant macroeconomic factors influencing market capitalization of listed domestic companies in South Africa, the most developed financial sector in Africa. Market capitalization serves as a vital macroeconomic indicator, impacting business activities and employment levels. Our findings highlight the pivotal role of GDP and repo rate in driving market capitalization. This underscores the influence of both real and monetary sectors on market dynamics. To enhance market performance, we recommend policy interventions aimed at bolstering the real sector, including creating a conducive macroeconomic environment to reduce investment costs for enterprises of all sizes. Measures such as subsidies, tax concessions, and streamlined registration processes for companies, and investment in modern infrastructure can be instrumental. Additionally, the South African Reserve Bank should design monetary policy channels that effectively transmit the impact of the repo rate through financial institutions, fostering market capitalization, productivity, and overall economic growth and development.

However, the outcomes derived from the Cochrane–Orcutt AR (1) regression with iterated estimates, while affirming the significance of GDP and repo rate in influencing market capitalization, also reveal the impact of broad money growth and trade openness. This underscores the critical role of both the real and monetary sectors in shaping market capitalization dynamics. Consequently, effective management of liquidity flows by the SARB becomes imperative to facilitate capital accessibility, reduce financial costs, and stimulate business activities, thereby influencing market capitalization positively. Conversely, trade openness exerts a negative effect on market capitalization. Nevertheless, with the increasing globalization of the world economy, it's evident that no economy can operate in isolation. Hence, we propose that the government implements rigorous quality control measures to ensure that cross-border business activities align with increased domestic business operations and employment, ultimately contributing to the macroeconomic goal of enhancing market capitalization of listed domestic companies.

LIMITATION OF THE STUDY

This study focused on the determinants of stock market capitalization in Africa's most advanced financial sector. However, future research could extend this investigation to other prominent stock markets, such as the Nigerian Stock Exchange and the Nairobi Stock Exchange.

DECLARATION OF INTEREST STATEMENT

There is no possible potential conflict of interest regarding this manuscript.

DATA AVAILABILITY STATEMENT

Data would be made available on request.

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Vol: 16 **No:** 01 **Year:** 2024 **ISSN:** 1309-8055 (Online) (**pp.** 178-205) **Doi:** 10.34109/ijefs.202416108

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