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ANALYZING THE IMPACT OF MACROECONOMICS VARIABLES ON STOCK RETURNS IN NIGERIA

Dr Esther Ikavbo Evbayiro-Osagie[1], Akinuli Bankole O.[2], Popoola, Olukemi E[3]., Ogunlade, Deborah A[4]., and Popoola Olugbenga M[5].

[1,2]University of Benin, Faculty of Management Sciences, Department of Banking and Finance, Benin City, Edo State, Nigeria.
[3,4]Department of Banking and Finance, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria

Corresponding author's e-mail: boakinuli@gmail.com

Abstract:
This study has empirically investigated the impact of macroeconomic variables on stock returns in Nigeria. The method of analysis used in this study is Autoregressive Distributed Lag (ARDL) model. The study spanned from 1987 up to 2022. The objective of the study is to assess the impact of macroeconomic variables on stock returns in Nigeria. Using econometrics techniques, a good number of pre-diagnosis tests and post-diagnosis tests were conducted. The study revealed that macroeconomic variables have significant impact on stock returns in Nigeria. Therefore, it is recommended that the government should prioritise the price stability with the view of availing the investors to plan ahead and optimally harness the market opportunities. The government should also direct and manage interest rate level with the sole aim of encouraging the investors to keep patronising the securities market and not dispel them. Exchange rate determination must be managed to strengthen the value of the naira in relation to foreign currencies. Also, the quantity of money supply to the circulation should be monitored and must be seen adequate so as not to create unnecessary scarcity of naira to the detriment of the stock market.
Key words: Macroeconomics variables, Stock returns and Money Supply

1.0 INTRODUCTION

The stock market of a nation serves as a platform, encompassing trading facilities and a conducive environment, facilitating the exchange of various securities, including equities and debt instruments, for both individual and institutional investors. Essentially, a stock exchange is a well-organized entity where the freely tradable securities of listed companies are exchanged. A pivotal role of the stock market is to function as an intermediary, bridging the gap between savers and borrowers (Ajao, et al. 2021). The significance of the stock market in any country is profound, contributing significantly to economic growth and development. It plays a crucial role in mobilizing domestic resources within the economy, directing them towards productive investments. The performance of the stock market is often assessed through its market index, influenced by a myriad of factors ranging from economic, political, and socio-cultural to global dynamics (Rafique, Amara, Naseem, & Sultana, 2013).

Economic theory and empirical research converge on the recognition of inventory prices and, consequently, market indices as paramount indicators of shifts in economic activity. This intellectual pursuit has gained prominence over the last four decades, fueled by the mounting

belief that tangible economic activities regularly exert an impact on stock prices. For instance, Chen et al. (1986) asserted and empirically substantiated that fluctuations in macroeconomic variables have a bearing on future dividends and reductions, thereby influencing stock prices. Smith (1990), in his examination of American stock price behaviour, observed a typical pattern wherein stock returns tend to decline precipitously (averaging over several months) before the onset of a recession and ascend swiftly just before a recession concludes. Capital markets inherently incorporate changes in consumption and investment opportunities, leading to stock price fluctuations that are intricately linked to innovations in economic variables (Goswami and Jung, 1997).

The dynamic interplay between stock returns and the broader economy follows a reversible model, with the stock market capable of influencing the economy, as evidenced by Smith (1990), or vice versa, as explored by Amadi and Odubo (2002). This phenomenon is particularly evident in the context of macroeconomic variables and their correlation with the stock market index. Foundational to this relationship is the tenet of fundamental analysis, which posits that stock prices undergo influence from changes in money supply, interest rates, inflation, and various other macroeconomic indicators. Adopting a general equilibrium approach, fundamental analysis underscores the interconnectedness of sectors as pivotal to comprehending the persistence and co-movement observed in macroeconomic time-series.

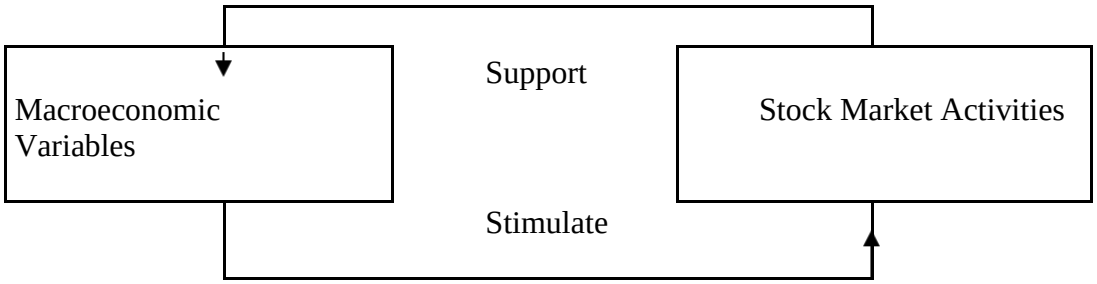
Despite a substantial body of economic literature delving into the nexus between stock market returns and real macroeconomic activities in developed economies such as the US and Japan, there is a noticeable dearth of similar inquiries in the context of developing economies like Nigeria. The nature of the relationship between stock prices, specifically the stock market index, and macroeconomic variables may exhibit distinctions between developed and developing economies. Therefore, this study endeavours to scrutinize the intricate relationship between selected macroeconomic variables—namely money supply, inflation, exchange rate, and interest rate—and stock returns in Nigeria, covering the extensive period from 1987 to 2022.

2.0 REVIEW OF LITERATURE

Conceptual Framework

Within the realm of the stock exchange, the ebb and flow of stock prices are predominantly steered by market dynamics. They exhibit an upward trajectory or stability when industries, individual companies, and the broader economy demonstrate indications of steadfastness and expansion. Conversely, an economic downturn, severe downturn, or financial upheaval may potentially trigger a stock market collapse. This study operates under the assumption that the fluctuations in stock prices serve as a barometer for the overarching direction of the economy. Hence, the correlation between stock trends and economic trends can be postulated to be cyclical in nature. See Figure 1 below.

Figure 2.1: The Relationship between Macroeconomic Variables and Stock Market
Activities



Source: Adapted from Adaramola (2012) for the current study by the Author, 2023

Theoretical Framework

Arbitrage Pricing Theory (APT)

The application of the Arbitrage Pricing Theory (APT) in scrutinizing the interplay between stock returns and macroeconomic variables has been a subject of exploration by various scholars, including Clare and Thomas (1994), Hamao (1998), Shama (2002), and Chen, Roll, and Ross (1986). Originating as an alternative to the Capital Asset Pricing Model (CAPM) proposed by Sharpe (1964), Lintner (1965, 1969), and Mossin (1966), the CAPM has faced criticism for its impracticality and reliance on the assumption of a perfect capital market.

In contrast, the APT acknowledges a spectrum of risk sources that could impact stock prices. This model establishes a connection between changes in stock prices and multiple risk factors, concurrently assessing the associated risk premiums for each of these factors. Recognizing that firms operate within the broader economic environment, the APT contends that macroeconomic variables serve as indicators of economic activities influencing a firm's ability to enhance sales, generate cash flow, and make investments. Any alteration in government policies affecting these macroeconomic variables introduces risk factors. Consequently, any economic factor influencing a firm's prospective cash flow or earnings is poised to affect its stock price. The primary objective of this research is to ascertain the impact of these macroeconomic variables on stock prices in Nigeria. The APT, incorporating multiple risk factors, is expressed as follows:

$$E(Rit) = \lambda 0 + \lambda 1 bi1 \ldots\ldots + \lambda j bij + \quad it \ldots\ldots\ldots\ldots\ldots \quad 2.1$$

Where: E(Rit) = Expected return on stock i.

$\lambda 0$ = Risk free rate of return.

λj = Asset return sensitivity to factor j/price-risk sensitivity.

bi1, bi2, ….bij = Risk factors/macroeconomic variables.

The APT was adapted as the theoretical framework of this study for its applicability in Nigeria.

Interest Rate and Stock Returns

Interest rates exhibit variability over time, influenced by factors such as default risk, inflation rate, and capital productivity, as articulated by Chandra (2004). Fluctuations in interest rates stimulate substitutions between stock market and money market instruments, as well as

speculative activities. According to Kevin (2000), the interest rates in the organized financial sector are managed within a preferred range through monetary policy, while in the unorganized financial sector, rates are uncontrolled and subject to wide fluctuations based on the dynamics of demand and supply in the market. Investors are confronted with the imperative task of considering the prevailing level and growth in interest rates across diverse sectors of the economy, meticulously assessing their impact on the performance and profitability of companies. Chandra (2004) contends that an upswing in interest rates not only depresses corporate profitability but also triggers an escalation in the discount rate applied to equity investors, both of which exert adverse effects on stock returns, and conversely. Consequently, an increase in interest rates is anticipated to have a detrimental impact on the overall organizational performance.

Money Supply and Stock Returns

The control of the money supply stands as a pivotal function of the central monetary authority in any given economy, driven by its significant impact on economic activities (Osamwonyi, 2003). Kevin (2000) designates the supply of money as a leading indicator, with M1 encompassing currency in circulation and demand deposits, while M2 includes M1 plus near monies, such as time deposits. For the purposes of this study, we will adopt M2.

Numerous studies, primarily conducted using data from developed countries, converge on a compelling consensus that money growth exerts an adverse influence on stock prices and stock returns (Davidson and Froyen, 1982; Rozeff, 1994). The prevailing rationale behind this consensus posits that unchecked money growth, unless accompanied by a commensurate expansion in the output of goods and services, has the potential to trigger an inflationary spiral in the economy. Consequently, stock prices tend to decline as rational economic agents strategically diversify their wealth holdings away from financial assets, such as stocks and shares, in favor of tangible assets. This nuanced understanding underscores the intricate relationship between money growth and its repercussions on stock markets.

Exchange Rate and Stock Returns

The exchange rate represents the valuation of a unit of a specific currency relative to other currencies. The exchange rate of the Naira against major world currencies significantly impacts the performance and profitability of industries and companies heavily reliant on imports (Osamwonyi, 2003). This metric is an outcome of a country's external trade and is intricately connected to its balance of payments, with the exchange rate being directly influenced by deficits in the balance of payments and the levels of external reserves. Despite the critical role exchange rates play in shaping economic dynamics, there is a dearth of literature addressing the impact of exchange rates on stock returns behavior. The theoretical proposition posits a positive relationship between exchange rates and stock prices, ultimately influencing stock returns. Maku and Atanda (2010) provide empirical support for this theory by demonstrating a positive correlation between stock prices and a depreciating Naira exchange rate. This underscores the need for a more comprehensive exploration of the nuanced interplay between exchange rates and stock market dynamics.

Inflation Rate and Stock Returns

Chandra (2004) observes that the impact of the inflation rate on the corporate sector is multifaceted, exhibiting a bidirectional nature where certain industries may experience benefits while others endure setbacks. Extensive research has delved into the intricate

relationship between inflation and stock prices. Notably, Fama and Schwert (1977) provide empirical evidence suggesting a negative correlation between stock prices and both the expected and unexpected components of the Consumer Price Index.

The conventional wisdom posits that common stock should serve as a hedge against inflation. However, Feldstein (1980) posits an alternative perspective, contending that an escalation in the inflation rate leads to a reduction in share prices due to the interplay of inflation with the tax system. Further substantiating this viewpoint, Summers (1981) asserts that this interaction between inflation and the tax system can account for a substantial portion of the observed decline in share prices. This nuanced understanding underscores the complexity of the relationship between inflation and stock prices, with different sectors and industries responding in diverse ways to inflationary pressures.

Other Theories of Stock Price Behaviour

Fundamentalist View

According to fundamentalists, the valuation of a corporation's stock hinges on expectations concerning future earnings and the rate at which those earnings are discounted. This school of thought employs present value principles to assess the worth of corporate stock, considering factors such as dividends, earnings, assets, and interest rates to derive the stock price. As articulated by Pilbeam (1995), the fundamentalist theory posits that it is the anticipated changes in economic fundamentals that propel share prices. The fundamental approach operates on the assumptions that every security possesses an intrinsic value, the intrinsic value is reflected by the market price, and basic economic factors pertaining to a firm determine the intrinsic value of its issued securities (Okafor, 1983). Furthermore, Okafor (1983) suggests that fundamentalists, while not universally agreeing on specifics, commonly utilize three fundamental performance indicators to predict intrinsic values: the earnings record, an index of risk, and a time-value conversion rate for funds. The fundamentalist analytical framework encompasses three major forms of analysis, focusing on general economic conditions, industry conditions, and company-specific analysis. This multifaceted approach underscores the meticulous consideration of various factors inherent to fundamental analysis in predicting the intrinsic value of securities.

Technicalist View

The technical school presents an opposing viewpoint to the fundamentalists, asserting that stock price behaviour can be forecasted using financial or economic data. Advocates of this school argue that stock prices adhere to specific patterns and that each price is influenced by preceding prices, creating interdependent successive price movements. Smith (1990) notes that technical analysts immerse themselves in studying market price changes, trading volume, and investors' sentiments. The foundational principles of this method, as delineated by Reilly and Norton (1999) and Okafor (1983), can be summarized as follows: the value (price) of securities is determined by the interplay between forces of demand and supply; these forces, in turn, are influenced by a combination of rational and irrational factors; movements in stock prices often follow recognizable systematic, self-sustaining, and recurring trends; these market trends form a robust basis upon which profitable trading strategies can be formulated.

Among the arsenal of tools in technical analysis, the Dow Theory stands out as the oldest and arguably the most widely embraced. In essence, this theory operates as a mechanical framework leveraging previous high and low points in a stock market index as indicators for projecting market trends and reversals. As elucidated by Charles Dow, the theory's originator as cited in Okafor (1983), he posits that all price actions on the exchange comprise three simultaneous movements, forming the foundational basis of this analytical approach.
:

(a) The primary movement

(b) The secondary movement and

(c) The minor movement.

Technical analysis, as articulated by Roberts (1959), represents a commonly adopted and convenient term for the examination of stock market patterns. Its influence is pervasive in the financial world, with its terminology deeply embedded in market reporting, and some market participants relying extensively on its principles. The realm of technical analysis encompasses various approaches, many of which necessitate a substantial degree of subjective judgment in their application. These approaches, as described by Roberts, are often empirical and, in part, draw analogies with physical processes such as tides and waves.

However, despite the widespread adoption of technical analysis and the prominence it enjoys in market discourse, there exists a noteworthy perspective, as posited by Alexander (1961). He suggests that the random walk and efficient market models of security value behavior imply that trading rules in the stock market solely based on past price series cannot yield profits surpassing those achieved through a straightforward buy-and-hold strategy. In contrast, technical analysts or chartists counter this assertion, contending that the subtle foundations underpinning their rules are not easily captured by simple statistical tests, as argued by Jenson and Benington (1970). This ongoing debate highlights the intricate nature of the financial markets and the divergent viewpoints regarding the efficacy of technical analysis in navigating them.

Empirical Review

Research conducted across different countries has sought to elucidate the intricate relationship between macroeconomic fundamentals—such as interest rates, inflation rate, exchange rate, domestic and external debt, trade balances, openness, foreign reserves, and industrial production—and stock prices, employing diverse methodological approaches. For instance, Chen, Roll, and Ross (1986) utilized the Arbitrage Pricing Theory (APT), developed by Ross in 1976, to explore the nexus between specific macroeconomic variables and stock returns in the US stock market. Their findings revealed positive associations between changes in risk premiums, alterations in the term structure, and expected stock returns. Conversely, both anticipated and unanticipated inflation rates exhibited negative relationships with expected stock returns. In a parallel study, Poon and Taylor (1991) replicated this analysis in the UK market, yielding results indicating that macroeconomic variables did not exert a discernible impact on share returns in the UK.

Shifting focus to the Nigerian context, Ayunku and Etale (2015) investigated the determinants of stock market development in Nigeria using data from the CBN Statistical Bulletin and the National Bureau of Statistics covering the period 1977 to 2010. Their findings highlighted the significance of market capitalization, credit to the private sector, and exchange rates as pivotal determinants of stock market development. Furthermore, the study revealed that inflation and savings rates negatively influenced stock market development, prompting recommendations for regulatory authorities to actively moderate and control these factors for macroeconomic stability.

Exploring another dimension, Ochieng and Oriwo (2012) scrutinized the relationship between macroeconomic variables (including Treasury bill rate, inflation rate, lending interest rate) and the performance of the Nigerian Stock Exchange, based on the All-share

index. Their regression model for the period 2008 to 2012 demonstrated a negative relationship between Treasury bill rate and the All-share index, while inflation exhibited a weak positive relationship.

Similarly, Osamwonyi and Evbayiro-Osagie (2012) delved into the relationship between macroeconomic variables and the stock market index in Nigeria, utilizing the Vector Error Correction Model (VECM) for the period 1975-2005. The macroeconomic variables employed encompassed interest rates, exchange rates, fiscal deposits, gross domestic product, and money supply. Their study affirmed that macroeconomic variables indeed wielded influence over the stock market in Nigeria. Overall, these diverse studies contribute valuable insights into the multifaceted dynamics linking macroeconomic fundamentals and stock market performance.

The intricate relationship between macroeconomic variables and stock prices or stock returns is fundamentally grounded in the arbitrage pricing theory in finance. An examination by Sangmi and Hassan (2013) delves into the impact of macroeconomic variables on stock prices in the Indian Stock Market, revealing a significant relationship between various macroeconomic factors (including inflation, exchange rate, interest rate, money supply, gold price, and industrial production) and stock prices in India.

Further insight into the interplay between macroeconomics and stock market dynamics comes from Corradi, Distaso, and Mele (2013). Their investigation focuses on the macroeconomic determinants of stock volatility and volatility premiums, utilizing Vix index data from the Chicago Board Options Exchange (CBOE) spanning from 2007 to 2009. In their analysis, they construct and estimate a no-arbitrage model explicitly linking stock market volatility to a range of macroeconomic and unobservable factors. The findings indicate that the level and fluctuations of stock volatility are predominantly explained by business cycle factors, with approximately 20% of overall variations in volatility attributed to unobservable factors. Notably, the study suggests a robust association between capital market volatility and business cycle trends, with higher volatility observed during economic slowdowns compared to economic booms. This conclusion aligns with earlier empirical findings by Schwert (1989 a, b), Hamilton & Lin (1996), as well as Brandt & Kang (2004). Together, these studies contribute to a nuanced understanding of the intricate dynamics between macroeconomic variables and stock market behaviour, shedding light on the multifaceted factors influencing stock prices and volatility.

3.0 METHODOLOGY

In an attempt to critically analyse the impact of macroeconomic variables on stock returns in Nigeria, three major areas would be examined which primarily include: research design, data source and specification of model for this study.

Research Design

This study employs macroeconomic variables, specifically exchange rate, money supply, interest rate, and inflation rate, as independent variables to assess their impact on stock returns in the context of Nigeria. The research adopts an ex-post facto research design, also known as a longitudinal research strategy. In the realm of longitudinal research, data are inherently historical and cannot be manipulated, providing a retrospective perspective that captures the causal relationship between macroeconomic variables and stock returns in the Nigerian context. This approach aims to analyze and understand the historical patterns and dynamics that have shaped the interplay between these macroeconomic factors and stock returns, offering valuable insights into the intricate relationship between economic indicators and financial market performance in Nigeria.

Population and Sample Size

This study is hanging on yearly aggregate data, hence, a census sampling technique which equates population and sample size is adopted. Thus, macroeconomic variables constitute population size while the exchange rate, broad money supply, interest rate and inflation rate represent the sample size culled from the statistical bulletin of the Central Bank of Nigeria (CBN) spanning the period of 1987 up to 2022.

Scope and Sources of Data

This study would use the available data substantiated by the Central Bank of Nigeria (CBN) Statistical bulletin ranging from 1986 to 2021. The dependent variable is stock returns which are extracted from All Share Index (ASI). To extract stock returns (SR) from ASI, natural log of present ASI over previous ASI multiply by 100 is used (Osamwonyi, 2003; Osamwonyi and Evbayiro-Osagie, 2012; Omorokunwa and Ikponmosa, 2014);

That is, $SR = Ln\left(\frac{ASI_1}{ASI_0}\right) X\ 100$

Where,

Ln = Natural log

ASI_1 = Present ASI

ASI_0 = Previous ASI

Meanwhile, on other hand, the independent variables include interest rate, exchange rate, inflation rate and money supply (Osamwonyi and Evbayiro-Osagie, 2012).

Model Specification

The proposition awaiting test is centred on the tentative statement that 'there is no relationship between stock returns (dependent variable) and the rest of explanatory variables comprises of exchange rate, interest rate, inflation rate and money supply. The study's theory is based on The Arbitrage Pricing Theory (APT) model as proposed by Stephen Ross (1976). APT simply gives potential investors a multi-factor pricing model for securities, based on the nexus between expected financial assets and its associated risks. This work would simply adapt Osamwonyi and Evbayiro-Osagie (2012) model with slight modification to the variables used, however, the gap intended to achieve here would be seen from time difference between previous work done and the current one if the causal relationships among variables would still hold or it would have been varied. Moreover, autoregressive distributed lag (ARDL) model is used because of the result of the unit root test conducted using Augment Dickey-Fuller (ADF) test. The model is specified below thus:
In the implicit form, we have
SR = *f*(EXC, INTR, INF, LMS2) ….. (1)

In explicit form/or mathematical form, the short-run equation for ARDL model can be expressed as:

$$\Delta SR_t = \propto_{0i} + \sum_{i=i}^{q_1} \propto_{1i} \Delta SR_{t-1} + \sum_{j=i}^{q_2} \propto_{2i} \Delta EXC_{2_{t-1}} + \sum_{j=i}^{q_2} \propto_{3i} INTR_{t-1} + \sum_{j=i}^{q_2} \propto_{4i} INF_{t-1} + \sum_{j=i}^{q_2} \propto_{5i} LMS2_{t-1} + \varepsilon_1, t \ \ldots (2)$$

ARDL Long run model specification (in case there is long-run relationship among the variables)

$$\Delta SR_t = \propto_{0i} + \sum_{i=i}^{q_1} \propto_{1i} \Delta SR_{t-1} + \sum_{j=i}^{q_2} \propto_{2i} \Delta EXC_{2_{t-1}} + \sum_{j=i}^{q_2} \propto_{3i} INTR_{t-1} + \sum_{j=i}^{q_2} \propto_{4i} INF_{t-1} + \sum_{j=i}^{q_2} \propto_{5i} LMS2_{t-1} + \alpha_1 ECT_{t-1} + \varepsilon_1, t \ \ldots (3)$$

Where;
SR = Stock returns
EXC = exchange rate
INTR = interest rate
INF = inflation rate
LMS2 = broad money supply
ECT_{t-1} denotes error correction term, while t is time
α_1 = is the coefficient of ECT in the short run
$\propto_{1i} - \propto_{5i}$ co-efficient in the long-run
And also, $\propto$ = constant/intercept

$\propto_{1i} - \propto_{5i}$= co-efficient in the short run

ε= error term/stochastic disturbance

***APRIORI* EXPECTATION**

$\propto_{1i} - \propto_{5i} > 0$

4. DATA ANALYSIS AND INTERPRETATION

Results of Descriptive Statistics

Descriptive statistics is conducted to assess the adequacy of the elements of the variables adopted in this study and to determine whether or not there is issue in normality condition, dispersion and volatility in the variables employed. The Table 1 below depicts descriptive statistics test thus.

Table 1 Descriptive Statistics

	EXC	INF	INTR	LMS2	SR
Mean	107.4251	18.07750	20.04528	6.098615	-16.20683

Median	115.2551	12.95000	19.09500	6.272794	-19.73242
Maximum	387.0000	72.80000	36.09000	9.301496	78.10146
Minimum	0.764900	5.400000	11.55000	1.923876	-69.01809
Std. Dev.	104.8184	15.59932	5.656160	2.330094	28.78963
Observations	36	36	36	36	36

Source: (Author's computation using E-views 10 version (2024) and Data extracted from CBN Statistical |Bulletin, (2022).

From Table 1 above, the descriptive statistics is displayed vital information. Firstly, the means of exchange rate (EXC), inflation rate (INF), interest rate (INTR), broad money supply (LMS2) and stock returns are 107.4251, 18.0775, 20.0452, 6.0986, and -16.2068 respectively. On the other hand, the maximum descriptive statistics result are 387.00, 72. 80, 36.09, 9.30 and 78.10 for exchange rate, inflation rate, interest rate, broad money supply and stock returns respectively within the period of review. There are 36 observations in this study.

Results of Correlation Matrix

Correlation coefficient was used to evaluate the relationship between variables adopted in this study and below is the result in table 2

Table 2 Correlation Coefficient Analysis

Correlation Probability	EXC	INF	INTR	LMS2	SR
EXC	1.000000				

INF	-0.265070	1.000000			
	0.1182	-----			
INTR	-0.404744	0.090057	1.000000		
	0.0143	0.6014	-----		
LMS2	0.860313	-0.329728	-0.252852	1.000000	
	0.0000	0.0495	0.1368	-----	
SR	0.276874	-0.276001	-0.399111	0.401791	1.000000
	0.1021	0.1032	0.0159	0.0151	-----

On examining the correlation matrix on Table 2, this concept is clarified based on the relationship between dependent variable of model and independent variables. From Table 2 above, the correlation coefficient result shows that stock returns has positive relationship with exchange rate (EXC) and money supply (LMS2) though the P-value is statistical insignificant for EXC while it is significant for LMS2. On the other hand, SR has a negative correlation with in INTR and INF. The result is statistical significant for INTR while it is not for INF. On the whole, the result may indicate there is no multicollinearity issue in this analysis.

Stationarity Test

To avoid spurious regression, unit root must be absence in the variables used, otherwise, the result may be misleading. This study |Augmented Dickey-Fuller test is used to test for unit root. The decision rule is that Mackinnon critical value should be 5% and it ought to be in absolute term. Table 3 and 4 indicate the summary of parameters tested for stationarity using ADF below.

Unit root test using Augmented Dickey-Fuller (ADF)

Table 3: ADF-*Unit root test at level*

Variables	ADF Test Statistic Value	Mackinnon critical Value at 5%	Prob.	Remark
SR	-5.4032	-3.5484	0.0005	Stationary $I_{(0)}$
EXC	-0.3636	-3.5442	0.9851	Non-stationary
INF	-4.3210	-3.5442	0.0083	Stationary $I_{(0)}$
INTR	-3.0149	-3.5442	0.1426	Non-stationary
LMS2	-0.9377	-3.5484	0.9396	Non-stationary

Table 4: ADF-*Unit root test at first Difference*

Variables	ADF Test Statistic Value	Mackinnon critical Value at 5%	Prob.	Remark
SR	-5.4032	-3.5484	0.0005	Stationary $I_{(0)}$
EXC	-5.7358	-3.5484	0.0002	Stationary $I_{(1)}$
INF	-4.3210	-3.5442	0.0083	Stationary $I_{(0)}$
INTR	-7.5009	-3.5484	0.0001	Stationary $I_{(1)}$
LMS2	-4.1997	-3.5484	0.0114	Stationary $I_{(1)}$

Source: *(Author's computation using E-views 10 version (2024)*

The computations in Table 3 and Table 4 showed the results of unit root test for Augmented Dickey-Fuller (ADF) as indicated above. From Table 3 and 4, the ADF reported that two of the variables were stationary at level while the rest became after first difference. Thus, at first difference all the variables became stationary as they have ADF statistics greater than Mackinnon Critical value at 5%.

Optimal Lag Selection

The optimal lag selection indicates the appropriate lag length to choose while estimating Autoregressive Distributed Lag (ARDL) model as the unit root test points to the choice of ARDL in our estimation. This is obtained using vector autoregressive (VAR) model. The optimal lag length for the variables is stated below in Table 7

Table 5: Appropriate lag length for dependent variables:

Dependent Variables	Lag Length Criteria
SR	2

Source: *(Author's computation using E-views 10 version (2024)*

From Table 5, the appropriate lag length to be selected are stated when each of the variables is specified under dependent variable and independent variables based on the causality model highlighted in this study. The stock returns should take 2 as lag length. The selection procedure was based on the AIC (Akaike information criterion) as displayed below in Table 6.

Table 6 AIC (Akaike information criterion).

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-236.9998	NA	18903.57	12.68420	12.85658	12.74553
1	-207.0176	52.07429*	4115.356	11.15882	11.37429*	11.23549
2	-205.3487	2.810845	3977.476*	11.12362*	11.38218	11.21561*
3	-205.3124	0.059182	4191.087	11.17434	11.47600	11.28167

* 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

Co-integration Test

In this sub-section, the Autoregressive Distributed Lag (ARDL) model bound test approach is adopted to evaluate whether or not long run relationship exists among the variables. It should be noted that before any meaningful conclusion could be made as touching the long run relationship between the series, it is crucial that co-integration must first exist among the variables.

ARDL Bounds Co-integration Test

From Table 3 and 4 some of the variables were stationary at level, while some were stationary after first difference. The result from unit root test informed the decision to choose ARDL bounds co-integration test to analyse the variables' long run relationship in this study. Below in Table 7, the ARDL bounds co-integration test was carried out.

Table 7: F-Bounds Test (see Appendix 5 for Robust Result)

ARDL Model

Bound significance	**10%**	**5%**	**2.5%**	**1%**	**F-Stat**	**D.F**
I(O) (Lower Limit)	2.2	2.56	2.88	3.29	7.596514	4
I(1) (Upper Limit)	3.09	3.49	3.89	4.37		

Source: *(Author's computation using E-views 10 version (2024)*

F-Bound test could be used to evaluate co-movement among the variables.

Decision Rule: at 5% Significance value

If F-Statistics (BT) < Lower Limit Bound ↔No Long-run relationship exist. Hence, accept null hypothesis of no long run relationship exist

If Lower Limit < F-Statistics (BT) > Upper Limit ↔ Long-run relationship exist. Hence, reject null hypothesis of no long run relationship exist.

If F-Statistics (BT) > Upper Limit (I_1) ↔ Long-run relationship exist. Thus, reject null hypothesis of no long run relationship exist.

NB: Any reasonable level of significance can be chosen depending on the researcher margin of confidence. Here, 5% level of significance is chosen as margin of safety or confidence.

Table 7 indicates that there is a long run relationship among the variables as F-Bound test conducted attest to this fact with the F-statistics result of 7.596514 which falls outside the Upper Limit at 1%.

Presentation of Results

Auto-Regressive Distributed Lag (ARDL) Model Results

ARDL techniques is adopted to analyse the model specified arising from the result of unit root test conducted.

Table 8: ARDL Long-Run and Short-Run Results for Model

Dependent Variable: SR (Proxy for stock returns)							
Long-Run Estimation				**Short-Run Estimation**			
Variable	**Coefficient**	**t-Statistic**	**Prob**	**Variable**	**Coefficient**	**t-Statistic**	**Prob**

SR(-1)	0.078537	0.478572	0.6361	*D(SR(-1))	0.474746	3.412368	0.0020
*SR(-2)	-0.474746	-2.995408	0.0058	EXC	-0.093862	-1.608776	0.1193
EXC	-0.131051	-1.640914	0.1124	**LMS2	7.004880	2.584964	0.0155
**LMS2	9.780276	2.529909	0.0176	INF	-0.331513	-1.678486	0.1048
INF	-0.462862	-1.595590	0.1222	**INTR	-1.608016	-2.546365	0.0169
**INTR	-2.245126	-2.513739	0.0182	*ECM(-1)*	-1.396209	-7.349806	0.0000
C	-15.27025	-0.532628	0.5986				

Source*: (Author's computation using E-views 10 version (2024)*
**implies significant at 1%, **implies significant at 5%*

Table 9: Statistical Properties and Post Diagnostic Results for the Model

Statistical Properties		Post Diagnostic Test Results	
R-Squared	0.636961	B-G Serial Correlation LM (F-Statistics)	1.592643
Adj R-squared	0.625616	B-G Serial Correlation LM Prob F (1, 28)	0.2233
F-statistics	4.698068	BPG Heteroskedasticity (F-stat)	0.863990
Prob(F-statistcis)	0.002151	BPG Heteroskedascity Prob(20, 9)	0.5336
Durbin Watson Statistics	1.974799	Jarque-Bera	2.306482
Akaike Info Criterion		JB Prob	0.315612
Model Selection	2		
ARDL Best Model	(2, 0, 0, 0)		

Source: *(Author's computation using E-views 10 version (2024)*

Interpretation of Results

The implication of findings when autoregressive distributed lagged model – ARDL is applied to analyse the relationship between stock returns (SR) (dependent variable) and other explanatory variables such as exchange rate (EXC), inflation rate (INF), interest rate (INTR), broad money supply (LMS2) are discussed in turns thus:

On examining the relationship between stock returns (SR) and exchange rate (EXC) in the long run, the EXC has an associated negative influence on the stock returns (SR). This implies that there is negative relationship between exchange rate and stock returns (SR) in Nigeria within the period of review. The coefficient result of EXC of 0.131051 implies that 1% increase in the exchange rate will stimulate 13.1051% in stock returns within the period of review. The results are statistically insignificant with the probability value of 0.1124.

Meanwhile, in the short run, EXC still maintains its negative relationship with the stock returns. The coefficient of exchange rate of -0.093862 connotes that 1% increase in the exchange rate will induce 9.3862% decrease in the stock return though the result is statistically insignificant with the probability value of 0.1193. The result of this work is consistent with the work of Ayunku and Etale (2015), Omorokunwa and Ikponmosa (2014).

Looking at the broad money supply (LMS2) at the long run, the result shows that there is a positive relationship between stock returns and money supply and the result is statistically significant with the probability value of 0.0176. The result tallies with the *a priori* expectation as a positive relationship is anticipated in this study. On the short run, LMS2 has an associated positive influence on the stock returns within the period of review. The LMS2's coefficient of 7.004880 depicts that a per cent increase in the money supply will stimulate 700.4990% boost in the stock returns within the period of investigation. The result is statistically significant with the P-value of 0.0155.

Likewise, the outcome is aligned with the *a priori* expectation. The result also aligns with work of Osamwonyi (2003); Osamwonyi and Evbayiro-Osagie (2012); Omorokunwa and Ikponmosa (2014).

A look at the inflation rate indicates that it has an associated negative influence on the stock returns. The coefficient value of inflation of 0.462862 connotes that 1% increase in INF will stimulate 46.2862% decrease in the stock returns within the period of review. The result is statistically insignificant with the P-value of 0.1222. Also, in the short, inflation still has a negative influence on the stock returns. The coefficient of inflation of -0.331513 denotes that a unit increase in the inflation rate will induce 33.1513% decrease in stock returns within the period of review. The result is in line with the work of Osamwonyi (2003).

Interest rate in the long run has an associated negative influence on the stock returns within the period of review. The coefficient of interest rate of -2.245126 implies a unit increase in the Interest rate will stimulate 224.5126% burst in the stock returns. The result is statistically significant with the probability value of 0.0182. The result here does not align with the a priori expectation as a positive relationship is projected. Meanwhile, in the short run, interest rate has a negative influence on the stock returns. The coefficient value of interest rate of -1.608016 implies that 1% increase in the interest rate will lead to 160.8916% decrease in the stock returns with the period of evaluation. The result of this particular variable is consistent with the work of Corradi, Distaso & Mele (2013).

The error correction mechanism (ECM) which measures the speed of adjustment is rightly signed with the negative sign. The ECM(-1) result of – 1.396209 indicates that error in the previous period could be corrected in the subsequent period with speed of adjustment of 139.6209%. Thus, any shock in the economic probably as a result of pandemic, financial meltdown, economic recession, global financial crisis or any global menace could be reverted to equilibrium with the speed of 139.6209%. The influence on stock return is statistically significant with the probability value of 0.0000. These results look impressive and technically balance in boosting stock returns especially in Nigeria. The finding is actually consistent with the work of Corradi, Distaso & Mele (2013), Osamwonyi and Evbayiro-Osagie (2012); Omorokunwa and Ikponmosa (2014).

Post-Diagnosis Test

Table 10

Diagnostic Test	**Statistics**	**P-Value**
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.863990	0.5336
Jarque- Bera test	2.306482	0.315612
Breusch-Godfrey Serial Correlation LM Test	1.592643	0.2233

Source: Author's computation using E-view 10 (2024)

It is relevant here to examine some of the post diagnostic results for the model specified in this study. Table 9 and Table 10 reported the post diagnostic results. The coefficient of determination (R-Squared) of 0.636961 indicates that the explanatory variables are able to give about 63.69% information as regards variation in the exchange rate, broad money supply, inflation rate and interest rate on stock returns in Nigeria. The outcome is supported

by the adjusted R square with 98.66. This is an indication that the model might be free from wrong specification and omission of vital variables as attested by the adjusted R square.

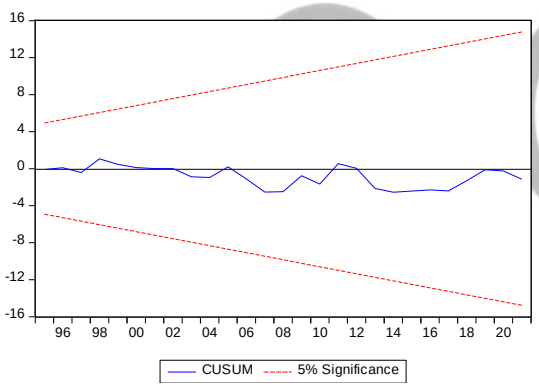
The Durbin Watson result of 1.974799 indicates that there might not be presence of autocorrelation problem in the study. Meanwhile, the F-statistics test result of 4.698068 with the probability value of 0.002151 connotes that the entire regression analysis is statistically significant.

Breusch-Godfrey Serial Correlation Lagranger Multiplier (LM) test is used to test for higher order Autoregressive Moving Average (ARMA) errors and it can be used to determine whether or not there are lagged dependent variables of serial correlation. The B-G tests the null hypothesis of no serial correlation against the alternative hypothesis of serial correlation. The Breusch-Godfrey's serial correlation LM probability result of 0.2233 is greater than 5% indicating the acceptance of the null hypothesis of no serial correlation connoting that the model is free from higher order correlation.

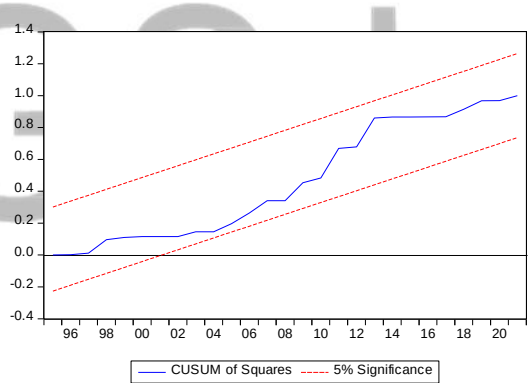
The Breusch-Pagan Godfrey (BPG) test assists in ascertaining whether or not there is presence of heteroskedasticity in the regression result. The BPG probability value of 0.5336 is greater than 5% indicating that there is no presence of heteroskedasticity in the regression result.

Stability Test

Graph 4.1: CUSUM result



Graph 4.2: CUSUM of Squares result



Graph 4.1 and Graph 4.2 depicted the cusum and cusum of squares test results at 5% significance level respectively. The cusum test and cunsum of squares test conducted showed the relative stability of the regression as it falls within the acceptable region at 5% significance level. In summary, every crucial post diagnostic test conducted and examined are enough to corroborate the validity and reliability of the model postulated in this study.

Discussion of Findings

The fantastic inferences deduced from the findings in this study are that broad money supply and interest rate have significant relevance with stock returns in both short run and long run within the period of investigation. However, exchange rate and inflation rate have no significant relevance with the stock returns within the period of review in this study. The implication of this finding is that broad money supply and interest rate should be addressed with serious actions in that it has significant influence on the stock returns. The finding agrees with the work of Chandra (2004) which submitted that interest rate has negative influence on the stock returns. Feldstein (1980) and Summers (1981) found that inflation rate

has a negative relationship with stock prices which exactly agree with this work. However, Osamwonyi (2003) submitted that exchange rate has a positive influence on stock prices, this study opposes that submission in that it was discovered that exchange rate has an associated adverse influence on stock prices or returns in Nigeria.

5. Conclusion and Recommendations

This study examined the appraisal of impact of macroeconomic variables on stock prices in Nigeria. It is interesting to note that stock returns are derived from All Share Index (ASI). However, this study revealed that interest rate and broad money supply had significant impact on the stock returns in Nigeria though with negative and positive relationship respectively. Also, exchange rate and inflation rate had negative relationship on stock returns within the period of investigation. It is therefore recommended that optimal policy measures should be put in place to direct and manage the affairs of macroeconomic variables especially the ones used in this study. More importantly, interest rate should be seriously monitored to ensure it does not dispel investors from the market. Likewise, the money supply must be handled with care so as to foster the situation where it does not lead to erosion of the purchasing power of |Nigerian currency. Exchange rate determination should be adequately managed to preserve the value and strength of naira. Finally, the government should foster price stability to avail investors the option to plan ahead and harness the market opportunities to the fullest.

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