Unravelling the Impact of Macroeconomic Fundamentals on Stock Market Performance in Nigeria: An Ardl-bound Testing Approach

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Authors' contributions

This work was carried out in collaboration between all authors. Author TOO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors FTK and MOO managed the analyses of the study. Authors TOO and FTK managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

In this study, we unravelled the impact of macroeconomic fundamentals on stock market performance in Nigeria for the periods from 1986 to 2015. This investigation helps to understand certain peculiarities in the Nigerian stock market; being an emerging stock market. Gross domestic product (GDP) and money supply (MS) was found to have significant impacts on stock market performance in Nigeria. Furthermore, all the features in this study except money supply (MS) and interest rate (INTR) were positively related to stock market performance, and there is the presence of a long run relationship (co-integration) between macroeconomic fundamentals and stock market performance. This study culled data on all-share index, gross domestic product, money supply, interest rate, inflation rate and exchange rate from the Nigerian Bureau of Statistics Bulletin, the Central Bank of Nigeria Statistical Bulletin and World Bank Development Indicators Database. Auto Regressive Distributed Lag (ARDL) bounds testing technique was adopted in this study as its estimation technique. Based on the findings of this study that the performance of the stock market in

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Nigeria is growth-driven, hence, policies such as reducing poverty and unemployment rates and increasing gross capital formation among others should be strengthened. We further recommend that the Central Bank of Nigeria should work hand-in-hand with the operators in the capital market in order to ensure a meaningful conduct of macroeconomic fundamentals through policy measures, and also by building a stronger regulatory framework for the stock market; especially to curtail unethical, shady and corrupt practices which can also make stock prices movement more drastic. In addition, interest rates channel must be effectively monitored to ensure that the stock market remains stable as any slight distortion in this channel may affect the market as it hinges on information, while it is also incumbent on the monetary authorities to monitor the implementation of formulated policies in the economy.

1. INTRODUCTION

The government in every nation remains enthusiastic as to the performance of her economy, but more specifically in terms of the growth prospects of the economy; hence, the stock market as an integral part of the financial system serves as the catalyst of any meaningful and sustainable growth in an economy. Stock market in any part of the world plays a formidable role in the financial sector of an economy by channeling idle funds from the pool of scattered surplus units to meet the investment needs of the deficit units, thus bridging the savings-investment gap [1]. He stressed further that the overall growth and development witnessed in any economy is a function of how well the capital market performs in terms of its efficiency in stabilising the financial sector, by providing a significant investment avenue which helps to attract domestic funds and foreign capital inflows. Evidence abounds in the literature that the existence of a well-developed capital market is *sine-qua-non* for economic growth and development to take place, hence, the activities of the capital market can enormously assist in fine-tuning the economy. Monetary policy have great influence on stock prices directly through interest rate channel, and indirectly through its effect on determinants of dividends and stock return premium by influencing the degree of uncertainty which the agents face [2]. However, this study will elaborate on the relationship between macroeconomic fundamentals and stock prices, while the strength of such relationship is based on the structural and institutional features of the Nigerian economy.

In order to be successful in conducting monetary policy, the monetary authorities must have an accurate assessment of the timing and effect of their policies on the economy, thus requiring a genuine understanding of the mechanisms through which monetary policy affects the economy [3]. These transmission mechanisms includes interest and exchange rates channel, stock price channel as well as the credit channel. The duo of interest and exchange rates channel and stock price channel is ideally relevant for this study as it links the two main variables of interest; macroeconomic fundamentals and stock market performance. The interest and exchange rates channel put forward that a shift in monetary policy changes interest and exchange rates. Also, changes in investment and aggregate demand, affects the performance of local firms; and in turn affects stock prices [1]. On asset price channel, a shift in monetary policy also changes asset prices, and consequently the change in value of assets held by household and firms would affect their spending habits (wealth channel) or affect their credit demand for investment consumption (Tobin's Q channel). Evidently, monetary authorities need to understand the relationship existing between monetary policy variables and stock prices so as to accurately predict the effects of their policies on the aggregate economy. Macroeconomic fundamentals relations with stock market performance has been emphasized in literature [4,5,6,7,8,9] over time in various countries across the world, and all these studies have provided different conclusions based on the use of different datasets and methodologies. However, the present study is set to further affirm and improve on previous studies in Nigeria by employing macroeconomic fundamentals, such as Inflation and Exchange Rates that are susceptible to overnight changes in the Nigerian situation. Also, this study will unlike what is common in conventional studies, adopt the Auto Regressive Distributed Lag (ARDL) approach to co-integration to determine the long run relationship between macroeconomic fundamentals and stock market performance. In addition, literature is replete with preponderance

of empirical studies relating to the impact of macroeconomic variables on stock market performance. However, previous studies relating to Nigeria have suffered from the lack of update and current relevance of the Nigeria stock market, this study is conducted to circumvent the limitations in previous researches. Furthermore, this study is expected to provide the monetary authorities and policymakers, observing public and economic experts with astounding insights. As a result, policy recommendations will be developed to equip various economic entities in Nigeria with the acumen needed to spur the performance of the capital market in Nigeria through the stability of macroeconomic fundamentals.

The rest of the paper is structured as follows: section two entails the review of conceptual, theoretical and empirical literatures on the impact of selected macroeconomic fundamentals on stock prices behaviour. Section three expounds on theoretical basis, data issues and pre-estimation analyses; while section four discusses the empirical results and analysis, and section five presents the implications of the research, concluding remarks and recommend policies.

2. REVIEW OF LITERATURES

This section lays to bare the conceptual review, existing theories and empirical studies on the relationship of macroeconomic fundamentals and stock market performance. This study aims to provide knowledge about how macroeconomic fundamentals affect stock market performance.

2.1 Conceptual Literature

2.1.1 Determinants of stock price movement

The movements in stock prices are affected by changes in macroeconomic fundamentals and the expectations about future prospects of these fundamentals. All-share index- ASI is a way of measuring the performance of a market over time. Plethora of studies conducted in Nigerian have attempted to find out the relationship between macroeconomic indicators and the fluctuations of stock prices, and majority of these studies have shown that with minor variation, these macroeconomic variables have significant impact on stock prices. These factors are grouped under the following headings:

1. Macroeconomic Factors
2. Institutional Factors

2.1.2 Environmental determinants

The prices of equities fluctuate as a result of changes in the macroeconomic fundamentals. The maladapted nature of the Nigerian capital market and the entire financial system as a whole is inherently laden; *inter alia,* with the problem of macroeconomic instability [1]. These macroeconomic fundamentals dictate the stance of stock prices in the capital market.

Environmental factors that are influencing the fluctuations in the Nigeria stock market as identified in [10] are not less than eight macroeconomic fundamentals that can affect stock prices, the list included real gross domestic product, money supply, fiscal deficits, index of industrial production, interest rate and financial deregulation. They noted that all these variables will have a negative influence on stock prices except for real GDP, money supply and total deficit that theory wants us to believe to be positively related to stock prices. This is to say that stock prices increases as inflation rate, index of industrial production, financial deregulation, interest rate decline. And on the other hand, as real GDP, money supply and total deficit increases the current stock prices also increase. But beyond those mentioned above, this study identified that there are several other environmental factors, such as volatility of exchange rate, tax rates, and trade openness influencing fluctuations in stock prices in the Nigeria stock market.

2.1.3 Institutional determinants

The operational activities of the dealers and agents in the Nigerian stock market are also capable of influencing the prices of equities in the market. Therefore, internal developments that occur within the dealer companies or the stock market itself are some of those institutional factors that affect the prices of it stocks, it also includes merger and acquisition, earnings report, the suspension of dividends, the development or approval of new innovative product, hiring and firing of the company's executives and allegations of fraud or negligence [1]. The study noted that unexpected internal developments, such as unethical, shady and corrupt practices coupled with poor regulatory practices can make stock prices movement more drastic. The stock prices are also affected by events such as war, civil unrest, natural disasters and terrorism; however, this influence can either be direct or indirect.

2.1.4 Performance of the stock market

Prior to 1989, only five (5) stock markets existed in the Sub-Saharan Africa (SSA). The number has increased to twenty-three (23) as of 2018. In all SSA countries, except South Africa, stock markets suffer from low turnover, limited numbers of listed firms and market capitalisation, partly as a result of asymmetric information, rules and supervisory framework as well as the unattractive listing requirements and high costs of utilizing the market facilities [11].

The Nigeria Stock Exchange evolved as self-regulatory institution with its history dating back to 1977 when the Lagos Stock Exchange was re-christened. However, the former Lagos Stock Exchange (now, Nigeria Stock Exchange) was incorporated on 15th September, 1960. The need for government recognition and protection led to the passing of the Lagos Stock Exchange Act, 1961. The Exchange officially began operations on 5th June, 1961 with 19 securities listed on it. In 2016, the Exchange was named the most innovative stock exchange in Africa [12]. And as of July 2017, there were 176 companies listed on the Exchange and a total market capitalization of ₦8.5 trillion. The transformation of the Lagos Stock Exchange into Nigeria Stock Exchange led to the establishment of two additional branches in Kaduna and Port Harcourt. These three branches merely operated as trading floors while the National council of the Exchange retained overall responsibility in terms of quotations and the enforcement of regulations in the capital market. Until 1977, the task of pricing of new securities was the role played by the Capital Issues Committee and later the Securities Exchange Commission.

The Nigerian stock market has grown consistently in it over fifty years of existence, as a result of various government measures to foster its growth, for instance, the indigenization measures of the early 1970's and the privatization exercise in the late 1980's. The development of the stock markets in nearly all African countries with emerging markets has been induced and fostered by their respective governments. This is in the belief that these markets would, by serving as source of industrial finance, greatly assist in fostering the economic and industrial development of their respective economies as rightly noted by Ojo (2010).

2.1.5 The role of the stock market in emerging economies

Although, stock market development is a common feature of financial and economic development, many analysts believe that the stock market in emerging economies can be thought of as "casinos" that have only little positive, and potentially large negative impact on economic growth [11]. Other analysts argue that, because not much corporate investment is financed through the issuance of equity [13,14] stock markets are unimportant for economic growth. There are various conceptual arguments, which emphasized the potentially positive, neutral or even negative implications for stock market development and economic growth [15]. In a study by [16], they observed that stock markets may affect economic activities in the following manner:

1. There is room for risk diversification through international integration of stock markets.
2. Stock market development may also influence corporate control.
3. Large liquid and efficient stock markets could ease savings mobilisation and enlarge the set of feasible investment.
4. Promotion of the acquisition of information about firms, which may enable investors to make profit from such information.

As reviewed by [15], disagreements exist on the relative importance of the above noted aspects on economic activities, most especially emerging economies with a shallow, narrow and grossly imperfect stock markets. For instance, in terms of raising capital, it has been shown and argued that new equity issues account for a very small fraction of corporate investment [13,14]. An empirical evaluation of the relationship between stock market development and long-run growth by [16], revealed that stock market development is positively associated with economic growth, but they cautioned that the results should be viewed as suggestive partial correlations requiring further research rather than as conclusive findings.

2.2 Theoretical Literature

2.2.1 Arbitrage pricing theory

Arbitrage pricing theory (APT) is a theoretical basis provided by [17] as a way by which stocks may be valued by developing a link between

monetary policy variables and stock market returns, where multiple risk factors can be used to explain assets returns or how assets are priced. That stock prices are determined by some fundamental macroeconomic variables- which can influence investors' investment decisions. The theory can be used in an individual security returns (CAPM) as well as aggregate stock market framework (APT). Hence, the APT is an extension of the Capital Asset Pricing Model (CAPM) which is based on the mean variance framework by the assumption of the process generating security. In other words, CAPM is based on one factor meaning that there is only one independent variable which is the risk premium of the market. There are similar assumptions of homogenous expectations, perfectly competitive markets and frictionless capital markets are the similar characteristics of CAPM and APT.

2.2.2 Random walk hypothesis

Scholars that have subscribed to the random walk hypothesis provide theoretical evidence to jettison the assertions of both the chartists and fundamentalists, which see stock price movements in terms of probability distribution of different possible outcomes. Though this financial theory can be traced to Regnault Jules in 1863. However, the random walk theory is based on the efficient market assumption of [18] that investors adjust security holdings rapidly to reflect the effect of new information. Those that lend credence to the efficient capital market hypothesis argue that stock prices are essentially random and therefore, there is no chance for a profitable speculation in the stock market. The persistence of random shocks is an interesting feature of the random walk hypothesis. Random shocks are unexpected or unpredictable events that affect the stock market either positively or negatively. Moore [19] and Fama [20] carried out an empirical test of the random work hypothesis in their work. In the research conducted individually, to test for the statistical randomness of successive changes in stock prices, their findings revealed insignificant departures from randomness and were both inconclusive and insufficient.

2.2.3 The behavioural school of thought

Paul De Grauwe [21] is one of the advocates of the behavioural school of thought. The school shifted attention to the fact that the market might fail to reflect economic fundamentals under three conditions. When all these three conditions hold,

the theory predicts that pricing biases in financial market can be both significant and persistent. The first behavioural condition is the irrational behaviour of the investors. Investors behave irrationally when they do not have access to all the available information, the investors will usually form their expectations on the future performance of the company. The second is systematic patterns of behaviour, which holds that when investors even decide to buy or sell securities without a cursory look of the associated macroeconomic fundamentals, the impact of stock prices would be limited. Lastly, limits to arbitrage in the financial markets ascertain that when investors assume that the appealing performance of the company at present is an indication of its future performance; these investors may start bidding for shares, thus drive the price up. According to Business Day Newspaper [22] some investors might expect a company that surprises the market in one quarter to go on exceeding expectations.

2.2.4 Efficient market hypothesis

This is a hypothesis championed by Fama [18]. In an efficient market, all the investors have access to relevant information about the changes in macroeconomic factors that are fully reflected in the current stock prices and hence, investors would not be earned abnormal profits in such market. Believing the tenets of the Efficient Market Hypothesis (EMH) would then mean that changes in any macroeconomic variables should not affect stock returns that much. In their research, Fama and Schwert [23] and Nelson [24] affirmed that macroeconomic variables do influence the stock returns by affecting stock prices. The concept of EMH was defined as the market which adjusts speedily to available information. It however assumed that the value (price) of the stocks in the market is a linear function of the information available at the disposal of the investors. The efficiency of the stock market has over the years been an area of attraction to economic and finance researchers particularly in the emerging economies. This is because the proper functioning of the capital markets in the emerging economies is *sine-qua-non* for achieving their macroeconomic goals.

2.3 Review of Empirical Studies

This section reviews empirical studies on the nexus between macroeconomic fundamentals and stock market performance.

[6] studied the effect of macroeconomic variables on stock market returns of South Eastern Asian countries between the 2005 and 2015 periods by employing panel regression technique, and it was discovered that macroeconomic variables have a negative effect on stock returns. In [25], an Auto-Regressive Distributed Lag modeling technique was employed to examine the causal relationship between macroeconomic variables and stock returns in Turkey during 2003 to 2016 periods. Their study revealed that consumer price index, industrial production index, current account to export ratio, exchange rate and world oil price index have significant effect on stock returns in Turkey.

[8] investigated the effect of macroeconomic factors on stock market performance in Nigeria for the periods of 1986 to 2015. Employing regression techniques, the study found that macroeconomic variables have no effect on stock market performance. In [26], the ARDL-bound testing approach to co-integration and VECM model was employed to discover in India, a long-run relationship between macroeconomic indicators and Indian stock prices. The VECM results indicated that short- and long-run unidirectional causality runs from the macroeconomic indicators to stock prices in India, while result of the variance decomposition also suggested that stock market development in India is mostly explained by its own shocks. Also in Nigeria, [1] studied the impact of monetary policy variables on stock prices for the periods of 1986 to 2013. The study which employed error correction mechanism (ECM), co-integration and Granger causality (GC) test found that monetary policy variables have a negative significant and long-run impact on stock prices, while a unidirectional causal relationship existed between exchange rate and stock prices, with the causality running from exchange rate to stock prices.

[27] examined the impact of macroeconomic variables on stock market returns in Pakistan for the 2007 to 2012 periods, employing the regression technique and found that macroeconomic variables have no significant effect on stock market returns. [28] investigated the dynamic relationship between stock prices and four macroeconomic variables in Kenya using co-integration and vector autocorrelation framework, the VAR and VECM. The study revealed that macroeconomic variables drive equity market in the long run. [29] also evaluated the relationship between selected

macroeconomic variables, volatility and stock market returns in Nairobi. Employing the Granger two-step co-integrating and TGARCH techniques to analyse quarterly data for the 2000 to 2012 periods, the results revealed that there is a long-run relationship in the study, while the TGARCH model for exchange rate, Gross Domestic Product and Treasury bill rate revealed that the impact of news was asymmetric and there was presence of leverage effects. There was also the absence of volatility persistence among all the macroeconomic variables.

In a study between the 1980 to 2012 periods, [5] evaluated the long run equilibrium relationship between money supply activities and aggregate stock prices in Nigeria as well as the direction of causality. The Engle Granger and Johansen-Juselius Methods of co-integration in a VECM settings, in addition to Granger causality test employed in the study showed that a long-run equilibrium relationship exist between the surrogates of money supply and aggregate stock prices. [30] also examined the macroeconomic determinants of stock price movements in Nigeria for the 1985 to 2010 periods. Employing Engle-Granger two-step co-integration test, the study was unable to establish any co-integration vector, hence there is no long run equilibrium relationship. In [31], the impact of macroeconomic variables on stock market in Bulgaria for the 2000 to 2010 periods was unravelled. Employing the regression technique, it was revealed that real GDP has positive impact on the stock market while government deficit, domestic interest rate, exchange rate and inflation rate have negative effect on stock market.

Employing VAR and GARCH models in the investigation of the relationship between Saudi stock market returns and eight macroeconomic variables, [32] found that there is no causal relationship between Saudi stock market and exchange rate; the impulse response function analysis also shows no significant relationship between Saudi stock market returns and the macroeconomic variables. [9] in a study of India, examined the relationship between two capital markets and some macroeconomic variables such as interest rates, inflation, and exchange rate and gross domestic product. Analysing quarterly data from January 1995 to December 2008 by employing the use of unit root test, co-integration and error correction modelling, the study found that inflation rate have a significant impact on both capital markets. Whereas interest

rate and foreign exchange rate have an impact on just one capital market, while gross domestic product played an insignificant role in both markets. Using quarterly data from February 1986 to April 2011, [7] investigated the link between monetary policy and stock prices in the Nigerian capital market. The results obtained by employing co-integration, error correction mechanism, impulse response function granger causality techniques in the study showed that there is a long-run equilibrium relationship between stock prices and a set of monetary policy variables, while a unidirectional causality from stock prices to money supply, and from foreign exchange rate to stock prices was recorded.

By adopting the Generalised Least Square Methodology, [4] examined the effect of some selected macroeconomic variables on stock variables. Using quarterly panel data on a sample of selected firms obtained from January 1985 to April 2009, the study revealed that interest rates and foreign exchange rates have a significant and negative impact on stock prices while broad money supply has a positive but insignificant effect. In a study of New Zealand, [33] investigated the relationship between macroeconomic variables and stock market index. Co-integration and Granger causality techniques was employed to analyse data from the 1990 to 2003 periods, and the findings revealed that a long-run relationship exist, while the Granger causality test revealed that stock market index was not a leading indicator for changes in macroeconomic variables. On a general note, the findings showed that the stock market index was consistently determined by certain macroeconomic variables. The relationship between stock market returns and sets of macroeconomic variables in Japan was examined by [34], employing vector error correction model (VECM) in the study, it was found that the set of macroeconomic variables are co-integrated with the Japanese stock price.

3. THEORETICAL BASIS, DATA ISSUES AND PRELIMINARY ANALYSES

This study is theoretically anchored on the working of a theory among those specified in the previous section of this study in the investigation of the relationship between macroeconomic fundamentals and stock prices in Nigeria. This study consider the Arbitrary Pricing Theory as most suitable to describe the Nigerian situation where macroeconomic fundamentals dictates the tone for stock prices behaviour through various channels, even though investors have limited access to relevant information about the changes in macroeconomic factors that are fully reflected in the current stock prices and hence, investors would not have earned abnormal profits in such market. Times series data was gathered for a study period which is between 1986 and 2015, the data will be taken in their natural logarithm. The data on all-share index, gross domestic product, money supply, interest rate, inflation rate, and exchange rate are compiled from the Nigerian Bureau of Statistics, the Central Bank of Nigeria *Statistical Bulletin* and World Bank Development Indicators Database. The preliminary analysis in this study includes descriptive statistics, correlation matrix and unit root tests.

Descriptive Statistics and Correlation Matrix

The result of descriptive statistics with normality test is contained in *Table 1*. In this table, the focus is on the normality test, so that the OLS assumptions are not violated. It is observed that all the series fulfill the normality of hypothesis to run OLS regression, hence, they are all normally distributed. *Table 2*, presents the results of pair-wise correlation on the series. It is observed that LASI as a proxy for stock market performance and economic growth have the highest (r = 0.97) correlation among all pairs, which is quite acceptable since a well-functioning stock market nurtures economic growth. However, only interest and inflation rates affect stock market performance negatively.

Unit Roots Test

At the initial stage of time-series analysis, it is important to examine the properties of the time-series, in that most time-series data have non-stationary property, thus indicating the presence of a unit root. In doing so, this study employed two traditional unit root tests, which are Augmented Dickey Fuller and Phillip Perron URTs to determine the presence of unit root and order of integration of the series. In order to reject the null hypothesis that a series has a unit root, the test statistic must be greater than the critical value when compared in absolute terms. The optimal lag length for the unit root test was based on the automatic lag length selection of the Schwarz Information Criterion (SIC) with the maximum lag length set at 7. All findings from unit root tests confirm that these variables fulfill all assumptions of ARDL

model. Therefore, the ARDL approach of [35] for the co-integration test can be applied for testing co-integration between stock market performance and macroeconomic fundamentals. The summary of the unit root test results at levels and at the first differences is reported in *Tables 3A&B.*

Having established that the variables have mixed order of integration as revealed by ADF test developed by [36] and complemented by the PP URTs, it is imperative we consider the use to the ARDL model to examine the long-run relationship between monetary policy fundamentals and stock market performance rather than the Engle-Granger co-integration or Johansen co-integration test which should only be used when variables are co-integrated in same order *I(1)*, hence the maximum order of integration (d_{max}) is 1.

Table 1. Results of descriptive statistics

Statistics	L(ALSI)	L(GDP)	L(MS)	L(INTR)	L(INFL)	L(EXGR)
Mean	11.11921	8.795689	6.815745	3.107182	2.693766	3.821141
Median	11.56974	8.921369	6.962203	3.090075	2.475967	4.671999
Maximum	13.31314	11.45259	9.846986	3.586016	4.288204	5.264136
Minimum	7.494319	5.310425	3.169954	2.484907	1.683102	0.703382
Std. Dev.	1.852008	1.964881	2.163116	0.204327	0.763476	1.365437
Skewness	-0.701455	-0.293472	-0.159138	-0.328826	0.829135	-0.718144
Kurtosis	2.152218	1.817361	1.754031	4.829727	2.455630	2.181518
Jarque-Bera	3.358612	2.178922	2.067174	4.725512	3.807745	3.416047
JB P-Value	0.186503	0.336398	0.355729	0.094160	0.148991	0.181224
Sum	333.5762	263.8707	204.4723	93.21547	80.81297	114.6342
Sum Sq. Dev.	99.46803	111.9620	135.6930	1.210733	16.90396	54.06810
Observations	30	30	30	30	30	30

Source: Authors' computation (2018)

Table 2. Results of correlation analysis

Correlation matrix						
	LALSI	LGDP	LMS	LINTR	LINFL	LEXGR
LALSI	1.000000	0.965856*	0.949992	-0.118579	-0.513379	0.941797
LGDP	0.965856	1.000000	0.996817	-0.055896	-0.517597	0.946534
LMS	0.949992	0.996817	1.000000	-0.044416	-0.510574	0.941048
LINTR	-0.118579	-0.055896	-0.044416	1.000000	0.094549	0.027613
LINFL	-0.513379	-0.517597	-0.510574	0.094549	1.000000	-0.500475
LEXGR	0.941797	0.946534	0.941048	0.027613	-0.500475	1.000000

Source: Authors' Computation (2018)
* GDP has the highest correlation with ALSI.

Table 3A. Results of unit root tests

	Level					
	Augmented dickey fuller (ADF)			Phillip perron (PP)		
	Intercept	Intercept & trend	None	Intercept	Intercept & trend	None
LALSI	-2.375352	-0.719398	2.720387	-2.548364	-0.534891	2.314144
LGDP	-3.003206*	0.208503	1.483173	-3.003206**	-0.039552	4.681813
LMS	-1.969709	0.368083	1.311978	-1.762111	-0.583203	4.456794
LINTR	-4.709697***	-4.558469**	0.594778	-4.720318***	-4.604298**	0.691638
LINFL	-2.844751*	-2.641876	-0.571823	-3.004662*	-3.643462**	-0.310708
LEXGR	-2.620483	-2.087895	1.677619	-5.683112***	-2.088714	1.502189
First difference						
LALSI	-3.643108**	-3.927055**	-3.031488*	-3.643108**	-5.580348***	-2.923033**
LGDP	-2.927816*	-3.873979**	-1.349813	-2.887641*	-3.822340**	-1.146751
LMS	-3.174264**	-4.845971***	-0.993273	-3.185598**	-3.567984*	-1.081934
LINTR	-7.375085***	-7.203783***	-7.471464***	-7.375085***	-7.203783***	-7.471464***
LINFL	-3.351179**	-3.267113	-4.901439***	-6.275696***	-5.925890***	-6.397555***
LEXGR	-5.397091***	-5.683112***	-4.643342***	-5.396281***	-6.471705***	-4.643014***

Note: ***, ** and * implies significance at 1%, 5% and 10% respectively.
Source: Authors' Computation (2018)

Table 3B. Summary of unit root tests results

	Augmented dickey fuller (ADF)			Phillip perron (PP)		
	Level	First Diff.	I(d)	Level	First Diff.	I(d)
LALSI	2.720387^c	-3.927055^{b**}	I(1)	-2.548364^a	-5.580348^{b***}	I(1)
LGDP	-3.003206^{a*}	-	I(0)	4.681813^c	-3.822340^{b**}	I(1)
LMS	-1.969709^a	-4.845971^{b***}	I(1)	4.456794^c	-3.567984^{b*}	I(1)
LINTR	-4.709697^{a***}	-	I(0)	-4.720318^{a***}	-	I(0)
LINFL	-2.844751^{a*}	-	I(0)	-3.643462^{b**}	-	I(0)
LEXGR	-2.620483^a	-5.683112^{b***}	I(1)	-5.683112^{a***}	-	I(0)

Source: Authors' Computation (2018)
*Note: ***, ** and * imply statistical significance at 1%, 5% and 10% levels respectively.*
Also, 'a' denotes model with intercept, 'b' is for model with intercept and trend and 'c'' is the model without intercept and trend.

3.1 Model Specification

In a bid to capture the impact of macroeconomic fundamentals on stock market performance in Nigeria, the current study employed an empirical model. The variables that featured in this study have been generally specified in prior researches, but frequent changes in certain variables, such as interest, inflation and exchange rates in Nigeria makes a call for the current study. The model can be expressed mathematically as:

$$ALSI = f \ (GDP, MS, INTR, INFL, EXGR, \mu)$$
………………………………………..Equa. 3.1

Where;

ALSI =All-Share Index, GDP = Gross Domestic Product, MS= Money Supply, INTR =Interest Rate, INFL = Inflation Rate, EXGR = Exchange Rate, and μ = Error Term.

The economic form of this model is depicted as:

$$ALSI = B_0 + B_{1Log}GDP_t + B_{2Log}MS_t + B_{3Log}INTR_t + B_{4Log}INFL_t + B_{5Log}EXGR_t + \mu_t$$…………….Equa. 3.2

B_0=Intercept, $B_1 - B_5$ = Coefficients of Regression; theoretically we expect B_1, $B_2>0$, but B_3, B_4, $B_5><0$.

Stock market size, liquidity, volatility, concentration and integration with world capital markets is usually a measure for stock market performance. The Nigeria stock market all-share index is well established, in that it listed financially-sound companies on the NSE. In this study, the ARDL specification will take the following form:

$$\Delta Log\left(ALSI\right)_t = B_0 + \sum_{i=1}^{n} B_{1i}\Delta Log\left(ALSI\right)_{t-i} + \sum_{i=0}^{n} B_{2i}\Delta Log\left(GDP\right)_{1t-i} +$$

$$\sum_{i=0}^{n} B_{3i}\Delta Log\left(MS\right)_{2t-i} + \sum_{i=0}^{n} B_{4i}\Delta Log\left(INTR\right)_{3t-i} + \sum_{i=0}^{n} B_{5i}\Delta Log\left(INFL\right)_{4t-i} +$$

$$\sum_{i=0}^{N} B_{6i}\Delta Log\left(EXGR\right)_{5t-i} + \beta_{7i}Log\left(ALSI\right)_{t-i} \beta_{8i}\Delta Log\left(GDP\right)_{t-i} +$$

$$\beta_{9i}\Delta Log\left(MS\right)_{t-i} \beta_{10i}\Delta Log\left(INTR\right)_{t-i} + \beta_{11i}\Delta Log\left(INFR\right)_{t-i} +$$

$$\beta_{12i}\Delta Log\left(EXGR\right)_{t-i} + \varepsilon_t \qquad ………………………Equa. 3.3$$

Equation 3 will be estimated by following the procedures stated as;

3.2 Estimation Procedure

The current study in its bid to examine the long-run dynamic relationship of macroeconomic fundamentals with stock market performance employs the Auto Regressive Distributed Lag (ARDL) co-integration procedure developed by [37]. The co-integration test with ARDL approach has four advantages. Firstly, this approach is simpler as opposed to other available co-integration approaches. This autoregressive distributed lag co-integration procedure facilitates, once the lag order is identified, to examine the relationship through OLS method. Secondly, unlike other approaches for the co-integration test, the autoregressive distributed lag co-integration procedures do not necessarily need the pre-testing such as unit root test. Third, the ARDL approach is more efficient than other approaches when the span of the sample period is smaller. Fourthly, ARDL technique is also applicable irrespective of whether the variables in the model is purely *I(0)* or purely *I(1),* or mutually co-integrated. Hence, it uses linear specification for dynamic error correction model without losing information about the long-run relationship. What follows is to compare using Wald test approach, that is the calculated Wald F-statistics with the critical value of the two asymptotic bound tabulated by [38] to test whether co-integration between the variables exists or not. In doing so, the hypothesis of co-integration is $B_1 \neq B_2 \neq B_3 \neq B_4 \neq B_5 \neq B_6 = 0$, against the hypothesis of no co-integration is, $B_1 = B_2 = B_3 = B_4 = B_5 = B_6 = 0$.

Co-integration exist in this study, if the lower and upper critical bound is found below calculated F-statistic or else decision is in favour of no co-integration between variables if the calculated F-statistic is found above both the lower and upper critical bound. If F-statistic lies just between the upper and lower critical bounds, the decision about co-integration is inconclusive at the point. The stability of ARDL model estimates is tested by applying CUSUM and CUSUMsq tests. The step that follows once co-integration is proven then it needs to estimate long run coefficients and error–correction model for estimating short-run dynamics to long-run equilibrium for

adjustment. With the error–correction model, it can predict short-run effects with significant F-statistic of Wald test, it can be said that there is a short-run effect.

4. ESTIMATION RESULTS

The ARDL technique employed encompasses the short-run result which the OLS technique aims to present. The selection of optimal lag length is based on the minimum values of SBC criterion. This study adopted the Schwarz Information Criterion (SIC) for the selection of the ARDL (1, 0, 0, 0, 0, 0) model.

The F-Statistics of the model must be greater than the upper bound of the test result at 5% significant level for a co-integrating relationship to exist. Hence, when the F-Statistics is greater than upper bound at 5% significant level, the alternative hypothesis which assumes that there exists co-integration among variables is accepted which shows that there is long-run relationship among variables and if otherwise, the null hypothesis is accepted. The co-integration result is summarized in table 4A as:

The results in Table 4A suggest that there exists a stable co-integrating relationship among variables specified in the model, hence the alternative hypothesis is accepted because the F-Statistics was found to be greater than upper bound at 5% critical value, and is denoted with ** in the table.

The next step is to estimate the short-and long-run estimates of the ARDL test. Hence, the long- and short-run results are indicated in tables 4B and 4C respectively.

From the long-run equation specified in table 4B, the coefficient of the constant parameter was found to be 1.618663 which means that if all explanatory variables are held at zero level, the explained variable (All-Share Index) will increase by 1.618579 per cent. Economic growth (GDP), Inflation (INFL) and Exchange rate (EXGR) coefficients are positive with values obtained as 2.861233, 0.126808 and 0.499117 respectively,

Table 4A. ADRL bound test to co-integration result

Estimated Equation: LALSI= f (LGDP, LMS, LINTR, LINFL LEXGR)

F-statistics	Lower bound (5%)	Upper bound (5%)
4.199782**	2.62	3.79

Source: Authors' computation (2018)

this implies that there exist a direct relationship between these three features (economic growth, inflation, exchange rate) and stock market performance in the long run, hence 1 per cent increase in economic growth, inflation and exchange rate will increase stock market performance by 2.861233, 0.126808 and 0.499117 per cents respectively. Conversely, Money Supply (MS) and Interest Rate (INTR) showed negative coefficient values of 2.129631 and 0.997313 respectively. These imply that 1 per cent increase in both variables: Money Supply (MS) and Interest Rate (INTR) will decrease stock market performance in the long-run by 2.129631 and 0.997313 per cents respectively. All the features in this study, except Money Supply (MS) were found to conform to the *a-priori* expectation in the long run. The model is specified as:

$$ALSI = 1.618579 + 2.861233_{GDP} - 2.129631_{MS} - 0.997313_{INTR} + 0.126808_{INFL} + 0.499117_{EXGR} + \mu$$
(3.951774)   (0.972358)   (0.862772)
(0.805845)   (0.209071)   (0.334278)
Note: The Standard Error Statistics are those stated in parenthesis

4.1 Long-Run Results

The long-run results of the model obtained through the use of the ARDL technique are summarized in table 4B as:

Table 4C presents the short-run relationship between stock market performance and macroeconomic fundamentals. As it can be seen from the table, the relationship between these variables does not seems to deviate from what was obtained in the long-run, Economic growth (GDP) and Inflation Rate (INFL) have significant and positive impact on stock market performance, while Exchange rate which also has positive impact on stock market performance is insignificant. Otherwise, Money Supply (MS) and Interest Rate (INTR) have negative but insignificant impact on stock market performance. Adjustment process in the short-run is examined from the ECM coefficient. The coefficient should lie between 0 and -1, the equilibrium is converging to the long-run equilibrium path, is responsive to any external shocks. However, if the value is positive, the equilibrium will be divergent from the reported values of ECM test. The negative coefficient of the lagged error-correction term (-0.389165) is significant at the 1% level of significance. The coefficient implies that a deviation from the

equilibrium level of all-share index in the current period will be corrected by 39 percent in the next period to restore the equilibrium. The model is presented as:

$$ALSI = 1.618579 + 2.861233_{GDP} - 2.129631_{MS} - 0.997313_{INTR} + 0.126808_{INFL} + 0.499117_{EXGR} + \mu$$
(3.951774)   (0.972358)   (0.862772)
(0.805845)   (0.209071)   (0.334278)

Note: The Standard Error Statistics are those stated in parenthesis

4.2 Model Diagnostic and Stability Tests

In a bid to check the validity and robustness of the model, several tests as recommended by [37] will be conducted, such tests include serial correlation test used to test for the correlation or correspondence of residuals in the model, the normality test used to determine the normal distribution of the model residuals, heteroskedasticity test for determining the presence of variance of errors across observations, linearity test to determine misspecification error and stability test to examine if the model is structurally stable. As reported in Table 5, the ARDL model passed the diagnostic test against functional misspecification and serial correlation at 5 per cent significance level. It also passed the test against heteroskedasticity and non-normal error at 10 percent significance level. The plot of cumulative sum of recursive residual (CUSUM) and cumulative sum of squares of recursive residual (CUSUMQ) of the model are between critical boundaries at 5% level of significance. This confirms the structural stability property of the long-run parameters which have an impact on the all-share index in Nigeria, hence signifying that the model seem to be steady and specified appropriately during the estimation period.

4.3 Implication of Findings

The interaction between each of the macroeconomic fundamentals used in this study and the performance of the Nigerian stock market has the following policy implications;

The positive relationship between gross domestic product and stock market performance, which is in consonance with the theoretical expectation implies that increasing real GDP as the most crucial economic fundamental in this study will boost investors' confidence in the stock market, thereby increasing stock prices as

expected profitability increases. The significance of real GDP implies that it plays a major role in ensuring the development of the capital market; this is possible in the small open Nigerian economy that encourages investment and improve the activities within the stock market. Hence, the performance of the Nigerian stock market is growth-driven. The positive value of this feature is consistent with the findings of [10,26,28].

Money supply exerts a negative and significant impact on stock market performance in the long-run. The implication of this is that, all things being equal, an increase in money supply will lower the performance of the stock market. This is contrary to the positive results of [6,10,30], where it was opined that any monetary expansion raises the disposable incomes of economic agents and this increases aggregate demand, and to meet the increased demand, business units expand

production leading to increased output through the multiplier effect. Consequently, increased demand will exert upward pressure on stock prices.

Also, interest rate relationship with stock market performance is found to be negative and insignificant. This is possible due to the high rate of interest on funds caused by increased money supply, which will only make borrowers borrow to fund investments with some level of certainty, considering the high interest rate attached to their investible funds. The result is in line with the study of [4,25,30] but negates those of [10,29] where it was upheld that interest rate in Nigeria is closely controlled, hence it has a positive influence on stock market performance.

Inflation rate was found to be positively related to stock market performance. This implies that when inflation increased in the long-run, the

Table 4B. Estimated long-run coefficients using the ARDL model

Dependent Variable: ALSI

Variable	Co-efficient	Std. error	T-statistics	P-value
LGDP	2.861233	0.972358	2.942573	0.0075**
LMS	-2.129631	0.862772	-2.468360	0.0218**
LINTR	-0.997313	0.805845	-1.237599	0.2289
LINFL	0.126808	0.209071	0.606528	0.5504
LEXGR	0.499117	0.334278	1.493120	0.1496
C	1.618579	3.951774	0.409583	0.6861

*Source: Authors' Computation (2018),** denotes the rejection of null hypothesis on features at 0.05 significance level at the long-run.*

Table 4C. Estimated short-run coefficients using the ARDL model

Dependent Variable: ALSI

Variable	Co-efficient	Std. error	T-statistics	P-value
Δ(LGDP)	1.113491	0.451511	2.466146	0.0219**
Δ(LMS)	-0.828777	0.340527	-2.433810	0.0235**
Δ(LINTR)	-0.388119	0.313307	-1.238783	0.2285
Δ(LINFL)	0.049349	0.077361	0.637903	0.5301
Δ(LEXGR)	0.194239	0.134639	1.442660	0.1632
ECM_{t-1}	-0.389165	0.140866	-2.762652	0.0114***

*Source: Authors' Computation (2018), Notes: ***,** denotes the rejection of null hypothesis on ECM and features at 0.01 and 0.05 significance level in the short-run respectively.Δ denotes first difference operator. L implies that the series have been transformed to natural logs.*

Table 5. Model robustness, stability and reliability checks

Diagnostic tests	Approach	Statistics	P-Value
Linearity test	Ramsey Reset Test	3.800572	0.0647**
Serial correlation	Breusch-Godfrey LM Test	3.121599	0.0661**
Heteroscedasticity test	ARCH LM Test	6.421050	0.3038*
Normality test	Jarque-Bera statistics	0.409435	0.8149*
Stability test	CUSUM Test	Lies within bounds	

*Source: Authors' Computation (2018), Notes: **, * signifies the rejection of null hypothesis at 5% and 10% significance level*
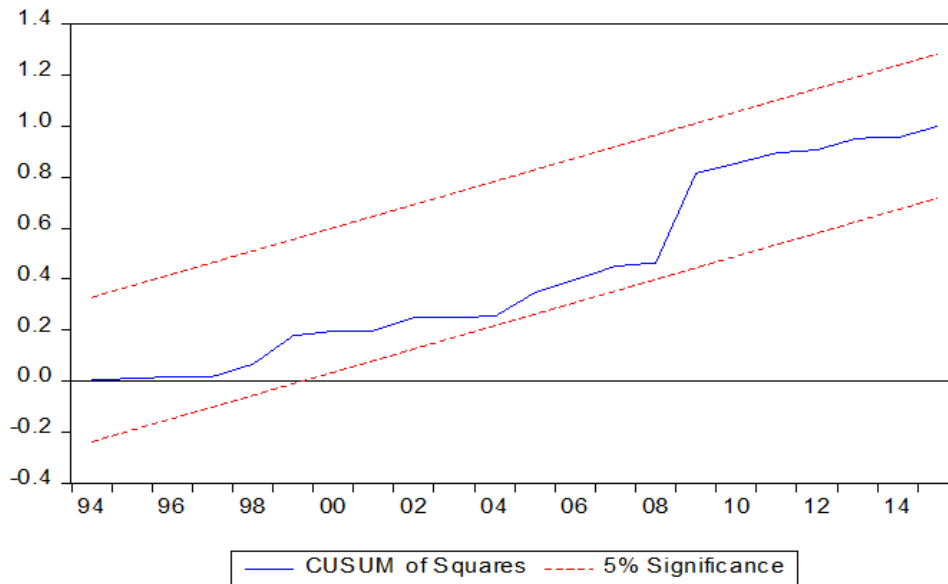
Fig. 1. Plot of cumulative sum of squares of recursive residuals of Nigeria
Source: Authors' Computation (2018)

market will improve. This is also justified based on the fact that a certain level of inflation, though low, is needed to boost economic activities in the country and consequently economic growth. This result is consistent with the findings of [6,27], but contrary to that found in [10,28,30,39]. Majority of these studies claimed that an increased expected inflation under general circumstances is likely to lead to economic tightening polices that would have a negative effect on stock prices.

In conformity with the *a priori* expectation, exchange rate has a positive impact on stock market performance which means that an appreciation in exchange rate over time has constantly improved the stock market and the economy in general as it will allows influx of foreign investment into the economy. This is consistent with the results of [6,25,27,28], but negates that of [4,30], whose findings want us to believe that appreciation in exchange rate is expected to encourage round tripping, thereby increasing operating cost of investment, hence stock market investment is discouraged as a result of lower profits.

5. CONCLUSION AND RECOMMENDATIONS

This study investigates the impact of monetary policy fundamentals on stock market performance in Nigeria for the 1986 to 2015

periods. Considering the mixed integration of the variables at different stationarity points as obtained through Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) unit root tests, the Auto Regressive Distributed Lag (ARDL) bound testing approach to co-integration was applied to estimate the long-run equilibrium relationship among variables. ADF and PP unit root tests confirm that variables are stationary after first differencing, while the ARDL model reveal that there exists a stable long-run relationship among macroeconomic fundamentals and stock market performance in Nigeria. Evidence from both the short- and long-run models carried out through the ARDL approach revealed that monetary policy fundamentals have direct insignificant impact to stock market performance in Nigeria.

In addition, the test for the reliability and robustness of the model was carried out. Diagnostic and stability tests were adopted in a bid to test for the presence of serial correlation, heteroskedasticity, linearity assumption, normal distribution and structural stability between variables through the Breusch-Godfrey Serial Correlation LM test, Ramsey Reset Test, ARCH LM Test, Jarque-Bera statistics and CUSUM Test respectively. This study passed all post-estimation tests, hence all results proved that the findings of this study can be relied on for policy formulation and decision making. This study reveals that macroeconomic fundamentals affect

stock market performance positively, though its significance is questionable. Following the empirical findings and conclusion drawn from this study, there is need to make policy recommendations that this study considers necessary for the development of the Nigerian capital market. The following policy options are recommended to bring about enhanced stock market performance. Firstly, the performance of the Nigerian stock market is growth-driven, as revealed by the results of this study, hence, as established in the theory, policies such as: reducing poverty and unemployment rates and increasing gross capital formation among others are those which spur economic growth. Second, the Central Bank of Nigeria (CBN) should work hand-in-hand with other operators in the capital market in order to ensure a meaningful conduct of macroeconomic fundamentals through policy measures, and also by building a stronger regulatory framework for the stock market; especially to curtail unethical, shady and corrupt practices which can also make stock prices movement more drastic. Interest rates channel must also be effectively monitored by the CBN to ensure that the stock market remains stable as any slight distortion in this channel may affect the market as it hinges on information, while it is also incumbent on the monetary authorities to monitor the implementation of formulated policies in the economy.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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