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Key Macroeconomic Variables and Stock Market Development in Nigeria: Evidence from Granger Causality Test

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Abstract
The study examined the key macroeconomic variables on stock market development in Nigeria using granger causality test from Nigeria from 1986 to 2019. The study relies heavily on secondary data (time series) sourced from the various institutions. Data on GDP, money supply (M2), interest rate and exchange rate were sourced from central bank of Nigeria (CBN). Data of all share index was sourced from Securities and Exchange Commission (SEC) and Nigeria Stock Exchange (NSE). Data on inflation was sourced from National bureau of statistics (NBS). The statistical properties of data were tested using ADF and PP test. The test indicated that interest rate and trade openness are stationary at level while all share index, money supply, exchange rate and inflation rate are stationary at first difference. Granger causality test indicates that there is bi-directional causality among the variables except for exchange rate. Based on these findings the study recommends that the Central bank of Nigeria should ensure stability in exchange rate by promote trade, tourism and foreign investment and recommends that the Central bank of Nigeria and Fiscal authorities should embark on the liberalization policies and eases all trade barriers to encourage trade amongst its trading partners.

Keywords: Macroeconomic Variables, Stock Market, Development, Nigeria.

1. Introduction

The stock market encourages households to save and invest in financial instruments on one hand and on the other hand provides easy financing to those firms who need long-term capital for investment projects. The stock market rallies both the players providing the facilities for trading stocks. The stock market thus channels funds from savers to investors with higher efficiency. Analogously, a well-established equity market attracts foreign investors. Foreign portfolio investment inflows raise the share prices up and reduce the cost of capital to corporations of the domestic country via lowering the price-earnings ratio (Rashid, 2008). It is often argued that stock market performance is determined by some fundamental macroeconomic variables such as the interest rate, Gross Domestic Product (GDP), exchange rate, inflation and money supply. Anecdotal evidence from the financial press reveals that investors generally believe that monetary policy and macroeconomic events have a large influence on the volatility of the stock market.

In the last three decades, numerous empirical studies have examined the dynamic relationships between stock market behavior and economic activity, particularly for developed stock markets but not much on emerging markets and also given the fact that there is yet not a consensus as to whether macroeconomic variables have a force to bear in the Nigerian stock market, the research on the impact of macroeconomic variables on stock market Nigeria is not only of vital importance to investors but also to policy makers. Therefore, stock market development is proxied by index of stock price at macro level. The selected macroeconomic variables are money supply, interest rate, exchange rate, inflation rate, interest rate and trade openness using time series data from 1986 to 2019 which captures the post adjustment and reform eras in Nigeria.

2. Literature Review

The Arbitrage Pricing Theory

Developed by Ross (1976), the Arbitrage Pricing Theory (ATP) is another way of linking macroeconomic variables to stock market development. It 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 between CAPM and APT namely: the assumption of homogenous expectations, perfectly competitive markets and frictionless capital markets. However, Ross (1976) proposes a multifactor approach to explaining asset pricing through the arbitrage pricing theory (APT). According to him, the primary influences on stock returns are some economic forces such as (1) unanticipated shifts in risk premiums; (2) changes in the expected level of industrial production; (3) unanticipated inflation and (4) unanticipated movements in the shape of the term structure of interest rate. These factors are denoted with factor specific coefficients that measure the sensitivity of the assets to each factor.

Although APT does not offer specific factors like other pricing models, there are four important factors that are considered by the theory. APT looks at changes in inflation, changes in industrial production, shifts in risk premiums, and shifts in the structure of interest rates when creating long-term predictive factors. The APT also allows for multiple risk factors to be included within the data set being examined instead of excluding them. This makes it possible for individual investors to see more information about why certain stock returns are moving in specific ways. It eliminates many of the questions on movement that other theories leave behind because there are more sources of risks included within the data set. It also has fewer restrictions regarding the types of information allowed to perform predictions. Because there is more information available, with fewer overall restrictions, the results tend to be more reliable with the arbitrage pricing theory than with competitive models.

The Classical Theory of Interest

Based on the theories reviewed above, the current study adopts the arbitrage pricing theory (APT) as a theoretical framework to analyze the impact of key macroeconomic variables on stock market development. The study appeals to this model because despite the notion of efficient market hypothesis (EMH), that it is impossible for investors to earn abnormal profit because all the available information is fully reflected in prices in the stock market. Also, despite the classical theory of interest rate which show interest rate is determined by the intersection of demand for and supply of investment or capital. Many researchers have identified that macroeconomic determinants influence stock returns

This believe tends to agree with the proposition of the arbitrage pricing theory (APT) formulated by Ross in 1976, that returns on stocks are subject to series of factors like inflation rate, size of the company, dividend yield, exchange rate, gross domestic product, consumer price index, industrial production index, unemployment rate, interest rate, real income (GDP per capita income), domestic savings, stock market liquidity, etc. Thus, this study is geared towards providing an in-depth analysis of the impact of certain macroeconomic fundamentals on stock market development in Nigeria. Therefore, this study will build a model that captures the reality of the Nigerian stock market and thus contributes to knowledge.

Empirical literature

kofi (2023) employed the ARDL cointegration approach to examine the long and short-term relationship between macroeconomic variables and stock market returns and development in Ghana. We found out that cointegration exists between the macroeconomic variables and stock market return and stock market

development. The study revealed that the log of the money supply, inflation rate and human capital has a negative impact on the stock market development whereas the log of foreign direct investment and interest rate has a positive impact on stock market development.

Pole, et al (2021) investigates the effect of macroeconomic factors on stock return in the Nigerian stock market. The study employed secondary data obtained from Nigerian Stock Exchange (NSE) fact book and Central Bank of Nigeria (CBN) statistical bulletin within the period of 1998 and 2019. The monthly data obtained was subjected to the Autoregressive Distributed Lag (ARDL) method of analysis. Findings revealed that money supply and aggregate industrial production positively and significantly affect stock return (β=0.466098, P<0.05; β=0.213141, P<0.05) while exchange and inflation rates negatively affect stock return in the Nigerian stock exchange market (β=-0.009285, P<0.05; β=-0.028260, P<0.05) respectively. The study concludes that macroeconomic factors significantly affect stock return in the Nigerian stock market at short run and long run. The study recommends that the Central bank of Nigeria should employ deflationary fiscal policy and Adaptive Stabilization Method of Exchange Rate policy to reduce variance between actual and expected stock returns in the Nigerian Stock Market. Overall, the study adds to the previous literature by identifying the dynamic effect of long and short runs of macroeconomic indicators on stock returns. To the best of the author's knowledge, this is the first work to incorporate money supply and aggregate industrial production in modeling stock returns in the Nigerian context.

Syed (2021) examined the symmetric and asymmetric impact of macroeconomic variables on the Indian stock prices (SPs) of the Bombay Stock Exchange index. An autoregressive distribution lag and non-autoregressive distribution lag approach is used for the full sample covering the period from January 2000 to June 2019 and later this sample is further subdivided into before and after the crisis period to study the variations in result. The findings show that macroeconomic variables and SP have a symmetric relation in the long run whereas an asymmetric relationship in the short run when the whole sample is analyzed. However, when data are segregated into “before and after” crisis period this relationship turns to be asymmetric in long run too, meaning that in the long run, the negative and positive changes in a macroeconomic variable do not affect SPs similarly.

Okorie, et al (2021) modelled the relationships across Nigeria inflation, exchange rate, and Stock Market Returns A positive relationship is found to exist between Nigeria inflation and the exchange rate of Nigeria Naira versus USD, a negligible positive relationship exists between Nigeria inflation and her stock market returns, and a weak positive relationship exists between the exchange rate of Nigeria Naira versus USD and her stock market returns. Eighteen months forecast for each of the time series and the value at risk estimates for the Nigeria stock market returns are given. The Nigeria stock market is confirmed to be weak form inefficient.

John (2018) also examined the macroeconomic determinants of stock market performance in Nigeria using annual time series data spanning 1981 to 2016 which four macroeconomic variables, namely: money supply, interest rate, exchange rate and inflation rate were used as independent variables, while market capitalization (proxy for stock market performance) was employed as the dependent variable. The Ordinary Least Square (OLS) regression results showed that money supply has a significant positive effect; interest rate has a significant negative effect, whereas exchange rate and inflation rate have no statistically significant effect on stock market performance in Nigeria. The cointegration test results disclosed that there exists a cointegrating relationship between the macroeconomic indicators and stock market performance. This implies that there is a long-run relationship between the variables. The

Granger Causality test results revealed that a unidirectional causality runs from money supply and exchange rate to stock market performance. Therefore, the study concluded that money supply and interest rate are the true determinants of stock market performance in Nigeria.

Asekome and Agbonkhese (2015) empirically examine the macroeconomic variables that contributed to the Nigeria stock market bubble, its consequent meltdown and its gradual recovery during the period under review and particularly between 2007 to 2013 relying on the Ordinary Least Square (OLS) regression technique, the study examined the joint impact of gross domestic product (GDP), money supply (M2), exchange rate (EXR), capacity utilization (CAU), and inflation (INF) on All Share Index (ASI). The results show that the coefficients of gross domestic product and money supply were statistically significant while the remaining three: exchange rate, capacity utilization and inflation were not significant.

Suleiman and Muhammad (2014) examined the impact of foreign direct investment, macroeconomic stability on the development of Nigeria stock exchange over the period of 1981 to 2010. The result revealed that a long run relationship exists between the variables. FDI was found to have the opposite but significant impact on stock market development, inflation has a negative insignificant effect, but stock exchange rate has a significant and negative relationship with stock market development. The work suggested the listing of foreign firms operating in the country's oil and gas and telecommunication will promote the development of the market and this should be complemented with policies that will promote macroeconomic stability to attract more direct foreign investment.

3. Methodology

The study examined the key macroeconomic variables on stock market development in Nigeria using granger causality test from Nigeria from 1986 to 2019. The study relies heavily on secondary data (time series) sourced from the various institutions. Data on GDP, money supply (M2), interest rate and exchange rate were sourced ``from central bank of Nigeria (CBN). Data of all share index was sourced from Securities and Exchange Commission (SEC) and Nigeria Stock Exchange (NSE). Data on inflation was sourced from the National Bureau of Statistics (NBS).

Granger Causality Test

Granger causality is a test between two variables that shows how one variable can provide information for the prediction of the other variable. It measures whether current and past values of one variable help to forecast future values of other variables (Enders, 2015).

Granger causality can be expressed as follows:

$$ASI_t = \alpha_1 + \Phi_1 ASI_{t-1} \dots \Phi p ASI_{t-p} + \beta_1 l1M2_{t-1} \dots + \beta p11M2_{t-p} \dots + \theta 1lEXCHt_{t-1} \dots + \theta pllEXCH_{t-p} + \Upsilon 1lINT_{t-1} \dots + \Upsilon pllINT_{t-p} + \pi 1lTOP_{t-1} \dots + \pi pllTOP_{t-p} + \rho 1lINFL_{t-1} \dots + \rho pllINFL_{t-p} + \varepsilon_t \qquad (1)$$

4. Results and Discussion

Table 1: Descriptive statistics

Statistics	ASI	MS	EXH	INT	TOP	INF
Mean	17053.80	7059.994	108.0126	13.764	35.23471	19.700
Median	13595.88	1792.343	119.7685	13.50000	35.26000	12.400
Std. Dev.	15286.38	9041.940	91.70817	3.836	10.31445	18.059
Skewness	0.512	1.033	0.669	0.721	-0.431	1.656
Kurtosis	2.147	2.609	2.743	4.897	2.924	4.375
Jarque-Bera	2.517	6.273	2.630	8.052	1.062	18.237
Probability	0.284	0.043	0.268	0.017	0.588	0.000
Observations	34	34	34	34	34	34

Source: researcher computation using E-views 10(2024).

From table 4.1, the results show that the standard deviations of the variables employed are not far away from their means except for interest rate and trade openness. The result of Skewness in table 4.1 indicates all the variables are positively skewed to the right except trade openness which is negatively skewed. Kurtosis shows the peak and flatness of the series, for kurtosis to be normally distributed is 3, that is either the distribution is peak (leptokurtic) or flat (platykurtic). The result from table 4.1 shows that all the variables are normally distributed because their kurtosis values are less than 3 except for inflation and interest rate. The Jarque-Bera test for normality is also estimated and indicate the acceptance of null hypothesis for money supply, interest rate and inflation and reject the hypothesis of all share index, exchange rate and trade openness because their probabilities value are greater than 5% which this means that are normally distributed.

Unit Root Test

Table 2: Augmented Dickey Fuller (ADF), Phillips Perron (PP) and KPSS

	Test at Level		Test at first difference	
Variables	ADF test	PP test	ADF test	PP test
ASI	-2.737906	-2.766148	-5.908403	-5.695029
MS	-0.002879	0.058165	-3.455419	-6.392296
EXH	-1.370984	-1.641069	-4.163186	-3.917167
INT	-3.768794	-3.768794	-	-
TOP	-3.408540	-3.354820***		
INFL	-3.184779	-3.352878	-6.140516	-6.337411

Source: researcher computation using E-views 10(2021).

****indicates stationary or non-stationary at 1% or 5% level of significance.*

Table 2 presents the results of unit root tests of Augmented Dickey Fuller (ADF) and Phillips Perron (PP). For ADF and PP unit root test, the result shows that interest rate and trade openness are stationary at level while all share index, money supply, exchange rate and inflation rate are stationary at first difference, in other words it is I (1) process. Therefore, there is a mixture of order of integration in ADF and PP test.

Bound Test for Long Run

This test is conducted to ensure that the variables employed in the model are related in the long run. The result of the one – tail F- statistics and critical values of I (0) and I (1) bounds (for lower and upper bounds respectively) are presented in table 4.4.

Table 3: Result of the cointegration Bound Test

	Statistics	Value	Critical	Value	Bounds	
			1%	2.5%	5%	10%
F-statistic	6.312596**	I (0) Bound	3.06	2.7	2.39	2.03
		I (1) Bound	4.15	3.75	3.38	3

Source: researcher computation using E-views 10(2021).

***indicates statically significant at 5% for all bounds.*

From table 3, the results of the cointegration bound test indicate a higher value of F statistic than any of the critical values of all bounds. Therefore, there is strong evidence of cointegration in the model.

Granger Causality Test

Table 4: Granger Causality Test

Variables	Chi-square	df	p-value
Money supply to all share index	2.294218	2	0.3176
Exchange rate to all share index	5.981053	2	0.0503
Interest rate to all share index	4.786643	2	0.0913
Trade openness to all share index	0.550087	2	0.7595
Inflation rate to all share index	4.889013	2	0.0868
all share index to money supply	0.209984	2	0.9003
all share index to exchange rate	6.985297	2	0.0304
all share index to interest rate	3.737913	2	0.1543
all share index to trade openness	0.505154	2	0.7768
all share index to inflation	4.615313	2	0.0995

Source: researcher computation using E-views 10.

From the result of granger causality tests indicate that all the independent variables under study (money supply, exchange rate, interest rate, trade openness and inflation) granger causes all share index while the dependent variable (all share index) granger causes money supply, interest rate, trade openness and inflation and does not granger cause exchange rate variable. Therefore, this indicates that there is bi-directional causality among the variables except for exchange rate.

5. Conclusion and Recommendations

The study examined the key macroeconomic variables on stock market development in Nigeria using granger causality test from Nigeria from 1986 to 2019. The study relies heavily on secondary data (time series) sourced from the various institutions. Data on GDP, money supply (M2), interest rate and exchange rate were sourced ``from central bank of Nigeria (CBN). Data of all share index was sourced from Securities and Exchange Commission (SEC) and Nigeria Stock Exchange (NSE). Data on inflation was sourced from National bureau of statistics (NBS). The statistical properties of data were tested using Augmented Dickey Fuller and Phillips Perron. The test indicated that interest rate and trade openness are stationary at level while all share index, money supply, exchange rate and inflation rate are stationary at first difference. Granger causality test indicates that all the independent variables under study (money

supply, exchange rate, interest rate, trade openness and inflation) granger causes all share index while the dependent variable (all share index) granger causes money supply, interest rate, trade openness and inflation and do not granger cause exchange rate variable. Therefore, this indicates that there is bi-directional causality among the variables except for exchange rate. Based on these findings the study recommends that the Central bank of Nigeria should ensure stability in exchange rate by promote trade, tourism and foreign investment and recommends that the Central bank of Nigeria and Fiscal authorities should embark on the liberalization policies and eases all trade barriers to encourage trade amongst its trading partners. The study was limited to five macroeconomic variables (money supply, inflation, exchange rate, interest rate and trade openness). Future researchers should attempt to employ other macroeconomics variables such as Bank Credit, oil price, etc.to analyses its effect on stock market development. The current study uses Grange Causality as future researchers could use GACH family since most of the data has volatility characteristics i.e., are highly volatile.

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