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Effects of the Gross Domestic Product on Stock Exchange of Nigeria

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Abstract:

This study examines the effect of Gross Domestic Product on Stock Exchange in Nigeria from 1996 to 2015. Secondary data were obtained from Annual stock market report of the Nigerian Stock Exchange, 2015 (55th Annual General Meeting) and Annual Statistical Bulletin of the Central Bank of Nigeria were used for the study. The variables considered include; Gross Domestic Product (GDP), Federal Government/State Bonds (FGS), Corporate Bonds (CB), Alternative Securities Market (ASeM), Exchange Traded Fund (ETFs), Main Board (MB) and Premium Board (PB). The result shows that ETFs and MB has a positive impact on the GDP.

Keywords: ***GDP, Multicollinearity, Stock, Nigeria.***

INTRODUCTION

Stock exchange market is the standardized and organized financial capital market which is very crucial in competitive world where by individuals, big companies, business firms, business corporations and governments participate by either investing their funds or raising funds by using this formal system and standardized capital market. This market is a formal market which trades different financial instruments of the given specific issuer at a given price and time. This market is systematically arranged with rules and regulations according to the laws and financial policy of the given country. The efficient functioning of financial markets is important not only to investors who trade frequently but also to listed companies and corporations which issued their Initial Public Offering (IPO) on the market. In this context, the trading system in which securities are traded is an extremely important part of the functioning of the markets. According to Singh (1997), stock exchange markets are basically playing a big role to accelerate economic growth and financial sector development by motivating, promoting, attracting domestic savings and increasing quality and quantity of investment.

Stock Exchange Market in Nigeria

The Nigerian Stock Exchange was established in 1960 as the Lagos Stock Exchange. In 1977 it became The Nigerian Stock Exchange, with branches established in some of the major commercial cities of the country with Lagos as the head office of the Nigerian Exchange and an office in Abuja. The Exchange started operations in 1961 with 19 securities listed for trading. Today there are 286 securities listed on the Exchange, made up of 190 Equities, 21 Corporate Bonds/Debenture, 15 Federal Government Bonds, 22 State/Local Government Bonds, 2 Supranational Bonds, 7 ETFs and 29 Funds (Memorandum Listing). Most of the listed companies have foreign/multinational affiliations and represent a cross-section of the economy, ranging from agriculture through manufacturing to services.

Over the past years, Nigerian economy has been subjected to series of social, political and economic policies and reforms. Before a decade after independence, the country was basically agrarian and the various regional governments then largely achieved food security. In 1961, the establishment of the Nigerian Stock Exchange (formally called Lagos Stock Exchange) promoted private capital investment for growth and development in order to develop the capital market. Past and present scholars believed that investment that promotes economic growth and development requires long term funding, far longer than the duration for which most savers are willing to commit their funds. In the capital market, both local and foreign investors provide long-term funds in exchange for long-term financial assets offered by fund users. Ologunde (2006) said that the market embrace both the new issues (primary) market and secondary market. Generally, capital markets are the heartbeat of every economy since their ability to respond instantaneously to fundamental problems change in all countries. Also, it encourages savings and real investment in any healthy economic environment. Aggregate savings are channeled into real investment which increases capital stock and therefore economic growth of the country. These attributes of capital market make it possible for the discerning minds to feed the impulse of such an economy. Nigeria Stock Exchange is not an exemption as it is expected to be influenced by external shocks, which are

outside the realm of capital market. The external shocks are the macroeconomic indicators that are expected to cause variation in the stock prices movement. Maku and Atanda (2009) argued that these changes are often reflected by the magnitude and movement in stock prices, market index and liquidity of the market. Stock exchange in Nigeria is widely reported in many literatures. This article looks at its analysis.

Methodology

Econometric can be defined as a measurement of economics relationship that bring together economic theory, mathematics and statistics phenomenon with a view of making economics decisions. The econometrics time series will be employed as a statistical method in this project; using secondary data obtained from Annual stock market report of the Nigerian Stock Exchange, 2015 (55th Annual General Meeting) and Annual Statistical Bulletin of the Central Bank of Nigeria, 2015 Volume 26. The econometrics time series data covers the period of twenty (20) years.

Various methods that will be used of analysis that will be used are:

- **i.** Multicollinearity test
- **ii.** Heteroscedasticity test
- **iii.** Autocorrelation test
- **iv.** Method of least square

Multicollinearity

Under the regression analysis, one of the assumptions states that the independent variables must not be highly correlated. Violation of this assumption will lead to multicollinearity. Thus, two or more independent variables do not tend to move together in the same pattern. Once these do not hold, it will lead to problem of multicollinearity. The regression model, Y = Xb + U assumes no exact linear relationship between values of the regression (i.e X's) in order to estimate the parameters b's. If multicollinearity exists, then some of the variables are linearly independent and hence b cannot be estimated.

Heteroscedasticity

One of the important assumptions of the classical linear regression model is that the variance of each disturbance term (ui), conditional on the chosen values of the explanatory variables, is some constant number equal to σ2. This is the assumption of homoscedasticity, or equal (homo) spread (scedasticity), that is, equal variance. Symbolically,

$\mathbf{E}(u_i^2) = \sigma^2 \qquad i = 1, 2 \ldots n$

Autocorrelation

Autocorrelation may be defined as correlation between members of series of observations ordered in time [as in time series data] or space [as in cross-sectional data]. The classical linear model assumes that the disturbances term (ui) relating to any other observation.

i.e. E(uiuj) = 0 $\quad i \neq j$

For example, if we are dealing with quarterly time series data involving the regression of output on labor and capital inputs, if there is a labor strike affecting output in one quarter, there is no reason to believe that this disruption will be carried over to the next quarter. That is, if output is lower this quarter, there is no reason to expect it to be lower next quarter. Similarly, if we are dealing with cross-sectional data involving the regression of family consumption expenditure on family income, the effect of an increase of one family's income on its consumption expenditure is not expected to affect the consumption expenditure of another family. However, if there is such dependence, we have autocorrelation.

i.e. E(uiuj) ≠ 0 $\quad i \neq j$

In this situation, the disruption caused by a strike in this quarter may very well

Affect output next quarter.

Econometrics Model

Econometrics model states in detail and in quantitative term the way in which the various aspects of the economy are interrelated. The basic idea of econometrics is the specification of the relationship between two variables, dependent variable (Y) and independent variable (X's) in to mathematical form as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_k X_k + u_i$$

Where:

Y	= dependent variable
X's (X1, X2. .Xk)	= explanatory variables
b0	= intercept
b1, b2, b3, .., βk	= coefficients of explanatory variables
ui	= error or disturbance term

Results and Interpretations

This chapter reports the effect of Gross Domestic Product on Stock Exchange in Nigeria from 1996 to 2015 which was carried out using Eview 7.0 econometric software. It deals

with the empirical findings alongside the detailed results. Gross Domestic Product (GDP) was used as Dependent variable while Federal Government/State Bonds (FGS), Corporate Bonds (CB), Alternative Securities Market (ASeM), Exchange Traded Fund (ETFs), Main Board (MB) and Premium Board (PB) are the explanatory variables.

Table 1: Using the inter correlation (correlation matrix)

	GDP	FGS	CB	ASeM	ETFs	MB	PB
GDP	1.000000	-0.369864	-0.233130	0.154620	0.699204	0.936922	0.315055
FGS	-0.369864	1.000000	0.131698	-0.218389	-0.216757	-0.461277	0.078789
CB	-0.233130	0.131698	1.000000	0.254721	-0.492428	-0.068727	0.107266
ASeM	0.154620	-0.218389	0.254721	1.000000	-0.244620	0.281556	0.162035
ETFs	0.699204	-0.216757	-0.492428	-0.244620	1.000000	0.468966	0.406360
MB	0.936922	-0.461277	-0.068727	0.281556	0.468966	1.000000	0.187394
PB	0.315055	0.078789	0.107266	0.162035	0.406360	0.187394	1.000000

Since R2 is very high (0.971701), we have collinearity problem, but quite a few variables are statistically insignificant (FGS, CB, ASeM and PB), a classic symptom of multicollinearity.

Using correlation matrix, in the table above the entries on the main diagonal (those running from the upper left-hand corner to the lower right-hand corner) give the correlation of one variable with itself, which is always one (1) and the entries off the main diagonal are the pair-wise correlations among the explanatory variables. Looking at the first row of the above table, this gives the correlation of GDP with other variables. For example, -0.369864 is the correlation between GDP and FGS, -0.233130 is the correlation between GDP and CB etc.

Decision Rule and conclusion

From the rule of thumb, if correlation coefficient is greater than 0.8, we conclude that there is multicollinearity but if the correlation coefficient is less than 0.8, there is no multicollinearity.

Multi-collinearity only exists between Main Board (MB) and Gross Domestic Product (GDP).

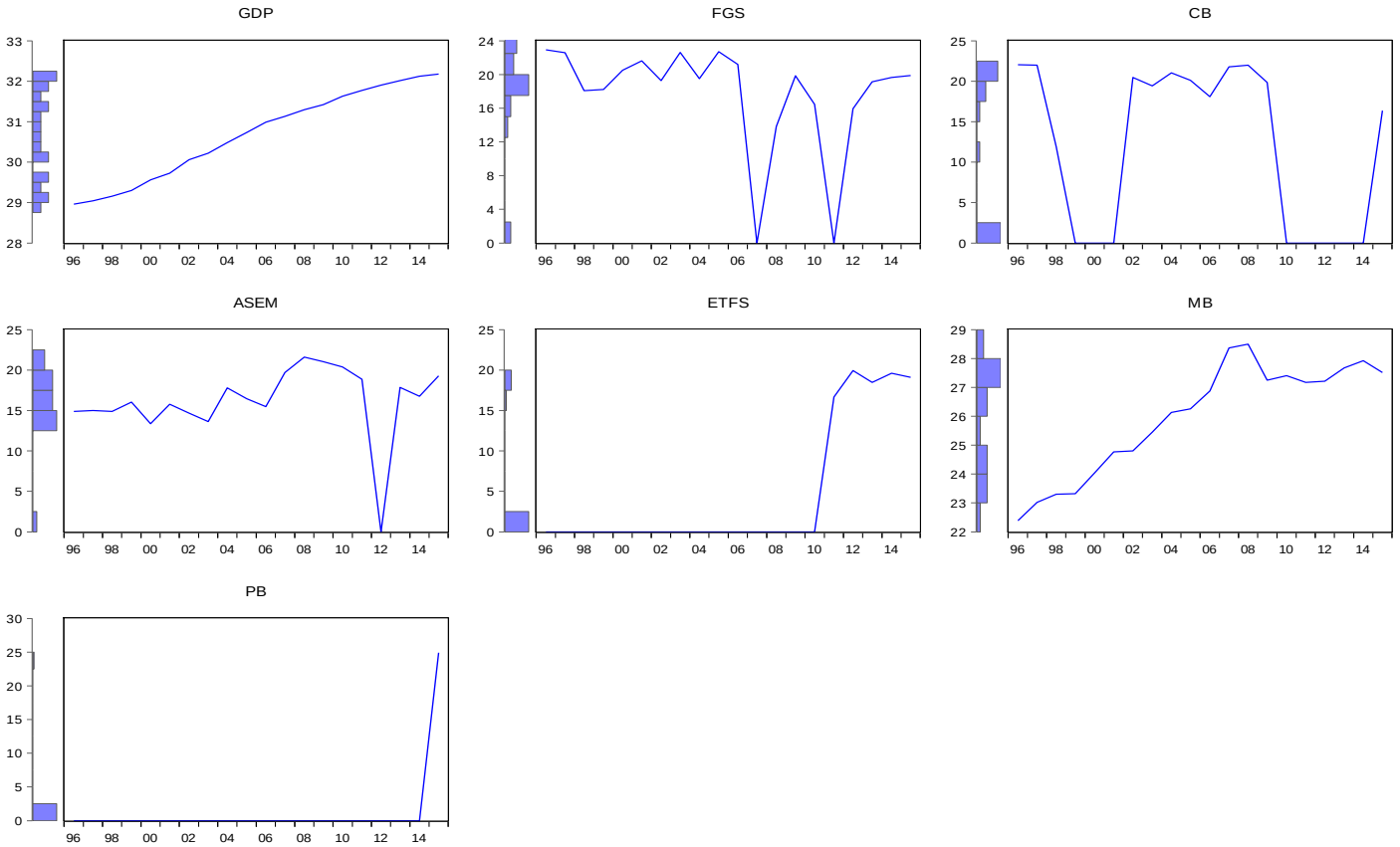

Figure 1: Graph representation of the variables.

Heteroscedasticity Test

This test is basically on the variance of the error term. It helps to ascertain whether the variance of the error term is constant or not.

$H_{0:}$ There is homoscedasticity
$H_{1:}$ There is heteroscedasticity

Table 2: Using Breusch-Pagan-Godfrey

F-statistic	2.473215	Prob. F(6,13)	0.0807
Obs*R-squared	10.66068	Prob. Chi-Square (6)	0.0994
Scaled explained SS	3.755697	Prob. Chi-Square (6)	0.0797

Decision Rule and conclusion:

Reject the null hypothesis ( ) if the probability of F-statistic is less than 0.05 or accept if otherwise; the result, probability value of F-statistic is 0.08. Since 0.08 > 0.05, we accept the null hypothesis ( ) and conclude that there is no heteroscedasticity in the model.

Test for Autocorrelation

This test is aimed at ascertaining if the error terms are correlated. To achieve this, we assume that the values of the random variable are temporarily independent by employing the technique of Durbin-Watson (DW) test.

$$d = \frac{\sum_{t=2}^{t=n} (\hat{U}_t - \hat{U}_{t-1})^2}{\sum_{t=1}^{t=n} \hat{U}_t^2}$$

Using n = 20 and k = 6

d_l= 0.649
d_u = 2.206
d = 1.4425
$d_L \leq d \leq d_U$
0.649 ≤ 1.4425 ≤ 2.206

Decision Rule and conclusion:

There is no positive autocorrelation since 0.649 ≤ 1.4425 ≤ 2.206; therefore, there is inconclusive evidence regarding the presence or absence of positive first-order serial correlation.

Table 3: Multiple Regression Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	29.14968	1.184802	24.60300	0.0000
FGS	-0.022005	0.031152	-0.706385	0.4915
CB	0.014237	0.022349	0.637040	0.5344
ASEM	0.077269	0.046341	1.667390	0.1176
ETFS	0.112741	0.032352	3.484885	0.0036
PB	-0.016621	0.041628	-0.399270	0.6957

The result of the estimated parameters can be written as:

GDP = 29.1497 – 0.0220 * FGS + 0.0142 * CB + 0.0773 * ASeM + 0.1127 * ETFs – 0.0166 * PB + μ

ANALYSIS OF RESULTS BASED ON ECONOMIC CRITERIA

A Federal Government/State Bonds (FGS)
There is a negative relationship between Federal Government/State bonds and Gross Domestic Product (GDP),the coefficient of FGS is -0.0220, which implies that a unit increase in FGS will decrease GDP by 0.02.

B Corporate Bonds (CB)
There is a positive relationship between Corporate Bonds and Gross Domestic Product (GDP), the coefficient of CB is 0.0142, it means a unit increase in CB would increase the GDP by 0.014.

C Alternative Securities Market (ASeM)
There is a positive relationship between ASeM and Gross Domestic Product (GDP), the coefficient of ASeM is 0.0773, which means that a unit change in ASeM will increase GDP by approximately 0.08.

D Exchange Traded Fund (ETFs)
There is a positive relationship between ETFs and Gross Domestic Product (GDP), the coefficient of ETFs is 0.1127, it means ETFs would have an increment of 0.11 on the GDP

C Premium Board (PB)
here is a negative relationship between Premium Board and Gross Domestic Product (GDP), the coefficient of PB is -0.0166, which means that a unit change in PB will ecrease GDP by approximately 0.02.

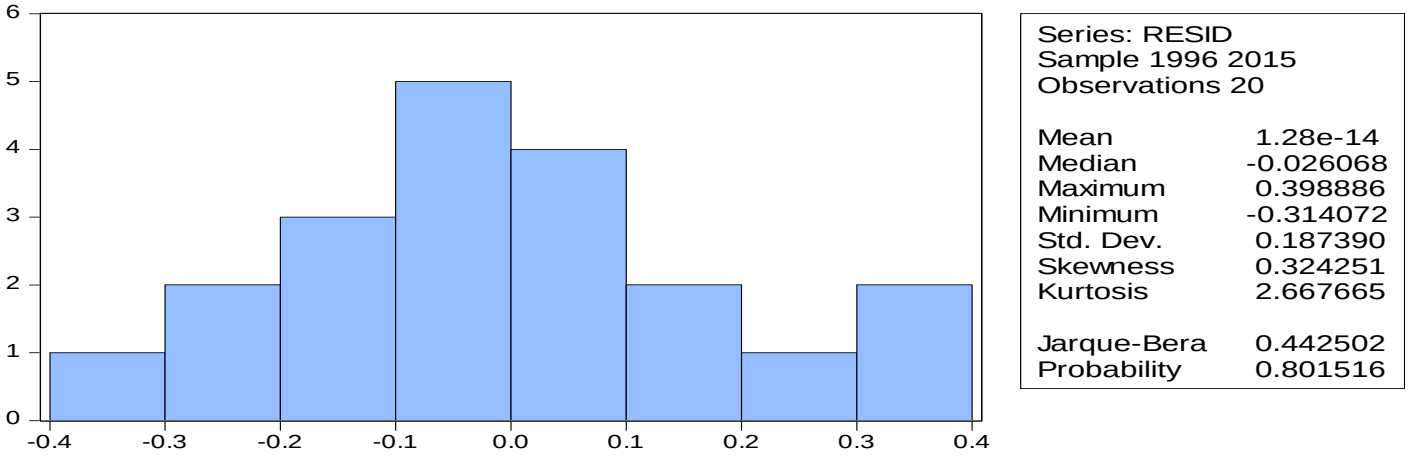

Figure 2: The Graph Above is the Histogram of the Residual Distribution (From 1996 to 2015).

ANALYSIS BASED ON STATISTICAL CRITERIA

Coefficient of Multiple Determinations (R^2):
From the result, the value of the coefficient of determination is 0.630963 which implies that 63.09% of the GDP is explained by the independent variables (Federal Government/State Bonds, Corporate Bonds, Alternative Securities Market, Exchange Traded Fund and Premium Board). This also implies that; the independent variables have 63.09% impact on the dependent variable while the other 36.91% is the residual value not included in the model i.e. µ.

Test of significance of the parameter
The student t-test is used to determine the significance of the individual parameter estimate. To achieve this, we have to compare the calculated t-value in the regression results with the tabulated t-value at n-1 degree of freedom (DF) and at 5% significant level.

H_0: $\beta = 0$ (not significant)
H_1: $\beta \neq 0$ (statistically significant)

Note: The null hypothesis assumes equality of the coefficient of the parameter with zero (0) which is not usually significant for the economy as a whole. But the alternative hypothesis ( ) assumes inequality of the coefficient of parameter (β) with zero which is always statistically significance for the economy as a whole.

Decision Rule and conclusion:

Reject if t-cal > t-tab and accept if otherwise.

From the data, n – f = 20 – 1 = 19

From statistical table, critical t-tabulated at 5% significance level is equal to 1.729. The result of the regression analysis is summarized in table below.

Table 4

Variable	t-calculated	t-tabulated	Decision rule	Conclusion
FGS	-0.706385	1.729	Accept	Insignificant
CB	0.637040	1.729	Accept	Insignificant
ASeM	1.667390	1.729	Accept	Insignificant
ETFs	3.484885	1.729	Reject	Significant
PB	-0.399270	1.729	Accept	Insignificant

From the table above the coefficients of Exchange Traded Fund (ETFs) is significant while that of Federal Government/State Bonds (FGS), Corporate Bonds (CB), Alternative Securities Market (ASeM) and Premium Board (PB) are insignificant. This implies that Exchange Traded Fund (ETFs) has a positive impact on the GDP while FGS, CB, ASeM and PB have little or no effect on GDP.

F-test was conducted to determine if the independent variables in the model are simultaneously significant or not. We therefore reject the null hypothesis ( ) and accept the alternative hypothesis ( ), since Fcal > Ftab (i.e 4.787324 > 2.90) and concluded that all coefficients are not simultaneously equal to zero, i.e. the independent variables are simultaneously significant, it also implies that the model is statistically significant.

From the OLS estimation, the result shows that Exchange Traded Fund (ETFs) was statistically significant and conformed with the apriori expectation of the model specified; this implies that Exchange Traded Fund (ETFs) has a great impact on the nation's economy in the last 20

years. The estimated equation further explains that Federal Government/State Bonds, Corporate Bonds, ASeM and Premium Board are statistically insignificant but does not conformed with the apriori expectation of the model specified; this implies that Corporate Bonds has been underutilized to aid the nation economic growth.

The model does not have heteroscedasticity and there is an inconclusive evidence regarding the presence or absence of autocorrelation problems, but there is problem of multicollinearity; nevertheless, this problem does not pose a threat on the model estimations, since the β's are statistically significant and the standard error values are not high, more especially, the overall model was statistically significant.

SUMMARY

The correlation matrix test which was used to test for the existence of multicolinearity showed that there is presence of multicollinearity in the data the null hypothesis was accepted and the X's were not orthogonal. The rule of thumb which was used for further testing verify the existence of multicollinearity between Main Board (MB) and Gross Domestic Product (GDP) with correlation of 0.936922 which is greater than 0.8.

In testing for the presence of heteroscedasticity, Breusch-Pagan-Godfrey Test was used and the result shows that there is no heteroscedasticity in the model with P-value 0.08 which is greater than 0.05.

Furthermore, Durbin Watson test was carried out to test for the presence of autocorrelation and it shows that there is no positive autocorrelation since $0.649 \leq 1.4425 \leq 2.206$; therefore, there is inconclusive evidence regarding the presence or absence of positive first-order serial correlation. The t-test shows that the coefficient of ETFs is significant while that of Federal Government/State Bonds, Corporate Bonds, ASeM and Premium Board are insignificant. This implies that ETFs (3.4849 > 1.729) has a positive impact on the GDP while FGS (-0.7064 > 1.729), CB (0.6370 > 1.729), ASeM (1.6674 > 1.729) and PB (-0.3993 > 1.729) were insignificant. Test of the significance of the joint parameters at 0.05 level of significance also show that b1, b2, b3. . . b6 are significant to the model. The test to determine whether the error term U are independent or not was also carried out and it was revealed that they are independent with P-value of 1.4425 > 0.05

The result shows that the co-efficient of determination R2 being 0.63 i.e. 63% and adjusted R2 of 0.499 ≈ 50% which show that 63% of the variation of Y (GDP) is explained by the explanatory variable and that signified the goodness of fit of the model as any prediction made by the model will be mostly accurate.

CONCLUSION

Based on our findings, the regression coefficient of ETFs is significant while that of Federal Government/State Bonds, Corporate Bonds, ASeM and Premium Board is insignificant. This implies that ETFs and MB has a positive impact on the GDP while FGS, CB, ASeM and PB were not having positive impact.

Using correlation matrix test to verify which of the explanatory variables are correlated with the dependent variable Y (GDP), the test shows that Main Boards is highly positively correlated with the dependent variable Y (GDP) with correlation coefficients 0.9369. By the graph of residual it shows that OLS residuals is right skewed (since it is positive) and the JarqueBera statistic was significant since the p-value > 0.05, hence we conclude that the error terms follow the normal distribution.

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