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Impact of Electronic Database on the Performance of Nigeria Stock Exchange Market

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Abstract
This study examines the impact of electronic database on the performance of Nigerian Stock Exchange Market. Time series data obtained from Central Bank of Nigeria (CBN) between 1970 and 2010 was used to analyze the pre- and pro-periods of Information Technology influx into the Nigeria Stock Exchange Market using econometric models. The results reveal that electronic database has great impact on the Nigerian Stock Exchange Market as revealed in the post e-database results. Furthermore, the results showed the importance of information technology to capital market development. Therefore, there is the need to improve the use and adoption of higher information technology so as have better performance of the market such that the business day transaction should be reduced to one day (T+ 0) instead of the three days (T+ 2) transaction as currently existing in the market. Apart from having better performance, this will invariably raise the level of awareness so that investors will be abreast with the happenings in the market.
Keywords: Stock Market, Information Technology, Database, Securities, Investors, Operators and Development.

Introduction

It is a known fact that investment that promotes economic growth and development requires long term funding, far longer than the duration for which most bank savers are willing to commit their funds (Wurgler, 2002). Investors raise long-term funds from capital market. The capital market, through the stock exchange market, is designed to finance long-term investments through the pooling of resources (funds) from divergent savings surpluses units and institutions. According to Suni (2004), it plays a very vital role in stimulating industrialization, provision of infrastructures and hence economic growth and development of a nation.

In the Nigerian context, capital market participants include Nigerian Stock Exchange, Stock Broking firms, Discount Houses, Development banks, Investment banks, Insurance and Pension Organizations, Building societies, the Nigerian Stock Exchange Commission (NSEC), Quoted companies, as well as the government and individuals. The Nigerian Stock Exchange (formally called the Lagos Stock exchange) is the pivot around which the entire capital market rotates. Since its establishment, its major significance is the mobilization of the countries resources for economic growth and development.

As a marketplace where securities (stocks, bonds, shares) are bought and sold openly with relative ease, the stock exchange is very important to the investors. For the government on the other hand, the stock exchange provides the mechanism for exchanging the mobilization of capital for creating goods and services for the satisfaction and well being of the citizens (World Bank, 2002).

But in modern perspective, this can only be achieved through adaptation of recent information technology which enables efficient business transaction in the market (Yartey and Adjasi, 2007). The Nigeria Stock Exchange (NSE) required a similar technology to support its large databases by making them greater in terms of performance and availability. The electronic database was used for this task. In November 1996 the Exchange launched its Internet System as one of the infrastructural support for meeting the challenges of internationalization and achieving an enhanced service delivery.

Electronic database gave the NSE the much needed performance and availability feature. The issue remained as to what level has the performance increased. This study quantified these performance gains and draw conclusive results from the statistics. The study concentrates on the impact of e-database on the performance of Nigerian Stock Exchange Market. The data for this study were annual reports, mainly obtained from the publications of the Central Bank of Nigeria, particularly the CBN statistics bulletin. It covered the period from 1970 – 2010.

Conceptual Framework of the Capital Market in Nigeria

The capital market is made up of institutions that facilitate the issuance of primary and secondary financial instruments both in the medium and long-term (John,1999). Nigeria, like many countries, has a formal capital market symbolized by the existence of stock exchange and an active new issue. Also, like in most capital markets, Nigeria has a Securities and Exchange Commission to represent government interest in regulation and development of market as well as protecting the interest of the investing public. The players in the capital market are: the providers of funds, users of funds, intermediaries and regulators.

In November, 1996 The Exchange launched its Internet System (CAPNET) as one of the infrastructural support for meeting the challenges of internationalization and achieving an enhanced service

delivery. This allows participants to receive and send e-mail globally and locally. Also, it gave them access to key market information - trading statistics (current and historical), corporate trading results, etc (Obi, 2008).

Furthermore, Information Technology (IT) has manifested on the floor of the NSE without expatiating on their roles in the working of the exchange. The most important of the IT was the Central Securities Clearing System (CSCS) which have had a profound impact on the stock exchange (Obi, 2008). Its main function is to act as a clearing and settlement machine for all transactions on the floors of the exchange. It's a securities clearing system, which implies that it records all transactions and acts as a bridge between the NSE and the investing public. The CSCS is like a central hub (Computer Server in a network of computers) that connects and co-ordinates buying and selling of stocks at the NSE. With better IT support, CSCS can reduce the present T + 3 (trading day + 3 business days-transaction time) to T + 0! This means that it is possible to begin and complete a transaction in one business day. One may be able to access value of his investment via trade alert.

Methodology

This study uses the Ordinal Least Square (OLS) method. E Views 3.1 econometrics software was used for the analysis of OLS method, while data were collected from Internet, journals, magazines, annual reports and publications of the Central Bank of Nigeria. The study uses two models to capture the null hypotheses of all the three objectives which are stated below;

Hypothesis H_0: Pre e-database has no significant with the performance of Stock Market.

Hypothesis H_0: The advent of e-database has no positive relationship with the performance of Nigerian Stock Market.

Hypothesis H_0: There are negative relationship between Nigeria stocks, Foreign Stocks, Non-Residential Stocks and the performance of Stock Market.

Model 1: Pre E - Database

This model captured pre e-database with the following equation;

$X = f(NS, FS, NRS, NOS)$ ……. (eq1)

Where: X = Nigerian Stock Exchange (NSE) (Value of Stocks is used to measure the performance of NSE)

NS = Nigeria Stocks ; FS = Foreign Stocks

NRS = Non Residential Stocks ; NOS = Number of Stocks

The above can be transformed into mathematical economics equation as given below:

$X_t = \alpha_0 + \alpha_1 NS_t + \alpha_2 FS_t + \alpha_3 NRS_t + \alpha_4 NOS_t$ ……. (eq 2)

To ensure numerical accuracy equation 2 is rescaled to obtain a log.

$\ln X_t = \alpha_0 + \alpha_1 \ln NS_t + \alpha_2 \ln FS_t + \alpha_3 \ln NRS_t + \alpha_4 \ln NOS_t$ ……. (eq 3)

Equation 3 will be transformed to econometrics equation by adding random disturbance (stochastic variable) that will make the model to consider other unforeseen factors that can affect the NSE and make the model an economic reality.

$\ln X_t = \alpha_0 + \alpha_1 \ln NS_t + \alpha_2 \ln FS_t + \alpha_3 \ln NRS_t + \alpha_4 \ln NOS_t + \mu_t$…. (eq 4)

where μ_t = error term or stochastic variable

Equation 4 will be subjected to stationarity test to know whether the variables are stationary at order of zero by difference them.

$D^{ko} \ln X_t = \alpha_0 + \alpha_1 D^{k1} \ln NS_t + \alpha_2 D^{k2} \ln FS_t + \alpha_3 D^{k3} \ln NRS_t + \alpha_4 D^{k4} \ln NOS_t + \mu_t$ …. (eq 5)

Where: D = Difference

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$ are orders of integration as indicated

Equation 5 assumes that $\alpha_0 \neq \alpha_1, \alpha_2, \alpha_3, \alpha_4$

Else, if α_0 is equate to any of $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ then a test for co-integration will be carried out between the dependent variable and any independent variable(s) by using unit root test. If it shows evidence of co-integration, then equation 5 will be transformed into Error Correction Model by adding Error Correction Mechanism to correct the co-integration between the endogenous variable and any exogenous variable(s).

$D\alpha^o \ln X_t = \alpha_0 + \alpha_1 D^{\alpha 1} \ln NS_t + \alpha_2 D^{\alpha 2} \ln FS_t + \alpha_3 D^{\alpha 3} \ln NRS_t + \alpha_4 D^{\alpha 4} \ln NOS_t + \alpha_5 D^{\alpha 5} \ln ECM_{t-1} + \mu_t$…. (eq 6)

Where: ECM_{t-1} = Error Correction Mechanism of the previous year.

Autoregressive Distributed Lag (ARDL) shall be use to build up R^2, t_{value}, $F_{statistic}$, $t_{probability,}$ thus, Equation 6 will be transform to an Autoregressive Distributed Lag

$D\alpha^o \ln X_t = \alpha_0 + \alpha_1 D^{\alpha o} \ln NSE_{t-1} + \alpha_2 D^{\alpha 1} \ln NS_t + \alpha_3 D^{\alpha 2} \ln FS_t + \alpha_4 D^{\alpha 3} \ln NRS_t + \alpha_5 D^{\alpha 4} \ln NOS_t + \alpha_6 D^{k5} \ln ECM_{t-1} + \mu_t$…….. (eq 7)

To avoid unnecessary loss of degree of freedom and specification error in our ARDL, model stimulation will be applied. This will ensure the marginalization of the irrelevant independent variables in the model. However, caution will be taken as not to totally marginalize the core variables in the model. If, however, our autoregressive variable becomes marginalized in the cause of our model stimulation, then equation 7 translates to only Distributed Lag (DL) model as shown below:

$D^{\alpha o}\ln X_t = \alpha_1 D^{\alpha 1}\ln NS_t + \alpha_2 D^{\alpha 2}\ln FS_t + \alpha_3 D^{\alpha 3}\ln NRS_t + \alpha_4 D^{\alpha 4}\ln NOS_t + \alpha_5 D^{\alpha 5}\ln ECM_{t-1} + \mu_t$ …….... (eq 8)

Model 2: Post E - Database

This model captured same null hypotheses objectives with model 1 but relate the maintained hypotheses to post e-database of the study.

Using equation 5, α_1 will be tested at 5% level of significance. If it is found to be significant at that level, the conclusion is as followings;

i. that pre e-database has no significant with the performance of Stock Market.
ii. that the advent of e-database has significant with the performance of Stock Market.
iii. that there are positive relationships between Nigeria stocks, Foreign Stocks, Non-Residential Stocks and the performance of Stock Market.

Results and Discussion

The results as well as the evaluation of the analyses are presented below in the models which captured the objectives of this study.

Table 1: Presentation of Results for Model 1

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	**-20947.93**	**54406.08**	**-0.385029**	**0.7043**
NS	**217.5048**	**543.8211**	**0.399957**	**0.6934**
FS	**209.2052**	**543.9395**	**0.384611**	**0.7046**
NRS	**200.3719**	**544.4254**	**0.368043**	**0.7167**
NOS	**0.004234**	**0.005122**	**0.826509**	**0.4183**

Source: Appendix 1

$R^2 = 0.580692$
$F(4, 25) = 6.924417$
F-probability = 0.001144
DW = 1.31

Interpretations

The result shows that the co-efficient of multiple determinations (R^2) of the model is: $R^2 = 0.580692$. This implies that 58 per cent of the variation in the dependent variable (NSE) is explained by the independent variables in the model.

F-statistic test is applied to ascertain the overall significance of the model. That is, to determine if the estimates of the parameters are simultaneously or jointly significant or not. Thus, the null hypothesis is as stated below:

Ho: $\alpha_1 = \alpha_2 = ... = \alpha_{12}$
Where $\alpha = 0.05$
$F_{cal} = F(4, 25) = 6.924417$ and $F_{tab} = 2.76$
F-probability = 0.001144

Decision Rule: Reject Ho if $F_{cal} > F_{tab}$; accept if otherwise. Alternatively, reject Ho if F-probability is not less than α; accept if otherwise. (Gujarat,2004). Since the F_{cal} (6.924417) > F_{tab} (2.76), we reject our Ho and conclude that the estimates of the parameters are simultaneously significant. This is further confirmed by the F-probability (0.001144), which is less than the level of significant ($\alpha = 0.05$).

The t – Statistic test is adopted to ensure that independent variables are individually significance. Thus, the null hypotheses are stated below:

$H_0: \alpha_i = 0$
Where i = 1,2...4
Let $\alpha = 0.025$

Decision Rule: Reject Ho if $/t_{cal}/ > /t_{tab}/$; accept if otherwise. From the statistical table,
$t_{cal} = t_{25}^{(0.025)} = 1.960$.

This shows that all our variables used in capturing electronic database are statistically insignificant in the model. In other words, independent variables have individually not impacted on the performance of the Nigeria Stocks Exchange. Therefore, we accept the null hypotheses and concluded as follows;

- that the pre e-database has no significant with the performance of Stock Market.
- that there are negative relationship between Nigeria Stocks, Foreign Stocks, Non-Residential Stocks and the performance of Stock Market.

One of the major assumptions of Least Squares is that no autocorrelation between the disturbances. Thus, the null hypothesis states that there is evidence of autocorrelation. That is:

Ho: $Cov(\mu_i, \mu_j / x_i, x_j) \neq 0$
Where x_i, and x_j are any two independent variables.

The presence or absence of autocorrelation can be detected by the use of the Durbin-Waston (DW) statistic.

According to Gujarat (2004), given

N = number of observations, and

K^1 = number of explanatory variable.

If DW < d_l: there is evidence of positive first-order serial correlation.

If DW > d_u: there is no evidence of positive first-order serial correlation.

But if d_l < DW < d_u: there is inconclusive evidence regarding the presence or absence of positive first-order.

Where: d_l and d_u are lower and upper limits of Durbin-Watson.

From the model 1, DW = 1.31; N = 25; K^1 = 4

Thus, d_l = 1.04; d_u = 1.77

Since the DW (1.31) of the model lies between d_l (1.04) and d_u (1.77), there is inconclusive evidence regarding the presence or absence of positive first-order. This implied that we do not know whether the dependent variable has affected the estimates of the independent variables.

Table 2: Presentation of Results for Model 2

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	**2099448.**	**767141.0**	**2.736717**	**0.0715**
D(NS(-1))	**117967.5**	**35799.30**	**3.295245**	**0.0459**
FS	**3341.691**	**1616.571**	**2.067148**	**0.1306**
NRS(-1)	**-301968.8**	**99547.20**	**-3.033424**	**0.0562**
NOS	**0.308974**	**0.016997**	**18.17849**	**0.0004**

Source: Appendix 1

R^2 = 0.997454

F(4, 10) = 293.8103

F-probability = 0.000321

DW = 3.29

Interpretations:

The result shows that the co-efficient of multiple determinations (R^2) of the model is: R^2 = 0.997454. This implies that 99 per cent of the variation in the dependent variable (NSE) is explained by the independent variables in the model. Thus, we conclude that the regression line in this model achieved high goodness of fit vis-à-vis the dependent variable (NSE).

F-statistic test is applied to ascertain the overall significance of the model. That is, to determine if the estimates of the parameters are simultaneously or jointly significant or not. Thus, the null hypothesis is as stated below:

Ho: $\alpha_1 = \alpha_2 = ... = \alpha_{12}$

Where $\alpha = 0.05$

F_{cal} = F(4, 10) = 293.8103

F_{tab} = 3.84; F-probability = 0.000321

Decision Rule: Since the F_{cal} (293.8103) > F_{tab} (3.84), we reject our Ho and conclude that the estimates of the parameters are simultaneously significant. This is further confirmed by the F-probability (0.000321) which is less than the level of significant ($\alpha = 0.05$).

The t- test is adopted to ensure that independent variables are individually significance. Thus, the null hypotheses are stated below:

H_0: $\alpha_i = 0$

Where i = 1,2...4

Let $\alpha = 0.025$

Decision Rule: From the statistical table, $t_{cal} = t_{10}^{(0.025)} = 1.960$

This shows that all our variables used in capturing electronic database are statistically significant in the model, expect for Non-Residential Stocks which is insignificant. In other words, Nigerian Stocks lag 1, Foreign Stocks, Number of Stocks has significantly impacted on the performance of NSE, expect for Non-Residential Stocks previous year which indicated low investment level in the stock market by Nigerian residence abroad. Therefore, we reject the null hypotheses and concluded as follows;

- that the advent of e-database has positive significant on the performance of Stock Market.
- that there are positive relationship between Nigeria Stocks, Foreign Stocks, Number of stocks with the performance of Stock Market.

One of the major assumptions of Least Squares is that no autocorrelation between the disturbances. Thus, the null hypothesis states that there is evidence of autocorrelation. That is: Ho: $Cov(\mu_i, \mu_j / x_i, x_j) \neq 0$

Where x_i, and x_j are any two independent variables.

The presence or absence of autocorrelation can be detected by the use of the Durbin-Waston (DW) statistic. According to Gujarat (2004), given

N = number of observations, and

K^1 = number of explanatory variable.
If DW < d_l: there is evidence of positive first-order serial correlation.
If DW > d_u: there is no evidence of positive first-order serial correlation.
But if d_l < DW < d_u: there is inconclusive evidence regarding the presence or absence of positive first-order.
Where: d_l and d_u are lower and upper limits of Durbin-Watson.

From table 2 above, DW = 3.29; N = 10; K^1 = 4
Since the DW > d_u in the model, we say that there is no evidence of positive first-order serial correlation. This implied that the dependent variable has not in any way affected the estimates of the independent variables.

Conclusion and Recommendations

This study examined the implications of the electronic database on the performance Nigerian Stock Exchange Market by using econometric models. The results reveal that electronic database has great impact on the Nigerian Stock Exchange Market as revealed in the post e-database results.

As a matter of policy implication, the business day transaction should be reduced to one day (T+ 0) instead of the three days (T+ 2) transaction currently operating by the introduction of grid computer which will cluster several servers on the same or different location together and present it as a single computer system. In addition, part of the fund invested in capital market should be channeled to small and medium scale businesses so as to increase the volume of investment by local investors. Finally, Nigerians both at home and abroad, as well as other local economic units such as firms and government at all level should be encouraged to invest more in the capital market. This will further stop the transfer of depression in Western economy to our local market.

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