A STUDY ON JOHANSEN COINTEGRATION APPROACH IN ANALYZING THE RELATIONSHIP BETWEEN CAPITAL MARKET ON THE ECONOMIC GROWTH IN NIGERIA

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Abstract: The study is to analyze the relationship between Nigerian capital markets in relation to her economic growth using cointegration approach. The capital market economic indicators (variables) used in this study consist of the market capitalization (MCAP); the value of transactions (VOT), total new issues values (TNI), and the economic growth indicated as gross domestic product (GDP) all in millions of naira. Augmented Dickey Fuller (ADF) Specification for Unit Root was used to examine the existence of stochastic non-stationarity in the series after which Johansen cointegration test applied to verify the long run equilibrium relationship that exists between the Nigerian capital market and the economic growth. The result of the analysis shows the trace statistic result of the **none**, **At most 1** and **At most 2** are significant to the value of the critical value at $\alpha = 0.05$ which is also confirmed by the p-values of 0.0001, 0.0001 and 0.0000, respectively except **At most 3** which is not significance. This shows that the variables are cointegrated and therefore they have a long run relationship. The results also showed that the total new issues of shares (TNI) and the total value of transaction (VOT) are positively correlated with the economic growth of Nigeria (GDP). Conclusively, the vector error correction model (VECM) indicate that there is both long run and short run association between the capital market indices and the economic growth.

Keywords: Cointegration, GDP, TNI, Market Capitalization, Value of Transaction

Introduction

Absence of effective capital market could leave most productive projects which carry developmental agenda unexploited. Capital market connects the monetary sector with the real sector and therefore facilitates growth in the real sector and economic development. The capital market mechanism allows not only an efficient allocation of the financial resources available at a certain moment in an economy from the market's point of view but also permits to allot funds according to the return and the risk from the investor's point of view, offering a large variety of financial instruments with different profitableness-risk characteristics, suitable for saving or risk covering. Nowadays, the protection against financial risks becomes a necessity, imposed by the transformations in the global economy, by the accented instability and the financial crisis that affects without discrimination both developed and emerging stock markets.

Capital market also provides equity capital and infrastructure development capital that has strong socio-economic benefits through development of roads, water and sewer systems, housing, energy, telecommunications, public transport, etc. These projects are ideal for financing through capital market via long dated bonds and asset backed securities. Infrastructure development is a necessary condition for long-term sustainable growth and development. In addition, capital market increases the efficiency of capital allocation by ensuring that only projects which are deemed profitable and hence successful attract funds. This will, in turn, improve competitiveness of domestic industries and enhance ability of domestic industries to compete globally, given the current momentum towards global integration. The result will be an increase in domestic productivity which may spill over into an increase in exports and, therefore, economic growth and development.

Recent empirical research linking capital market development and economic growth suggests that capital market enhances economic growth and development. Countries with well-developed capital markets experience higher economic growth than countries without. A study in 2011 showed that South Africa, the country whose capital market is the largest and most developed in Africa, in terms of market capitalization and trading volume, has been growing significantly since 2000. Its average per capita real GDP over the last 8 years has been at 3.2%. Countries like Egypt, Ghana, Tanzania, Botswana and Mauritius, whose capital markets have been developing recently, were able to realize average per capita growth rates of more than 2.8% for the past 8 years. However, some economies which did not have formal or effective capital market like Lesotho, Seychelles and Ethiopia could not manage to realize average per capita growth rates above 2.7% over the past 8 years. Even those countries with small and less developed capital market like Swaziland and Uganda did not manage to realize average per capita growth rates above 2.7% during the past 8 years (CBL Economic Review, August 2009, No. 109). The role of capital markets is vital for inclusive growth in terms of wealth distribution and making capital safer for investors.

Various authors have worked on importance of capital Market to economy among which are: Al-Faki (2006), state that "the capital market is a network of specialized financial institutions, series of mechanism, processes and infrastructure that, in various ways facilitate the bringing together of suppliers and users of medium to long term capital for investment in economic developmental project". Several attempts have been made by previous writers to link the growth of the capital market with the economy. Levine (1991) argued that developed stock market reduces both liquidity shock and productivity shock of businessmen to investment funds as well as enhancing the production capacity of the economy, thereby leading to higher economic growth. This view was supported by king and Levine (1993) that financial development fosters economic growth. Moreover, Bensivenga *et al.* (1996) concluded that well developed financial market (stock market) induces long run economic growth. Levine and Zervos (1996) examines whether there is a strong empirical association between stock market development and long-run economic growth. The study used pooled cross-country time-series regression of forty-one countries from 1976 to 1993 to evaluate this association. The study toed the line of Demirguc-Kunt and Levine (1996) by conglomerating measures such as stock market size, liquidity, and integration of the world markets into index of stock market development. The growth rate of Gross Domestic Product (GDP) per capita was regressed on a variety of variables designed to control for initial conditions, political stability, investment in human capital, and macroeconomic conditions; and then include the conglomerated index of stock market development. The finding was that a strong correlation between overall stock market development and long-run economic growth exist. This means that the result is consistent with the theories that imply a positive relationship between stock market development and economic growth.

Pedro and Erwan (2004) asserted that financial market development raises output by increasing the capital used in production and by ensuring that capital is put into best uses. Ogwumike and Omole (1996), Ojo (1998), Abdullahi (2005); Adam and Sanni (2005) also stressed the importance of capital market in economic development in Nigeria. Agarwal (2001) argued that financial sector development facilitates capital market development, and in turn raises real growth of the economy. Thornton (1995), Rousseau and Sylla (2001); Calderon and Liu (2002) supported that financial system development promotes economic growth. In the same vein, Beckaert *et al.* (2005) demonstrated that capital market development increases economic growth. Similarly, Bolbo *et al.* (2005) indicated that capital market development has contributed to the economic growth of Egypt.

Tharawanji (2007) observed that countries with deeper capital market face less severe business cycle output contraction and lower chances of an economic downturn compared to those with less developed capital market. On their part, Ben and Ghazouani (2007) reported that financial system development could have adverse effect on economic growth in a sample of 11 countries they studied, and therefore advocated for a vibrant financial sector. Hamid and Sumit (1998) examined the relationship between stock market development and economic growth for 21 emerging markets over 21 years, using a dynamic panel method. Their results indicated a positive relationship between several indicators of stock market performance and economic growth both directly and indirectly by boosting private investment behaviour.

In Nigeria, some authors have also attempted to examine the relationship between stock market development and economic growth. For instance, Adam and Sanni (2005) examined the roles of stock market on Nigeria's economic growth using Granger-causality test and regression analysis. The authors discovered a one-way causality between GDP growth and market capitalization and a two-way causality between GDP growth and market turnover. They also observed a positive and significant relationship between GDP growth turnover ratios. The authors advised that government should encourage the development of the capital market since it has a positive effect on economic growth.

Abu N. (2009), examined whether stock market development raises economic growth in Nigeria, by employing the error correction approach. The econometric results indicate that stock market development (market capitalization GDP ratio) increases economic growth. He however, recommended the removal of impediment to stock market development which include tax, legal and regulatory barriers, development of the nation's infrastructure to create enabling environment where business can strive, employment policies that will increase the productivity and efficiency of firms as well as encouraging of the Nigerian Securities and Exchange Commission to facilitate the growth of the market, restore the confidence of stock market participants and safeguard the interest of shareholders by checking sharp practices of market operators.

Osinubi and Amaghionyeodiwe (2003) also examined the relationship between Nigeria stock market and economic growth during the period 1980-2000 using ordinary least squares regression (OLS). The result indicated that there is a positive relationship between the stock market and economic growth and suggest the pursuit of policies geared towards rapid development of the stock market.

This study is undertaken to examine the contribution of the Nigerian capital market to her economic growth and development using co-integration approach.

The data for this study is mainly a secondary data obtained from Central Bank of Nigeria (CBN) statistical Bulletins for Capital Market between 1981 and 2014.

Measurement of variables

Gross domestic product (GDP)

This is the broadest quantitative measure of a nation's total economic activity. More specifically, GDP represents the monetary value of all goods and services produced within a nation's geographic borders over a specified period of time.

Total new issues (TNI)

A new issue is a reference to a security that has been registered, issued and is being sold on a market to the public for the first time. New issues are sometimes referred to as primary shares or new offerings.

Market capitalization (MCAP)

This is the most widely used indicator in assessing the size of a capital market to an economy. It comprises of equities and debts.

Value of transaction (VOT)

This is the annual total values of shares traded in the Nigerian stock exchange.

Johansen cointegaration test

Cointegration is a statistical property of a collection ($X_1, X_2, \ldots, X_k$) of time series variables. First, all of the series must be integrated of order 1. Next, if a linear combination of this collection is integrated of order zero, then the collection is said to be co-integrated. Cointegration has become an important property in contemporary time series analysis. Time series often have trends either deterministic or stochastic. The Johansen test is a test for cointegration that allows for more than one cointegrating relationship, unlike the Engle–Granger method, but this test is subject to asymptotic properties, i.e. large samples.

Methodology

Test model

The generalized specification framework of the over-parameterized VEC model is expressed below and extended for the four variables with (GDP, MCAP, TNI and VOT introduced in the equation each at a time, during estimation).

$$\Delta \mathbf{gdp} = \boldsymbol{\beta_0} + \sum_{i=0}^{k-1} \boldsymbol{\beta_i} \vartriangle \mathbf{gdp_{t-i}} + \sum_{i=0}^{k-1} \boldsymbol{\alpha_i} \vartriangle \mathbf{mcap_{t-i}} + \sum_{i=0}^{k-1} \boldsymbol{\gamma_i} \vartriangle \mathbf{vot_{t-i}} + \sum_{i=0}^{k-1} \boldsymbol{\delta_i} \vartriangle \mathbf{tni_{t-i}} + \boldsymbol{\Omega ecm_{t-i}} + \boldsymbol{\varepsilon_t} \quad (1)$$

Where: Δ indicates the first difference of a series; $\boldsymbol{\beta_0}$, $\boldsymbol{\beta_i}, \boldsymbol{\alpha_i}, \boldsymbol{\gamma_i}, \boldsymbol{\delta_i}$ and $\boldsymbol{\Omega}$are the parameters of the model to be estimated. 'I' is the number of lags included for the first difference of both the dependent and independent variables; $\boldsymbol{ecm_{t-i}}$ is the lagged error correction term and t represent time period.

Augmented Dickey Fuller (ADF) specification for unit root

To examine the existence of stochastic non-stationarity in the series, there is need to tests for the order of integration of the individual time series since only variables that are of the same order of integration may constitute a potential co-integrating relationship. The test is the t-statistic on parameter from the equation

$$\Delta \boldsymbol{X_t} = \boldsymbol{\beta_0} + \boldsymbol{\alpha X_{t-1}} + \sum_{i=1}^{k} \boldsymbol{\beta_i} \Delta \boldsymbol{X_{t-i}} + \boldsymbol{\varepsilon_t} \quad (2)$$

Where: Δ is the first difference operator,$\boldsymbol{\beta}$is the coefficient of the preceding observation, $\boldsymbol{X_{t-1}}$ is the immediate prior observation, $\Delta X_{t-1}$is the differenced lagged term, **k** is the number of lags, $\boldsymbol{\beta}$ is the parameter to be determinedand $\boldsymbol{\varepsilon_t}$ is the disturbance term.

The role of the lagged dependent variables in the augmented Dickey Fuller (ADF) regression equation is to ensure that $\boldsymbol{\varepsilon_t}$ is white noise. Therefore, appropriate lag length **k** needed to be chosen. The optimal lag length (k) is determined by the Schwarz Information Criterion (SIC), the lag length was set equal to the integer portion of two values of ℓ, e.iℓ_4 ={4(T/100)$^{1/4}$ } and $\ell_{12} = int\{4(\mathrm{T}/100))^{1/4}\}$,T is the number of observations.

The null hypothesis, H_0: X_t is I(1), that is, a unit root is rejected in favour of I(0), If α is found to be negative and statistically significantly different from zero. The computed t-statistic on parameter α, is compared to the critical value tabulated in MacKinnon (1991). When k= 0, we have the standard Dickey Fuller test.

The unit root tests for the first-difference of the variables is carried using the following regression equation;

$$\Delta^2 \boldsymbol{X_t}=\boldsymbol{\beta_0}+ \boldsymbol{\alpha}\Delta \boldsymbol{X_{t-1}} + \textstyle\sum_{i=1}^{k} \boldsymbol{\beta_i}\Delta^2 \boldsymbol{X_{t-i}} + \boldsymbol{\varepsilon_t} \qquad (3)$$

Where the null hypothesis is H_0: X_t is I(2), that is, two unit roots which is rejected in favour of I(1) if $\boldsymbol{\alpha}$ is found to be negative and statistically significant different from zero.

Cointegration test

After determining that the series are of the same order of integration, we test whether the linear combination of the series that are non-stationary This is done by employing the Johansen (1991), procedure of testing for a cointegrating relationship in a system of equations to determine whether the linear combination of the series possesses is a long-run equilibrium relationship. The numbers of significant cointegrating vectors in nonstationary time series are tested by using the maximum likelihood based λtrace and λmax statistics introduced by Johansen and Juselius (1990). However, a brief discussion onthe Johansen-Juselius technique is provided below. We begin by defining a k-lag vector autoregressive (VAR) representation.

$$\boldsymbol{X_t}= \boldsymbol{\alpha}+\textstyle\prod_1 \boldsymbol{X_{t-1}}+\prod_2 \boldsymbol{X_{t-2}}+\ldots+\prod_n \boldsymbol{X_{n-1}}+\boldsymbol{\varepsilon_t}, \ (\mathbf{t}=1,2,\ldots,\mathbf{T}) \qquad (4)$$

where $\boldsymbol{X_t}$ is a n×1 vector of non-stationary I(1) variables, α is a n×1 vector of constant terms, $\prod_1, \prod_2$,$\prod_3$,…, $\prod_n$ are **n**×**k** coefficient matrices and $\boldsymbol{\varepsilon_t}$ is a $n \times 1$ vector of white Gaussian noises with mean zero and finite variance. Equation (4) can be rewritten as.

$$\Delta \boldsymbol{X_t}=\boldsymbol{\alpha} + \boldsymbol{\Gamma}\Delta \boldsymbol{X_{t-1}}+\boldsymbol{\Gamma_2}\,\Delta \boldsymbol{X_{t-2}}+\ldots+\boldsymbol{\Gamma_{n-1}}\,\Delta \boldsymbol{X_{t-n+1}}+\textstyle\prod_n \boldsymbol{X_{t-n}}+\boldsymbol{\varepsilon_t}, \qquad (5)$$

Where $\boldsymbol{\Gamma_j}$ =−**J** + $\prod_1$ + $\prod_2$ + $\prod_3$ + …+ $\prod_j$ (**j** = **1,2,…,n−1**) and **Π** is define as

$$\boldsymbol{\Pi} = -\boldsymbol{j} +\textstyle\prod_1 + \prod_2 + \prod_3 + \ldots + \prod_n \qquad (6)$$

Johansen (1988) shows the coefficient matrix $\prod_n$ contains the essential information about the cointegrating or equilibrium relationship between the variables in the data set. Specifically, the rank of the matrix $\prod_{\mathbf{n}}$ indicates the number of cointegrating relationships existing between the variables in $\boldsymbol{X_t}$. In this study, for a two case variables, **Xt** = (Market capitalization and Economic Growth) and so n=2. Therefore, then the hypothesis of cointegration between Market capitalization and Economic Growth is equivalent to the hypothesis that the rank of $\prod_n = \mathbf{1}$. In other words, the rank **r** must be at most equal to $\boldsymbol{n}-\mathbf{1}$, so that $\boldsymbol{r}\leq\boldsymbol{n}-\mathbf{1}$, and there are *n*−*r* common stochastic trends. If the $\boldsymbol{r} = \mathbf{0}$, then there are no cointegrating vectors and there are *n* stochastic trends. The Johansen-Juselius procedure begins with the following least square estimating regressions;

$$\Delta \boldsymbol{X_t} = \boldsymbol{\alpha_1} + \textstyle\sum_{j=1}^{n-1} \boldsymbol{\Gamma_j}\,\Delta \boldsymbol{X_{t-j}} + \boldsymbol{\varepsilon_t} \qquad (7)$$

$$\boldsymbol{X_{t-n}} = \boldsymbol{\alpha_2} +\textstyle\sum_{j=1}^{n-1} \boldsymbol{\Gamma_j}\,\Delta \boldsymbol{X_{t-j}} + \boldsymbol{\varepsilon_{2t}} \qquad (8)$$

Define the product moment matrices of the residuals as;

$\boldsymbol{S_{ij}} = \boldsymbol{T^{-1}}\boldsymbol{\Sigma}_{\mathbf{t=1}}^{\mathbf{T}}\, \bar{\boldsymbol{\varepsilon}}_{\mathbf{it}}\bar{\boldsymbol{\varepsilon}}_{\mathbf{jt}}$**(for i, j=1,2)**,

Johansen shows that the likelihood ratio test statistic for the hypothesis of at most r equilibrium relationships is given by;

$$-\boldsymbol{2lnQ_r} =-\boldsymbol{\Sigma}_{\boldsymbol{i=r+1}}^{\boldsymbol{n}} \mathbf{ln}(\mathbf{1} - \boldsymbol{\lambda_i}) \qquad (9)$$

Where $\boldsymbol{\lambda_1} > \boldsymbol{\lambda_2} > \ldots > \boldsymbol{\lambda_n}$ are eigen values that solves the following equation.

$$|\boldsymbol{\lambda s_{22}} - \boldsymbol{s_{21}s_{11}s_{12}}| = \mathbf{0} \qquad (10)$$

The eigen value are also called the squared canonical correlations of ε_t with respect to ε_{1t}. The limiting distribution of the $-\boldsymbol{2lnQ_r}$ statistic is given in terms of a $\boldsymbol{n}-\boldsymbol{r}$ dimensional Brownian motion process, and the quantiles of the distribution are tabulated in Johansen and Juselius for $\boldsymbol{n}-\boldsymbol{r}$ **=1,...,5** and in Osterwald Lenum (1992) for $\boldsymbol{n}-\boldsymbol{r}$ = **1,...10**.

Equation (10) is usually referred to as the trace test statistic which is rewritten as follows

$$\boldsymbol{L_{trace}}=-\boldsymbol{T}\textstyle\sum_{i=r+1}^{n} \mathbf{ln}(\mathbf{1} - \boldsymbol{\lambda_i})(11)$$

where $\boldsymbol{\lambda_{r-1}},\ldots,\boldsymbol{\lambda_p}$ are the $\boldsymbol{n}-\boldsymbol{r}$smallest squared canonical correlation or eigenvalue. The null hypothesis is at most ***r*** cointegration vectors. The other test for cointegration is maximal eigenvalue test based on the following statistics

$$\boldsymbol{L_{max}} = -\boldsymbol{T}.\mathbf{ln}(\mathbf{1} - \boldsymbol{\lambda_{r+1}})$$

Where $\boldsymbol{\lambda_{r+1,}}$ **is the** $(\mathbf{r}+\mathbf{t})^{\boldsymbol{th}}$largest squared canonical correlation or eigenvalue. The null hypothesis is ***r*** cointegrating vectors, against the alternative of ***r+1*** cointegrating vectors.

Data Analysis and Results

The Jarque-Bera statistic for all the variables is significant hence we reject the null hypothesis that the series are normally distributed. The graphical representation for each variable data are presented below:

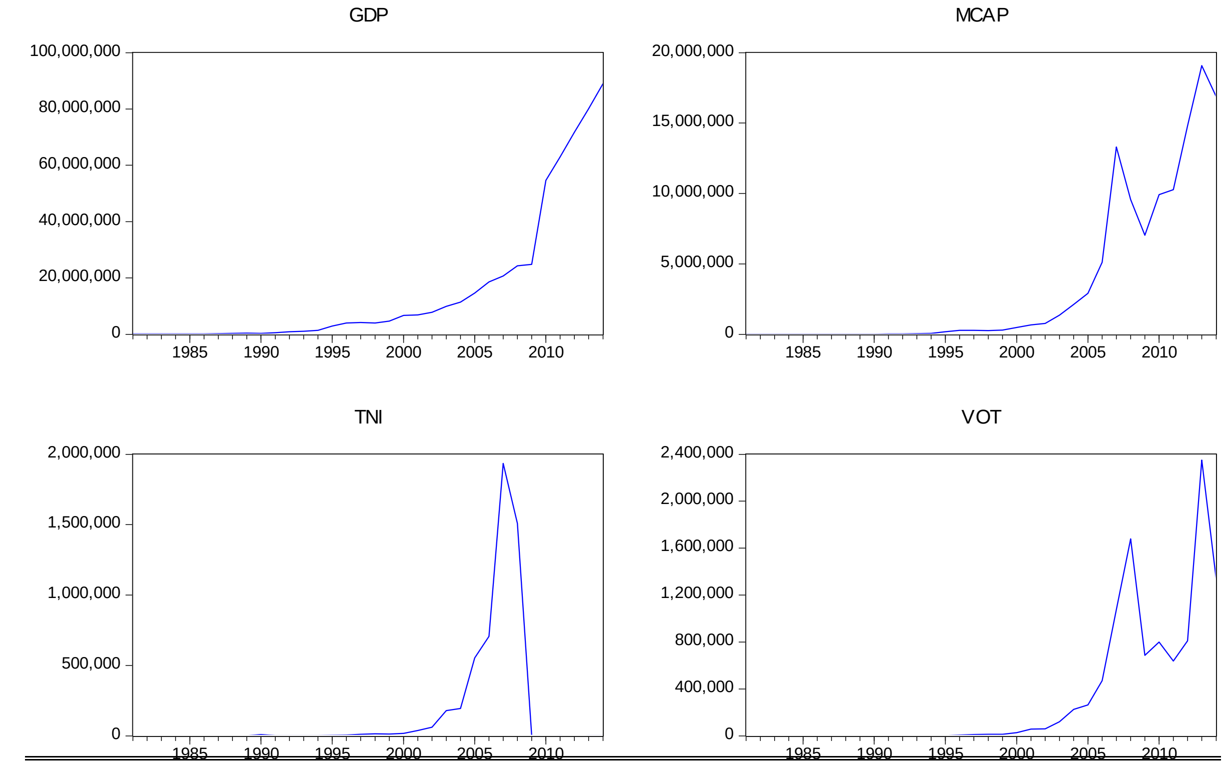

Fig. 1

Fig 1 is the graphical representation of the four variables in their raw state; this shows that the variables (GDP, MCAP, TNI and VOT) are not stationary because they contain trends and other variations over the stipulated time or period considered.

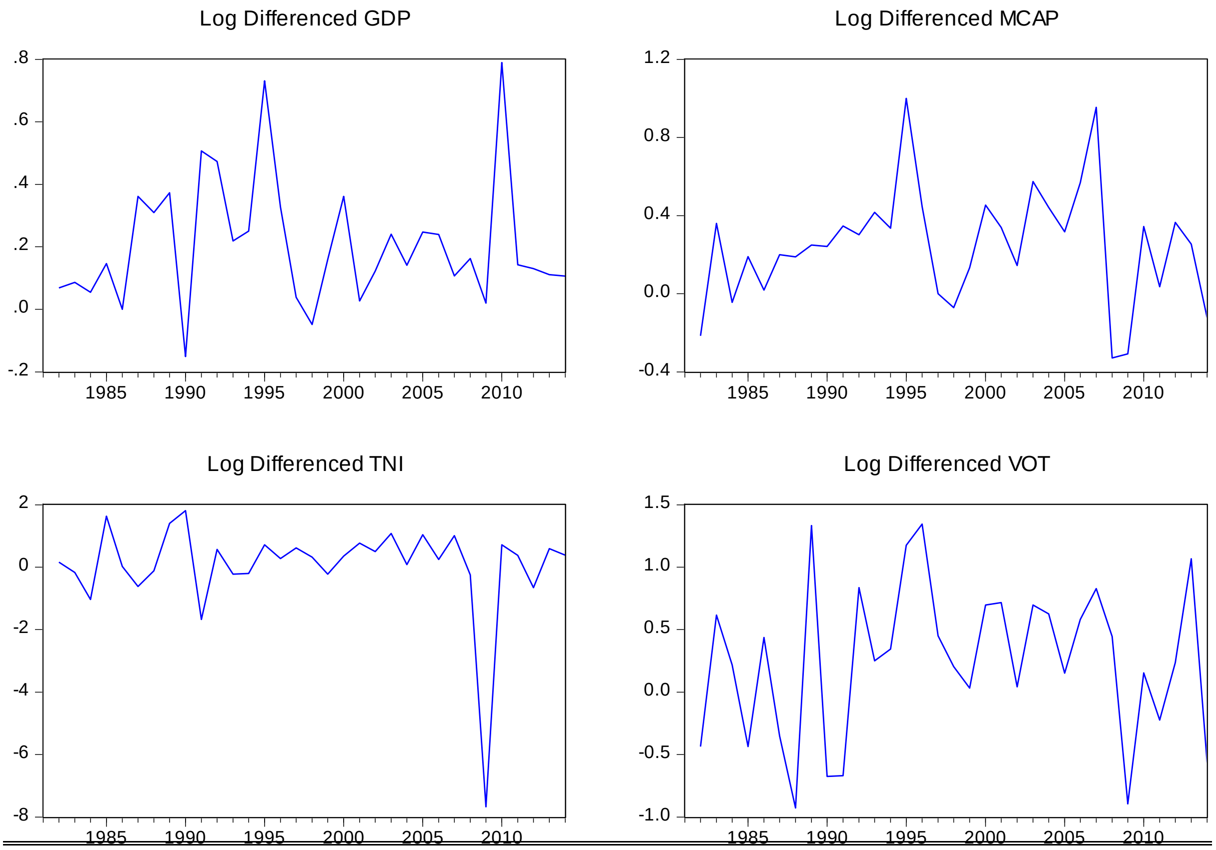

Fig. 2

Fig. 2 shows the transform state of the four variables after the log differenced was adopted, and the variables are now seen to be weakly stationary.

Unit Root Test
Augumented Dickey-Fuller Test

Table 1: ADF unit root test for GDP

~~GDP~~		~~Test statistic~~	~~Probability*~~	~~Remark~~
~~Augmented Dickey-Fuller test statistic~~		~~-5.588289~~	~~0.0004~~	~~I(1)~~
~~Test critical values~~	~~1% level~~	~~-4.273277~~		
	~~5% level~~	~~-3.557759~~		
	~~10% level~~	~~-3.212361~~		

The Table 1 above indicate that the ADF t-value of **-5.588289** is significant with the one-sided p-values of **0.0004** with respect to α **= 0.05**. this implies that the null hypothesis which state that there is unit root (non- stationary) in the variable at the first difference level will be rejected and conclude that the GDP does not contain a unit root at the first difference level **I(1)** which means that it is stationary.

Conclusion from the ADF unit root test for all the four variables

Since the ADF test shows that all the four variables are stationary at the first difference level i.e. I(1), this shows that cointegration test using the Johansen methodology can be carried out to test for the long run equilibrium relationship between the variables.

The trace statistic result of the **none***, **Atmost 1*** and **Atmost 2***is significant to the value of the critical value at α = 0.05 which is also confirmed by the **MacKinnon-Haug-Michelis (1999) p-values of 0.0001, 0.0001 and 0.0000 respectively that is less than 0.05 except for that of the **Atmost 3** which is not significance. This shows that there are three (3) cointegrating equations according to the Trace test, therefore we reject the null hypothesis which state that there is no cointegration among the variables and conclude that the variables are cointegrated and therefore they have a long run relationship or association.

GDP = -174.1174 **MCAP** + 67.05472 **TNI** + 982.7914 **VOT** + 2.34E+08

The equation above is the long run equilibrium equation showing the relationship of the Nigerian economic growth in relation to the capital market.

Table 2: Johansen Trace test cointegration results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.984895	280.7402	47.85613	0.0001
At most 1 *	0.956972	146.5724	29.79707	0.0001
At most 2 *	0.760269	45.90373	15.49471	0.0000
At most 3	0.006235	0.200149	3.841466	0.6546

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level; *denotes rejection of the hypothesis at the 0.05 level; **MacKinnon-Haug-Michelis (1999) p-values

Vector Error Correction Model (VEC) Framework

The following is the VECM equation with GDP as the dependent variable and MCAP, TNI, VOT are the independent variable. With C(1) to C(10) as the coefficient of the model.

D(GDP) = C(1)*(GDP(-1) - 174.117393849*MCAP(-1) + 67.0547235508*TNI(-1) + 982.79136777*VOT(-1) + 234481593.753) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(MCAP(-1)) + C(5)*D(MCAP(-2)) + C(6) *D(TNI(-1)) + C(7)*D(TNI(-2)) + C(8)*D(VOT(-1)) + C(9)*D(VOT(-2)) + C(10)

Table 3: Output of the regressed vector error correcting model for GDP

Dependent Variable: D(GDP)
Method: Least Squares

Sample (adjusted): 1984 2014
Included observations: 31 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.005009	0.001790	-2.797887	0.0108
C(2)	0.677259	0.091716	7.384279	0.0000
C(3)	0.040981	0.047300	0.866396	0.3961
C(4)	-0.451096	0.623384	-0.723624	0.4773
C(5)	-2.172121	0.629732	-3.449277	0.0024
C(6)	-1.722714	2.148098	-0.801972	0.4316
C(7)	-3.888848	1.539591	-2.525897	0.0196
C(8)	3.373454	2.187388	1.542230	0.1380
C(9)	27.15922	2.089864	12.99569	0.0000
C(10)	1376722.	435722.1	3.159633	0.0047

R-squared	0.990700	Mean dependent var	2868824.
Adjusted R-squared	0.986715	S.D. dependent var	5745886.
S.E. of regression	662276.7	Akaike info criterion	29.90045
Sum squared resid	9.21E+12	Schwarz criterion	30.36303
Log likelihood	-453.4570	Hannan-Quinn criter.	30.05124
F-statistic	248.5743	Durbin-Watson stat	2.246606
Prob(F-statistic)	0.000000		

From the Table above the value for the error correcting model (ECM) cofficient C(1) is -0.005009 and the probability is significant with the value0.0108 which is less than $\alpha = 0.05$ this implies that there is a long run causality running from the variables MCAP, TNI and VOT to GDP with speed of adjustment of 0.5% in lag of 1.

To estimate the short run causality for each independent i.e. the short term shock of adjustment, we use the WALD TEST for each coefficient of each variables.

D(GDP) = C(1)*(GDP(-1) - 174.117393849*MCAP(-1) + 67.0547235508*TNI(-1) + 982.79136777*VOT(-1) + 234481593.753) + C(2)*D(GDP(-1)) + C(3)*D(GDP(-2)) + C(4)*D(MCAP(-1)) + C(5)*D(MCAP(-2)) + C(6) *D(TNI(-1)) + C(7)*D(TNI(-2)) + C(8)*D(VOT(-1)) + C(9)*D(VOT(-2)) + C(10)

For **MCAP**;

In the regressed cointegration equation above, the coefficient for MCAP are C(4) and C(5)

So to test for the short run casaulity for MCAP on GDP we need to define the null hypothesis as;

C(4) = C(5) =0 (i.e no short run causality) at $\alpha = 0.05$.

Table 4: causality test result for MCAP

Test Statistic	Value	df	Probability
F-statistic	13.04424	(2, 21)	0.0002
Chi-square	26.08847	2	0.0000

Null Hypothesis: C(4)=C(5)=0

The result from Table 4 above shows that the causality test for MCAP is significant since the chi-square probability 0.0000 is less than $\alpha = 0.05$. so we reject the null hypothesis that C(4) = C(5) =0 and conclude that there is a short term running causality running from MCAP to GDP. The results are the same for TNI and VOT.

There is both long run and short run association between the capital market indices and the economic growth and this is shown graphically below:

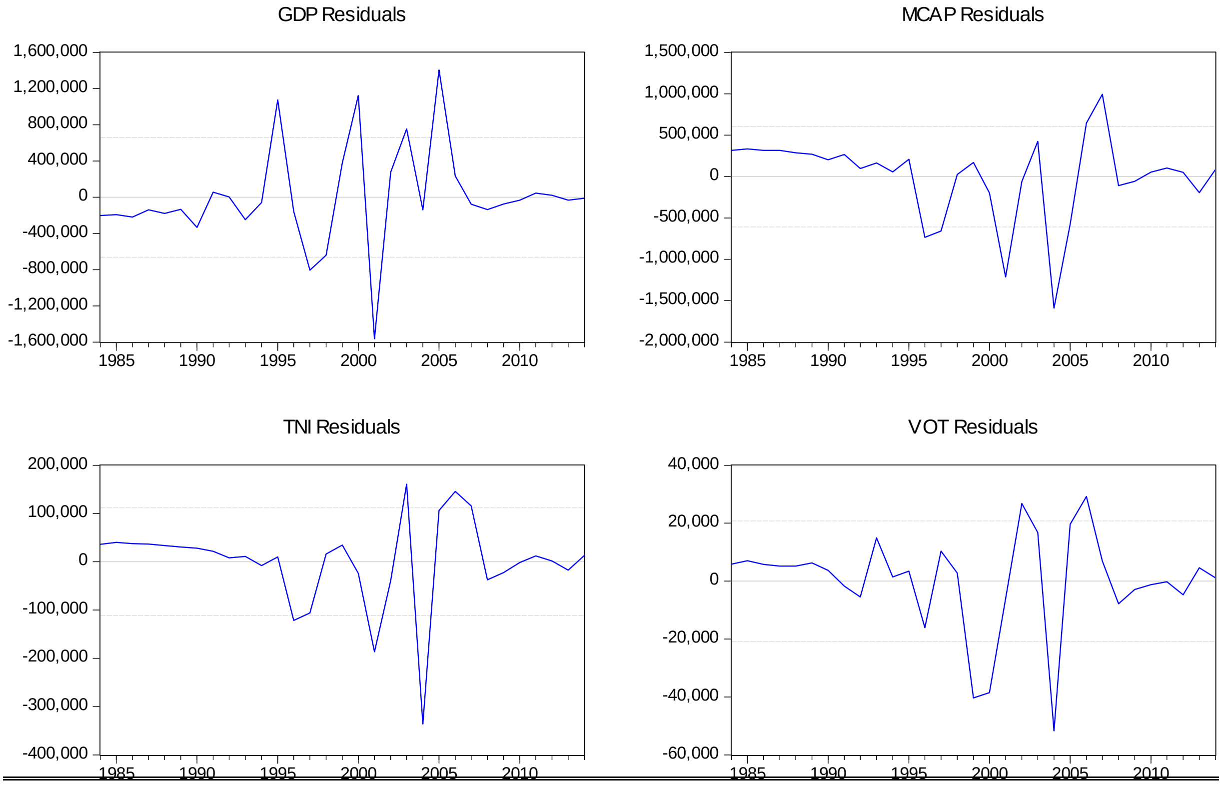

Fig. 3

The Fig. 3 shows the graphical representation of the cointegration residual plot for all the variables considered, which confirmed the long run correlation among the variables.

Conclusion

In conclusion, from the numerous test carried out using different methodology to test for the long run equilibrium or relationship between the capital market and economic growth of Nigeria, it was discovered that there is a long run and short run stable equilibrium relationship between the capital market and the Nigerian economic growth

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Conflict of Interest

Authors declare that there is no conflict of interest related to this study.

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APPENDIX

Table a: Vector error correction estimates

Vector Error Correction Estimates
Date: 06/22/16 Time: 13:10
Sample (adjusted): 1984 2014
Included observations: 31 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP(-1)	1.000000
MCAP(-1)	-174.1174 (20.6316) [-8.43934]
TNI(-1)	67.05472 (101.131) [0.66305]
VOT(-1)	982.7914 (291.333) [3.37343]
C	2.34E+08

Error Correction:	D(GDP)	D(MCAP)	D(TNI)	D(VOT)
CointEq1	-0.005009	-0.002539	0.000663	-0.001348
	(0.00179)	(0.00165)	(0.00030)	(5.6E-05)
	[-2.79789]	[-1.54105]	[2.19957]	[-23.9777]
D(GDP(-1))	0.677259	0.855520	0.118146	0.012944
	(0.09172)	(0.08441)	(0.01543)	(0.00288)
	[7.38428]	[10.1353]	[7.65482]	[4.49359]
D(GDP(-2))	0.040981	0.447637	0.093742	-0.007067
	(0.04730)	(0.04353)	(0.00796)	(0.00149)
	[0.86640]	[10.2829]	[11.7769]	[-4.75704]
D(MCAP(-1))	-0.451096	-2.132656	-0.113098	-0.168194
	(0.62338)	(0.57372)	(0.10490)	(0.01958)
	[-0.72362]	[-3.71721]	[-1.07810]	[-8.59063]
D(MCAP(-2))	-2.172121	-5.746802	-0.946717	-0.373524
	(0.62973)	(0.57957)	(0.10597)	(0.01978)
	[-3.44928]	[-9.91568]	[-8.93358]	[-18.8857]
D(TNI(-1))	-1.722714	7.083310	0.649155	0.879975
	(2.14810)	(1.97698)	(0.36149)	(0.06747)
	[-0.80197]	[3.58290]	[1.79579]	[13.0432]
D(TNI(-2))	-3.888848	20.11100	2.861404	1.708978
	(1.53959)	(1.41695)	(0.25909)	(0.04835)
	[-2.52590]	[14.1932]	[11.0442]	[35.3428]
D(VOT(-1))	3.373454	12.04551	2.231405	0.105090
	(2.18739)	(2.01314)	(0.36810)	(0.06870)
	[1.54223]	[5.98345]	[6.06197]	[1.52970]
D(VOT(-2))	27.15922	6.880089	0.970749	-0.376418
	(2.08986)	(1.92338)	(0.35169)	(0.06564)
	[12.9957]	[3.57708]	[2.76026]	[-5.73485]
C	1376722.	263879.6	-194527.2	309510.0
	(435722.)	(401012.)	(73324.4)	(13684.9)
	[3.15963]	[0.65803]	[-2.65297]	[22.6170]
R-squared	0.990700	0.942896	0.936863	0.998252
Adj. R-squared	0.986715	0.918423	0.909805	0.997503
Sum sq. resids	9.21E+12	7.80E+12	2.61E+11	9.09E+09
S.E. equation	662276.7	609519.0	111449.5	20800.32
F-statistic	248.5743	38.52766	34.62363	1332.611
Log likelihood	-453.4570	-450.8836	-398.2115	-346.1748
Akaike AIC	29.90045	29.73442	26.33623	22.97902
Schwarz SC	30.36303	30.19700	26.79880	23.44160
Mean dependent	2868824.	544172.0	78.03548	43044.68
S.D. dependent	5745886.	2134039.	371096.5	416257.5

Determinant resid covariance (dof adj.)	7.73E+40
Determinant resid covariance	1.63E+40
Log likelihood	-1611.094
Akaike information criterion	106.7803
Schwarz criterion	108.8156