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MONEY MARKET AND THE NIGERIAN ECONOMY (1981-2018): EMPIRICAL EVIDENCE FROM FMOLS AND GRANGER CAUSALITY

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ABSTRACT: *This paper investigates the relationship between money market and economic growth using annual time series data for the period 1981-2018 based on Fully Modified Ordinary Least Squares (FMOLS) and Granger causality analysis. Other econometric techniques applied include ADF unit root test, Pearson correlation, impulse response and variance decomposition techniques. Empirical findings reveal the existence of a positive, strong and significant correlation between money market and economic growth. The study also found that money market has positive and significant impact on economic growth in Nigeria. Causality flows from money market to economic growth but not vice versa. The study concludes that money market constitutes a veritable vehicle for achieving economic growth in Nigeria. It is imperative for Nigerian government to strengthen the money market by encouraging participants in the market through its various policies like tax incentives, extension of interest-free short term investment loans to investing public.*

KEYWORDS: FMOLS, Granger Causality, Impulse Response, Money Market, Nigerian Economy, Variance Decomposition

INTRODUCTION

The Nigerian financial markets (consisting of money and capital markets) focus on the channelization of surplus loanable funds to the deficit units of the economy for the purpose of trade and investments. Long term funds, financial assets and liabilities are traded in the capital market while the money market deals in short term funds and securities. The Nigerian money market exchanges loanable funds, financial assets and liabilities and other securities on a short term basis.

The Nigerian money market was established in April 1960 with issuance of the first Central Bank of Nigeria (CBN) Treasury bill (Afiemo, 2013). Commodities traded in the market vary from a maturity of 1 day to 12 months. The values of instruments traded in the market have continued to increase from as low as ₦11.75billion in 1981 to ₦48,578.51billion in 2018 with an average value of ₦4332.828billion. Given its standard deviation of ₦10907.58billion, which exceeds the average value, there is a wide dispersion in the values of money market instruments

traded over the study period of 38years (1981 to 2018) (CBN, 2018). To what extent has the astronomical increase in the value of instruments traded in the market reflect in the economic growth of Nigeria? Scholars have attempted providing answers to the puzzle between money market-growth nexus in Nigeria but there are divergent evidences across different studies. For instance, most studies (such as Aminu et al. (2017), Etale and Ayunku (2017), Eze and Nera (2017), Igbinosa and Aigbovo (2015), Iwedi and Igbanibo (2015)) found evidence that money market has significant impact on the Nigerian economic growth. However, Pavtar (2016) argues that money market has no significant impact on economic growth in Nigeria. In the same vein, some other studies (such as Akarara and Eniekezimene (2018), Uruakpa (2019)) had mixed conclusions. This study was thus motivated by the need to resolve the puzzle and contribute to the debate on the nexus between money market and economic growth in Nigeria. However, unlike most past studies (such as Agbada and Odejimi (2015), Aminu et al. (2017), Etale and Ayunku (2017), Pavtar (2016), Uruakpa (2019)) which employed Ordinary Least Squares (OLS) method, this study employs Fully Modified OLS (FMOLS) as well other econometric techniques like Granger causality, correlation analysis, impulse response and variance decomposition in the empirical investigation of the interaction between money market and economic growth in Nigeria for the period 1981 to 2018.

Objectives of the Study

The main objective of this paper is to investigate the relationship between money market and economic growth in Nigeria between 1981 to 2018. The specific objectives are to:

i. Determine the nature of relationship between money market and economic growth in Nigeria

ii. Assess the impact of money market on economic growth in Nigeria; and

iii. Examine the direction of causality between money market and economic growth in Nigeria.

Research Hypotheses

i. There is no significant correlation between money market and economic growth in Nigeria;

ii. Money market does not have significant impact on economic growth in Nigeria; and

iii. Money market does not Granger-cause economic growth in Nigeria.

LITERATURE REVIEW

Money market is a second part of the Nigerian financial market which exists to facilitate trading in short-term financial instruments to meet short-term needs of large users of funds such as governments, banks and other similar institutions (Aminu et al., 2017). The market could also be described as any arrangement and facilities that bring about the exchange of short term funds, securities. According to Afiemo (2013), the money market developed as a subset of the

financial market that managed short-term lending, borrowing, buying and selling of securities with original maturities of one year or less.

Just like the capital market, the money market has two segments, namely, the primary and secondary markets. The primary market exists for the issue of new debt instruments while the secondary market is the market for the trade of previously issued instruments (Afiemo, 2013).

Participants in the Nigerian money market include the CBN, the Nigerian Deposit Insurance Corporation, Debt Management Office, Federal Ministry of Finance, Deposit Money Banks, Microfinance Banks, Discount Houses and the private individuals. These participants deal in instruments such treasury bills, treasury certificates, certificates of deposits, commercial papers, bankers' acceptances(BAS) and other short term/medium term investments. According to Afiemo (2013), treasury bills(TBS) are short-term money-market securities issued by government at a discount and mature within 3 to 12 months from the date of issue. Treasury certificates(TCS) are similar to TBS but are issued at par and pay fixed interest rates. TCS serve to bridge the gap between the TBS and long term government securities, which mature after a period of one to two years. Commercial papers (CPS) are short-term promissory notes issued by large corporations and blue chip companies. CPS are unsecured debt instrument and are traded at a discount, having typical maturities of between 1 month and 9 months. Certificates of deposits are the time deposits held with a deposit money bank with specific maturities ranging from 3 months to 12 months (Afiemo, 2013).

Economic growth which refers to the sustained quantitative increase in the productive capacity of a country evidenced by expansion in products and services, can be achieved when scarce resources are put into productive use. One of these resources is finance, that is capital. The financial market, of which money market is one, ensures through financial intermediation, that loanable funds exchange hands between borrowers and lenders in the market. These funds when accessed by borrowers and put to use for investment purposes, has the potentiality of enhancing the productive capacity of the borrowers and the economy in general.

The extent to which money market influence economic growth in Nigeria has been under discussion over the years. Thus, the interaction between money market and economic growth in Nigeria has been examined empirically by some researchers. Amongst are Eze and Nera (2017) who investigated the relationship between different money market instruments and the economic development of Nigeria. (1990-2014) based on error correction model(ECM). The study found that money market has significant impact on the growth of the Nigerian economy. In another study, Aminu et al. (2017) via OLS, examined money market-growth nexus in Nigeria (1999-2017). Money market was found to contribute significantly to the economic growth of Nigeria. Specifically, all instruments (TBS, CDS, BAS) except CPS which have positive effect on GDP.

Furthermore, Igbinosa and Aigbovo (2015) studied the impact of money market development on Nigerian economic development between 1986-2013. From the empirical findings, based on OLS, co-integration analysis, ECM and Granger causality test, the authors found that BAS significantly influence economic development in both in the short run and long-run respectively, while value of TBS and CPS have significant impact on economic development only in the long run. Furthermore, causality flows from BAS to economic development in Nigeria.

Conversely, Pavtar (2016) carried out a time series analysis of the nexus between money market instruments and Nigeria's economic growth (1985-2014). From the results of the OLS, the study concluded that except CDS which is negatively related to GDP, all other money market instruments (TBS, CPS and TCS) have no significant effect on GDP of Nigeria.

Using OLS, cointegration test, variance impulse and variance decomposition, Uruakpa (2019) investigated the impact of money market reforms on economic growth of Nigeria (1990-2017). The study established evidence of co-integration between money market value and GDP, with the former having positive and significant effect on the latter. TBS outstanding has positive but insignificant effect on GDP (Uruakpa, 2019).

Etale and Ayunku (2017) also assessed the relationship between money market and economic growth in Nigeria for the period 1989-2014. From the OLS, the study found that TBS and CPS had positive and significant influence on GDP, while BAS had positive but insignificant influence on GDP in Nigeria. Furthermore, the granger causality test result indicates a unidirectional causality running from GDP to TBS, but not vice-versa. However, there was no causality between CPs and GDP. Similarly, BAS does not granger-cause GDP and vice versa.

In another study, Agbada and Odejimi (2015) explore developments in money market operations and economic viability in Nigeria (1981-2011). The results from Pearson correlation coefficient matrix attest to strong linear relationship between money market (TBS, TCS, CDS, CPS and BAS) and GDP. OLS results show the evidence of a long run relationship between money market operations and economic growth in Nigeria.

In the same vein, Iwedi and Igbanibo (2015) via vector autoregressions (VAR), Johansen co-integration, and Granger causality tests examined the nexus of money market operations and economic growth in Nigeria (1980-2013). The study found a positive significant short-run and long-run relationship between money market operations and economic growth in Nigeria. Also, causality flows from economic growth to money market operations but not vice versa. However, based on the Autoregressive Distributive Lag (ARDL) and Bound Testing, Akarara and Eniekezimene (2018) investigated the effect of selected money market instruments on the growth of the Nigerian economy. Result shows no form of convergence among the variables in the long-run. According to the authors, money market variables are positively related with economic growth rate both in the short and long-run, except for CDS and CPS that have inverse relationship with economic growth in the long-run. The study also found that TCS has a significant positive impact on GDP in the short-run but an insignificant impact on GDP in the long-run.

It is evident from the review that OLS constitutes the commonest method employed and annual time series data employed by previous studies. While this current study is a time series study based on annual data, it however, applies the FMOLS, a method considered to produce a more consistent and robust estimates than OLS. FMOLS may be considered a rare technique applied by previous empirics on money market-economic growth nexus in Nigeria. It was found from the review that money market is typically operationalised as values of instruments outstanding in the market and this current study follows suit. However, this study employs data spanning a longer period (38 years) and more recent dates (2018) than all the studies reviewed. Since, the larger the data-set, the more robust the results of the estimation and a more recent data employed tends to give an up-to-date empirical evidence on the subject investigated.

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METHODOLOGY

Research Design and Data Description

The study employed ex-post facto research design. The design deals with historical data which are not manipulated but used to establish relationship between variables of study. The study employed annual time series data spanning from 1981 to 2018, obtained from the CBN statistical bulletin (2018). The dates were chosen as research duration solely because of data availability.

The measurement of the various variables in the models in this study as well as the *a priori* expectations of the relationship between them are presented in Table 1.

Table 1: Variables measurement and theoretical expectations

Variables	Measurement	A priori
Economic growth: GDP	Real gross domestic product, denominated in Billion Naira; Pavtar (2016), Akarara and Eniekezimene (2018); *IV*	*N/A*
Bankers acceptances: BAS	Values of bankers acceptances outstanding at the end period, denominated in Billion Naira; Pavtar (2016); *DV*	Positive
Certificates of deposits: CDS	Values of certificates of deposits outstanding at the end period, denominated in Billion Naira; Pavtar (2016), Akarara and Eniekezimene (2018) ; *DV*	Positive
Commercial papers: CPS	Values of commercial papers outstanding at the end period, denominated in Billion Naira; Pavtar (2016), Akarara and Eniekezimene (2018) ; *DV*	Positive
Treasury bills: TBS	Values of treasury bills outstanding at the end period, denominated in Billion Naira; Pavtar (2016) ; *DV*	Positive
Treasury certificates: TCS	Values of treasury certificates outstanding at the end period, denominated in Billion Naira; Pavtar (2016), Akarara and Eniekezimene (2018) ; *DV*	Positive
Parameters: β_1-β_6	Coefficients of the parameters of the models	*N/A*
Error terms: U	Stochastic error terms	*N/A*
Time series: t	Time series in years from 1981 to 2018	*N/A*

NB: *IV, DV and N/A denotes independent variables, dependent variable and not applicable respectively.*
Source: Authors' computation using Eviews 10, (2020).

Econometric Techniques

The study applied econometric tools and models in the analysis of the secondary data. Specifically, descriptive analysis of the variables was carried out to have an understanding of the statistical properties and behavior of the data. The Pearson correlation test was carried out to determine the nature of relationship between money market and economic growth in Nigeria. The data were also tested for any evidence of unit root via the augmented Dickey-Fuller (ADF) unit root test. Furthermore, the Johansen cointegration test was applied to the data to establish any evidence of long run equilibrium relationship among the variables.

In the same vein, the direction of causal relationship between money market and economic growth was investigated based on the pairwise Granger causality test. To assess the impact of money market on economic growth, the FMOLS technique was employed. To get further information about the impact of money market on economic growth, both variance decomposition and impulse response techniques were applied to the data. Thereafter, diagnostic tests like Jacque-Berra normality test, serial correlation test were applied to the FMOLS estimated.

Fully Modified Ordinary Least Squares Method (FMOLS)

FMOLS as a technique has been applied to time series studies by several scholars (such as Aljebrin (2012), Bashier and Siam (2014), Mehmood and Shahid (2014), Bashier and Wahban (2013), Tursoy (2019)) in their studies. The method was developed by Phillips and Hansen (1990), which according to the authors is an estimator which employs a semi-parametric correction to eliminate the problems caused by the long run correlation between the cointegrating equation and stochastic regressors innovations. The estimator is asymptotically unbiased and has fully efficient mixture normal asymptotics allowing for standard Wald tests using asymptotic Chi-square statistical inference (Phillips & Hansen, 1990).

FMOLS is suitable when all the variables attain stationarity after first differencing and at the same time cointegrated (Mehmood & Shahid, 2014). The technique modifies OLS to account for the serial correlation and test for the endogeniety in the regressors that result from existence of cointegrating relationship (Aljebrin, 2012). The method produces reliable estimates for small sample size and provides a check for robustness of the results (Bashier & Siam, 2014). The technique employs kernel estimators of the Nuisance parameters that affect the asymptotic distribution of the OLS estimator (Aljebrin, 2012).

FMOLS is considered suitable in this study because of the evidence of cointegrating relationship among the variables of study and they are I(1) series. Thus, the FMOLS model for this study is specified thus:

$$GDP=f(BAS, CDS, CPS, TBS, TCS) \quad (1)$$

Taking logarithm of all the variables, the equation is transformed and specified in equation 2:

$$\mathrm{LOG(GDP)_t}=\beta_0+\beta_1\mathrm{LOG(BAS)_t}+\beta_2\mathrm{LOG(CDS)_t}+\beta_3\mathrm{LOG(CPS)_t}+\beta_4\mathrm{LOG(TBS)_t}+\beta_5\mathrm{LOG(TCS)_t}+\mathrm{U_t} \quad (2)$$

Granger Causality Test Equations

Investigating the direction of causality between money market and economic growth in Nigeria, the study applied the pairwise Granger causality test and the equations are stated thus:

$$LOG(GDP)_t=\sum_{t=1}^{n}\mathrm{LOG(BAS)}_{t-i}+\sum_{t=1}^{n}\mathrm{LOG(CDS)}_{t-j}+\sum_{t=1}^{n}\mathrm{LOG(CPS)}_{t-k}+\sum_{t=1}^{n}\mathrm{LOG(TBS)}_{t-l}+\sum_{t=1}^{n}\mathrm{LOG(TCS)}_{t-m}+U_{1t} \quad (3)$$

$$LOG(BAS)_t=\sum_{t=1}^{n}\mathrm{LOG(GDP)}_{t-i}+\sum_{t=1}^{n}\mathrm{LOG(CDS)}_{t-j}+\sum_{t=1}^{n}\mathrm{LOG(CPS)}_{t-k}+\sum_{t=1}^{n}\mathrm{LOG(TBS)}_{t-l}+\sum_{t=1}^{n}\mathrm{LOG(TCS)}_{t-m}+U_{2t} \quad (4)$$

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$$LOG(CDS)_t = \sum_{t=1}^{n} \text{LOG(GDP)}_{t-i} + \sum_{t=1}^{n} \text{LOG(BAS)}_{t-j} + \sum_{t=1}^{n} \text{LOG(CPS)}_{t-k} + \sum_{t=1}^{n} \text{LOG(TBS)}_{t-l} + \sum_{t=1}^{n} \text{LOG(TCS)}_{t-m} + U_{3t} \quad (5)$$

$$LOG(CPS)_t = \sum_{t=1}^{n} \text{LOG(GDP)}_{t-i} + \sum_{t=1}^{n} \text{LOG(BAS)}_{t-j} + \sum_{t=1}^{n} \text{LOG(CDS)}_{t-k} + \sum_{t=1}^{n} \text{LOG(TBS)}_{t-l} + \sum_{t=1}^{n} \text{LOG(TCS)}_{t-m} + U_{4t} \quad (6)$$

$$LOG(TBS)_t = \sum_{t=1}^{n} \text{LOG(GDP)}_{t-i} + \sum_{t=1}^{n} \text{LOG(BAS)}_{t-j} + \sum_{t=1}^{n} \text{LOG(CDS)}_{t-k} + \sum_{t=1}^{n} \text{LOG(CPS)}_{t-l} + \sum_{t=1}^{n} \text{LOG(TCS)}_{t-m} + U_{5t} \quad (7)$$

$$LOG(TCS)_t = \sum_{t=1}^{n} \text{LOG(GDP)}_{t-i} + \sum_{t=1}^{n} \text{LOG(BAS)}_{t-j} + \sum_{t=1}^{n} \text{LOG(CDS)}_{t-k} + \sum_{t=1}^{n} \text{LOG(CPS)}_{t-l} + \sum_{t=1}^{n} \text{LOG(TBS)}_{t-m} + U_{6t} \quad (8)$$

Where U_{1t} , U_{2t} , U_{3t} , U_{4t}, U_{5t} and U_{6t} are assumed to be uncorrelated,

Impulse Response Function (IRF)

Impulse response functions (IRFs) trace the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables in the VAR (Rummel, 2015). Since individual coefficient estimates of VAR model only provide limited information on the reaction of the system to a shock, impulse responses (IRs) provide a better picture of the model's dynamic behavior. Thus, IRF traces the transmission of a single shock within an otherwise noisy system of equations and, this technique is a useful in the assessment of economic policies (Mohr, 2020).

An impulse response is the reaction of any dynamic system in response to some external changes. An IRF is a description of the reaction of the variable of interest over stated time periods after a shock in one or more variables at a stated time. In this study, the variable of interest is GDP. Thus, the IRF of GDP describes the reaction of GDP to money market variables (BAS, CDS, CPS, TBS, TCS) at the time of the shock and over subsequent periods of time, from 1 to 10 years.

Variance Decomposition

Variance decomposition(VDC) separates the variation in an endogenous variable into the contributions explained by the component shocks in the VAR. It states the proportion of the movements in a variable that is due to its 'own' shock versus shocks to the other variables (Rummel, 2015). In other words, VDC determines how much of the variability in endogenous variable is lagged by own variance and also indicates which of the exogenous variable is stronger in explaining the variability in the endogenous variable over time. In this study, the VDC of GDP determines the proportion of variations in GDP explained by each of the money market variables over the 10 years' periods.

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EMPIRICAL ANALYSES AND RESULTS

Descriptive Statistics

Table 2 depicts the descriptive statistics of the variables under investigation.

Table 2: Descriptive statistics

	GDP	BAS	CDS	CPS	TBS	TCS
Mean	33725.22	24.70954	14.25464	75.08144	1355.291	7.628829
Maximum	69810.02	137.4500	238.1400	822.7009	14660.99	39.70590
Minimum	13779.26	0.008600	0.000000	0.073000	5.782000	0.000000
Std. Dev.	19578.10	30.77402	41.91428	166.1994	2996.196	13.29342
Observations	38	38	38	38	38	38

Source: Authors' computation using Eviews 10, (2020).

Table 2 shows that the minimum and maximum value for Gross domestic product (GDP) is ₦13779.26 and ₦69810.02 respectively with ₦33725.22 as an average for the 38years of study. GDP has its standard deviation (S.D.) (₦19578.10) exceeds its mean value. Also, BAS value ranges between a minimum value of ₦0.08600 and a maximum value of ₦ 137.4500 and its mean and S.D. records ₦24.70954 and ₦30.77402 respectively. The minimum and maximum value of certificates of deposits (CDS) are ₦0.000000 and ₦238.1400 respectively with a mean value of ₦14.25464. The S.D. of the series (₦41.91428) is more than its mean value. Commercial papers (CPS) have its minimum and maximum value standing at ₦0.073000 and ₦822.7009 respectively with a mean value of ₦75.08144. The S.D. of CPS (₦166.1994) is more than its mean value. TBS value ranges between a minimum value of ₦5.782000 and a maximum value of ₦14660.99 and its mean and S.D. records ₦1355.291 and ₦2996.196 respectively. Treasury certificates (TCS) has its minimum and maximum value standing at ₦0.000000 and ₦39.70590 respectively with a mean value of ₦7.628829. The S.D. of TCS (₦13.29342) is more than its mean value.

A general examination of the differences between the minimum and maximum values of the money market instruments reveals that the market has witnessed increased growth in the 38 years of study (1981-2018). Asides the GDP with highest maximum value, treasury bills (₦14660.99) has the highest maximum among the money market instruments while the treasury certificates (₦39.70590) has the lowest maximum value in the period of investigation. All the variables of study are widely dispersed, evidence by their average and S.D. values.

Correlation Analysis

In order to determine the nature of relationship between money market and economic growth, Pearson correlation analysis was carried out and the results presented in table 3.

Table 3: Correlation analysis Estimates

Dependent Variable: GDP

Method: Pearson correlation

Variables:	BAS	CDS	CPS	TBS	TCS
Coefficient	0.6257	0.5667	0.2804	0.6621	-0.3360
T-Stat.	4.8127	4.1270	1.7532	5.3022	-2.1409
P-value	0.0000***	0.0002***	0.0881*	0.0000***	0.0391**

*NB: ***, **, and * denotes statistically significant at 1%, 5% and 10% respectively*
Source: Authors' computation using Eviews 10, (2020).

Table 3 shows that except TBS which has a negative correlation with GDP, the remaining the money market instruments (BAS, CDS, CPS and TBS) have positive correlation with economic growth. All the correlations are statistically significant while most dependent variables (BAS (r=0.62), CDS(r=0.56) and TBS (r=0.66) have strong correlations with GDP and only (CPS(r=0.28) and TCS(r=-0.33) exhibit weak correlation with GDP. Generally, there is a strong, positive and statistically significant correlation between money market and economic growth in Nigeria.

Unit Root Test

To avoid running a spurious regression, we test for the presence of unit roots in the variables via the ADF unit root test, whose results are presented in table 4.

Table 4: Results of ADF nit root test

Variables	**ADF-Statistics Level**	**p-value**	**ADF-Statistics 1st Difference**	**p-value**	**I(d)**
LOG(GDP)	-0.027817	0.9497	-3.395063	0.0177**	I(1)
LOG(BAS)	-1.937944	0.3116	-3.904498	0.0050***	I(1)
LOG(CDS)	-0.477471	0.4926	-12.04934	0.0000***	I(1)
LOG(CPS)	-1.895716	0.3306	-6.322491	0.0000***	I(1)
LOG(TBS)	-0.462503	0.8874	-5.970371	0.0000***	I(1)
LOG(TCS)	-1.377978	0.5622	-3.876054	0.0137**	I(1)

*NB: *** and ** denotes rejection of null hypothesis at 1%, and 5% levels of significance respectively.*
Source: Authors' computation using Eviews 10, (2020).

Table 4 shows that that all the variables (GDP, BAS, CDS, CPS, TBS and TCS), tested in their logarithm forms are non-stationary but attain induced stationarity only after first differencing. This implies that any shocks to the variables will be sustained for a long period of time. Can all these variables be pulled together in the long run? To answer the question, the study applied the Johansen's cointegration to evaluate the existence of a long run relationship among the variables.

Optimum Lag Selection

Selecting the optimum lag for the various models in this study becomes imperative because the arbitrary or default lag may not always be the optimum. Therefore, the VAR lag order selection criteria and the VAR lag exclusion Wald test were carried out using the logarithm forms of the variables.

The lag order selection criteria reported in table 5 are sequential modified LR (LR), Final prediction error(FPE), Akaike information criterion (AIC), Schwarz information criterion(SC), and Hannan-Quinn information criterion (HQ) and each test carried at 5% level).

Table 5: VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-37.89124	NA	3.46e-05	6.752499	7.013244	6.698904
1	41.70979	73.47788*	9.03e-08*	0.044647	1.869868	-0.330518
2	2089.258	0.000000	NA	-309.4243*	-306.0347*	-310.1211*

* indicates lag order selected by the criterion,
Source: Authors' computation using Eviews 10, (2020).

Table 5 indicates that the optimal lag length, based on the AIC, SC and HQ is 2 lags but LR and FPE suggests 1 lag.

To make the final choice between the different lags suggested by the criteria, the VAR lag exclusion Wald test was carried out and results presented in table 6.

Table 6: VAR lag exclusion Wald tests

Chi-squared test statistics for lag exclusion:							
	GDP	BAS	CDS	CPS	TBS	TCS	Joint
Lag 1	113.1755	87.98135	26.85476	724.0047	239.9850	37.29271	4126.976
	[0.0000]	[0.0000]	[0.0002]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Df	6	6	6	6	6	6	36

NB: *Numbers in* [ ] *are p-values.*
Source: Authors' computation using Eviews 10, (2020).

As contained in table 6, the results of the lag exclusion test indicate that the optimal lag to be used in the models and tests in this study is 1 lag.

Co-Integration Tests

Since the ADF results shows all the included variables are I (1) series, the Johansen co-integration method was used to verify the existence of a long run equilibrium relationship among the non-stationary variables of the same order based on lags interval (in first differences).

Table 7: Results of Johansen's cointegration tests

Null hypothesis: There is no long run relationship among the variables

A). Unrestricted Cointegration Rank Test (Trace):				
Hypothesized No. of CE(s)	Eigenvalue	Trace Stat.	0.05 Critical Value	Prob.**
None *	0.820452	148.6587	95.75366	0.0000
At most 1 *	0.636697	86.83537	69.81889	0.0012
At most 2 *	0.506256	50.38470	47.85613	0.0284
At most 3	0.316973	24.97813	29.79707	0.1622
At most 4	0.157702	11.25420	15.49471	0.1963
At most 5 *	0.131507	5.075832	3.841466	0.0243
B). Unrestricted Cointegration Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Stat.	0.05 Critical Value	Prob.**
None *	0.820452	61.82332	40.07757	0.0001
At most 1 *	0.636697	36.45067	33.87687	0.0241
At most 2	0.506256	25.40657	27.58434	0.0926
At most 3	0.316973	13.72393	21.13162	0.3881
At most 4	0.157702	6.178366	14.26460	0.5904
At most 5 *	0.131507	5.075832	3.841466	0.0243

NB: ** denotes rejection of the hypothesis at the 0.05 level; and ** is MacKinnon-Haug-Michelis (1999) p-values.*
Source: Authors' computation using Eviews 10, (2020).

Table 7 repots the results of the Johansen co-integration tests. As indicated in panel A, the Trace test indicates 3 cointegrating equations at the 0.05 level while Max-eigenvalue test (based on panel B) indicates 2 cointegrating equations at the 0.05 level. Since the existence of long run equilibrium relationship have been confirmed from the Johansen co-integration tests, it is safe to estimate the long run relationship between money market and economic growth in Nigeria based on FMOLS framework.

Granger Causality Analysis

Table 8 reports the results of the pairwise Granger-causality test which was carried out based on the optimum lag of 1. The test determines the direction of causality between the money market and economic growth in Nigeria.

Table 8: Results of pairwise granger causality test

Null Hypothesis:	**F-Stat**	**Prob.**	**Decision**	**Causality**
LOG(GDP) does not Granger Cause LOG(BAS)	0.02837	0.8672	Accept	
LOG(BAS) does not Granger Cause LOG(GDP)	6.60941	0.0147**	Reject	Unidirectional
LOG(CDs) does not Granger Cause LOG(GDP)	0.58413	0.4558	Accept	
LOG(GDP) does not Granger Cause LOG(CDs)	1.07746	0.3147	Accept	No Causality
LOG(GDP) does not Granger Cause LOG(CPS)	0.18312	0.6714	Accept	
LOG(CPS) does not Granger Cause LOG(GDP)	14.1711	0.0006***	Reject	Unidirectional
LOG(TBS) does not Granger Cause LOG(GDP)	5.33863	0.0271**	Reject	
LOG(GDP) does not Granger Cause LOG(TBS)	3.06571	0.0890*	Reject	Bi-directional

LOG(TCS) does not Granger Cause LOG(GDP)	1.39335	0.2627	Accept	
LOG(GDP) does not Granger Cause LOG(TCS)	1.63377	0.2275	Accept	No Causality

NB: ****, **, * denotes rejection of null hypothesis at 1%, 5% and 10% respectively.*
Source: Authors' computation using Eviews 10, (2020).

Table 8 shows that there is unidirectional causality running from bankers' acceptances (BAS) to economic growth (GDP) and from commercial papers (CPS) to economic growth (GDP). The test also indicates a bi-directional causality between treasury bills (TBS) and economic growth (GDP). However, there is no causal link between certificates of deposits (CDS) and economic growth (GDP). Similarly, the is no causality between treasury certificates (TCS) and economic growth (GDP).

Fully Modified Ordinary Least Squares(FMOLS) Estimates

Since the six variables of study are cointegrated of the order I(1), they can be represented in terms of a long run FMOLS model. The FMOLS model estimated based on an optimum lag of 1 and estimates of the model are reported in table 9.

Table 9: FMOLS estimates

Dependent Variable: LOG (GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(BAS)	0.041667	0.006349	6.562596	0.0002***
LOG(CDS)	0.023810	0.004160	5.724095	0.0004***
LOG(CPS)	0.026465	0.013254	1.996751	0.0809*
LOG(TBS)	-0.031892	0.018114	-1.760660	0.1163
LOG(TCS)	0.063602	0.009054	7.024987	0.0001***
C	9.821568	0.058089	169.0766	0.0000
R-squared	0.908297	Adjusted R-squared	0.850983	

NB: ***, **, * denotes statistically significant at 1%, 5% and 10% respectively.
Source: Authors' computation using Eviews 10, (2020).

Table 9 reports that bankers' acceptances (BAS) has a significant positive impact on economic growth (GDP), where a 1% increase in BAS results in a 4.1% increase in GDP. The positive coefficient (0.023810) of certificate of deposits(CDS) suggests that CDS causes a significant increase in economic growth in the long run. Also, this study reports a positive coefficient (0.026465) for commercial papers (CPS) which implies that a 1% increase in CPS causes a 2.6% increase in GDP. In the same vein, treasury certificates (TCS) positively signed with a coefficient of 0.063602, suggesting that a 1% increase in TCS causes a 6.3% increase in GDP. However, the negative coefficient (-0.031892) of treasury bills (TBS) implies that TBS has negative but insignificant impact on economic growth over the study period.

Generally, the FMOLS coefficients indicates that most of the independent variables (CDS, CPS, TCS and BAS) are positively signed and statistically significant except TBS which exhibits a negative and statistically insignificant relations with economic growth.

The model show that of a good fit as indicated by both the R-squared value of 0.90 and the adjusted R-squared of 0.85. Other diagnostic tests' carried are Jarque-Bera [J-B] residual normality test and serial correlation test based on Q-Statistics (correlogram of residuals) and their results reported in figure 1 and table 10 respectively.

Jarque-Bera Residual Normality Test

Figure 1 reports that the p-value (0.937333) of the J-B statistic (0.129433) is higher than the levels of significance (1%, 5%, and 10%). Therefore, this study fails to reject the null hypothesis of normal distribution of residuals. It can be concluded that the residual of the FMOLS model is normally distributed.

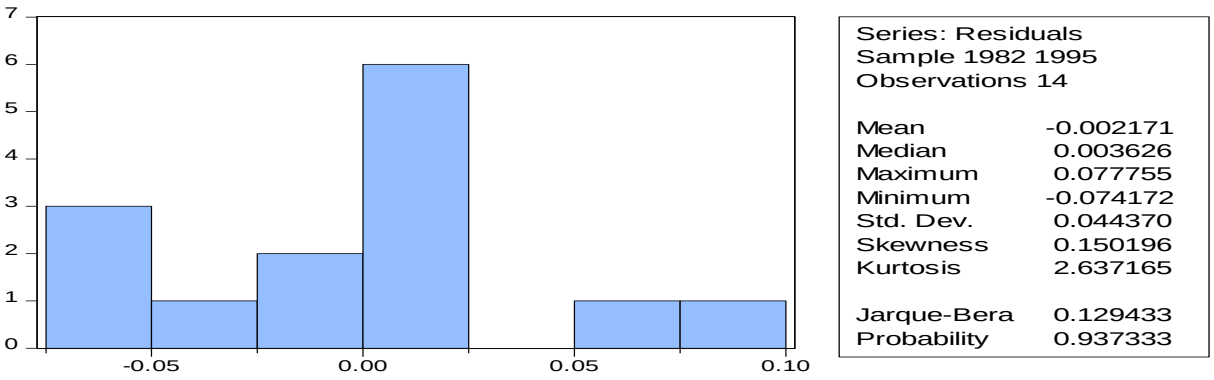

Figure 1: Graph of J-B normality test

Source: Authors' computation using Eviews 10, (2020).

Serial Correlation

To diagnose the FMOLS for any problem of serial correlation, this study carried out the Q-Statistics (correlogram of residuals) test of serial correlation and table 10 reports the results of the test.

Table 10: Q-Statistics: Correlogram of residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	-0.024	-0.024	0.0102	0.920
.***| . |	.***| . |	2	-0.354	-0.355	2.3517	0.309
. *| . |	. *| . |	3	-0.126	-0.167	2.6725	0.445
. | . |	. *| . |	4	0.030	-0.133	2.6927	0.610
. |* . |	. | . |	5	0.146	0.038	3.2231	0.666
. *| . |	. *| . |	6	-0.132	-0.204	3.7135	0.715
. | . |	. |* . |	7	0.069	0.123	3.8677	0.795
. **| . |	.***| . |	8	-0.243	-0.407	6.0742	0.639

. *| . |	. **| . |	9	-0.160	-0.206	7.2197	0.614
. |** . |	. *| . |	10	0.244	-0.072	10.553	0.393
. |* . |	. *| . |	11	0.092	-0.119	11.180	0.428
. | . |	. | . |	12	0.044	-0.031	11.397	0.495

*Probabilities may not be valid for this equation specification.
Source: Authors' computation using Eviews 10, (2020).

The null hypothesis of the test of serial correlation, is that, there is no serial correlation in the error terms. The p-values attached (in each period) to the Q-statistics of the correlogram of residuals, are higher than the levels of significance (1% 5% and 10%). Therefore, the study fails to reject the null hypothesis and concludes that the model's residual is free from serial correlation.

Generally, the diagnostics the FMOLS model imply that the model is of a good fit and also from of serial correlation and abnormal distribution of errors problems.

Variance Decomposition

Variance decomposition technique was employed to determine the contribution of each of the dependent variables to variation in the dependent variable. Table 11 reports the variance decomposition of GDP.

Table 11: Variance decomposition of GDP

Period	S.E.	GDP	BAS	CDS	CPS	TBS	TCS
1	872.5718	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1650.376	90.0564	0.1154	7.5579	0.1470	0.1499	1.9730
3	2410.520	72.7030	10.8815	7.7632	0.3672	5.7520	2.5329
4	3733.500	31.6467	33.6142	17.5350	0.5152	14.6544	2.0338
5	10756.99	7.8952	43.1992	2.1264	0.0636	46.4628	0.2525
6	28811.67	14.9237	32.8376	1.8185	0.0793	50.2960	0.0446
7	84000.51	16.9136	29.5315	0.2610	0.0102	53.1512	0.1322
8	217176.8	20.4710	26.1186	0.1478	0.0039	53.1420	0.1164
9	581476.0	20.2282	25.5763	0.0614	0.0036	53.9615	0.1686
10	1486348.0	21.3866	24.5548	0.0151	0.0006	53.8881	0.1545

Source: Author's computation using Eviews 10, (2020).

Table 11 shows that the standard error(S.E.) for GDP increased from 872.571 in year 1 to 1486348.0 in year 10. However, the variance of economic growth (GDP) shows a decreasing value from 100 in period 1 to 21.386 in period 10. The table also reveals that in the first year, GDP accounts for 100% of it its changes. In the second year, BAS accounts for 0.115%, CDS 7.557%, CPS 0.147%, TBS 0.149%, TCS 1.973% of the variation in GDP respectively. From the third year, the contribution of BAS to GDP has been on positive increase up to a maximum

of 43.199% in fifth year but starts nosediving from the sixth year (32.837%) until the tenth year (24.554%).

There is also a positive increase of CDS's contribution to GDP from 7.763% in year three, to 17.535% in year four. However, it starts decreasing in contribution to GDP, as from the fifth year (2.126%) until the tenth year (with a contribution of 0.015%). CPS's variance decomposition estimates over the period is similar to that of CDS, in terms its increasing/decreasing contribution to GDP over the period.

The contribution of TBS to GDP has been increasing positively as from the third year (5.752%) to the seventh year (53.151%) but reduces to 53.142% in year 8 until it reaches the peak (53.961%) in year nine and in year ten, TBS contribution 53.888% to the variation in GDP.

TCS's contribution to the variation of GDP was at peak in year three (2.53%) but starts decreasing from year four with alternating increase and decrease in the subsequent years up till the tenth year but other increases are still less than the maximum attained in year three.

Furthermore, table 11 shows that bankers' acceptances(BAS) and the treasury bills(TBS) together predict the largest percentage of the variance of the GDP, equal to 78 per cent after 10 years. The variance decomposition of GDP to a shock to itself is still close to 22 per cent at the end of the observation period. Generally, the variance decomposition of GDP suggests that BAS accounts for the greatest changes/variation in GDP, follows by TBS. CDS has the third most significant contribution to variation in GDP while TCS and CPS follows in hierarchy of amount of contribution to the changes in economic growth in Nigeria.

Impulse Response Function of GDP

Table 12 reports that accumulated response of GDP to generalised one standard deviation (S.D.) innovations in selected money market instruments.

Table 12: Accumulated Response of GDP

Periods	RGDP	BAS	CDS	CPS	TBS	TCS
1	0.048253	0.002325	0.016333	0.010969	-0.018875	0.007586
2	0.083965	-0.005812	0.040102	0.030458	-0.030088	0.019084
3	0.117507	-0.032010	0.079564	0.066892	-0.037659	0.024856
4	0.147586	-0.061020	0.118633	0.104766	-0.041994	0.026701
5	0.173962	-0.084345	0.148671	0.135453	-0.043054	0.030603
6	0.198708	-0.101481	0.170473	0.158959	-0.041823	0.040815
7	0.224631	-0.116467	0.190073	0.180213	-0.040047	0.057605
8	0.253572	-0.133945	0.213696	0.204635	-0.039301	0.077978
9	0.285668	-0.156420	0.244331	0.235039	-0.040261	0.097971
10	0.319678	-0.183460	0.280961	0.270792	-0.042588	0.114894

Source: Author's computation using Eviews 10, (2020).

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The impulse response output of GDP in table 9 reports that the accumulated response of GDP to CDS, CPS and TCS are positive response in all the periods, except BAS and TBS which are negative. Specifically, shock to BAS at period 9, imparts GDP by -15.642% and shock to TBS at period 9 impacts GDP by -0.402%. However, at period 9, shock to CDS, CPS and TCS imparts GDP by 24.433%, 23.503% and 0.979% respectively.

Furthermore, the impulse response graph in figure 2 reinforces the analysis in table 12.

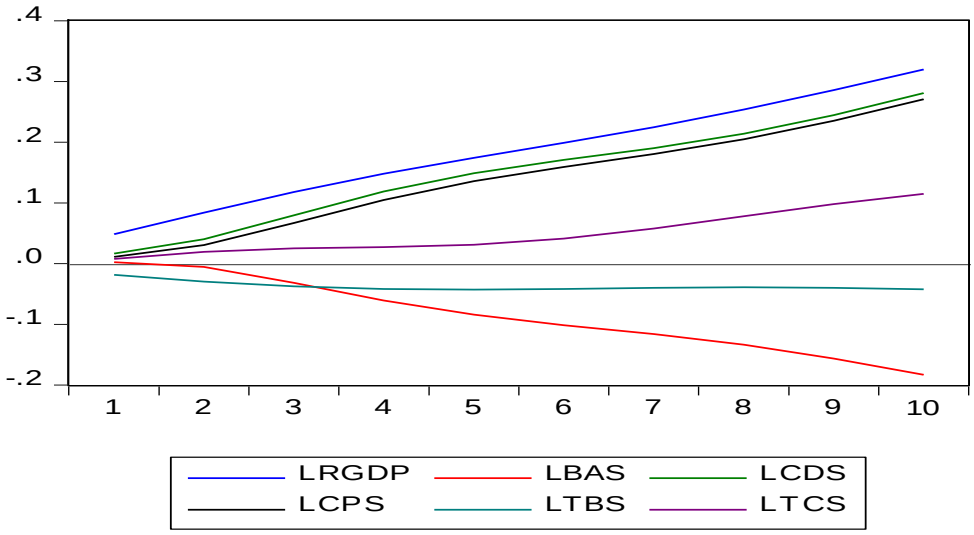

Figure 2: Accumulated response of GDP to generalised one S.D. innovations in selected money market variables

Source: Author's computation using Eviews 10, (2020).

In response to a positive one-standard deviation structural shock to GDP increases for all the ten years. Similarly, CDS, CPS and TCS increase and are positive for all 10 periods and GDP increases in response to a shock to itself. The GDP obviously increases as a result of a one-time positive shock to itself (the increase is 0. 0.048253 in year one to 0.319678 in year ten. In other words, a one standard deviation shock to each of CDS, CPS and TCS causes significant increases in GDP from year 1 to year 10. Conversely, a one standard deviation shock to each of BAS and TBS causes significant decreases in GDP from year 1 to year 10.

DISCUSSION OF FINDINGS

The nature of relationship between money market and economic growth in Nigeria examined from the Pearson correlation analysis reports high coefficients, attesting to strong linear relationship. We reject the null hypothesis of no relationship between money market and economic growth in Nigeria and conclude that there is a strong linear relationship between money market and economic growth in Nigeria. This evidence is in consonance with the finding of Agbada and Odejimi (2015).

Also, the Johansen cointegration tests suggest that there is convergence among the variables in the long-run. This evidence was also found by Uruakpa (2019). However, Akarara and Eniekezimene (2018) found otherwise.

This found evidence of a unidirectional causality running from bankers' acceptances to economic growth. This implies that changes in economic growth can be Granger-caused by the variation in the values of bankers' acceptances but not vice versa. This result is in line with Igbinosa and Aigbovo (2015)'s. However, Etale and Ayunku (2017) found that there was no causality between bankers' acceptances and economic growth. In the same vein, the unidirectional causality running from commercial papers to economic growth suggests that commercial papers account for changes in economic growth in Nigeria but economic growth does not lead to variability in the values of commercial papers. This conclusion is not in congruence with Etale and Ayunku (2017)'s who confirmed that no causality between commercial papers and economic growth in Nigeria. Furthermore, the granger causality shows a bi-directional causality between treasury bills and economic growth. In other words, treasury bills Granger cause economic growth and vice versa. This result partially aligns with Etale and Ayunku (2017) who found evidence of a unidirectional causality running from economic growth to treasury bills, but not vice-versa.

The evidence of no causality between certificates of deposits (CDS) and economic growth (GDP), found in this study; implies that, neither the variation in the values of CDS directly change economic growth nor economic growth causes changes in the value of CDS in Nigeria. Similarly, finding causality analysis indicates that there is zero causality between treasury certificates (TCS) and economic growth (GDP), suggesting that TCS does not bring about changes in economic growth and vice versa.

Generally, the causality test suggests that money market Granger-cause economic growth in Nigeria but not versa. This finding led to the rejection of the null hypothesis that money market does not Granger-cause economic growth in Nigeria. This conclusion is not in consonance with the findings of Iwedi and Igbanibo (2015) who found that causality flows from economic growth to money market operations but not vice versa.

Generally, the selected money market instruments, as revealed by the variance decomposition out, are related to economic growth in Nigeria. This finding is line with the results of the variance decomposition applied by Uruakpa (2019) which showed that GDP has a decreasing variance with money market value and treasury bill rate but an increasing variance with treasury bill outstanding. Similarly, inference from the impulse response function of GDP in this study is line with Uruakpa (2019)'s finding which found that GDP responds to the movement in money market value.

The FMOLS results indicate that bankers' acceptances significantly and positively impact economic growth in Nigeria. This finding is similar to that of Aminu et al. (2017) and Igbinosa and Aigbovo (2015). The positive and statistically significant relationship between certificates of deposit and economic growth found in this study is in agreement with the findings of Aminu, Bambur and Aliyu (2017) and Pavtar (2016). However, Akarara and Eniekezimene (2018) found a negative relation between the duo. Also, the FMOLS model reports a positive significant impact of commercial papers (CPS) on GDP, and this agrees with Etale and Ayunku (2017)'s but not in consonance with the evidence by Akarara and Eniekezimene (2018), Aminu et al.(2017) and Pavtar (2016) who found a negative relation between money market and

economic growth in Nigeria. The treasury certificates (TCS)'s positive and significant impact on economic growth in Nigeria established in study was the same conclusion made by Akarara and Eniekezimene (2018) but contrary to Pavtar (2016)'s findings.

However, this study discovered from the FMOLS estimates, that treasury bill(TBS) has negative but insignificant impact on economic growth over the study period. This is line with the finding of Pavtar (2016). However, Aminu et al. (2017) and Etale and Ayunku (2017) concluded otherwise.

Generally, the FMOLS results reveal that money market has positive significant impact on economic growth in Nigeria. This conclusion led to the rejection of the null hypothesis that money market does have positive and significant impact on economic growth in Nigeria. Thus, this study like most past studies (such as Agbada and Odejimi (2015), Akarara and Eniekezimene (2018), Aminu et al. (2017), Igbinosa and Aigbovo (2015), Iwedi and Igbanibo (2015), Etale and Ayunku (2017), Eze and Nera (2017) Uruakpa (2019)) aligns with the positivists' school of thought on the money market-growth nexus in Nigeria.

SUMMARY

This paper investigates the relationships as well as causality between money market and economic growth using annual time series data for the period 1980-2018 based on fully modified ordinary least square (FMOLS) and Granger causality test. The study employed other econometric techniques like ADF unit toot test, Johansen cointegration tests, VAR impulse response and variance decomposition tests and found strong evidence of long run relationship between money market and economic growth. There was also a positive, strong and significant correlation between money market and economic growth. The study also found that money market variables have positive and significant impact on economic growth in Nigeria. Causality was also found to flows from money market to economic growth but not vice versa.

RECOMMENDATIONS

It is imperative for Nigerian government to strengthen the money market by encouraging participants in the market through its various policies like tax incentives, extension of interest-free short-term investment loans to investing public. Excessive use of treasury bills by the government through the CBN as a liquidity management strategy should be de-emphasised as its prolong use could endanger the economic growth of the country. The development of current and other interbank market instruments in the money market, like commercial papers, certificates of deposits, bankers' acceptances should be encouraged by the government through proper surveillance of its operations and rolling of incentives aimed at encouraging investments in the sub-market. Similarly, in addition to the inter-bank money market, the short term investments component of the money market should also be strengthened with policy framework and application that will ensure trading and investments in the instruments (such as treasury bills, treasury certificates, and short term securities) in the sub-market do not retard the growth of the Nigerian economy.

CONCLUSION

This study concludes that the Nigerian money market has positive and significant impact on economic growth in Nigeria. Thus, the development of the Nigerian money market can be a virile vehicle that can spur economic growth in Nigeria.

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