

## ON THE TREND OF FINANCIAL DEEPENING IN NIGERIA: A TIME SERIES APPROACH

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### ABSTRACT

*This study examined the trend of financial deepening from 1999-2017. The objective of the study was to determine the best time series trend model for estimating financial deepening in Nigeria and to make a forecast financial deepening from 2018 to 2022. Secondary source of data collection was employed in this study. The statistical tool used in the study was the time series analysis. The findings of the study revealed that the linear trend model outperformed the quadratic trend model, exponential trend model and the S-curve trend model. Hence the linear model was selected as the adequate trend model for estimating financial deepening in Nigeria. It was found that financial deepening in Nigeria has an increasing trend and the linear model is best for estimating financial deepening in Nigeria. Also, the series of financial deepening was found to be stationary over time. The result of a five -year of financial deepening showed that in the year 2022, financial deepening will grow to 26.8%.*

**Keywords:** FinancialDeepening, Forecast, linear trend model, Exponential trend model

### 1. INTRODUCTION

Financial deepening involves increase in the financial resource mobilization of the financial assets in an economy. Financial deepening can equally be referred to as an increase in assets and the provision of needed financial services to the economy. According to Ndebbio (2004), an optimal measure of financial deepening must include the total amount of banking and non-banking financial assets including domestic credit to the private sector, liquidity liabilities, stock and bond market capitalization, Treasury bill and others. Dehesa et al. (2007) opined that financial deepening indicator constitutes the ratio of credit to private sector to gross domestic product (GDP). According to Okoli (2014), poor supply of financial assets is a product of financial related repression. However, financial repression breeds ‘financial shallowness’ which is a common challenge identified to be affecting negatively economic growth. Also, shallow finance is as a result of lack of growth of any country. Shallow financial depth involves a situation where the depth of financial assets of a country is narrow. This condition is attributed to low or negative per capital income experience by countries in such situation (Okoli, 2014).

The aim of the present study is to examine the trend of financial deepening over the observed period with the specific objectives: (a) to determine the best time series trend model for estimating financial deepening in Nigeria and (b) to make a forecast financial deepening from 2018 to 2022.

### 2. LITERATURE REVIEW

Nzotta and Okereke (2009) opined that financial deepening is a situation where by financial institutions in an economy effectively supply savings and credit for investment purposes. Financial deepening often attracts the reservoir of savings and unused funds and allocates the fund to business, entrepreneurs, households and government for investments which is expected to positively impact on economic growth.

Ang (2008) in his study examined the ratio of credit to private sector to GDP as proxy to economic growth which was considered a primary financial deepening measure and also employed money supply as a relative to GDP considered as an alternative indicator. Aye (2015)

investigated the causality between financial deepening and economic growth in Nigeria over the period 1961-2012. The study used a bootstrap rolling window estimation which was used to evaluate the Granger causality between financial deepening and economic growth over different time points. The findings of the study revealed that there was no causality between the two series. Further findings revealed that as financial deepening was found to have predictive influence for economic growth at some periods, as well, economic growth was found to predictive control of financial deepening at some other periods.

Study by Sackey and Nkrumah (2012) considered the contribution of financial deepening on economic growth in Ghana. The study investigated the causal relationship between financial development and economic growth using quarterly data over the period of ten years (2000–2009). The statistical tools employed in the study were the Johansen Co-integration technique and bivariate vector auto-regressive framework which were used to design the regression model. The findings of the study revealed that there exist a significant positive relationship between the financial development and economic growth in Ghana.

According to Jalilian and Kirkpatrick (2005), there exists relationship between financial deepening and economic growth in most developing countries. They argued that empirical studies have shown that there exist a positive relationship between financial deepening and growth, especially developing countries. Financial services and financial deepening stimulates economic growth which is achievable by increasing the rate of capital accumulation and by improving the efficiency at which economies invest the capital in the current period as well as in the future. Sahoo (2013) explained that financial deepening can lead to improved efficiency of financial intermediation which can be achieved through intermediation of larger amounts of domestic savings and investment cycles, and greater stability. The diversified funding base of financial institutions has played a role in addressing the impact of a global credit (wholesale funding) crunch on domestic financial intermediation.

In his contribution, Fisher (2001) noted that financial deepening refers to greater financial resource supply in the formal financial sector and the ease in liquidity constraints of banks and enlargement of funds available to finance projects which are expected to impact positively on the economy. Nwanna and Chinwudu (2016) examined the relationship between financial deepening and economic growth in Nigeria for the period 1985 to 2014. The study focused on the impact of stock market and bank deepening variables such as money supply, market capitalization, private sector credit and financial savings have on economic growth of Nigeria. The study used annual time series data for 1985 to 2014 obtained from the Central Bank of Nigeria Statistical bulletin. The ordinary least square (OLS) econometric techniques was employed for the data analysis. The findings of the analysis revealed that both bank based and stock market financial deepening proxies has significant and positive effect on economic growth and that the banking sector and stock market in Nigeria has an important role in the process of economic growth.

Adu et al. (2013) examined financial deepening and economic growth in Ghana. The study investigated the long-run growth effects of financial deepening in Ghana using one indicator at a time among a set of controls variable. The financial deepening variables used were credit to private sector ratio to GDP, money supply ratio to GDP, total domestic credit to GDP and total bank deposit liabilities to GDP and set of control variables namely inflation rate, trade openness,

real gross government expenditure. The statistical tool used for analysis in the study was the ordinary least square method. The findings revealed that all the measure of financial deepening have a positive effect on economic growth in Ghana except broad money supply to GDP.

Luqman (2014) considered the nexus between financial deepening and economic growth in Pakistan. The findings of the study showed that foreign direct investment, inflation, economic growth and financial deepening proxy by credit to private sector are co-integrated. This result implies that long run relationship exists among the variables. The variables were tested using the vector error correction model and it was found that the level of financial deepening in Pakistan has remained relatively low.

Shittu (2012) in his study examined the impact of financial intermediation on economic growth in Nigeria using data index b time for the period 1970 to 2010. The study employed the co-integration test and error correction model for the analyzing the obtained data. The findings of the study showed that financial intermediation has a significant impact on economic growth in Nigeria.

Sulaiman and Azzez (2012) examined the effect of financial liberalization on economic growth in developing nations with keen focus on Nigeria. The statistical tools used for the study were the co-integration test and the error correction model (ECM). The study considered Gross Domestic Product as the response variable while variables such as lending rate, exchange rate, inflation rate, financial deepening ( $M2/GDP$ ) and degree of openness as its financial liberalization variables of predictors. The result of the Co-integration analysis revealed that there exist a long run equilibrium relationship while the ECM results show a very high adequacy of the model for both the over-parameterized model with a R-square value of 0.950 and that of the parsimonious model with a value of 0.91. The study found that financial liberalization has a growth stimulating effect on the economic growth in Nigeria.

Also, Onwumere et al. (2012) examined the impact of financial deepening on economic growth in Nigeria. The proxies employed for financial deepening were: broad money velocity, money stock diversification, economic volatility, market capitalization and market liquidity, while the proxy for the dependent variable was rate of Gross domestic product. The findings of the study reveals that broad money velocity and market liquidity impact significantly on economic growth while market capitalization, economic volatility and stock diversification were found to be statistically insignificant in determining economic growth during the period under study (1992-2008).

### **3. METHODS AND MATERIAL**

#### **3.1 Research Design**

Research design can be defined as methods and procedures used in collecting and analyzing measures of the variables specified in a particular research problem(s). Research designs are useful in research because they help the researcher to develop a logical view of the structure for the source of data and the analysis expected to be performed in the study (Nworuh, 2004). The type of research design employed in this study was the Ex-post facto research design.

#### **3.2 Method of Data collection**

Secondary source of data collection was adopted for this study with data obtained from Central Bank of Nigeria Statistical Bulletin for several years. The data comprises of the ratio of money supply and Gross Domestic Product (GDP) from 1999-2017.

### 3.3 Time Series

Time series analysis involves the collection of random variables indexed according to the order they are obtained in time. Time in this case can be generic and can represent seconds, hour, day, month, quarter or Year. The parameters of a linear time series process can be estimated using the least square estimator.

### 3.4 The Least Square Regression

The least square method of estimating regression parameters aims at generating estimators in such a way that the sum of squares of the error is minimized.

Suppose we consider,

$$Y_t = \beta_0 + \beta_1 x_t \quad (1)$$

where  $t$  is the time parameter,  $\beta$  is a  $(k+1) \times 1$  vector of unknown parameters, and  $\epsilon_t$  is an  $n \times 1$  random vector with mean 0 and variance  $\sigma^2 I$ .

### 3.4 Stationarity Test

Stationarity of a time series process is a series where the statistical properties of the series does not change over an observed time period. Econometric methods require that the data to be used for forecasting purposes be stationary. Most of the macroeconomics time series, instead, display a trend and heteroskedasticity, failing to fulfill stationarity conditions. As a consequence, time series must be modelled taking into account non-stationary features detected in the observed data. Statistical forecasting methods are often based on the assumption that the time series can be rendered approximately stationary through the use of mathematical transformations. Stationarity of a process then implies that predictions of the statistical properties will be the same in the future as they have been in the past. In addition, the stationary assumption allows the straight forward calculation of the long run equilibrium distribution of the process. In this study, the test proposed by Kwiatkowski et al. (1992) test (KPSS) will be employed.

### 3.5 The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test

The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test is used for testing the null hypothesis that the observed time series data is stationary around a deterministic trend (Ihueze and Ekwueme, 2015). The KPSS test assesses the null hypothesis that an observed series is trend stationary which implies being stationary around a deterministic trend (Kwiatkowski et al., 1992).

Testing the stationarity hypothesis helps the researcher distinguish series that appear to be stationary, series for which the data are not sufficiently informative to be sure whether they are stationary or integrated and series that are fit to be used in predicting future behavior of the data of interest.

### 3.6 Accuracy Measure in Time Series Analysis

Accuracy measures are used for validating a times series model and forecasts. This measures includes the mean absolute percentage error, the mean absolute deviation and the mean square deviation.

**1. Mean Absolute Percentage Error (MAPE):** the mean absolute percentage error (MAPE), also referred as mean absolute percentage deviation (MAPD) measures the prediction accuracy of a forecasting method in a time series model. It usually expresses accuracy as a percentage, and is defined by the formula:

$$MAPE = \sum_t^N \left| \frac{y_t - \hat{y}_t}{y_t} \right| \times \frac{100}{N} \quad (2)$$

where:  $y_t$  is the actual time series data,  $\hat{y}_t$  is the estimated value of time series

## 2. Mean Absolute Deviation (MAD)

The mean absolute deviation is defined as the mean distance between each data point and the mean of the series. It gives an idea about the variability in a dataset. The formula is given as:

$$MAD = \sum_t^N \left| \frac{y_t - \bar{y}_t}{n} \right| \quad (3)$$

$\hat{y}_t$  is estimate of trend value at time t and  $\bar{y}_t$  is the mean of estimated values

3. Mean Square Deviation (MSD) measures the variability. The variance of the estimated is given as:  $MSD = \sum_t^N \left| \frac{\hat{y}_t - \bar{y}_t}{n} \right|^2$  (4)

The decision rule for the accuracy measure is that the model with the least accuracy measure becomes the selected model.

## 3.7 Data Presentation

**Table 1: Summary of Financial Deepening Parameters from 1999-2017**

Year	Money Supply <sup>2</sup> M2(₦ Billion)	GDP (₦ Billion)	Financial Deepening M2/GDP
1999	628.95	5,307.36	11.9
2000	878.46	6,897.48	12.7
2001	1,269.32	8,134.14	15.6
2002	1,505.96	11,332.25	13.3
2003	1,952.92	13,301.56	14.7
2004	2,131.82	17,321.30	12.3
2005	2,637.91	22,269.98	11.8
2006	3,797.91	28,662.47	13.3
2007	5,127.40	32,995.38	15.5
2008	8,008.20	39,157.88	20.5
2009	10,780.63	44,285.56	24.3
2010	11,525.53	54,612.26	21.1
2011	13,303.49	62,980.40	21.1
2012	15,483.85	71,713.94	21.6
2013	15,688.96	80,092.56	19.6
2014	18,913.03	89,043.62	21.2
2015	20,029.83	94,144.96	21.3
2016	23,591.73	101,489.49	23.2
2017	24,140.63	113,711.63	21.2

Source: Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics for various years

## 4. Data Analysis and Results

This section deals with the analysis of the data using the statistical tool explained in the previous section. Figure 1 shows the time series plot financial deepening in Nigeria from 1999-2017.

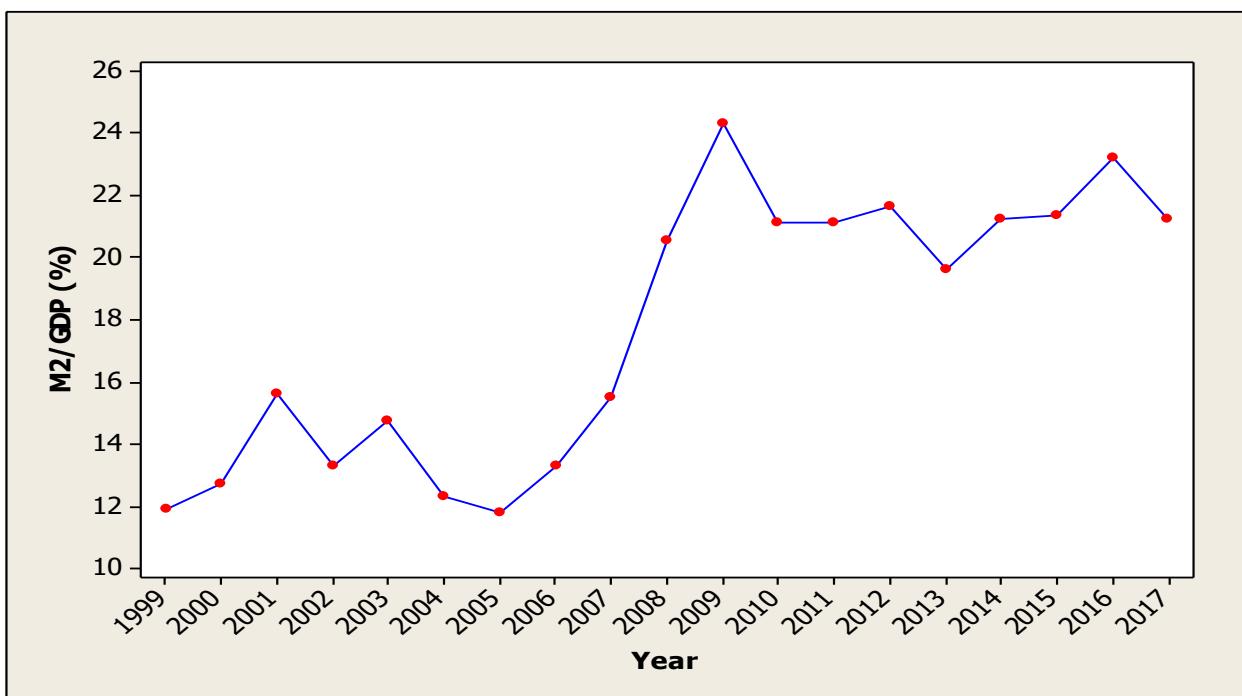


Figure 1: Time Series Plot of Financial Deepening in Nigeria from 1999-2017

Result obtained in figure 1 revealed that financial deepening in Nigeria has a steeply increasing trend.

**Table 2: Summary of Trend Equations for Financial Deepening in Nigeria**

Name of Model	Model	MAPE	MAD	MSD	Decision
Linear	$Y_t = 11.22 + 0.647*t$	10.4702	1.7762	5.3553	Adequate
Quadratic	$Y_t = 10.27 + 0.918*t - 0.0135*t^2$	10.9508	1.7947	5.2242	Not Adequate
Exponential Growth	$Y_t = 11.7101 * (1.03899^t)$	10.4965	1.8356	5.7896	Not Adequate
S-Curve (Pearl-Reed Logistic)	$Y_t = (10^2) / (4.33722 + 6.92840 * (0.833188^t))$	11.8496	1.8797	5.4857	Not Adequate

The result of comparison of the four trend models (linear, quadratic, exponential and S-curve) presented in table 1 showed that the Linear model gives the least MAPE and MAD values. Hence the linear model was selected as the adequate trend model for estimating financial deepening in Nigeria.

**Table 3: Result of Kwiatkowski-Phillips-Schmidt-Shin test statistic for Financial Deepening in Nigeria**

Null Hypothesis: M2/GDP is stationary			
Exogenous: Constant			
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel			
			LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic			0.491767
Asymptotic critical values*:	1% level		0.739000
	5% level		0.463000
	10% level		0.347000

\*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

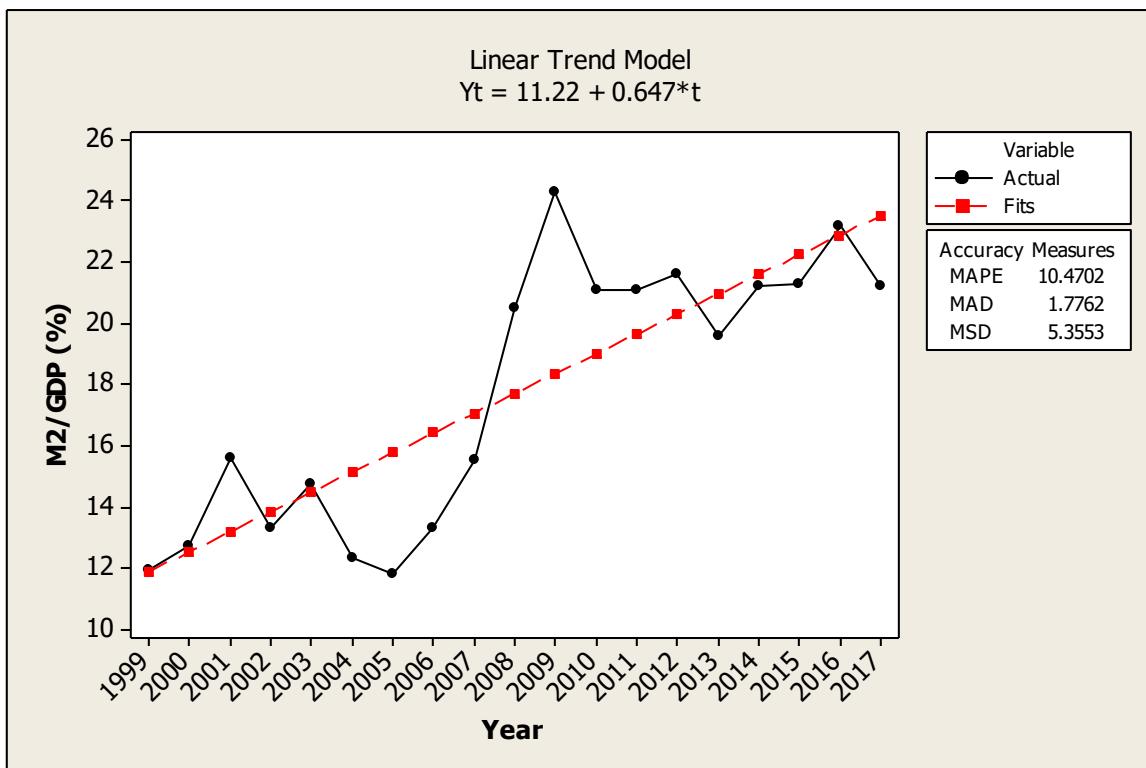

**Figure 2: Linear trend Plot of Financial Deepening in Nigeria from 1999-2017**

Figure 2 shows that financial deepening in Nigeria has an increasing trend and the linear model is best for estimating financial deepening in Nigeria.

The result of the KPSS test found a test value of 0.4917 and a p-value of 0.4630 which falls on the acceptance region of the hypothesis setting alpha to 0.05. This result that the series of financial deepening is stationary over time and can be used to make future forecast of the series.

**Table 4: Five year Forecast of Financial Deepening in Nigeria**

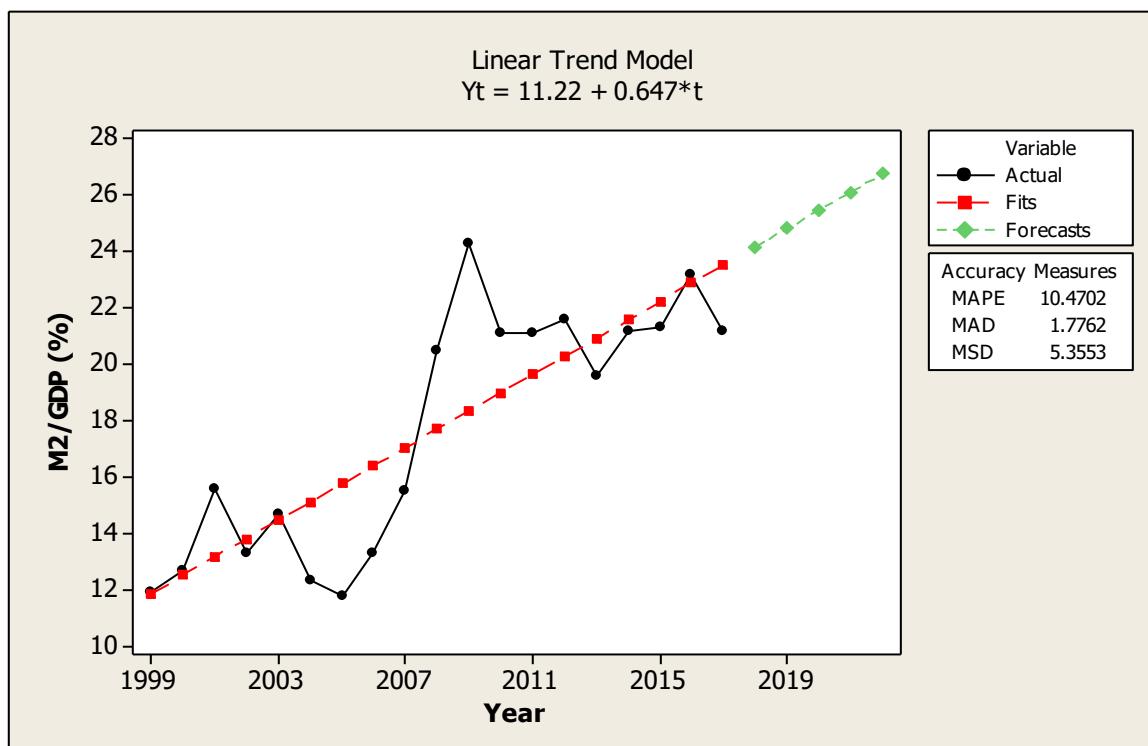
Period	Forecast
2018	24.1684
2019	24.8158
2020	25.4632
2021	26.1105
2022	26.7579

The result obtained in figure 3 and table 4 shows five years forecast of financial deepening in Nigeria from 2018 to 2022. The result revealed an increasing trend of financial deepening over the years.

## 5. CONCLUSION

This study examined the trend of financial deepening from 1999-2017. Financial deepening refers to an increase in assets and the provision of needed financial services to the economy. The findings of the study revealed from the comparison of performance in estimating financial deepening that the linear trend model outperformed the quadratic trend model, exponential trend model and the S-curve trend model. This is because the linear model recorded the least MAPE and MAD values. Hence the linear model was selected as the adequate trend model for estimating financial deepening in Nigeria.

It was found that financial deepening in Nigeria has an increasing trend and the linear model is best for estimating financial deepening in Nigeria. Also, the series of financial deepening was found to be stationary over time. The result of a five -year of financial deepening showed that in the year 2022, financial deepening will grow to 26.8%. This result implies that an increased percentage of the financial resource of Nigeria will be mobilized in the economy which is expected to grow and sustain the economy.


**Figure 3: Five Years Forecast Plot of Financial Deepening using the Linear trend model**

## REFERENCE

- Adu, Marbuah and Mensah (2013) Financial development and Economic Growth in Ghana: Does the measure of financial development matter, *The Journal of Development Finance*, 3 192-203
- Ang, J. B. (2008). Are financial sector policies effective in deepening the Malaysian financial system? *Discussion Paper*, 33:1-13.
- Aye, G. C. (2015). Causality between financial deepening and economic growth in Nigeria: Evidence from a bootstrap rolling window approach. *Journal of Economics, Business and Management*, 3(8): 795-801.
- Dehesa, M., Druck, P., and Plekhanov, A. (2007). Relative price stability, creditor rights, and financial deepening. *IMF Working Paper*, WP/07/139: 2-21.
- Fisher, S. (2001). The Importance of Financial Markets in Economic Growth: Memo, The Brazilian Mercantile and Futures Exchange. Citigroup, Campos do Jordao, Brazil.
- Ihueze, C. C. and Ekwueme, O. G. (2015). Modelling and forecasting the Maintenance Cost of Roads in Anambra State. *International Journal of Scientific & Engineering Research*, 6(9): 355-357.
- Jalilian H. and Kirkpatrick C. (2005) Does Financial Development Contribute to Poverty Reduction. *The Journal of Development Studies*, Volume 41, issue4.
- Kwiatkowski, D., Phillips, P., Schmidt, P. and Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?. *Journal of Econometrics*, 54, 159–178
- Luqman, S. (2014). Financial Deepening and Economic Growth in Pakistan: An application of Cointegration and VECM Approach. *Interdisciplinary Journal of Contemporary Research in Business*, Vol 5, No 12.
- Ndebbio, J. E. U. (2004). Financial deepening, economic growth and development: Evidence from selected Sub-Saharan African countries. *AERC Research Papers* No. 142 African Economic Research Consortium, Naira; 2004.
- Nwanna, I. O. and Chinwudu, C. F. (2016). The Effect of Financial Deepening on Economic Growth in Nigeria (1985 -2014). *IOSR Journal of Economics and Finance (IOSR-JEF)* , 7(4): 11-28.
- Nworuh, G. E.(2004). Basic Research Methodology for Researchers Trainees and Trainers in Management Sciences (Second Edition). Ambix Printers Nigeria.
- Nzotta, S.M. and Okereke, E.J. (2009). Financial Deepening and Economic Development in Nigeria: An Empirical Investigation. *African Journal of Accounting, Economics, Finance and Banking Research*, 5(5): 52-66.
- Okoli, M. N.(2014). Evaluating the nexus between financial deepening and stock market in Nigeria, *European Scientific Journal*, July edition vol. 8, No.15
- Onwumere, J.U.J. , I. G. Ibe, F. O. Ozoh and O. Mounanu (2012). The Impact of Financial Deepening on Economic Growth: Evidence from Nigeria. *Research Journal of Finance and Accounting*, 3(10).
- Sackey, F. G. and Nkrumah, E.M. (2012). Financial sector deepening and economic growth in Ghana. *Journal of Economics and Sustainable Development*, 3(8):122-139.
- Sahoo, S. (2013). Financial Structures and Economic Development in India: An Empirical Evaluation. *RBI Working Paper No.02*, Department of Economic and Policy Research, Reserve Bank of India, Mumbai.
- Shittu, A. I. (2012). Financial Intermediation and Economic Growth in Nigeria. *British Journal of Arts and Social Sciences*, 4 (2).
- Sulaiman L. and Azzez, B. (2012) The Effect of External Debt on Economic Growth of Nigeria. *Journal of Economies and Sustainable Development*. www.iiste.org 3(8)