Iran. Econ. Rev. Vol. 24, No. 1, 2020. pp. 225-246

Investigating Causal Relationship between Financial Development Indicators and Economic Growth: Toda and Yamamoto Approach

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Received: 2018, July 14 Accepted: 2018, November 1

Abstract

The Causal relationship between financial development and economic growth has received divergent views in the literature under the traditional Granger approach to causality using data from various countries. The more recent Toda and Yamamoto and Dolado and Lütkepohl (TYDL) approach to causality were used to investigate the causal relationship between financial development and economic growth in Nigeria for the period 1985 to 2015. TYDL is based on an augmented VAR modeling and it is adjudged more robust to order of integration of the variables when compared with Granger framework. The maximum order of integration was two while the optimal lag length of three was selected by FPE, AIC and HQ criteria. Bi-directional causality was found between financial markets indicators and economic growth while unilateral causality running from stock market indicators to GDP was established. The findings support existing studies that agree with the fact that a well-structured financial sector breeds economic growth and this by implication suggests, it is imperative for the government of Nigeria and other developing countries to create an atmosphere for a thriving financial sector and engage in reforms that will stimulate the economy.

Keywords: Causality, Financial Development, Granger, Economy, Toda, Yamamoto.

JEL Classification: C01, C18, D3, E44.

1. Introduction

There are several perspectives on the link between economic growth and financial development; a different school of thought has been

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expressed in the past. These views may explain arguments based on an economy; for either emerging or developed markets. The financial sector is the key point and it constitutes sets of institutions and markets.

It is important that there is a strong regulatory framework that permits global and local transactions. Furthermore, strong enforcement of a chain of processes in a financial system for development that will be continuous and retained. Many emerging markets struggle with these standards. For this paper *'emerging economies' and 'developing economies'* will be used interchangeably.

It is known that a sound financial sector minimizes risks associated with market forces, thereby facilitating trade, promoting investment management amongst others. Continuous development in the financial sector of a country may be a powerful driver to a country's prosperity by encouraging savings and investments in local businesses.

While there are several shreds of evidence suggesting that a developed financial sector plays a role in economic growth through capital accumulation, technological growth, and encouragement of foreign capital flows, there are alternative views to this. These views will be captured in the background review.

2. Background Review

The extent to which a financial system is sound and its effect on economic growth vary from developed to developing economy. Sound financial systems are more common in developed economies. Studies that have been carried out recently have utilized different econometric estimation techniques with different data sets for each work to assess the link between financial development and economic growth. Various researchers have used different estimation techniques resulting in significant and remarkable results that cannot be downplayed. The more developed countries with stable financial system showed a strong positive relationship between financial development and economic growth, as economic theory predicts. A well-developed financial system remains a major driver for steady economic growth.

Rousseau and Wachtel (2000) use panel vector autoregression with the generalized method of moment technique to examine simultaneously the relationship between stock markets, banks, and economic growth. They used M3/GDP as a measure of banking sector

variable while the stock market system is measured by market capitalization and total value traded. After examining the relationship in 47 countries using annual data from 1980-1995, their results indicate that both banks and stock markets promote economic growth.

Carporale, Howello and Soliman (2005) based on the endogenous growth model study the linkage between the stock market, investment and economic growth using vector autoregression (VAR) framework. It uses quarterly data covering the period 1971q1 - 1998q4 for four countries: Chile, South Korea Malaysia, and the Philippine. The stock market variables are measured through the ratio of market capitalization to GDP and the ratio of value-traded to GDP. The overall findings indicate that the causality between stock market components, investment, and economic growth is significant and it is in line with the endogenous growth model. It shows also that the level of investment is the channel through which stock markets enhance economic growth in the long-run.

Conversely, there are different views on some studies on financial development and economic growth like; Arestis et al. (2001) through quarterly time-series data samples. The variables used in the VAR framework include the real GDP, the ratio of market capitalization, domestic bank credit to the private sector and stock market volatility. The results reveal that in Germany, there is bidirectional causality between banking system development and economic growth. The stock market, on the other hand, is weakly exogenous to the level of output. In the USA, financial development does not cause real GDP in the long-run. Japan exhibits bidirectional causality between both the banking system and stock market and the real GDP while in the UK, the results indicate evidence of unidirectional causality from the banking system to stock market development in the long-run but the causality between financial development and economic growth in the long-run is very weak.

The evidence in France suggests that in the long-run both the stock market and banking sector contribute to real GDP but the contribution of the banking system is stronger.

Dritsaki & Dritsaki-Bargiota (2005) use a trivariate VAR model to examine the causal relationship between credit stock, credit market and economic growth for Greece. They use industrial production as a proxy

of economic development, while market capitalization and money supply (M2) are used as the proxy for stock and credit market respectively. Using monthly data covering the period 1988:1- 2002:12, their results reveal unidirectional causality from economic development to the stock market and bidirectional causality between economic developments and the banking sector. The paper establishes no causal relationship between stock market function and the banking sector

Development Economist and Financial economists have provided different views. Lucas (1988) says the relationship between finance and growth is unimportant, he asserts that economist over-stress the role of financial factors in economic growth. The different views on this topic, therefore, encourage more work to be done for more clarity, and to know if this theory varies across economies.

Ross Levine (1997) stated: "a growing body of work would push even most skeptics toward the belief that the development of financial markets and institutions is a critical and inextricable part of the growth process and away from the view that the financial system is an inconsequential sideshow, responding passively to economic growth and industrialization. There is even evidence that the level of financial development is a good predictor of future rates of economic growth, capital accumulation, and technological change. Moreover, cross country, case study, industry-and firm-level analyses document extensive periods when financial development-or the lack thereof-crucially affects the speed and pattern of economic development."

From all these analyses we can deduce that the dynamics in the oil and gas local and global Industries affect all arms of its financial sector and overall financial development.

A formal econometric analysis on panel data of 125 countries confirms that financial development has a significant positive effect on growth, especially in developing countries, Gemma, Donghyun, Arief (2010). Building up a very sound and efficient bond and equity markets that drive local and international trade and business is key to a stable financial sector.

Bearing in mind the key functions of the financial sector in boosting economic growth, especially in developing countries, drives the need for this study and Nigeria, a developing country in Sub-Saharan African is a case study. Nigeria is chosen because it is the biggest economy in

Africa presently, after overtaking South Africa. This monumental change in her economy calls for pondering; *what has driven the Nigerian Economy to such growth?* Is it the fact that banks are leveraging on new activities aimed at development, opened to it by recent reforms by the Central Bank of Nigeria (CBN) which includes; financing of infrastructure and oil project that was previously not included in their function, also directives that community banks be recapitalized and changed to Microfinance Bank from 2008, to support SMEs amongst others, is this a driver to the growth in Nigerian economy? These questions demand answers and the study is posing to delve into it.

In addition, while it is acknowledged that this study is not the first to work on economic growth and financial sector; For instance, authors like Levine and Zervos (1988), Arestis et al. (2001), Umar (2010) and Roja and Valen (2011) had done so in the past using time series data. However, the present study is dissimilar from the works previously undertook on this subject matter in the application of a novel approach to causality which is based on augmented VAR modeling. The approach was recently used by Gulmez & Besel and Yardimcioglu, 2017 and proposed by Toda and Yomamoto, 1995; Dolado and Lütkepohl, 1996 (TYDL). This work is imperative because there is limited work on Nigeria's growth and financial development using the technique. This VAR model introduces a "modified WALD test statistic (MWALD), this avoids a potential bias associated with unit roots and cointegration tests.

To select appropriate variables for the present study, a holistic survey of previous work on the subject matter was carried out. This is to guide in choosing tested and trusted indicators for the stock market, banking sector, and economic growth. The summary is presented in table 1.

Table1: Indicators of Stock Market, Banking Sector and Economic from Previous Studies

Authors	Stock market	Banking system	Economic

	indicators	indicators	growth indicators
Levine and Zervos (1998)	Market size, value traded, turnover and market volatility	Bank credit to the private sector	Real GDP per capita, capital stock growth, productivity growth, and savings
Rousseau and Wachtel (2000)	Market capitalization and total value traded	M3/NGDP i.e. financial depth	Real GDP
Arestis et al. (2001)	Market volatility	Bank credit to the private sector	Real GDP
Carporale, Howello, and Soliman (2005)	The ratio of market capitalization to GDP, Ratio of value-traded to GDP		GDP
Laura Alfaro et al. (2003)	Market liquidity (turnover ratio) Market size	Ratio commercial bank assets to CBN assets (BTOT)	Real GDP
Dritsaki& Dritsaki-Bargiota (2005)	Market capitalization	Money supply (M2)	Industrial production
Zang and Chul Kim (2007)		The ratio of private sector credit provided by financial intermediaries to GDP Ratio commercial bank assets to CBN assets (BTOT), Liquid liabilities	Real GDP
Umar (2010)	The ratio of market capitalization to GDP, turnover ratio and value traded	Bank credit to the private sector	Real GDP
Ndikumana (2000), Xu (2000), Yartey and Adjasi (2007)	Turnover ratio, Ratio of market capitalization to GDP (market size)	Bank credit to the private sector	Real GDP
Gemma Estrada, Donghyun Park and Ramayandi (2010)	The ratio of market capitalization to GDP (market size)	Financial depth, private credit by deposit money banks relative to GDP	GDP

Considering the previous studies, variables such as market size, turnover ratio and value of share traded had been used repeatedly by many authors as indicators of the stock market. Equally, indicators such as Credit to the private sector by all financial intermediaries (excluding

Central banks), financial depth, the ratio of commercial bank assets to Central bank assets and money supply were used as banking sector variables. Also, the real GDP had been used by most authors as an indicator of economic growth.

From the foregoing, market size (MCAP_GDP), turnover ratio (VT_MCAP) and value of share traded (TVT_GDP) were chosen as stock markets indicators while credit to private sector (CPS_GDP), Financial depth (M2_GDP) and ratio commercial bank assets to Central bank assets (CMA_CBA) were used as indicators of financial markets. Also, real GDP was used as an indicator of economic growth. The definition of each variable is presented in what follows.

Market Size (MCAP_GDP): The size of the stock market is measured as market capitalization divided nominal GDP. This is denoted in the study as MCAP_GDP. The assumption underlying the use of this variable as an indicator of stock market development is that the size of the stock market is positively correlated with the ability to mobilize capital and diversify risk (Levine and Zervos, 1996).

Turnover ratio (VT_MCAP): Turnover ratio computed as the ratio of total values of trades on the major stock market exchanges divided by market capitalization is a measure of liquidity of the stock market. It captures the activeness or the liquidity of the stock market size relative to its size since markets may be large but inactive. Beck and Levine (2004) prefer this measurement to another measurement of stock market variables. This is because unlike other measures, the numerator and denominator of turnover ratio contain prices.

Value Traded (TVT_GDP): This is the value of all shares traded in the stock market divided by nominal GDP. It measures how active the stock market is as a share of the economy. While not a direct measure of trading costs or the uncertainty associated with trading on an exchange, theoretical models of stock market liquidity and economic growth directly motivate Value Traded (Levine, 1991; Bencivenga et al., 1995). Value traded measures trading volume as a share of national output and should therefore positively reflect liquidity on an economy-wide basis. Value Traded may be importantly different from Turnover as shown by Demirguii-Kunt and Levine (1996). While Value Traded captures trading relative to the size of the economy, Turnover measures trading relative to the size of the stock market. Thus, a small, liquid

market will have high Turnover but small-Value Traded. Since financial markets are forward-looking, Value Traded has one potential pitfall. If markets anticipate large corporate profits, stock prices will rise today. This price rise would increase the value of stock transactions and therefore raise Value Traded. Problematically, the liquidity indicator would rise without a rise in the number of transactions or a fall in transaction costs. This price effect plagues Capitalization too. One way to gauge the influence of the price effect is to look at Capitalization and Value Traded together. The price effect influences both indicators, but only Value Traded is directly related to trading. Therefore, both market Capitalization and Value Traded indicators are included together. If Value Traded remains significantly correlated with growth while controlling for Capitalization, then the price effect is not dominating the relationship between Value Traded and growth. A second way to gauge the importance of the price effect is to examine Turnover. The price effect does not influence Turnover because stock prices enter the numerator and denominator of Turnover. If Turnover is positively and robustly associated with economic growth, then this implies that the price effect is not dominating the relationship between liquidity and long-run economic growth (Ross Levine and Sara Zervos, 1996).

Credit to Private Sector (CPS_GDP): This is defined as the credit issued by all financial intermediaries (excluding Central Bank) to the private sector divided by nominal GDP. While this measure includes intermediaries in addition to banks, banks still account for a major share. This indicator had been widely used in the literature. The rationale underlying this indicator is that financial systems that allocate more credit to private firms are more engaged in researching firms, exerting corporate control, providing risk management services, mobilizing savings, and facilitating transactions than financial systems that simply funnel credit to the government or state-owned enterprises.

Financial Depth (M2_GDP): Another indicator of financial development. Gelb (1989), Ghani (1992), King and Levine (1993a, b) and DeGregorio and Giudotti (1995) identify a significant correlation between financial depth and long-run economic growth rates in a broad country sample. To measure financial depth, these authors typically use a measure of broad money, such as M2, divided by GDP. This study

follows the approach of these authors by defining financial depth as the ratio of M2 to nominal GDP. As noted by King and Levine (1993a), financial depth indicator does not measure whether the liabilities are those of banks, the central bank, or other financial intermediaries, nor does it identify where the financial system allocates capital. Thus, they use the value of loans made by commercial banks and other deposit-taking banks to the private sector divided by GDP.

Commercial Bank Assets to Central Bank Assets (CMA_CBA): This indicator equals the ratio of commercial bank assets divided by the commercial bank plus central bank assets, CBA_CBA measures the degree to which commercial banks versus the central bank allocate society's savings. King and Levine (1993a) and Levine et al. (2000), as well as others, have used this measure, which provides a relative size indicator, i.e., the significance of the different financial institutions and sectors relative to each other.

3. Data and Methodology

The study makes use of data on economic variables collated and published by the Central Bank of Nigeria (CBN) in her Statistical Bulletin; National Bureau of Statistics (NBS) and Nigerian Stock Exchange (NSE) Factbook. Time-series data were extracted from 1980 to 2016 taking into consideration the variables of interest and to ensure data consistency, only 1985 to 2015 period was considered in the study.

The most frequently used operational definition of causality in econometrics is Granger definition (Granger, 1969), which says: variable x is said to cause y ($x \rightarrow y$), if the present value of variable x can be predicted with greater accuracy based on the knowledge of the past values of variable x, with other conditions unchanged (*ceteris paribus*). It is well known that the *F* test of causality in VAR is not valid in the presence of non-stationary time series. However, Toda and Yamamoto (1995) proposed an alternative method for testing causality which unlike the standard Granger test implies the estimation of the VAR model augmented with extra lags determined by the maximum order of integration of the series under consideration. This method is applicable regardless of the order of integration or cointegration rank of the observed variables.

The Toda-Yamamoto procedure of Granger non-causality test

involves four steps. Firstly, we need to find the highest order of integration in the variables (d_{max}). Determination of d_{max} entails conducting unit root tests on the variables and establish the level of stationarity of the series. Dickey and Fuller (1979; 1981) suggest the use of one of the commonly applied tests known as augmented Dickey-Fuller (ADF) to detect whether the time series is of stationary form.

However, the Dickey-Fuller type test may have low estimation power against the plausible stationary alternative hypothesis and the null hypothesis of a unit root may tend to be accepted unless there is strong evidence against it. The Phillips-Perron (P-P) test is a non-parametric approach to unit root test and offers an alternative method for correcting for serial correlation in unit root testing. Basically, the P-P test uses the standard DF or ADF test but modifies the t-ratio of the α coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. Both ADF and P-P tests will be used in this study and where there is a conflicting result on the level of integration of a variable under study, P-P decision will be upheld because of its robustness and higher power compare with ADF.

In order to test whether the series Y_t contains unit root test using the ADF test, the following equation is used

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \delta Y_{t-i} + \sum_{i=1}^{N} \varphi \Delta Y_{t-i} + \varepsilon_t \qquad (1)$$

Where Δ represent the first difference processor, t represents a time series trend, ε_t represents the error term. Y_t represents the used series, N represents delay number determined with Akaike Information Criterion. The ADF test considers a null hypothesis of unit root against an alternative hypothesis that assumes the series is stable or stationary. The test is based on the estimation of δ parameter and determination of its test statistics. If the test statistics are greater than the critical values in absolute value, the null hypothesis is rejected. In other words, it can be said that the series is stable. The P-P test is based on the statistic:

$$t_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{\frac{1}{2}} - \frac{T(f_0 - \gamma_0)\left(se(\hat{\alpha})\right)}{2f_0^{\frac{1}{2}} s} \qquad (2)$$

where $\hat{\alpha}$ is the estimate, and t_α is the t-ratio of α, $se(\hat{\alpha})$ is the coefficient standard error, and s is the standard error of the test regression. In addition, γ_0 is a consistent estimate of the error variance in any of equations (1-3) and it is calculated as $(T-K)s^2$ (where k is the number of regressors). The remaining term, f_0, is an estimator of the residual spectrum at frequency zero. Therefore, both equations (4) and (5) are used to test for the stationarity of the variables.

Secondly, it is necessary to find the optimal number of lags for the VAR model (k). Thirdly, it is necessary to construct VAR of order $k + d_{max}$ in levels, which in general, for six variables is:

$$RGDP_t = a_0 + \sum_{i=1}^{k+d_{max}} a_{1i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} a_{2i} MCAP_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} a_{3i} TVT_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} a_{4i} VT_{MCAP\,t-i} + \sum_{i=1}^{k+d_{max}} a_{5i} CPS_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} a_{6i} CMA_{CBA\,t-i} + e_{GDP_t} \quad (3)$$

$$MCAP_{GDP\,t} = b_0 + \sum_{i=1}^{k+d_{max}} b_{1i} MCAP_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} b_{2i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} b_{3i} TVT_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} b_{4i} VT_{MCAP\,t-i} + \sum_{i=1}^{k+d_{max}} b_{5i} CPS_{GDP\,t-i} + \sum_{i=1}^{k+d_{max}} b_{6i} CMA_{CBA\,t-i} + e_{MCAP\_GDP_t} \quad (4)$$

$$TVT_{GDP_t} = c_0 + \sum_{i=1}^{k+d_{max}} c_{1i} TVT_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} c_{2i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} c_{3i} MCAP_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} c_{4i} VT_{MCAP_{t-i}} + \sum_{i=1}^{k+d_{max}} c_{5i} CPS_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} c_{6i} CMA_{CBA_{t-i}} + e_{TVT\_GDP_t} \quad (5)$$

$$VT_{MCAP_t} = d_0 + \sum_{i=1}^{k+d_{max}} d_{1i} VT_{MCAP_{t-i}} + \sum_{i=1}^{k+d_{max}} d_{2i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} d_{3i} MCAP_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} d_{4i} TVT_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} d_{5i} CPS_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} d_{6i} CMA_{CBA_{t-i}} + e_{VT\_MCAP_t} \quad (6)$$

$$CPS_{GDP_t} = f_0 + \sum_{i=1}^{k+d_{max}} f_{1i} CPS_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} f_{2i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} f_{3i} MCAP_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} f_{4i} TVT_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} f_{5i} VT_{MCAP_{t-i}} + \sum_{i=1}^{k+d_{max}} f_{6i} CMA_{CBA_{t-i}}$$

$$+e_{CPS\_GDP_t} \quad (7)$$

$$CMA_{CBA_t} = g_0 + \sum_{i=1}^{k+d_{max}} g_{1i} CMA_{CBA_{t-i}} + \sum_{i=1}^{k+d_{max}} g_{2i} RGDP_{t-i} + \sum_{i=1}^{k+d_{max}} g_{3i} MCAP_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} g_{4i} TVT_{GDP_{t-i}} + \sum_{i=1}^{k+d_{max}} g_{5i} VT_{MCAP_{t-i}} + \sum_{i=1}^{k+d_{max}} g_{6i} CPS_{GDP_{t-i}} + e_{CMA\_CBA_t} \quad (8)$$

Where $a_0, b_0, c_0, d_0, f_0 \; and \; g_0$ are constants, RGDP, MCAP_GDP, TVT_GDP, VT_GDP, CPS_GDP, and CMA_CBA are the variables, a, b, c, d, f, and g are the parameters of the model, k is the optimal lag order, d_{max} is the maximal order of integration of the series in the system, $e_{GDP_t}, e_{MCAP\_GDP_t}$, $e_{TVT\_GDP_t}$, $e_{VT\_MCAP_t}$, $e_{VT\_MCAP_t}$, $e_{CPS\_GDP_t}$ and $e_{CMA\_CBA_t}$. We estimate VAR of order $(k + d_{max})$ using Seemingly Unrelated Regression (SUR) because the power of the Wald test improves when the SUR technique is used for the estimation (Rambaldi and Doran, 1996).

Finally, we conduct the Wald test (also known as modified Wald or MWald) for testing the significance of the parameters of a VAR $(k + d_{max})$ model. For instance, to test the hypothesis that each of MCAP_GDP, TVT_GDP, VT_GDP, CPS_GDP, and CMA_CBA does not Granger cause RGDP from equation (3), we test $H_0: a_{2i}, a_{3i}, a_{4i}, a_{5i} = 0$ against $H_1: a_{2i}, a_{3i}, a_{4i}, a_{5i} \neq 0$. $(i = 1 \ldots k)$. In the same vein, to test the hypothesis "RGDP, TVT_GDP, VT_GDP, CPS_GDP, and CMA_CBA *does not Granger cause MCAP_GDP*" from equation (4), we test, $H_0: b_{2i}, b_{3i}, b_{4i}, b_{5i} = 0$ against $H_1: b_{2i}, b_{3i}, b_{4i}, b_{5i} \neq 0$. Similarly, the procedure is repeated until all the variables in the VAR system are covered. Wald test is then applied on the first k coefficient matrices, whereas the coefficient matrices of the last d_{max} lagged vectors in the model are ignored (since they are

regarded as zeros). In that case, the Wald test statistics follow asymptotic χ^2 distribution with *m* degrees of freedom and it can be applied even if the X variables in the system are I(0), I(1) or I(2), cointegrated or non-cointegrated with a condition that the order of integration does not exceed the true lag length of the model (Toda and Yamamoto, 1995).

4. Data Analysis and Result Discussion

Every other variable in this study is in ratio form apart from real GDP and this necessitates its logarithm transformation prior to the analysis. At the onset, Pearson Product Moment Correlation analysis was carried out among the variables over the sample period and its significance was established using a t-test. The correlation matrix presented in Table 2 showed a positive and significant correlation among the variables. That is each pair of the variable tend to move in the same direction. Also, there is a very high degree of correlation between market size (MCAP_GDP), Credit to the private sector (CPS_GDP) and Real GDP while other variables moderately correlated with Real GDP. In addition, (M2_GDP) was removed from the analysis due to its near-perfect association with another variable in the system. Correlation, however, does not say anything about a causal relationship and thus, leaves unsettled the debate concerning the causal relationship between financial market and economic growth of the country under consideration.

Table 2: Correlation Analysis

Variables	RGDP	MCAP_GDP	TVT_GDP	VT_MCAP	CPS_GDP	CMA_CBA
RGDP	1					
MCAP_GDP	0.822**	1				
TVT_GDP	0.537**	0.857**	1			
VT_MCAP	0.489**	0.678**	0.886**	1		
CPS_GDP	0.862**	0.670**	0.445*	0.371*	1	
CMA_CBA	0.489**	0.408*	0.358*	0.460**	0.604**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

As a custom in the application of the Toda Yamamoto causality approach, ADF and P-P tests are applied to determine the maximal order of integration of the variables used in the analysis. This was carried out using the model with only intercept and model that include both trend and intercept. The result of the ADF and P-P unit root test are shown in table 3 and 4 at level, first difference and second difference of the series. From the two tables, the null hypothesis of non-stationarity was rejected for other variables in the study except real GDP which attained stationarity at the second difference. Thus, the MCAP_GDP, TVT_GDP, VT_MCAP, CPS_GDP, and CMA_CBA are integrated of order one, I(1) while RGDP is integrated of order two, I(2) at 5% level. Thus, the result obtained from the ADF and P-P tests suggest that the maximal order of integration of the series under study is two, i.e. $\boldsymbol{d_{max} = 2}$.

Table 3: ADF Unit Root Test

	ADF						
	LEVEL		FIRST DIFFERENCE		SECOND DIFFERENCE		
VARIABLE	CM	C&LTM	CM	C&LTM	CM	C&LTM	Decision
RGDP	0.3901260	-1.6566060	-3.1016620	-3.1249450	-7.454626	-7.440470	**I(2)**
MCAP_GDP	-1.8017130	-3.2470530	-5.9943910	-5.8816230			**I(1)**
TVT_GDP	-1.7359280	-3.4764760	-5.6643900	-3.3811180			**I(1)**
VT_MCAP	-2.2857250	-2.5857010	-6.0001190	-5.0177720			**I(1)**
CPS_GDP	-0.3898750	-1.7145620	-4.5438080	-2.3428260			**I(1)**
CMA_CBA	-0.7274270	-4.5156850	-3.9926780	-4.0897070			**I(1)**
Crit. Values							
1%	3.679322	-4.309824	-3.679322	-4.309824	-3.689194	-4.323979	
5%	-2.967767	-3.574244	-2.967767	-3.574244	-2.971853	-3.580623	
10%	-2.622989	-3.221728	-2.622989	-3.221728	-2.625121	-3.225334	

Note: The more negative value or the absolute value of ADF tests statistic greater than the critical value indicates rejection of the null hypothesis.

Table 4: P-P Unit Root Test

	P-P TEST						
	LEVEL		FIRST DIFFERENCE		SECOND DIFFERENCE		
VARIABLE	CM	C&LTM	CM	C&LTM	CM	C&LTM	Decision

RGDP	1.181507	-1.517489	-3.120979	0.0993120	-9.120499	-9.615642	I(2)
MCAP_GDP	-1.773280	-3.219652	-8.332595	-7.902297			I(1)
TVT_GDP	-2.323935	-2.614422	-6.389143	-6.192794			I(1)
VT_MCAP	-2.297258	-2.622409	-6.471304	-6.319844			I(1)
CPS_GDP	-0.274410	-1.594303	-4.478298	-7.128179			I(1)
M2_GDP	-0.837998	-2.291180	-4.810045	-5.160830			I(1)
CMA_CBA	-2.369731	-6.494691	-5.804379	-6.963663			I(1)
Crit. Values							
1%	-3.670170	-4.296729	-3.679322	-4.309824	-3.689194	-4.323979	
5%	-2.963972	-3.568379	-2.967767	-3.574244	-2.971853	-3.580623	
10%	-2.621007	-3.218382	-2.622989	-3.221728	-2.625121	-3.225334	

Note: The more negative value or the absolute value of P-P tests statistic greater than the critical value indicates rejection of the null hypothesis.

Therefore, the Toda-Yamamoto test involves the addition of two extra lags of each of the variables to control for potential cointegration. Then it is required to select the appropriate lag length for the VAR in order to perform the causality test. In this study, the Akaike Information Criterion (A1C), Final Prediction Error (FPE) and Hannan-Quinn (HQ) techniques are used to determine the optimal lag length. These criteria, without an iota of doubt, are superior to others, especially in a small sample. Lutkepohl, 1991; Liew, 2004, found that AIC, FPE, and HQ performed better compared with other selection criteria in a small sample study (n<60). The result of the optimal lag test is presented in table 5. The optimal lag length, thus selected is $k = 3$.

Table 5: Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	128.5431	NA	6.37e-12	-8.753076	-8.467604	-8.665804
1	286.9877	237.6670*	1.08e-15	-17.49912	-15.50082*	-16.88822
2	320.0798	35.45583	1.98e-15	-17.29142	-13.58028	-16.15688
3	389.0649	44.34752	6.97e-16*	-19.64749*	-14.22352	-17.98933*

Note: * indicates lag order selected by the criterion.

Table 6: Toda Yamamoto Causality between Real GDP and Financial Development Indicators

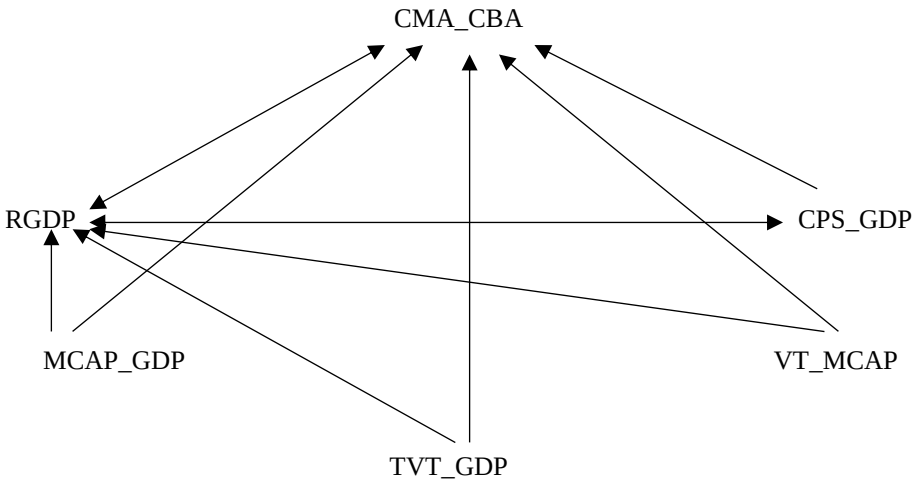
Dependent Variables	Independent Variables					
	RGDP	**MCAP_GDP**	**TVT_GDP**	**VT_MCAP**	**CPS_GDP**	**CMA_CBA**
RGDP	--	222.0493***	128.5591***	89.98952***	43.28679***	66.13144***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
MCAP_GDP	0.262199	--	0.557367	0.221435	0.838380	1.487441
	(0.9670)		(0.9061)	(0.9741)	(0.8403)	(0.6852)
TVT_GDP	0.203955	0.703750	--	0.228038	1.036792	1.729841
	(0.9769)	(0.8723)		(0.9729)	(0.7924)	(0.6303)
VT_MCAP	3.471917	9.008530**	1.662905	--	7.200207	1.171289
	(0.3244)	(0.0292)	(0.6452)		(0.0658)	(0.7599)
CPS_GDP	11.75653***	2.144871	1.220322	1.205840	--	2.591741
	(0.0083)	(0.5429)	(0.7481)	(0.7516)		(0.4589)
CMA_CBA	22.41409***	45.82455***	17.93843***	19.00518***	24.98733***	--
	(0.0001)	(0.0003)	(0.0005)	(0.0000)	(0.0000)	

Note: *** and ** denotes significant at 1% and 5% significance level, respectively. The figure in the parenthesis (…) represents p-value.

The results of tests of restrictions from a VAR estimated by the procedure proposed by Toda and Yamamoto (1995) are presented in table 3. Panel 1 of the table showed that there is no sufficient evidence to support the claim that each of the financial development variables did not granger cause economic growth. Therefore, the null hypothesis of no Granger causality of both stock markets and financial markets indicators on economic growth are rejected at a 1% level. However, it is noticed that the causality is unidirectional except for credit to the private sector and ratio of commercial bank asset to central bank asset which have bidirectional causality with the economic growth. Our result agreed in many respect with previous studies on this subject matter. One example of these studies is Dritsaki & Dritsaki-Bargiota (2005) using a tri-variate VAR model to examine the causal relationship between credit stock, credit market and economic growth for Greece. Like this study, their results reveal unidirectional causality from economic development to stock market indicators and bidirectional causality between economic developments and banking sector variables also establishes no causal relationship between stock market function and banking sector.

5. Conclusion

The major task of this study was to find out if stock markets and financial markets indicators are drivers of Nigeria Economy using Toda and Yamamoto (1995) causality approach which is based on augmented VAR. The augmented VAR of order 5 *(p = k + d)* was estimated with Seemingly Unrelated Regression (SUR) and the Wald test was carried out using standard chi-square distribution. Our finding showed that there was a unidirectional causal relationship running from the stock market variables proxied by market size, turnover ratio and the total value of share traded to economic growth captured by real GDP. Regarding the banking sector indicators (credit to the private sector and the ratio of commercial bank asset to central bank asset), bidirectional causality existed between them and economic growth. The causal channels among the variables are summarized below.



The deduction from the result reiterated the fact that the financial sector plays a crucial role in the Nigeria economy. The unidirectional causality from the stock market indicators to economic growth suggests that the development of stock markets contributes to economic growth rather than stating that stock markets develop as the economy develops. It also indicates that growth is not a good indicator for predicting stock returns. Furthermore, the already established fact from the study that credit market expansion as measured by bank credit to private sector leads to economic growth can be explained in the sense that, with the expansion of bank credit to private sector, more innovative projects are

to be undertaken and as a result, investment, employment, and output will increase putting the country's economy on a path of growth. However, the most recent global financial crisis is there to remind us that the banking sector is arguably the most cyclical and risk-prone sectors of the economy and the private sector is the most unaccountable sector.

In a developing economy like Nigeria, oil dependency is a major determinant on how stocks and financial Institutions stimulate economic growth, sadly there is little control over how oil shocks can be minimized especially on an international scale.

Government policies aimed at reducing dependency on crude oil and gas export as a major source of revenue and improvement of foreign investments may help in projecting how much financial development activates economic growth, sustainably. There is a need to continue with these reforms to enable it to contribute effectively to economic growth. However, a lot still needs to be done in translating this achievement to the proper growth process.

Based on this result, it will not be misleading to assert that reforms and restructuring that can boost financial markets and diminish dependence on natural resources should be pursued by the developing countries. This will provide panacea and rescue for the economy in case of an unforeseen crisis in the oil sector. Diversification of Economy and a strengthened financial sector is unavoidable for survival in times of global crisis.

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