

Determinants of Bond Market Development in Nigeria

Abubakar Jamilu Baita

Faculty of Economics and Business, Universitas Islam Internasional Indonesia

Corresponding Author: Abubakar Jamilu Baita abubakarbaita@gmail.com

ARTICLE INFO

Keywords: Bonds, Fiscal Deficit, Domestic Debt, Banking Size, Stock Market

Received: 19, February

Revised : 20, March

Accepted: 21, April

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ABSTRACT

Capital market is of paramount importance in financing the activities of public and private sectors in both developed and developing economies. Consequently, this research analyzed the long run equilibrium relationships between bond market development (BMD) and a set of fiscal, macroeconomic and financial variables in Nigeria using Granger causality test and Johansen cointegration model. The findings reveal the importance of macroeconomic and financial variables in facilitating the development of Nigeria's bond market. The study recommended that policy makers should ensure macroeconomic stability and financial soundness in order to develop bond market in the country.

INTRODUCTION

The importance of bond in the development of capital market cannot be overemphasized. Development in capital market is important for financing the activities of public and private sectors in both developed and developing economies. Further, macroeconomic and financial factors are important for the development of bond market. Khalid and Rajaguru (2017) contended that it seemed "...unrealistic to plan policies for bond market development without establishing certain norms of macroeconomic stability and implementing reforms of the financial sector. Financial discipline is perhaps the most important". Governments, also, legislate fiscal deficit in the public budget as well as map out ways and means of sourcing funds to fill the deficits. Consequently, they resort to borrowing in the capital market particularly the bond market to finance the deficit. Thus, this study examines the causality and long run relationship between BMD and fiscal, macroeconomic and financial factors in Nigeria.

The research built on five parts. Empirical literature was reviewed in the second part, and part three provided the methodological framework in terms of data sources, variables measurement and econometric modelling. More so, part four presented and interpreted the results, as well as discussed, the findings in the light of previous researches. Finally, part five concluded the paper and proffered recommendation.

LITERATURE REVIEW

This section reviews the empirical researches on the determinants of bond market development. Both single and cross-country empirical studies have been conducted in explaining the importance of macroeconomic and financial determinants of BMD. For example, Ogboi, Njogo and Nwankwo (2016) examined the relationship between bond market development and economic growth in Nigeria using GMM instrumental variable approach and granger causality test. The findings suggested that no significant effect of BMD on economic growth. However, the result of granger causality found a significant bi-directional causality between GDP and BMD. Similarly, Kapingur and Maketha-Kosi (2014) investigated the link between BMD and growth in South Africa using Engle Granger cointegration and causality test. The study found a long run relationship between real GDP and BMD in South Africa. Similarly, there is a significant bi-directional causality between GDP and BMD.

A cross-country analysis by Teplova and Sokolova (2017) to examine the driving forces behind domestic corporate bond market in 15 EMDE between 2006 and 2015. The results showed significant positive relationship between inflation and local currency corporate bonds, while exchange rate showed significant negative relationship. Size of bank credit has mixed effects (i.e. both positive and negative) on local currency corporate bonds, while GDP growth was not significant. Also, Smaoui, *et al* (2017) examined the determinants of BMD using a sample of 22 emerging economies between 1990 and 2013. The findings revealed that GDP, openness, banking size, and exchange rate volatility have significant

positive relationship with BMD. In contrast, significant negative relationship between fiscal balance and BMD is established. After decomposing BMD, openness, banking size, exchange rate volatility and fiscal balance remained significant in explaining sovereign BMD. Using GMM method, GDP, openness and banking size appeared significant in determining BMD, while fiscal balance and exchange rate variability were not significant.

A related study by Khalid and Rajaguru (2017) examined the social, economic and institutional drivers of domestic bond market in a sample of 47 countries. It was established that economic size and banking have significant positive relationship with domestic total and government bond markets respectively. Inflation has significant negative impact on total bond market. However, it is having no significant relationship with government bond market. Similar and consistent results were documented after employing panel GMM with the exception of inflation. Inflation was consistently negative but insignificant for both total and government bond market except in the sample of developed economies where it appeared significant.

However, Essers, et al (2016) focused on the Sub-Saharan Africa's local currency bond markets (LCBMs). The authors found significant negative relationships among average fiscal balance, inflation, and domestic BMD. On the contrary, GDP, other government debt and openness were not significant in determining BMD. They further employed GMM model to account for endogeneity; the relationship between fiscal balance and inflation remained significant. In contrast, the coefficients of average fiscal balance and size of banking system were not significant. Likewise, Park (2016) analyzed the development of domestic currency Asian bond markets from 1995 to 2015. The findings established significant positive effects of GDP and volatility of exchange rate on BMD, while inflation has significant negative effect. However, fiscal balance was not significant.

Another study by Presbitero, et al (2016) investigated the international sovereign bonds in developing economies between 1995 and 2014 using standard probit regression. The findings confirmed that country is more likely to issue bond relative to non-issuing countries when GDP is high. On the other hand, it is less likely to issue bond when public debt increases. Again, Pradhan, et al (2016) analysed the causality relationship between BMD, growth and some macroeconomic factors in a sample of 35 countries for the period of 1993-2011. The study established long run relationship between BMD, economic growth, inflation and openness. In the long run, BMD, inflation and openness are significant in determining growth. The result of short-run Granger causality documented bidirectional causality between growth and BMD, inflation and growth, openness and BMD, and real effective exchange rate and BMD. In the case of public bond, bidirectional causal relationship between openness and public bond intensity exists. Unidirectional causality is established running from bond intensity to inflation. The findings on composite BMD showed unidirectional causal relationship running from BMD to inflation, and openness to BMD.

Pradhan, et al (2015) analysed the nexus between BMD and economic growth using a case study of G-20 countries between 1990 and 2011. The study employed Granger causality and cointegration tests, Fully Modified OLS (FMOLS), and Dynamic OLS. It was found that economic growth and measures of bond market development are cointegrated at individual country and at the panel level, implying the existence of long run relationship between the two variables. The result of fully modified FMOLS and DOLS revealed a significant positive relationship between BMD and economic growth. Bidirectional causality was established between composite index of BMD and economic growth in G-20 countries.

Mu, *et al* (2013) investigated the financial and macroeconomic factors explaining BMD in Africa between 1980 and 2010. Using linear panel regression and GMM models, the findings revealed that GDP and size of banking exhibited positive relationship with government BMD. In contrast, fiscal balance, exchange rate volatility, and trade openness have significant negative relationships with government bond market development. GDP also revealed significant negative relationship in fixed effect panel regression.

Bhattacharyay (2011) investigated the drivers of Asian BMD between 1998 and 2008. The result of findings established significant positive relationship between economic size and total bond financing, while trade openness and exchange rate variability appeared insignificant. GDP has significant positive relationship with government bond, trade openness exhibit significant negative relationship, while exchange rate variability appeared insignificant. Size of banking has marginal significant positive relationship with both total bond financing and government bonds. Abbas and Christensen (2010) studied the impact of domestic debt on economic growth for the period 1975-2004. They found that domestic debt as a percent of GDP and bank deposits have significant positive impact on economic growth, after controlling for fiscal balance, openness, inflation, external debt among others.

A study by Adelegan and Radzewicz-Bak (2009) examined the drivers of BMD in 23 SSA countries between 1990 and 2008. They documented significant positive influence of GDP and GDP per capita on BMD. In contrast, openness, banking size, exchange rate volatility and fiscal balance have significant negative relationship with BMD. Development of public debt market was significantly increased by exchange rate stability and fiscal balance, while GDP, per capita GDP, openness and banking size were not significant. Private debt market was positively influenced by banking size, exchange rate stability and fiscal balance, while per capita GDP was significantly negative. GDP and openness were not statistically significant.

Borensztein, *et al* (2006) analysed the factors responsible for the development of bond markets in Latin America. They found that GDP, GDP per capita, and openness have significant positive relationship with the development of both government and private bonds. Intermediate exchange rate and public debt have significant positive relationship with government BMD, while lagged GDP exhibited significant negative relationship public bonds. However, banking

size was not significant in explaining public bonds. A positive relationship was established between banking size and private bonds.

Eichengreen, *et al* (2006) established significant positive effects of GDP, per capita GDP, public debt, openness, and intermediate exchange rate on government bond capitalization, while lagged GDP has significant negative effect. On the contrary, fixed exchange rate and domestic credit were not significant. Private bond capitalisation was positively determined by GDP, per capita GDP, openness and domestic credit but public debt was not statistically significant. Burger and Warnock (2006) studied the determinants of domestic BMD in 49 countries. The findings indicated that GDP has significant relationship with domestic BMD, while stability in inflation and fiscal balance showed significant negative relationship. In a different model, banking size was significantly positive in explaining BMD. The study further disaggregated BMD into government and private. It was revealed that GDP, inflation stability and fiscal balance were significant in explaining the development of government and private bond markets respectively.

Eichengreen and Luengnaruemitchai (2004) investigated the factors behind the underdevelopment of Asian bond market by sampling 41 countries between 1990 and 2001. The first model found that GDP, openness, banking size and exchange rates volatility have significant positive relation with BMD. In the second model, fiscal policy variables (i.e. public debt, past fiscal balance and 3-year moving average past fiscal balances all as ratios of GDP) were included. The result found that fiscal policy influences the development of entire bond market. Specifically, it was established that fiscal balance has significant negative relationship with BMD. As a result of fiscal balance, exchange rate volatility became negatively related to BMD. After disaggregating BMD into public and corporate, fiscal deficit appeared significant in explaining public bond market and insignificant in influencing corporate bond market. Further, banking size has significant positive relationship with corporate BMD but it was not significant in relation to the public BMD.

METHODOLOGY

Data and Variables

Central Bank of Nigeria (CBN) publishes annual statistical bulletin on the Nigerian economy. Thus, the datasets on fiscal deficits and domestic debts, GDP, inflation, interest rate, banking size and stock market are obtained from the CBN Statistical Bulletin (2021). The data cover a period of 33 years between 1989 and 2021. The variables measurement is presented in Table 1.

Table 1 Variable Measurement

Variable	Measurement	Source
BMD	Total bonds as % of GDP	CBN
Fiscal deficit	Fiscal deficit as a percent of GDP	CBN
Domestic debt	Domestic debt as a percent of GDP	CBN
GDP	Real GDP at constant price	CBN
Inflation	Consumer price index	CBN
Interest rate	Central bank's policy rate	CBN
Banking size	Banks' credit to private sector by as % of GDP	CBN
Stock market	Stock market capitalization as % of GDP	CBN

Econometric Models

The study employed Johansen system cointegration method to test for the long run relationship among BMD and the fiscal, macroeconomic and financial variables. Specifically, fiscal deficits and domestic debts represent fiscal variables; the macroeconomic variables include GDP, inflation, interest rate. Again, the financial variables consist of banking size and stock market. In addition, Granger causality test is employed to examine the causality relationships among the variables. Thus, the econometric model is expressed in 3.1.

$$BMD_{it} = \alpha + \beta_1 FD_{it} + \beta_2 DD_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \beta_5 INT_{it} + \beta_6 BS_{it} + \beta_7 STOCK_{it} + \varepsilon_{it} \quad 3.1$$

Where BMD stands for bond market development; FD stands for fiscal deficit; DD stands for domestic debt; GDP is the natural log of real gross domestic product; INF represents natural log of consumer price index; BS represents banking size; and STOCK represents stock market capitalization. The parameters β_1 to β_7 represent the coefficients of the explanatory variables, α is the intercept, while ε_{it} represents the error term.

RESEARCH RESULT

This section presents the results of findings as earlier expressed in the research methodology. It contains the summary statistic of the research variables, results of Johansen cointegration, and Granger Causality.

Descriptive Statistics and Stationarity Tests

This sub section presents the results of summary statistics and the tests for stationarity of the research variables. The summary statistics is presented in Table 2.

Table 2 Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
BMD	5.49	2.09	2.09	11.12
Fiscal Deficit	-0.29	0.23	-0.01	0.15
Domestic Debt	11.64	4.56	5.93	23.12
GDP	9.49	1.82	6.04	11.88
Inflation	3.69	1.39	0.81	5.59
Interest Rate	13.95	3.95	6.00	26
Banking size	12.22	5.63	6.22	20.77
Stock Market	12.71	8.39	3.05	39.95

Source: Authors' computation using E-Views

In Table 1, mean bond market development (BMD) is 5.49, with a minimum of 2.09 and a maximum of 11.12. The average fiscal deficit is 0.29% which is below 1% of GDP. The minimum fiscal deficit is 0.01%, and the maximum value (0.15%) represents fiscal surplus recorded in 1996. During the study period, Nigeria recorded fiscal surplus in 1996, 1997, and 1999, while in the year 1998 the country had a balance budget. Again, fiscal deficit is consistently below 1% of GDP from 1989 to 2019. Similarly, domestic debt as a ratio of GDP is 11.64% on average, with a standard deviation of 4.56. The highest domestic debt is 23.12% (about one fifth) of GDP recorded in 1994. However, a low debt ratio (5.93%) was witnessed in the year 2008. But in the aftermath of financial crisis, the debt ratio keeps rising in the country. The GDP and CPI are transformed into natural log, therefore the transformed series do not have meaningful economic interpretations. The mean interest rate is about 14%, with a minimum rate of 6% in 2009. This may be due to the negative implication of global financial crisis on Nigeria's financial market. However, a maximum interest rate of 26% was experienced in 1993 due to high inflation in the economy, following the implementation of Structural Adjustment Program (SAP) and the adoption of expansionary monetary policy by the then military government. More so, Nigeria's banking industry and stock market are slightly above 10% of GDP on average; implying low level of development of the country's financial market. Besides, banking sector and stock market have accounted for no more than 20% and 40% of GDP respectively. Despite this scenario, banking size and stock market development are by no means above BMD in the country. The highest size of Nigeria's bond market relative to GDP is slightly above 10% representing about half of banking size and one quarter of the stock market. In summary, the average banking size and stock market development are twice the size of bond market.

Further, the study conducts unit root tests to examine whether the research variables are stationary and at what level. This is important as it serves as a guide for determining the appropriate model(s) to be employed. The results

of Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests for stationarity are presented in Table 3.

Table 3 Results for ADF and PP Stationarity Tests

VARIABLES	ADF Test		PP Test		Order of Integration
	Level	1 st Difference	Level	1 st Difference	
BMD	3.1418***		2.9779**		0
Fiscal Deficit	2.3074	6.0903***	2.3074	6.3558***	1
Domestic Debt	1.3120	3.2876**	1.3120	5.1392***	1
GDP	4.0434***		3.7001***		0
Inflation	3.2722***		3.2722**		0
Interest Rate	3.0001**		2.9712**		0
Banking size	0.9279	4.4491***	0.9435	4.4137***	1
Stock Market	2.0287	6.0374***	1.8992	8.1769***	1

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

As Table 3 reveals, BMD, GDP, inflation and interest rate are stationary at level using ADF and PP tests respectively. BMD, GDP and inflation are stationary at 1% level of significance, while interest rate is stationary at 5% significance level. Therefore, these variables have I(0) order of integration. In contrast, fiscal deficit, domestic debt, banking size and stock market are non-stationary at level; however, ADF and PP stationary tests using 1st difference show that fiscal deficit, domestic debt, banking size and stock market are stationary at 1% significance level. Therefore, the series are integrated of order one i.e. I(1).

It should be noted that the study intends to employ autoregressive distributed lagged (ARDL) model to examine the short run and long run relationships; however, the dependent variable BMD is I(0) and the result of ARDL model is invalid in this context. Consequently, the research conducts Johansen cointegration test to examine the long run relationships among the variables of interest.

Johansen System Cointegration Test

The results of findings are presented in Tables 3, 4 and 5. Table 3 examines the long run relationship between the fiscal variables and BMD.

Table 4 Cointegration among Fiscal deficit, Domestic Debt and BMD

Hypothesis	Trace statistics	Critical value (0.05)	P-value
None	26.6001	29.7971	0.1118
At most 1	10.3873	15.4947	0.2521
At most 2	1.8448	3.8415	0.1744

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

In Table 4, the trace statistics for each of the three hypotheses is below the critical value at 5% level of significance. Thus, the results fail to reject the hypothesis of no cointegration. Therefore, this indicates no long run relationship between fiscal variables and BMD. In this regards, fiscal deficit and public debt do not have long run equilibrium relationship with BMD in Nigeria. This implies that fiscal policy does not significantly influence Nigeria's bond market over the long run. However, this does not mean fiscal policy is not effective on the country's bond market in the short run.

Further, the research hypothesized the importance of macroeconomic fundamentals in driving bond market in the long run. A robust and stable macroeconomic environment may foster BMD, while a fragile and volatile macroeconomic situation may be a stifling factor. Hence, Table 4 presents the results of long run relationship between macroeconomic factors and BMD.

Table 5 Cointegration among GDP, inflation, interest rate and BMD

Hypothesis	Trace statistics	Critical value (0.05)	P-value
None*	67.0035	47.8561	0.0003
At most 1*	37.7870	29.7971	0.0049
At most 2	10.6451	15.4947	0.2343
At most 3*	4.9491	3.8415	0.0261

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

Table 5 shows the cointegrating relationship among GDP, inflation, interest rate and BMD. The trace statistics for hypotheses 1 and 2 are greater than the critical value at 5% significance level, and their p-values are less than 1%. Therefore, the intuition of no long run cointegration is rejected; the study concludes that there is long run equilibrium relationship between macroeconomic variables (i.e. GDP, inflation and interest rate) and the development of bond market in Nigeria.

The link between banking system, stock market and BMD has been emphasized in many empirical studies. Therefore, the result of findings is presented in Table 5.

Table 6 Cointegration among Banking Size, Stock Market and BMD

Hypothesis	Trace statistics	Critical value (0.05)	P-value
None*	36.4905	29.7971	0.0073
At most 1	14.2679	15.4947	0.0759
At most 2	1.3355	3.8415	0.2478

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

Table 5 shows the existence of long run relationship between financial market variables and BMD. Banking size and stock market development have long run relationship in the long run. As the table shows, trace statistics for the first hypothesis is greater than the critical value (0.05). In fact, the cointegrating relationship is significant at 1% level, suggesting that financial market factors have important implication for the Nigeria's bond market in the long run.

Granger Causality Test

The test of Granger Causality is conducted to examine the causality relationship between BMD and a set of fiscal, macroeconomic and financial variables. Table 6 presents the causality test between fiscal variables and BMD.

Table 7 Granger Causality Test between Fiscal Variables and BMD

Null Hypothesis	F- Statistics	P-value
Fiscal balance does not Granger Cause BMD	1.9625	0.1624
BMD does not Granger Cause Fiscal balance	0.1289	0.8797
Domestic Debt does not Granger Cause BMD	0.2720	0.7641
BMD does not Granger Cause Domestic Debt	4.9528	0.0158
Domestic Debt does not Granger Cause Fiscal Balance	1.9329	0.1666
Fiscal Balance does not Granger Cause Domestic Debt	0.2175	0.8061

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

Table 6 the results of Granger Causality among BMD, fiscal deficit and domestic debt. The results indicate that BMD granger causes domestic debt. This is statistically significant at 1%. However, domestic debt does not granger cause BMD. This means there is uni-directional causality running from BMD to domestic debt. In addition, Table 6 shows no any uni-directional causality among fiscal deficit and BMD, and domestic and fiscal deficit. Thus, fiscal variables have no significant causal relationship with BMD in Nigeria.

Table 8 Granger Causality Test between Macroeconomic Factors and BMD

Null Hypothesis	F- Statistics	P-value
GDP does not Granger Cause BMD	1.0169	0.3768
BMD does not Granger Cause GDP	1.2458	0.3057
Inflation does not Granger Cause BMD	3.2489	0.0564
BMD does not Granger Cause Inflation	1.2693	0.2992
Interest does not Granger Cause BMD	1.7471	0.1957
BMD does not Granger Cause Interest	2.6712	0.0896
Inflation does not Granger Cause GDP	1.8286	0.1823
GDP does not Granger Cause Inflation	4.5740	0.0208
Interest does not Granger Cause GDP	1.3690	0.2735
GDP does not Granger Cause Interest	0.9252	0.4102
Interest does not Granger Cause Inflation	1.6962	0.2046
Inflation does not Granger Cause Interest	0.9677	0.3943

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

Table 8 shows a unidirectional causality relationship running from inflation to BMD; this is significant at 10% level of significance. However, there is no causality running from BMD to inflation. Again, BMD granger causes interest rate whereby the causality runs from BMD to interest rate at 10% significance, although interest rate does not granger cause BMD. The results found a significant (at 5%) causality relationship running from GDP to inflation, though the causality relationship does run from inflation to GDP. Nevertheless, the findings suggest no any directional causality relationship between GDP and BMD, between interest rate and GDP, and between interest rate and inflation.

Table 9 Granger Causality Test among BMD and Financial Factors

Null Hypothesis	F- Statistics	P-value
Banking does not Granger Cause BMD	0.9490	0.4012
BMD does not Granger Cause Banking	1.7052	0.2030
Stock does not Granger Cause BMD	0.4418	0.6480
BMD does not Granger Cause Stock	0.0923	0.9121
Stock does not Granger Cause Banking	13.9364	0.0001
Banking does not Granger Cause Stock	1.0597	0.3622

Note: ***, ** and * denote 1, 5 and 10 percent significance level respectively.

Source: Author's computation using E-Views

Table 8 presents the results of causality relationship between financial variables and BMD. The findings suggest a uni-directional causality running from stock market to banking size which is significant at 1% level. However,

causality between banking and BMD, and between stock market and BMD are not statistically significant even at 10% significance level.

DISCUSSION

The findings of a long run relationship between macroeconomic variables and BMD is in line with Pradhan, et al (2016) and Kapingur and Maketha-Kosi (2014). Pradhan, et al (2016) established long run relationship between BMD, economic growth, inflation and openness. In the long run, BMD, inflation and openness are significant in determining growth. Similarly, Kapingur and Maketha-Kosi (2014) found a long run relationship between real GDP and BMD in South Africa. Also, Pradhan, et al (2015) found that BMD and inflation are cointegrated at individual country and at the panel level, implying the existence of long run relationship between BMD and inflation.

Regarding the causality, Pradhan, et al (2016) and Nwankwo (2016) contradict the findings of no causality relationship between BMD and GDP. In fact, both studies found a significant bi-directional causality between GDP and BMD. More so, the findings of no causality between inflation and BMD is supported by Pradhan, et al (2016). Nevertheless, Pradhan, et al (2016) documented bidirectional causality between inflation and GDP, while this study found a unidirectional causality relationship running from GDP to inflation.

CONCLUSIONS AND RECOMMENDATIONS

The study is conducted to examine the fiscal, macroeconomic and financial determinants of bond market development (BMD) in Nigeria. In this connection, ADF and PP tests for unit root test, Johansen cointegration test and Granger Causality test are employed in the study. The findings of unit root tests show that BMD, GDP, Inflation and interest rate are stationary at level, meaning the series are integrated of order 0, i.e. $I(0)$. Though, fiscal deficit, domestic debt, banking size and stock market are non-stationary at level, they are stationary at 1st difference. Therefore, the series are integrated of order one i.e. $I(1)$. In addition, the results of Johansen cointegration test fail to establish a long run relationship between fiscal variables (fiscal deficit and domestic debt) and Nigeria's BMD. Yet, the findings revealed a long run equilibrium relationship between macroeconomic variables and the development of bond market in Nigeria. Likewise, the financial variables have significant long run equilibrium relationship with BMD in Nigeria. Finally, the results of Granger Causality tests document a strong unidirectional causality relationship from stock market to banking size, and from GDP to inflation. Again, the unidirectional causality relationships between inflation and BMD, and between BMD and interest rate are significant but weak (at 10% significance level). The study recommends that policy makers should ensure the stability of macroeconomic environment and the soundness of financial system in order to facilitate the development of bond market in the country.

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