

Accelerating Private Sector Participation in Nigeria Green Bond Market

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Abstract: *Climate change mitigation and adaptation in Nigeria has largely been financed by Federal Government as a public sector. However, public sector funding of sustainable investment in green finance has been found inadequate and insufficient to achieve Paris Climate Agreement in Nigeria. Therefore, this study examines the effects of catalytic first-loss capital on potential rise in private sector participation in the Nigeria green bond market. A simple random sampling technique was utilized to select 90 registered Fund Managers in Nigeria. From the estimation results of probit regression and conditional marginal effects, it was revealed that government grant and subordinated debt are significant catalytic first-loss capital instruments that can increase the probability of private sector participation in the Nigeria green bond market. The study, therefore, affirmed that both government grant and subordinated debt are essential to stimulate private sector participation in Nigeria green bond market. The study recommends that governments (both National and sub-Nationals) in Nigeria and Development Finance Institutions (DFIs) should provide more sovereign grants and higher subordinated debts for listed companies that engage in green projects and investments.*

Keywords: Green Finance, Green Bond, First-Loss, Probit Model, Marginal Effect

Introduction

At Climate Agreement (2015) Summit held in Paris in 2015, two important objectives were unanimously set by 195 participating members including Nigeria. These objectives are climate change mitigation and climate change adaptation (Oche, 2020). These objectives were aimed at keeping global average temperature level below 2⁰ celsius above pre-industrial levels and reduction of greenhouse gas (GHG) emissions. Consequently, a sustainable finance pathway was developed to attain low GHG emissions worldwide and achieving global climate-resilient development. In response to the Paris Agreement as a participating member country, Nigeria developed Nationally Determined Contribution (NDC) plan to solely achieve a 20 per cent reduction in carbon emission by 2030 and 45 per cent reduction if supported by international funding (Oche, 2020; Debt Management Office, 2019). As a result, Nigeria government estimated that about US\$142 billion is required in Green Bond investment to achieve her NDC target under Paris Agreement by 2030.

Commitment to 2015 Paris Agreement significantly explain the rationale behind the launching and issuance of first green bond by Federal Government of Nigeria in 2017 (Adejojo, 2022; Saka & Akinde, 2022a; Financial Sector Deepening Africa [FSD], Climate Bonds Initiative

[CBI] and FMDQ Group, 2022; Chiemeka, 2021) and second green bond issuance in 2019 (Adejojo, 2022). In

the process, the national government raised a sum of ₦10.69 billion in 2017 and ₦15 billion in 2019 to finance environmental / green projects and climate change-resilient projects (Adejojo, 2022). Despite this effort by Federal Government, public sector funding of sustainable investment in green finance has been found inadequate and insufficient to achieve Paris Climate Agreement in Nigeria (Oche, 2020). This financial gap situation highlights that a need for private investment in green finance is essential and vital towards achieving sustainable development in Nigeria. In fact, data-driven recommendations in Saka and Akinde (2022a; 2022b) underscore a requirement for improved private sector participation in the Nigeria green bond market.

Even at global level, the need to fill wide financial gap in nature-based solutions through increased private sector investment has been previously established by previous studies (Desalegn & Tangl, 2022; Debrah, Chan, & Darko, 2021; Chang, Wang, Xiang & Liu, 2021; Volz, 2108). Meanwhile, Krushelnyska (2017) noted that private investment in green bond market is challenging due to private investors perceived high risk and low return on environmental investment projects. As a result, factors that could help leverage private sector



participation in green bond investment deserve scientific investigation particularly in the case of Nigeria where private investment in green bond is limited. From available extant literature, it was found that only two previous evidence-based studies (Krushelnytska, 2017; Saka & Akinde, 2022b) linked catalyst first-loss capital to private investment in green bond market. Krushelnytska (2017) analysed Global Environmental Facility (GEF) analyzed catalytic first-loss capital and private sector participation in green project investments around the globe (Krushelnytska, 2017) with evidence in Europe, America, and Africa (South Africa in particular). On the other hand, Saka and Akinde (2022b) specifically evaluated implications of catalytic first-loss capital to enhance private sector participation in the Nigeria green bond market. Despite the study robustness, Saka and Akinde (2022b) failed to consider government grant in its analysis coverage. Meanwhile, government grant can be regarded as one of the important stimulants towards increased private participation in very risky investments in developing countries particularly green and energy-based financial securities.

Against this backdrop, the current study builds on empirical framework in Saka and Akinde (2022b) by including government grant in a model to examine potential effects of catalytic first-loss capital on private sector participation in green bond investment in Nigeria. Consequently, the study seeks to provide scientific response to a research question that to what extent does catalytic first-loss capital affects private sector investment in Nigeria bond financial market. This study is important to stimulate the interest of private investors via possible catalytic capital means (such as junior equity, subordinated debt and grants) to reduce perceived risk and increase private sector participation in the Nigeria green bond market.

Literature Review

Climate change can simply be referred to as alteration in the natural atmosphere or environment due to human activities with negative consequences upon the inhabitants of earth both human beings and available environmental resources. The incidence of climate change causes variability of natural environmental resources with serious implications to physical and socio-economic structures (Rahman, 2012). According to Rahman, some of the indicators of climate change include greenhouse gas (GHG) concentration, change in world temperature, ozone layer destruction, ice sheets shrinking, high acidized ocean, and warming oceans. Recognition of the serious consequences of climate change has given the concept a global popularity since 1980s till the current period and making it to be among top priorities on public agenda. Over time, the issue of climate change has been viewed as development problem which has great potential in threatening global sustainable development (World Summit on Sustainable Development, [WSSD], 2002). A

summit of 195 countries converged at Paris in 2015 to discuss way forward on addressing climate change and the outcome of the meeting produced a significant policy paper titled 2015 Paris Climate Agreement (Bachelet *et al.*, 2019) and paved way for issuance of green bond to mitigate against global warming (Cortellini & Panetta, 2021).

Investment in green bond may be orchestrated by both public sector and private sector although public institutions dominate in its issuance and investment in most economies particularly in developing like Nigeria.

The private investment in green bond market refers to individual investors or institutional arrangement for issuance or buying of long-term fixed interest based investments in environmental friendly or green projects which has environmental benefits. According to Krushelnytska (2017), private investors' participation in the green bond financial market can be stimulated with the use of catalytic first-loss capital. Conceptually, catalytic first-loss capital is credit enhancement provided for socially and environmentally-based projects by grant-maker or investor (governments in most cases) to catalyse private investors' participation who could have ignored investment in those projects had such facility unavailable.

The most common measurements of catalytic first-loss capital are junior equity or ordinary stock investment by government, subordinated debts, grants and credit / loan guarantees.

Theoretically, this study is underpinned by portfolio theory postulated by Harry Markowitz in 1952. The theory illustrates a need for well-diversified portfolio by every rational and risk averse investor so as to maximise his/her expected return at a given specific level of risk. Markowitz explained that there is tendency for every risk-averse investor who is sensitive to risk-taking to reduce overall risk exposure of a portfolio to the minimum level with effective diversification and simultaneously maximize expected portfolio return. In principle, portfolio theory requires a risk-averse investor to combine two assets or securities (such as shares, bonds and stocks) whose rates of return move in opposite direction in an economy. Thus, the extent of portfolio risk reduction as benefit of diversification depends on the nature of covariance between the returns of two or more assets included in a portfolio (Lumby & Jones, 2019).

The significance of portfolio theory to the current study is manifested by the way potential private investors in the Nigerian green bond market could leverage on the opportunity of such investment instrument to reduce the risk elements of their respective portfolios. As noted in Krushelnytska (2017) private investors often perceive low level of return on green or environmental investment projects. Therefore, low return capped green investments can be combined with high return investments at current



period and in future time potential returns on green securities can become high.

Moreover, there is a growing level of academic efforts toward empirical studies on green finance investments particularly on investments in green bond financial market among developing economies. A large number of available studies provides evidence of positive relationship between green bond investment and inclusive green economy or inclusive economic growth (Saka & Akinde, 2022a; Desalegn & Tangl, 2022; Zhang, 2015; You, 2018; Chen *et al.*, 2018; Liu, 2019; Wang & Wang, 2020). However, two common issues are found in the existing literature on green investments or green bond market investment in developing countries. Firstly, unlike Asia where green finance is more prominent, evidence suggests that there is scanty of research efforts toward green finance in Africa (Saka & Akinde, 2022a; 2022b; Desalegn & Tangl, 2022). This research lacuna shows an essential need for more empirical investigations on green investment in Africa. Secondly, Saka and Akinde (2022b) ignored the impact of government grant in their empirical model despite importance of the predictor in developing countries with high risk profile green investment securities such as Nigeria. Hence, this current study is motivated by these two identified flaws in the existing literature.

Methodology

This study employs cross-sectional survey research design to obtain required information and provide a framework for inferential analysis. The survey research design was employed because of its potential to detect empirical relationship between two economic series and for generalization about population under study (Saka & Adeyanju, 2022; Saka & Akinde, 2022a; 2022b). The population of this study is considered as the total number of Fund / Portfolio Managers who are active members of Fund Managers of Nigeria (henceforth, FMAN) as at August 20th, 2022. The selection of Fund or Portfolio managers is premised on assumption of high level of experience in managing their clientele investments over time. More importantly, Fund Managers significantly help to safeguard and maximize returns on retail investors' investments as well as ensuring risk diversification for the benefits of their clients (Securities and Exchange Commission [SEC] Nigeria, 2022). According to Members' List obtained from FMAN website, there are currently 117 active registered members (see FMAN, 2022). This figure of 117 FMAN registered Portfolio Managers represents the population of the current study. Consequently, sample size determination formula by Krejcie and Morgan (1970) for a known population was used to determine the required sample size for the study. The formula previously utilized by Saka and Akinde (2022b); Saka and Fatogun (2021); Saka (2021); Amusa and Saka (2017) is specified as follows:

$$S = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2 P(1-P)}$$

Where s = sample size; X^2 = table value of chi-square at 1 degree of freedom for desired confidence level (0.95); N = population size (117); and P = population proportion (0.5). The result yields a sample size of 90 Funds Managers.

Furthermore, the study developed a probit model to explain how measures of catalytic first-loss capital could affect the decisions of private investors in the Nigeria stock market to invest in green bond market or green investment projects. The choice of probit model in this study is informed by the nature of the dependent variable (decision to invest in green bond investment instruments or not) of the study which is categorical or binary. The dependent variable is coded as "1" if a Fund Manager will invest in listed green bond investment instruments on behalf of his clients or "0" if a Fund Manager will refuse to invest. On the other hand, the measures of catalytic first-loss capital employed as independent variables in this study are junior equity (or ordinary share), junior debt (or subordinated debt) and public guarantee (or government guarantee). The probit developed was based on model adapted from Katchova (2013) and stated as:

$$F(X'\beta) = \Phi(X'\beta) = \int_{-\infty}^{X'\beta} \phi(z) \delta z \dots (1)$$

Where; Φ = cumulative distributive function (cdf); X = explanatory variable; β = coefficient of explanatory variable; Equation 1 was modified to incorporate the study explanatory variable in equation (2) as:

$$F(CFC'\beta) = \Phi(CFC'\beta) = \int_{-\infty}^{CFC'\beta} \phi(z) \delta z \dots (2)$$

Where; CFC = Catalytic First-loss Capital
 Equation (2) is adjusted to probability-based (probit) model in equation (3) as:

$$\Pr(PGB = 1|CFC) = \Phi(CFC'\beta) \dots (3)$$

Where: \Pr = probability; PGB (Private Investment in Nigeria Green Bond Market)
 The study takes into consideration the possible occurrence of random events (random variable) and that brings additional adjustment to equation (3) which transforms into equation (4) as thus:



$$PGB^* = CFC'\beta + \varepsilon \dots (4)$$

Where; ε (being error term) $\sim N(0, 1)$. Then PGB can be viewed as an indicator for whether this latent variable is positive in equation (5) as:

$$PGB = 1\{PGB^* > 0\} = \begin{cases} 1 & \text{if } PGB^* > 0 \\ 0 & \text{otherwise} \end{cases} -\varepsilon < \sum_{i=1}^n CFC'\beta_j, \dots (5)$$

Where; $\sum_{i=1}^n CFC$ = summation of number of CFC as independent variable ranging from $n = 1, 4$. Unlike Saka and Akinde (2022b), the independent variables of this study consist of 4 components (JES, GRA, JDB, and GUA). JES = Junior Equity Shares (or Ordinary share); GRA = Government Grant; JDB= Junior Debt (or Subordinated debt); GUA = Government Guarantee.

By extension, equation (5) is expanded into equation (6) to reflect final model of the study as:

$$PGB = 1\{PGB^* > 0\} = \begin{cases} 1 & \text{if } PGB^* > 0 \\ 0 & \text{otherwise} \end{cases} -\varepsilon < \beta_1 JES + \beta_2 GRA + \beta_3 JDB + \beta_4 GUA, \dots (6)$$

In term of sample unit selection, the study employed a simple random sampling technique to ensure that every registered Fund Manager by FMAN has equal chance of

representation. In doing this, the study used lottery design by assigning a unique number to each of the registered members and then picked at random (1, 2, 3... 90) from a pool of numbers representing all the Fund Managers. Subsequently, a well-structured questionnaire was administered among the randomly sampled Fund Managers (90) using Google Forms. The questionnaire contains information on sampled Fund Manager demographic factor and operational data on relationship between catalytic first-loss capital and potential private sector investments in the Nigeria green bond financial market. The target respondents, Fund Managers, were reached through their email addresses obtained from FMAN website. Lastly, maximum likelihood estimation is used to analyse the study final model in equation 6 at 5% level of significance with the aid of STATA 12 as statistical software.

Presentation of Results

This section provides estimation outcomes of MLE-based probit regression and Conditional Marginal Effect analyses using cross-sectional survey data obtained from randomly sampled Portfolio Managers. The results are presented in Table 1.

Table 1: MLE-based Probit Regression Estimation Results

	Number of observation	=	82
	LR chi2(4)	=	4.32
	Prob > chi2	=	0.0006
	Pseudo R2	=	0.5189
Log likelihood = -35.766221			

PGB	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
JES	.1850643	.1640532	1.11	0.327	.7412143 .1387134
GRA	.1543633	.1283534	4.25	0.000	.6712423 .3002217
JDB	.2110939	.1808564	3.06	0.000	.3453376 .1128640
GUA	.1921068	.1684439	1.23	0.659	.4832583 .278087
_cons	1.627992	.3029732	3.45	0.005	.5267041 .3594328

Conditional marginal effects

Model VCE : OIM

Expression : Pr(PGB), predict()

dy/dx w.r.t. : JES GRA JDB GUA

at : JES = 2.564177 (mean)

GRA = 2.835412 (mean)



JDB = 2.752965 (mean)
 GUA = 2.220454 (mean)

	dy/dx	Std. Err.	z	P> z	Delta-method [95% Conf. Interval]	
JES	.0156933	.0119134	0.95	0.270	.0348702	.0389239
GRA	.0926346	.0158902	3.27	0.000	.0825364	.0476848
JDB	.1105945	.0355468	2.48	0.000	.0218428	.0456554
GUA	.031048	.0225921	0.44	0.306	.0759254	.0167538

Source: STATA 12 Outputs (2022)

Interpretation and Discussion of Results

The analyses conducted in this study follow empirical estimation procedures of Saka and Akinde (2022b) albeit an extension of the paper. The two estimation procedures involved are probit regression and conditional marginal effects analyses. Similar to Saka and Akinde (2022b), same 82 fully completed and retrieved questionnaires from sampled Fund / Portfolio Managers who were randomly drawn from Members' List of Fund Managers Association of Nigeria (FMAN) entered final analyses. It is important to reiterate that the study analyses procedures were carried out through STATA 12 statistical software application. The Conditional Marginal Effects (CMEs) was performed to help provide effective interpretation of the magnitude of the coefficients. Unlike Ordinary Least Square (OLS) techniques, the magnitude of coefficients in Generalized Least Square (GLS) estimation techniques such as Probit Regression employed in this study cannot be interpreted rather through marginal effects (Katchova, 2013).

Interestingly, the study Probit model was found sufficient and significant ($Prob > chi2 = 0.0006$) to explain variation of almost 52% in private sector participation in green finance investment in Nigeria. From Table 1, Probit regression estimation procedure reveals that government grant and junior debt are significant catalytic first-loss instruments that have higher probabilities to increase private sector investment in Nigeria green bond market.

That is, if governments provides more grants or provide debt financing with low security (subordinated debt), or government and DFIs provide first-loss capital guarantee there is high likelihood that private investors will invest more in the Nigeria green bond market. With CMEs, an increase in government grant is more likely to significantly increase private investors' participation in the Nigeria bond market by 9.26 percent ($GRA: coeff. = .0926; p-value = 0.000$) and also for increase in low-security debt financing (or subordinated) by government of DFIs there is high likelihood that private investors'

investment in Nigeria green bond increases significantly by 11.05 percent ($JDB: coeff. = .1105; p-value = 0.000$). However, both junior equity and government guarantee as green bond catalytic first-loss instruments were found insignificant to affect private investment in the country green bond market.

The findings obtained in this study follow portfolio theory postulations. In line with the theory, the results obtained in this study implies that risk-averse investors in Nigeria investment environment will leverage on catalytic first-loss capital through assurance of government grants and issuance of low-risk subordinated debt by government to maximise their expected returns on potential investments in the country green bond market. Similarly, the results observed in this study are in agreement with previous findings by Krushelnyska (2017) and Saka and Akinde (2022b). More closely, the results in this study further reinforced earlier findings by Saka and Akinde (2022b) on the significance of junior debt and also provide additional evidence on the importance of government grant in stimulating private sector investment in the Nigeria long-term fixed interest investment (bond) market.

Conclusion and Recommendation.

This study examines potential effects of catalytic first-loss capital on private sector investor investments in the Nigeria long-term fixed interest investment market using probit regression method. The analyses of cross-sectional obtained from randomly sampled Fund / Portfolio Managers illuminate that increases in government grant and junior are significant catalytic first-loss capital measures that can increase the probability of private sector participation in the Nigeria green bond market. The study, therefore, affirms that both government grant and subordinated debt are very essential to stimulate high likelihood of private sector participation in green finance within the context of Nigeria green bond market. The study recommends that governments (both National and sub-Nationals) in



Nigeria and Development Finance Institutions (DFIs) should provide more sovereign grants and higher subordinated debts for listed companies that engage in green projects and investments. Besides, Nigeria

government needs to strengthen institutional capacity that could spur green bond market development in the country.

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