MACROECONOMIC AND INSTITUTIONAL DETERMINANTS OF DOMESTIC CORPORATE BOND YIELD SPREAD IN NIGERIA

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Abstract

On paper, the coupon on corporate bonds is simply seen as the risk-free rate plus a spread, but in reality, the empirical analysis of the determinants of the spreads is highly demanding. Unmasking the determinants of corporate bond yield spreads has remained an important research issue. In Nigeria, there seems to be dearth of research into this area of corporate spreads due to insufficient bond data. Even in the advanced economies where studies have been carried out, there seems to be no universally accepted determinants of corporate bonds yield spread: different variables and proxies are used in different studies. Other identified research problems include the measurement of the variables used in the studies. This study investigates the extent to

which macroeconomic and institutional factors affect corporate bonds yield spread in Nigeria. It applies the random effects model on an unbalanced firm-level panel data from 2000 to 2014 to examine the determinants of domestic corporate bonds yield spread in Nigeria. We find that domestic corporate bonds yield spread responded to macroeconomic and institutional factors in Nigeria at the 1 per cent level of significance. The significance of the individual explanatory variables, with the control variables, was maintained, at the 5 per cent level for interest rate volatility and sovereign risk. The outcome of the study is consistent with most of the studies conducted with secondary market data on corporate bonds in the advanced economies, and so, justifies our use of inflation-adjusted coupons on bonds as the yield on corporate bonds. We therefore recommend that government should work hard to strengthen her institutional framework, as well as enhance the deepening of the financial market in order to assisting in narrowing corporate credit spreads. Researchers should also not shy away from using inflation-adjusted coupons as proxy for corporate bonds yield spread.

Keywords: **Corporate Bond Yield, Interest Rate Volatility, Institutional Variables**

INTRODUCTION

The importance of domestic corporate bond market as an alternative source of financing for corporations was once again brought to the front burner by the Asian financial crisis of June 1997 to January 1998. The financial crisis swept across the South East Asian economies of Thailand, Malaysia, Singapore, Indonesia, Hong Kong and South Korea. The prominence of the market has also been accentuated by the global financial crisis of 2007-2009 which led to a bailout of many financial institutions in different countries of the world. Following these crises, managers of national economies are revisiting the corporate bond market, particularly the domestic corporate bond market, with more intensity. The renewed recourse to the domestic corporate bond market is aimed at addressing its well-deserved position in the mobilization of long-term investible funds agenda and in the cushioning of the domestic economy from foreign financial crisis contagion effects. Irked by the recession of 2008 – 2009, corporate bonds issuance in United States of America witnessed a 300 percent increase between 2008 and 2012 [1]. This translated into the aggregate size of bonds issued increasing from US$ 600 billion in 2007 to US$1.8 trillion in 2012.

The huge increase in corporate bonds issuance occasioned by the lessons of the global financial meltdown was actually not peculiar to the United States of America. In Europe, the realization that the crisis- and after-crisis times are characterized by tight money and tough credit forced smaller and mid-cap businesses to look to the corporate bond market for financing. According to Hillion [2], in Europe, growth in corporate bond issuance was particularly pronounced in Germany, where net issuance swung from a relatively flat growth in 2007/2008 to an annualized growth rate of 17 percent between

2008 and 2012. In the whole of the European Union (EU), corporate bond issuance increased from US$ 200 billion in 2007 to over US$ 400 billion in 2012; an increase of over 100 per cent [3]. The trend is the same in Asia. For instance in China, according to Johnson [4], between 2011 and 2012, 572 small and medium enterprises (SMEs) borrowed a total of about 315 billion yuan (about US$ 50.4 billion) from the bond market. This figure was almost four times the amount they raised in the three years between 2008 and 2010.

In Nigeria, the trend of the developments in the bond market is quite different. According to the records of the Securities and Exchange Commission of Nigeria (SEC), in 2007, no corporate bond was issued. In 2008, only two corporate bonds were issued, with an aggregate size of N5.3 billion, equivalent of US$ 44.7 million calculated at N/$ 120 exchange rate. In 2009, the number of issuances was still two but the aggregate bond size increased to N15.4 billion, equivalent of US$ 128.33 million calculated at N/$ 120 exchange rate. There was a substantial increase in the number of issuances in 2010 to six, with aggregate size of N83 billion, equivalent of US$ 554 million, calculated at N/$ 150 exchange rate. This trend was repeated in 2011with nine issuances but with lower aggregate size of N64.5 billion, equivalent of US$ 430 million, calculated at N/$ 150 exchange rate. In 2012, however, the number tumbled to two, as well as the aggregate bond size which went down to N12.94 billion, equivalent of US$ 80.9 million, calculated at N/$ 160 exchange rate.

The 2012 data needs further mention: only one of the two issuances can actually be said to be a domestic corporate bond. The only corporate bond, in the strict sense and definition, was issued by C and I Leasing, with a bond size of N940 million (about US$ 5.9 million at N/$ 160). The second issuance was by the International Finance Corporation (IFC) with a size of N12 billion. The issuance by the IFC, being a supranational bond, has its rating and circumstances determined beyond Nigeria even though it is listed by SEC under corporate bonds. In view of this, therefore, one can conclude that the number of corporate bond issuances in Nigeria in year 2012 declined both in number and size.

However, while the performance of the corporate bond market in Nigeria is obviously dismal, the performance of the government bond market sector seems to be impressive. For instance, the total bond market capitalization which stood at N3.74 trillion in 2011 grew by 55.6 per cent in 2012 to N5.87 trillion. Between 2012 and 2013, the total bond market capitalization also grew by 25.1 per cent to N6.42 trillion. This figure was expected to grow even further in 2014 and the years ahead. This expectation of future growth was predicated on the nation's dire need for new and revamped infrastructure. In fact, the Transformation Agenda of President Goodluck Jonathan's administration projected an investment programme of N25.7 trillion for the period 2011 to 2015. Of this amount, the private sector was expected to mobilize N11.1 trillion; constituting about 43.19 per cent of the total sum. On the part of corporate bonds, growth expectations were predicated on the privatization of the power assets which requires huge investments from the power assets investors. Other reasons for the growth expectation

included the expected privatization of the refineries, the railways and a whole lot of other sectors of the economy that require financing. Obviously, the financial requirement of these projects is burdensome to the federal and state governments. The expectations from the private sector are clear enough, but to meet these, there is a need to revisit the factors that influence corporate bond yield spreads; especially in view of the financial meltdown and economic recession which may have impacted on the spread.

The literature is endowed with works on the factors that determine corporate bonds yield spread. Most of these works, however, are concentrated on the advanced economies of the world with dearth studies on Africa and other emerging economies. Min [5] argues that lack of research in this area is common to most emerging markets in the world due to the unavailability of accurate and sufficient data. Ameer [6] supports this argument by observing that there were an extremely limited number of empirical evidences concerning relationship between macroeconomic variables and bond markets in Asian economies; and indeed in the emerging market economies as a whole. Although the Nigerian corporate bond market seems to be developing gradually, not much is known in terms of the determinants of corporate bond yield spreads. Despite a seeming consensus on factors that can influence corporate bonds yield spread, to the best of our knowledge there seem to be no known empirical studies in Nigeria that have addressed this issue. We further contribute to literature by examining the extent to which institutional factors (in this case, sovereignty risk, and regulatory control) influence domestic corporate bond yield spread in Nigeria.

The rest of the paper is structured as follows: Section 2 reviews the empirical literature; Section 3 details the data and empirical approach; Section 4 deals with the estimation and interpretation of the results while Section 5 concludes.

LITERATURE REVIEW

While a number of theoretical and empirical studies exist on the determinants of corporate default risk premiums (corporate yield spreads) in industrial countries or, more specifically, in the United States of America, there seem to be no universally accepted variables for representing the determinants of corporate bond spread. Even where a particular variable has been used by two or more researchers, the calculation and measurement of such a variable often differs. One of the first of such investigations carried out by Fisher [7], finds that the yield spread on a firm's bonds depends on (1) the probability of default by the firm, and (2) the liquidity of the firm's bonds (that is, the ease of exchanging the bonds for cash with minimum loss in value). In measuring the default risk, Fisher [7] used three variables, namely leverage (debt-equity ratio), variability of earnings and period of solvency.

Merton [8] applied the option pricing model in the pricing of corporate debt. In this Merton's theoretical model, the corporate default risk premium is a function of only three variables: (i) the volatility of the returns on the firm value, (ii) the debt-to-firm value ratio, and (iii) the time to maturity of the bond. Following the observed short-comings of the

Merton study, Shimko et al. [9] introduced stochastic (risk-free) interest rates into the Merton model. As a result, corporate default premiums could also be treated as a function of interest rate volatility. However, in their study of the slope of the credit yield curve for high-yield-bond issuers (issuers of bonds of lower credit ratings), Helwege and Turner argued that a case of upward yield spread for high-yield grade bonds is in contradiction with the findings of Merton [8]. This view is in support of the earlier findings of Jones et al. [10] who argued that some basic determinants of corporate bonds yield spread are hard to ascertain.

Most of the existing studies introduce Min [5]; Elton et al. [11]; Mussa and Kihongo [12]; and Mayberger [1] have empirically examined the influence of macroeconomic variables on corporate bond yield spreads in the advanced economies. Some other literature of Ameer [6]; Norliza et al. [13] have examined the changes in corporate bond yields as a function of macroeconomic and solvency variables in emerging economies, particularly in Asian economies. Standard macroeconomic variables such as the real GDP growth, inflation rates, the real exchange rate, industrial production, exports, imports, foreign reserves and other trade figures have all been investigated. Most of them were found to be significant in explaining corporate bond yield spreads. However, some variables at times yield different results in different studies based on different economies. The varying results create a need to have country specific studies. It also creates a need to harmonise the studies by investigating why the results vary.

According to Huang and Huang [14] and Christensen [15], the challenges of determining the factors that influence the corporate bond yield spread have remained a puzzle. In fact, Jones et al. [10] opined that some fundamental determinants of corporate credit spreads continue to be indefinable. Expectedly, the unravelling of the puzzle has elicited several researches from many scholars, including Jones et al. [10], Collin-Dufresne et al. [16], Elton et al. [11] and Huang and Huang [14], among others. Mayberger [1] identified profitability, leverage and size as possible determinants of corporate bond spreads. He stressed that an increase in profitability reduces bond yield spread, as well as a decrease in firm leverage. In the case of firm size, it was expected that larger firms will have a smaller corporate bond credit spread [17]. Other factors affecting the bond yield spread are the inflation rate as shown by Batten et al. [18]; and Norliza, et al. [13]. The general market liquidity is yet another factor in the bond yield spread equation as shown by Brunnermeier and Pedersen [19]; Lin et al. [20]; Bao et al. [21]; and Acharya, et al. Grandes and Peter [22] also show that sovereignty risk is another important factor in the domestic bond yield spread equation.

Given the above, the understanding of the determinants of corporate bond yield spread is very important from many perspectives. Firstly, capital and the cost of capital, particularly debt capital, is one of the most important determinants of economic growth, especially in the emerging economies as shown by Olayiwola et al. [23]. The understanding of the determinants of corporate bond yield spread aids in capital structure decisions and timing of new debt issuance [20]; and ultimately assists in managing the cost of capital to the firm. Secondly, according to Christensen [15], it is

also necessary to solve the puzzle of what actually determines corporate bonds spreads for proper risk management of corporate bond portfolios. This is important from the perspective of portfolio managers and institutional, as well as individual fixed income security investors. Thirdly, since developments in the corporate bonds market provide a timely and forward-looking measure of the pulse of the general business climate, a solution to the puzzle will be a useful tool for the conduct of monetary policy. This need to empirically study the factors that influence credit spread has also become more imperative in the face of the financial meltdown of 2008 – 2010; and the threatening economic downturn (economic recession) in the Nigerian economy that has been occasioned by the decline in the price of crude oil in the international market among other reasons.

METHODOLOGY

In specifying the model for this study, the authors adapted the models used by Norliza, et al. [13] and Maybeger [1], with modifications. Mayberger [1] used ordinary least squares (OLS) but the authors used pooled panel GMM. The reason behind this derives from the fact that our dependent variable possesses both cross-sectional and times series characteristics (panel data) while the independent variables possess only time series properties. The main assumption behind the use of pooled panel GMM approach is that some of the explanatory variables are the same across the sections. The pooled panel GMM overcomes the problem of heteroskedasticity. In specifying our model, unlike in the study of Mayberger [1], we distinguished between the panel data and time series data. The authority behind our approach is based on the work of Wooldridge [24].

Model Specification

Corporate Bond Yield Spread (CBYS) in this study was calculated on each domestic corporate bond basis vis-à-vis the FGN bond of equivalent maturity over time, till maturity of each bond. This paper categorizes the variables that influence (CBYS) as follows; (1) macroeconomic, captured by interest rate volatility and financial deepening (market liquidity); (2) institutional factors, measured by sovereignty risk, and regulatory control; and (3) the control variable, which is gross domestic product (GDP).

The functional form of the CBYS model is specified in equation 1 below, with the a-priori expectations stated directly below each variable. Thus, it can be written implicitly as follows:

$$CBYS_{it} = f(INTV_t, SOVR_t, REQ_t, M2/GDP_t, GDP_t) \qquad (1)$$
$$\quad + \qquad +- \qquad - \qquad - \qquad -/+$$

where

$CBYS_{it}$: Corporate Bonds Yield Spread for bond i, at period t

$INTV_t$: Interest Rate Volatility for the period t

$SOVR_t$: Sovereign Risk score for the period t

REQ_t: Regulatory Quality for the period t

$M2/GDP_t$: Financial Deepening (proxy for market liquidity) for the period t

GDP_t: Gross Domestic Product (measure of size of economy) for the period t

The following are the justifications for the inclusion of the various variables in the model:

Corporate Bonds Yield Spread (CBYS) is the dependent variable. As stated earlier in this study, a spread is the difference between two values, yield on two bonds in this case. The spread can be between the bids and ask prices of the same bond; or between a bond and the Credit Default Swap (a derivative) created on the same bond. For the purposes of this study, however, CBYS is the difference between the yield on a corporate bond and the yield on Federal Government of Nigeria bond of equivalent maturity.

Lack of (corporate) bond yield data is a problem that prominently exists in most, if not all, less developed and emerging market economies [5,6]. To arrive at the yield on the different corporate bonds under study, we reasoned that the concern of investors about any investment and return therefrom is the real value of such returns or investment income. In the absence of sufficient data on corporate bond yield in Nigeria (if they exist at all), we deflated the coupon on each bond with the annual inflation growth rates. The resultant figure – inflation-adjusted coupon – is our proxy for corporate bonds yield. With this procedure we were able to overcome the problem of lack of corporate bond yield data for the period under study. It is this corporate bond yield that we related with the Federal Government of Nigeria bond yield to obtain the corporate bonds yield spread.

Interest rate volatility (INTV). Batten et al. [18] and Norliza et al. [13] found that the interest rate is negatively related and significant in explaining bond yield spreads. These findings were consistent with earlier findings by Longstaff and Schwartz [25], Duffee [17] and Van-Landschoot [26]. However, this paper argues that the concern of both bond issuers and bond investors is as much as the volatility of the interest rate, as much as it is of the rate itself. If the rate is known and it is stable over time, borrowers and lenders will plan their operations and portfolios better. The volatility factor exacerbates the risk of the rate itself. During a regime of high interest rate volatility, investors will ask for a higher premium while pricing any fixed income security so as to hedge against any negative real returns on their investments: higher volatility attracts higher risk premium, and higher spreads.

Interest Rate Volatility captures the extent to which changes in interest rate influences corporate spreads of corporations. This variable is usually measured by the standard deviation or variance of annual Treasury bill rate. To obtain the standard deviation, certain steps need to be taken [27]. First of all, it is necessary to observe that, on the average, the Central Bank of Nigeria sells Treasury bills every two weeks; with different maturities – 91 days, 182 days and 364 days. During each auction session, the stop

rate for each tenor becomes the ruling rate for that class of Treasury bill until its maturity. However, this stop rate may differ from the rate at which such a T-bill will be disposed of when an investor wants to sell (discount) the Treasury bill in the secondary market before the maturity of the bill. To arrive at the annual Treasury bill rate for a particular year, the average of the stop rates for the 91-day T-Bills for that particular year is calculated. From the annual T-bill rates, then the standard deviation is obtained; which then serves as the Interest Rate Volatility.

Rather than using the stop rates for the 91-day or 182-day T-bills to calculate the volatility, the 364-day T-bill stop rates were used in this study. The 364-day T-bill stop rates were used because there was incomplete and insufficient data in Nigeria for the 91-day or 182-day T-bills stop rates over the study period. Consistent data on the 91-day and 182-day T-bill stop rates are only available from year 2009. Before this date, the issuance of T-bills in Nigeria was done on as-the-need-arises basis. Again, rather than the standard deviation, the variance approach was used in this study to calculate the interest rate volatility.

Interest rate volatility is captured at the macro level, and affects every bond issue and issuer equally. As interest rates become more volatile the perception of risk becomes higher and subsequently higher expected compensation is requested. The a-priori expectation therefore is that higher interest rate volatility will lead to a higher cost of funds. Some studies, however, used interest rate volatility as an interaction variable; that is, the volatility of risk-free interest rates does not add to corporate bond yield spread by itself but by means of its interaction with leverage.

This paper therefore hypothesizes that interest rate volatility has a positive relationship with domestic corporate bond yield spreads: high interest rate volatility will bring about a wider corporate credit spread.

Sovereign risk (SOVR) is the risk that the sovereign of incorporation of a firm will default on her obligations. This is an indirect transfer risk which seeks to capture the extent to which the risk of the sovereign of incorporation influences the borrowing cost of domestic corporations in the domestic economy. The sovereign entity technically sets the ceiling for the credit rating of every firm in its jurisdiction. Therefore, the risk of a country – sovereign risk – exacerbates the risk of an issuer of a domestic-currency-denominated bond such that no local corporate can obtain a loan at a cost lower than that at which the country can borrow. That is, a country with a better credit rating has a positive influence on its local firms who have the ability to attract both local and domestic investors at low rates of interest than another with poor ratings who can only attract would-be investors with high rates of interest.

Elton et al. [11] opined that even in the US, a corporate default premium is significantly attributable to systematic, rather than diversifiable risks. Therefore, one could argue that in emerging markets, a major source of systematic risk is (indirect) sovereign risk. Sovereign risk is calculated at the macroeconomic level and therefore affects every

corporate bond and issuer equally, subject to the specific conditions of each bond. In this study, sovereign risk is calculated using the Mo Ibrahim Index of African Governance. Thus, we hypothesize a negative relationship between domestic corporate bond yield spread and sovereignty risk: an increase in sovereign risk leads to an increase (wider) corporate spread. In other words, as sovereignty risk improves (declines), the yield spread contracts, ceteris paribus.

Financial deepening (M2/GDP) is used in this study as a proxy for financial markets liquidity and absorptive capacity of the financial markets. Brunnermeier and Pedersen [19] and Lin et al. [20] argue that market-wide liquidity risk is a priced factor in the determination of the coupon on a bond. In lending support to the priced place of market liquidity in corporate spreads determination, Bao et al. [21] find that a market-wide liquidity explains a substantial variation of credit spreads; and that illiquidity is also priced in corporate bonds returns. In line with this argument, when liquidity is high in the market, the opportunity cost of holding idle funds will be low, and so available investment vehicles will rather offer low yields as well. This translates into low corporate bond yield spread as well.

In this study, financial deepening is given by the ratio of broad money (M2) to the GDP (M2/GDP). The Central Bank of Nigeria calculates financial deepening in two ways – ratio of broad money to the GDP, and ratio of credit to private sector to the GDP (CPS/GDP). We chose to use M2/GDP calculation of financial deepening because it is more encompassing than the alternative ratio. It is necessary to emphasis here that market liquidity is quite different from the liquidity of the particular bond in question. Based on the above, this paper hypothesizes an inverse relationship between financial deepening and corporate bonds yield spread: high market liquidity/financial deepening ratio leads to low (narrow) domestic corporate bond yield spread.

Regulatory quality (REQ) is an index that captures the strength of institutional framework. This index, calculated by the Political Risk Services International Country Risk Guide (www.prsgroup.com), measures the extent of sound regulations that permit private sector development. The index ranges between 0 and 1. An increase in the index implies an improved and efficient regulatory mechanism – a sign of strong institutional framework. Thus, a stronger and more efficient regulator will give bond issuers the needed impetus to issue bonds, and will boost investors' confidence in the economy. A strong institutional framework boosts the confidence of the market participants, reduces the perceived risk of the bond and bond-issuer and in turn narrows the yield spread. A negative relationship is predicted: an improvement in regulatory control (strong institutional framework) will narrow corporate credit spread.

Lastly, the Gross Domestic Product (GDP) captures economic growth and market size of any economy. A growing economy provides impetus for domestic bond issuance. The direction of the impact of GDP on domestic bond yield spread, however, is somewhat unpredictable as it also depends on the state of the given economy. For a developing economy, the need for infrastructural development financing drives up the need for

corporate borrowings which may lead to the widening of the yield spread. This may result from the inadequacy of the available resources to meet all development needs, and, as such, the available funds will go to the highest bidder in line with the doctrine of availability and cost. The widened corporate spread also becomes an attraction for corporate and foreign investors since their risks would have been adequately priced in. However, in a well-developed and matured economy, a growing GDP will only provide more investible resources for fewer development projects. Again the growing GDP may portend less risk perception on the part of issuers. In that case, the yield spread may contract.

Assuming a linear relationship between the dependent and independent variables, the explicit function of the domestic corporate bonds yield spread equation can be presented as follows:

$$CBYS_{it} = \alpha + \beta_1 INTV_t + \beta_2 SOVR_t + \beta_3 REQ_t + \beta_4 M2/GDP_t + \beta_5 GDP_t + \varepsilon_t \qquad (2)$$

where

ε_t: random term; other variables and the $\beta_i s$ are as defined earlier

Estimation Technique

The study uses the pooled panel generalized methods of moment estimator on an unbalanced firm-level panel dataset covering 25 bonds, issued by 19 firms distributed across five sectors in Nigeria from 2000 – 2014. The pooled panel GMM methodology of data analysis is preferred in this study as it considers the cross-sectional and time-series characteristics of our sample quoted companies' data, more especially, some of the variables in the study are cross-sectional in nature while some are time series. According to Gujarati [28], "by combining time series of cross-section observations, panel data gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency." In essence, the panel data analysis accommodates 'time as well as the heterogeneity effects of the quoted companies. A first important step in panel econometrics is to disentangle the source of variability in the dependent variable.

In addition to the above, the specific type of panel data econometric technique adopted in this study is the unbalanced panel data regression technique based on the fact that some data are missing, and the unbalanced structure of our panel. The use of unbalanced short panel data regression methodology is based on four fundamental justifications. First, the sampled companies have different issuing dates and year of maturity for their respective securities. For instance, some of the bonds under study that were issued in year 2000 matured in 2006 while others matured in 2004, while some others were issued in year 2005 and matured in 2013. This means that there will be an expectation of an unbalanced panel data structure since the sampled companies would be pooled with different time period. This approach of studying corporate bond was

found in the work of Chen et al. Second, the data collected for the work possesses both time series and cross sectional attributes. This enabled the study on corporate bond yield spread of firms over time (time series) as well as across the sampled quoted companies (cross-section). There were 25 (cross-sections) bonds in all, and the period of study spanned between year 2000 to year 2014 (time series). The yield spread was calculated for each of the domestic corporate bonds under study vis-à-vis a government bond of equivalent maturity; starting from the year of issuance of the domestic corporate bond to its year of maturity. Third, the pooled panel GMM data regression provides better results since it increases sample size and reduces the problem of degree of freedom. Fourth, the use of pooled panel GMM regression helped to avoid the problem of multicollinearity, aggregation bias and endogeneity problems, in line with the work of Greene. The pooled panel GMM overcomes the problem of heteroskedasticity, in line with the work of Wooldridge [24].

The sample of bonds for this study comprises local-currency-denominated corporate bonds that were issued by firms in Nigeria at different times within the period of study. The bonds had varied tenures and were issued at different times over the period 2000 and 2014. They have different times to maturity. While there are a total of 25 corporate bonds in this sample, the longest tenure among the tenures of the bonds is 15 years. The implication of the bonds having different tenures is that the panel data is unbalanced. And since the number of subjects (in this case, the number of bonds) is larger than the maximum tenure of any of the bonds, the panel data will be a short panel data. Based on this, therefore, this study adopted the unbalanced short panel data regression method.

Data Sources and Measurements

Table 1 contains the names of all the variables used in the model. It has also the symbols used in representing each of the variables, as well as the description, source and unit of measurement of the variables.

ESTIMATION RESULTS AND DISCUSSION

The main objective of this paper is to assess the effect of macroeconomic and institutional factors on domestic corporate bonds yield spread, where corporate bonds yield spread has been calculated as the difference between the yield on the corporate bonds under study and the yield on government bonds. We present here, the descriptive statistics, diagnostic test for multicollinearity, and discussion of the estimation result.

Descriptive Analysis

Table 2 presents the summary statistics of the variables used in this study. It outlines the properties of the variables. The properties include the mean, minimum, maximum and standard deviation. These properties are relevant in describing the distribution of

the series in the model. As shown in Table 2, corporate bonds yield spread has a minimum value of -0.1 and a maximum value of 2.8, while mean and standard deviation are 0.06 and 0.28 percent, respectively. The economic implication of the wide gap between the mean and maximum value is that yields differ significantly across corporate bonds in Nigeria. This is in line with theoretical expectations since corporate bonds yield vary between bonds and issuers. There seems to be less variability in interest rate volatility with mean value as 1.22, maximum value of 4.6 and standard deviation of 1.29, meaning that there is less volatility in the volatility variable. For sovereign risk, with a mean value of 0.25, minimum value of -1.9, maximum value of 1.4 and standard deviation of 0.83, there seems to be les variation on the sovereign risk variable. This implies that over the years under study, the sovereign risk variable exerted about the same level of impact on the dependent variable.

Table 1: Data Sources and Measurement

Variable and (Symbol)	Description	Sources	Measurement
Corporate Bonds Yield Spread (CBYS)	Difference between the yield on each corporate bond and a government bond of equivalent maturity	CSCS, NSE, SEC	Percentage
Interest Rate Volatility (INTV)	Measure of how much interest rates move up or down, on average, per day, week or month.	CBN Statistical Bulletin 2013	Percentage
Sovereign Risk (SOVR)	Measure of the strength of a country's institutional framework (proxy for probability of default on debt obligations)	MIF	Percentage
Financial Deepening (M2/GDP)	(Proxy for market liquidity) – a measure of the absorptive capacity of the capital market. It is calculated as broad money (M2) as a ratio of the gross domestic product	CBN Statistical Bulletin 2013	Ratio

Regulatory Quality (REQ)	An index of institutional framework showing the extent of sound regulations that permit private sector development (ranges from 0 to 1)	PSR (WGI)	Number - units
Gross Domestic Product (GDP)	Measure of the size of the economy, a pointer to the demand and supply of corporate bonds	CBN Statistical Bulletin 2013	Trillions of Naira
Source: Authors' compilation from various sources			

Table 2: Summary Statistics of Variables.

Variable	Mean	Minimum	Maximum	Std. Dev.
CBYS	0.06	-0.1	2.8	0.28
INTV	1.22	0.0	4.6	1.29
SOVR	0.25	-1.9	1.4	0.83
M2/GDP	22.8	17.7	43.3	6.08
REQ	0.47	0.2	0.5	0.06
GDP	3.67e+11	4.4e+10	5.7e+11	1.76e+11
Source: Computed by the authors				

In the case of financial deepening (proxy for market liquidity), there seems to be stability in the values. With a minimum value of 17.7, maximum value of 43.3 and mean value of 22.8, there seems to be stability in the level of liquidity in the market over the period under study. This relative stability is expected since the variable is a strong policy tool for the achievement of stability the financial market and the economy as a whole.

Test for Multicollinearity

The correlation matrix is presented in Table 3. The correlation matrix is used in testing for multicollinearity among the explanatory variables. The multicollinearity test is actually a pre-estimation procedure used to ascertain the extent of linear relationship among the explanatory variables. This test is pertinent as it becomes extremely difficult to ascertain the unique effect of the explanatory variables on the dependent variable in the face of perfect collinear relationship. The correlation matrix presented in Table 3 indicates no serious problem of multicollinearity among the explanatory variables, except for between GDP and Interest Rate Volatility where the coefficient is 0.5793. However, it is impossible to have two economic variables without any form of relationship. Multicollinearity only becomes a serious problem where there is high or perfect linear

relationship among two or more explanatory variables in a model.

Table 3: Correlation Matrix.

	INTV	SOVR	REQ	M2_GDP	GDP
INTV	1.000000	-0.242532	-0.176109	0.381057	-0.579312
SOVR	-0.242532	1.000000	0.201265	-0.010324	0.345929
REQ	-0.176109	0.201265	1.000000	0.136841	0.484680
M2_GDP	0.381057	-0.010324	0.136841	1.000000	-0.105779
GDP	-0.579312	0.345929	0.484680	-0.105779	1.000000
Author's calculation					

DISCUSSION OF RESULTS

The paper now discusses the estimation results as shown in Appendix B.

The estimation result shows that three of the explanatory variables, namely, interest rate volatility, sovereign risk, and regulatory quality are significant at the 1 per cent level of significance. Financial deepening (proxy for market liquidity and absorptive capacity of the financial market) was significant at the 5 per cent level of significance while GDP is significant at the 10 per cent level of significance. The result shows also that interest rate volatility, regulatory quality, financial deepening, and gross domestic product (size of the economy) exert negative impact on the dependent variable while sovereign risk exerts a positive impact. While the magnitude of the impact of interest rate volatility is -0.070959, that of sovereign risk is 0.035165, regulatory quality is -4.513009, financial deepening is -0.013237 and size of the economy is -0.000238. The baseline equation, based on the result can be written as follows, with the standard errors in brackets under the respective parameter estimates:

$$cbys_{it} = 0.596021 - 0.070959intv_t + 0.035165sovr_t - 4.513009req_t - 0.013237m2\_gdp_t$$

$$\phantom{cbys_{it} = }(0.505794) \quad (0.010818) \quad\quad (0.010736) \quad\quad (0.674348) \quad\quad (0.006323)$$

$$- 0.000238gdp_t \hfill (3)$$

$$\phantom{cbys_{it}}(0.000454)$$

In this study, we hypothesized a positive relationship between corporate bonds yield spread and interest rate volatility, however, the outcome shows otherwise. The outcome of the interest rate volatility implies that for a one percent increase in interest rate volatility, corporate bonds yield spread will decline by 0.070959. Though this outcome is not in line with the apriori expectation, the result is consistent with the findings of Batten et al. [18] and Norlizer et al. [13], though Batten et al. [18] and Norlizer et al. [13] used interest rate in their studies, while we used interest rate volatility. This result could be

explained by the fact that during periods of high volatility, fixed income security investors tend to develop apathy to investments, as much as issuers who will not want to offer higher premiums than their risk is worth. To encourage the market participants, the government may offer incentives that can assist to stabilize the volatility in the market.

Financial deepening (given as M2/GDP) is used as a proxy for market liquidity: the higher the liquidity in the market, the narrower will be the yield spread. The estimation result meets this apriori (sign) expectation. The results show that for every percentage increase in market liquidity, corporate spreads decline by 0.013237. For the size of the economy, this study hypothesized a mixed relationship – positive and/or negative – subject to the investors or issuers' point of view, and stage of economic development. A large and increasing GDP portends growth in economic activities, wellbeing of the citizens and less risk perception.

Given this argument, corporate credit spread is expected to get narrower in the face of high and growing GDP. The flip side of this argument is that in the face of high and growing GDP, there will be a greater demand for investible funds: too many projects will be competing for the available, often insufficient, resources. In the light of the principles of the availability and cost doctrine, this may push up the cost of funds, thereby increasing the spread. The estimation result shows that the size of the economy variable appeared significant, and supports the argument that a high and increasing size of the economy will reduce risk perception and help in narrowing corporate credit spread. For every one trillion naira increase in the GDP, corporate bonds yields spread will decline by 0.000238.

Sovereign risk and Regulatory Quality capture the quality of institutional framework. Sovereign risk was hypothesized to have a positive relationship, while regulatory quality was hypothesized to have a negative relationship with corporate bonds yield spread. An improvement in the quality of institutional framework presupposes a reduction in sovereign risk, and an improvement in regulatory quality: these will reduce the corporate credit spread. In a like manner, a reduction in sovereign risk will mean a stronger institutional framework and will lead to a reduction in bond yield spread. The result shows that sovereign risk meets the theoretical expectation: for a percentage increase in sovereign risk, corporate spread increases (worsens) by 0.035165. Regulatory quality, on the other hand, was hypothesized to have an inverse relationship with corporate spread. The result shows an inverse relationship, as expected, but the magnitude of the parameter lies outside the theorized range of between 0 and 1. The result shows that for a percentage increase in regulatory quality, corporate bonds yield spread will decline (improve) by 4.513009. Based on the outcome of the Sovereign risk and Regulatory Quality, we conclude that strong institutional framework helps in narrowing corporate credit spread in Nigeria.

CONCLUSION AND RECOMMENDATIONS

Empirical studies in the area of corporate bonds yield spread in the emerging market economies are, at best, very scanty. The dearth of studies in these economies stem from lack of data, and at times, inaccurate and insufficient data, where they exist. This study argued that the prime concern of investors is the real (inflation-adjusted) value derivable from their investments, rather than the absolute (nominal) value realized from such investments. In view of this, the study adjusted the coupon on the corporate bonds under study with the inflation growth rates of the respective years when such bonds were in issue to obtain the corporate bond yield. The yield on government bonds was subtracted from the corporate bonds yield for the different years to obtain the corporate bonds yield spread used in this study as the dependent variable. The dependent variable as calculated in this study produced a result that is comparable to those obtained in the economies where there is relatively adequate corporate bonds yield spread data. This clearly supports the idea that in place of the yield spread data derived from trading activities on corporate bonds (bid-ask spread), or even spreads calculated on the basis of comparison with credit default swaps and yield on corporate bonds, the inflation-adjusted corporate bonds coupons can used as the corporate bonds yield.

Macroeconomic and institutional factors were regressed on the dependent variable and the baseline equation showed that all the variables were significant, at different levels of significance. Interest rate volatility, sovereign risk and regulatory quality were significant at the 1 per cent level of significance, while financial deepening was significant at the 5 per cent level and the GDP at the 10 per cent level. The estimation result shows that a rise in interest rate volatility narrows corporate credit spread in Nigeria, though this was against the theoretical expectation. The result is however consistent with the findings of Batten et al. [18] and Norlizer et al. [13] despite the fact that Batten, et al. and Norlizer et al. [13] used interest rate in their study while we used interest rate volatility. This outcome supports the idea that both investors and issuers of bonds are as much concerned with the volatility of the interest rate as they are with the rate of interest. Again in times of high interest rate volatility, both issuers and investors develop cold-feet to fixed income securities.

Beyond the liquidity of any particular bond, the general liquidity of the financial market is very important in the determination of corporate spreads. In line with the theoretical expectation, the result shows that the liquidity and absorptive capacity of the financial markets is vital in the calculation of corporate bonds yield spread in Nigeria. For a percentage increase in the liquidity of the financial market, corporate credit spreads narrows by 0.013237. In the case of the GDP, where we hypothesized a mixed relationship, the result shows that for every 1 trillion naira increase in GDP, corporate spread will narrow by 0.000238 per cent.

In line with the theoretical expectation, an improvement in sovereign risk (reduction in sovereign risk), as well as regulatory quality, narrows the yield spread. This outcome is consistent with the finding of Elton et al. [11] who stated that even in the US, corporate

default premiums are, to a large extent, traceable to systematic, rather than unsystematic risks. In the case of regulatory quality, as the quality of regulation becomes stronger (index moves from 0 to 1), corporate spreads tend to narrow. The result supports this expectation in direction of relationship, though the magnitude of the parameter was outside the boundary specified by the originators of the index. Above all, the result shows that strong institutional framework supports a reduction in domestic corporate bonds yield spread.

The explanatory variables, to a great extent, explained the variations in the independent variable (up to 73.87 per cent of the variations). All the explanatory variables in this model are, directly or indirectly, systematic: they are related to the government in one way or the other. A simple conclusion from this therefore is that the reduction in the risk premiums paid by corporate bond issuers in Nigeria, and by extension, the cost of funds paid by borrowers in Nigeria, rests mainly on the government. This can be achieved through the strengthening of institutional framework – improvement in regulatory quality and reduction in sovereign risk, and increase in the depth of the financial market.

This study, therefore, recommends that Nigeria should evolve policies to improve her institutional framework so as to reduce corporate bonds yield spread. The authorities should also create enough liquidity in the market to achieve the same low corporate bonds yield spread. Scholars should not shy away from studies in the area of corporate bonds yield spread in the emerging markets because corporate credit spreads can also be calculated through other means that are not dependent of the trading information on corporate bonds.

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