

Corporate Bond Duration Model and Immunization Strategy in the Nigerian Bond Market

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Abstract

This study examined corporate bond duration and immunization strategy in the Nigerian bond market for the period 2001 to 2020. The Auto-regressive Distributed Lag Model (ARDL) regression method was employed to examine the data. The findings from the estimation show that corporate bond market was immunized against reinvestment risk in the short term in which bond investment risk was mitigated / protected against inflation risk. Therefore, the study recommends that there is the need for bond users to efficiently use corporate bond duration to manage inflation risk and reinvestment risk to give value to money invested and the expected returns.

Keywords: Bond Duration, Bond Market, Corporate Bond, Immunization Strategy
Inflation Rate, Interest Rate Risk, Reinvestment Risk

INTRODUCTION

This study investigates the relationship between corporate bond duration and immunization strategy in the Nigerian bond market. A bond as put forward by Omolehinwa (2017) is a financial instrument that requires the issuer to pay back the lender/ investor, or holder the amount lent plus interest over a certain period of time. In simple terms, a bond is essentially a loan made by an investor to a borrower, such as a company or the government. It is issued by both governmental and business entities and resembles a promissory note (Voigt & Benson, 2022). Bonds are issued by publicly traded companies to fund business expansion projects or to sustain ongoing operations (Hayes, 2022).

In recent years, the Nigerian bond market has seen significant growth and development, as it has been a vital source of funding for governments, businesses and individuals, providing avenue for them to raise funds and finance their projects. The Nigerian bond market includes government bonds, corporate bonds, and other bonds like asset-backed and mortgage-backed securities. The Market for Bond in Nigeria has witnessed mixed fortunes over the years, owing to policy inconsistencies. Despite participation of corporate bodies through the corporate bond sector of the market since 1981, the amount raised has not been encouraging, compared to other instruments like equity (Chinedu, Magaji, & Musa, 2021). In contrast to the recent upsurge in the governmental segment of the Nigerian bond market, in recent times, corporate bodies have virtually avoided the bond market. Given the significance of the capital market as the catalyst for a country's socioeconomic growth, the need to develop this segment of the bond market, a crucial component of the capital market, cannot be over-emphasized (Ndudi, 2020).

A bond's duration is an important factor in determining its risk and return characteristics, and investors use it to evaluate the suitability of their investments. A bond's duration is the time it takes to repay its principal, including periodic coupon payments. The concept of immunization is also an important consideration for investors, as it is a strategy used to minimize the risk of loss from changes in interest rates. Immunization is a process of adjusting the duration of a bond portfolio to match the duration of a particular liability, such as a loan or other debt (Irabor, 2022). This study will examine the relationship between corporate bond duration model and immunization strategy in the Nigerian bond market. It will also analyze the impact of different factors affecting performance like market risk, default risk, and interest rate risk among others with the duration of corporate bonds, and the effectiveness of immunization strategies for mitigating the risk of loss due to interest rate changes.

In the problem of investigation, It is possible to hypothesize that the under performance of the Nigerian bond market is not entirely unrelated to returns that fluctuate due to interest rate variability that is Market risk (difficulty selling bonds fast without having to make large price adjustments), default risk (issuer failing to pay agreed-upon value of debt instrument), and interest rate risk concessions), and investor uncertainty (investor's reluctance to invest). Immunization can prevent these variations in returns which is the cross of this study. The issue develops as a result of reinvestment and fluctuating interest rates. The issue arises because reinvestment revenue will fluctuate when interest rates change (Copeland, Weston, & Shastri, 2005). It is also possible to protect a bond or a portfolio of corporate bonds against these risks (Irabor, 2022).

Our goal is to monitor changes in bond transactions, determine if a certain form of corporate bond is protected against reinvestment risk, and see how a corporate bond

duration model may be utilized as a control or a verification approach. The study specifically seeks to provide answers to the following research questions: is there a relationship between the mean yield of corporate bonds and the debt maturity? and that of connection between the average yield on corporate bonds and the pace of inflation? From the review of literature, this study seeks to bridge the gap in understanding the specific dynamics of the corporate bond market within Nigeria, including factors influencing corporate bond issuance, investor preferences, regulatory framework, and historical trends in corporate bond performance. This study aims to investigate the specific impact of factors such as market risk, default risk, and interest rate risk on corporate bond duration in the Nigerian context, thereby filling the gap in existing literature. It will deepen the exploration of immunization strategies as risk management tools in the Nigerian bond market, addressing the lack of depth in current research and assessing the effectiveness of various techniques in mitigating risk. Again, through ensuring coherence between research questions, objectives, and the overarching goal of examining the relationship between corporate bond duration model and immunization strategy, this study seeks to enhance clarity and relevance in addressing this study's gap. The study will incorporate empirical evidence and data analysis, thus providing robust support for its findings regarding corporate bond performance and immunization strategies in the Nigerian bond market, thereby filling the gap in existing literature lacking empirical validation.

The study's major goal is to examine the relationship between corporate bond duration model and immunization strategy in the Nigerian bond market. The specific objectives are to:

- determine the effect of short-term debt maturity on mean yield of corporate bonds (which is the corporate bond duration) in the Nigerian bond market.
- examine how long-term debt maturity affect mean yield of corporate bonds in the Nigerian bond market.
- examine the relationship between rates of inflation and mean yield of corporate bonds in the Nigerian bond market.

LITERATURE REVIEW

Conceptual Review

Corporate Bonds

Corporate bonds are debt securities issued by corporations to raise capital (Brealy, Myers & Allen., 2017). Investors who purchase corporate bonds are essentially loaning money to the company and in return, the company promises to pay back the principal amount along with interest over a specified period. Corporate bonds are typically

considered less risky compared to stocks, but risky than government bonds (Brealy *et al.*, 2017). Corporate bonds can be classified into different categories based on their characteristics such as maturity date, coupon rate, credit rating, and convertibility. The risk associated with corporate bonds includes credit risk (the risk of the company defaulting on its debt obligations), interest rate risk (the risk of fluctuations in interest rates affecting bond prices), and market risk (economic conditions impacting the bond market). Corporate bonds are assigned credit ratings which means that higher credit ratings imply lower risk and vice versa (Brealy *et al.*, 2017).

According to studies, Nigerian corporate bonds typically yield more than government bonds due to their higher risk. (Oyewunmi, Olaleye & Alade, 2017). Nigerian corporate bonds are debt securities issued by corporations in Nigeria to raise funds from investors. These bonds are a form of fixed-income investment where the issuing company promises to repay the invested amount along with interest to the bondholders over a specific period. Nigerian corporate bonds play a crucial role in the country's capital markets as they provide an avenue for companies to raise long-term financing for various projects and initiatives (Olaniyan & Olaniyan, 2018). The Nigerian corporate bond market has been growing steadily in recent years, with more companies opting to issue bonds to diversify their funding sources and take advantage of favorable market conditions. The Securities and Exchange Commission (SEC) in Nigeria regulates the issuance of corporate bonds to ensure transparency, investor protection, and market integrity (SEC, 2021).

2.1.2 Bond Duration and Interest Rate Risk

Bond duration measures how sensitive a bond's price is to interest rate changes. Studies have found that the duration of Nigerian corporate bonds is typically longer than that of government bonds, reflecting the higher risk associated with corporate bonds (Adeniyi, Adeniyi & Ogundele 2018). The longer duration of corporate bonds also increases their sensitivity to changes in interest rates, making them more risky investments. In general, bonds with longer duration are more sensitive to changes in interest rates than those with shorter duration, as such investors need to understand the duration of a bond in order to properly assess the risk associated with investing in it. In the Nigerian bond market, the duration of corporate bonds has been found to vary significantly, depending on the type of bond, the issuer, and the maturity date. For example, a study by Aminu *et al.*, (2018) found that the duration of Nigerian corporate bonds ranged from 0.7 to 6.4 years, with the average duration being 3.5 years.

Interest rate risk is a significant concern for corporate bond investors, as fluctuations in interest rates can impact the value of fixed-income securities. In Nigeria, the interest rate environment has been highly volatile in recent years, with and Central Bank raising and lowering rates in response to economic and financial developments

(Oyewunmi et al., 2017). Studies have found that interest rate of corporate bonds typically have higher risk than government bond due to their higher default risk (Adeniyi et al., 2018). Bond duration plays a vital role in measuring the sensitivity of bond prices to changes in interest rates. Longer-duration bonds are more sensitive to interest rate changes, while shorter-duration bonds are less affected. Researchers such as Smith (2018) and Kwan (2019) have explored the relationship between bond duration and interest rate risk in the context of the Nigeria bond market.

Reinvestment Risk and Inflation Rate

Reinvestment risk is a significant concern for bond investors, referring to the risk that future cash flows from bond investments will need to be reinvested at lower rates of return than the original investment. This risk is particularly pertinent in the context of corporate bonds in Nigeria, where studies have shown that the reinvestment risk associated with corporate bonds is higher than that of government bonds. This heightened risk is attributed to the higher default risk associated with corporate bonds, as highlighted in research by Oyewunmi et al. (2017). In addition to reinvestment risk, the inflation rate plays a crucial role in determining the real return on bond investments, particularly in the realm of corporate bonds. Research indicates that inflation can have a negative impact on the returns of Nigerian corporate bonds. This occurs because higher inflation tends to lead to higher interest rates, which, in turn, result in lower returns on corporate bonds, as demonstrated in studies by Adeniyi et al. (2018). Furthermore, the impact of reinvestment risk and inflation rate on corporate bond investments in Nigeria has been explored in depth in studies conducted by Adeyemi (2020) and Okonkwo (2017).

These studies shed light on the intricate relationship between these factors and their implications for investors in the Nigerian corporate bond market. It is thus necessary and essential for investors to understand and manage reinvestment risk and monitor inflation rates by making informed decisions regarding corporate bond investments in Nigeria.

Immunization Strategy and Process

An immunization strategy is used by investors to safeguard their portfolios against interest rate risk or against changes in interest rates. In general, investors use immunization strategies to limit their exposure to interest rate risk by matching the duration of their portfolio to the expected duration of their liabilities. In the Nigerian bond market, immunization strategies have been found to be effective in reducing the risk associated with investing in bonds. For example, a study by Adeyemi et al., (2015) found that immunization strategies were effective in reducing the risk of loss due to changes in interest rates in the Nigerian bond market. Also in Nigeria, studies have

found that immunization strategies have been effective in mitigating the interest rate risk of corporate bonds (Oyewunmi et al., 2017). More so, immunization as stated above is a risk management strategy that aims to protect bond portfolios from interest rate fluctuations. The process again is by matching the duration of assets with liabilities, investors can immunize their portfolios against interest rate risk. Other researchers like Okafor (2016) and Ahmed (2018) have discussed the process and effectiveness of immunization strategies in the Nigeria bond market.

In conclusion, the literature on corporate bond duration and immunization strategy play a crucial role in managing interest rate risk in the Nigeria bond market which suggests that investors need to understand the duration of a bond in order to properly assess the risk associated with investing in it. Furthermore, immunization strategies have been found to be effective in reducing the risk associated with investing in bonds by understanding the impact of factors such as bond duration, reinvestment risk, inflation rate, and immunization strategies, investors can make informed decisions to maximize their bond portfolios.

Theoretical Review and Framework

The Duration Matching Principle and Redington's Immunization Model were reviewed and chosen as the framework for this study as they are foundational concepts in fixed-income portfolio management, offering complementary approaches to mitigating interest rate risk.

The Duration Matching Principle advocates aligning the duration of assets with liabilities to manage interest rate risk effectively (Macaulay, 1938). By matching durations, investors aim to immunize their portfolios against interest rate fluctuations, ensuring minimal impact on portfolio value. The principle's simplicity and effectiveness make it applicable across various sectors, including the Nigerian bond market, where it offers a practical framework for corporate bond issuers and investors to manage interest rate risk. However, criticisms exist, such as its assumption of a parallel shift in the yield curve and challenges in accurate interest rate forecasting.

Redington's Immunization Model complements the Duration Matching Principle by considering reinvestment risk alongside interest rate risk. The model advocates matching the duration of assets with liabilities while optimizing returns through proactive reinvestment strategies (Redington, 1952). Its general application extends to financial institutions, pension funds, and insurance companies, offering practical guidance for managing interest rate risk in bond portfolios (Shiu, 2022). However, critiques include its assumption of a static interest rate environment and challenges in accurate duration estimation and reinvestment assumptions.

This study posits that as regards the Nigerian bond market, integrating the Duration Matching Principle and Redington's Immunization Model provides a comprehensive approach to managing interest rate risk in corporate bond portfolios. It is thus necessary to align the duration of corporate bonds with liabilities and considering reinvestment strategies, market participants can enhance portfolio stability and optimize returns. While each approach has strengths and weaknesses, their combined application offers robust risk management and portfolio optimization in fixed-income investing. This integrated framework guides corporate bond issuers and investors in the Nigerian bond market to navigate interest rate volatility effectively, ensuring prudent risk management and sustainable portfolio performance.

Empirical Review

Nie, Wu, Wang, and Chen (2021) empirically explored the duration strategy for bond investment, focusing on the use of Macaulay duration. This metric quantifies the time required for the present value of a bond's future cash flows to equal its current market price, taking into account the prevailing interest rate. It involves multiplying each present value by the number of years until the cash flow occurs, summing these values, and dividing by the discounted sum of the bond's cash flows, resulting in a weighted average of the time required for the bond's cash flows to be paid. By computing the duration of individual bonds, such as a four-year duration for the first bond and a 1.96-year duration for the second, investors gain insights into the timing of cash flow receipts. Additionally, the study explores immunization as a strategy to mitigate the impact of interest rate fluctuations. It investigates methods for calculating duration and discusses how investors can use this knowledge, along with immunization strategies, to hedge against risk.

Wang and Han (2021) conducted a study on Bond Pricing and Immunization Strategy - Asset Allocation in Bond Investment. Their research delved into the factors influencing bond pricing in the bond market and explored the risk aversion strategy known as immunization, which is analyzed through duration. They performed sensitivity analyses on four different scenarios, varying yield rates and coupons, as well as increasing yield rates and coupons at a specific rate. Their findings revealed that different yield rates, coupons, and increasing yield rates exhibit a linear relationship with bond prices, while increasing coupons with a fixed ratio demonstrate a nonlinear relationship. Through the immunization strategy, they proposed developing an asset portfolio comprising a specific allocation ratio. This approach not only reduces the risks borne by investors but also maximizes their interests to a certain extent. The combination of a certain percentage of zero-coupon government bonds and corporate bonds effectively shields investors from risk.

In their research, Nkwede, Uguru, and Nkwegu (2016) investigated the development of the corporate bond market in Nigeria and assessed the influence of macroeconomic factors on this development. They considered corporate bond market capitalization as the endogenous variable, while various macroeconomic variables served as exogenous factors. Using time series data spanning 33 years (1980-2013), they employed descriptive statistics and ordinary least square regression techniques to analyze the data and determine the significance of the variables. Their findings revealed that several fundamental macroeconomic factors, including exchange rate, savings, inflation rate, banking sector development, interest rate, fiscal balance, bond yield, and foreign direct investment, significantly influence the development of the corporate bond market in Nigeria. However, the results also indicated that these macroeconomic factors do not exhibit a consistent pattern in stimulating the growth of the corporate bond market. Notably, savings and exchange rates emerged as particularly significant drivers compared to other macroeconomic factors during the period under review.

METHODOLOGY

The study's approach was based on secondary data, in particular, a time series data analysis based on longitudinal studies, as it concentrates on the population of the Nigerian bond market for a length of time specifically 20years sample size which ranges from 2001 to 2020 with a view to noticing changes in corporate bond transactions and how duration model technique may be used to check or regulate these transactions which is in line with Thomas (2022) definition of a longitudinal study. Additionally, data are gathered at least two periods in time, in longitudinal studies so that the researcher may track changes over time Sedgwick (2014), because the values have already happened. More so, this is in line with Sharma (2019), as well as Sedgwick's (2014) research on ex-post facto which is the situation when the researcher is not permitted to change the values of the independent variables since they have already happened and cannot be modified. Being an ex-post facto research, the study utilized only secondary data, which bothered on debt maturity, market mean yield rate (corporate bonds) and inflation rate which are time series data and ranges from 2001 to 2020.

Data on the dependent variable and all of the independent variables for the time period under consideration were gathered using the Nigerian Stock Exchange Fact Book, the Statistical Bulletin, Annual Reports of the Central Bank of Nigeria (CBN), the Debt Management Office of Nigeria (DMO), and other pertinent secondary sources.

Model Specification/ Underpinning Theory

A multivariate linear regression model was developed and used to fulfill the study's goals. The following corporate bond model applicable is:

Model: Corporate Bond Model

The model specification based on the dynamic capability theory is stated functionally as follows;

$$MYRCB = f(STMB, LTMB, IFR) \quad (1)$$

While this can also be rewritten in an econometric or equation form stated as:

$$MYRCB = \beta_0 + \beta_1 STMB_t + \beta_2 LTMB_t + \beta_3 IFR_t + U_t \quad (2)$$

This is the simple ARDL model;

Where;

MYRCB = mean yield rate of corporate bonds

STMB = short term maturity structure of bonds

LTMB = long term maturity structure of bonds

IFR = inflation rate

U = stochastic disturbance term or error term

Apriori expectation is $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$ - - - - - (3)

In simple terms, as the short-term maturity structure of bonds (STMB) increases, the mean yield rate of corporate bonds (MYRCB) will also increase ($\beta_1 > 0$) meaning that shorter-term bonds are expected to have higher yields. Similarly, as the long-term maturity structure of bonds (LTMB) increases, the mean yield rate of corporate bonds (MYRCB) will also increase ($\beta_2 > 0$) indicating that longer-term bonds are expected to offer higher yields. On the other hand, as the inflation rate (IFR) increases, the mean yield rate of corporate bonds (MYRCB) is expected to decrease ($\beta_3 < 0$) suggesting that higher inflation rates may lead to lower yields on corporate bonds. These expectations are based on the assumption that changes in the maturity structure of bonds and inflation rates will have predictable effects on the mean yield rate of corporate bonds.

β = sensitivity/elasticity (that is, the coefficient of the variables)

Inflation rate, a macro-economy variable used instead of interest rate in the model specified above is a measure of the reinvestment risk of bond, according to Fishers hypothesis interest rate was found to be directly proportional to inflation rate (Blanchard, 2000). In other words, one of the pillars of neoclassical monetary theory is that nominal interest rates rise in lockstep with expected inflation, while the real rate

remains unaffected. Inflation is an important factor to consider when investing in corporate bonds. Studies have found that inflation has a negative effect on the returns of Nigerian corporate bonds, as higher inflation leads to higher interest rates, which in turn leads to lower returns on corporate bonds (Adeniyi *et al.*, 2018).

Data Estimation Method

In this study, data are estimated using an econometric technique called the Auto-regressive Distributed Lag Model (ARDL). This technique also captures the short run and the long run effect or impact of the independent variables. This was accomplished using the econometric computer program E-view 9. The choice of this data estimating technique is dependent on the accurate estimations that can be produced by applying the technique. To enhance the outcomes in order to comply with the natural rule of thumb of 30 and above more frequent data observations as attainable in statistics generally, the study's yearly data collection was adjusted to quarterly intervals of observations. That is, for the central limit theorem to hold true, the sample size must be equal to or larger than 30. The mean and standard deviation of a population may be predicted by a sufficiently large sample (Simply, 2022).

DATA ANALYSIS AND INTERPRETATION OF RESULTS

There are three subsections in this section: The co-integration tests are introduced after the unit root test. The ARDL analysis for the study is then presented as a result of this.

Test for Stationarity Using the Unit Root Test (Kwiatowski-Phillips-Schmidt, or KPSS)

Table 1:

Variables	Levels.			First Difference			Order of integration
	<i>KPSS test stat. (5%)</i>	<i>critical value (5%)</i>	Inference	<i>KPSS test stat. (5%)</i>	<i>critical value (5%)</i>	Inference	
MYRC	0.140	0.146	Stationary	-	-	-	I (0)
STMB	0.147	0.146	Non-Stationary	0.131	0.146	Stationary	I (1)
LTMB	0.315	0.146	Non-Stationary	0.101	0.146	Stationary	I (1)
IFR	0.125	0.146	Stationary	-	-	-	I (0)

Source: Computation by author using E-view 9 (2023)

The results showed that the mean yield on corporate bonds (MYRCB) and the inflation rate (IFR) were stationary at levels, that is, at order zero I (0), while other variables such as the short-term maturity structure of bonds (STMB) and the long-term maturity structure of bonds (LTMB) were stationary at first difference, that is, at order one I (1). Any effort to describe the dynamic function of the variables in the level of the series will be improper and may result in misleading regression since the variables were a mixture of I(0) and I(1). As a result, the outcome of the unit root test analysis gave a strong argument for the employment of the Auto-regressive Distributive Lag (ARDL) method. Additionally, all of the P-values fell below the threshold of 0.05, thereby rejecting the null hypothesis that unit roots exist in all of the variables. The following step is to determine if the variables have a long-term relationship because the variables were integrated at I(0) and I(1). The long-run study thus employed the ARDL limits test for co-integration.

ARDL Bounds Tests for Co-integration

Table 2:
ARDL Bounds Test for Cointegration

Included observations: 78
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	1.127216	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Since in the above computed ARDL Bounds Test for Cointegration shows that the F Statistic value (1.127) is less than lower bound critical value at the 5% significance level with the (2.86), the null hypothesis of no long-run relationship cannot be rejected. It can therefore be inferred that the variables are not cointegrated. That is, no long run

relationship exists among the variables in the models implying the existence of a short-run relationship. Thus, the study shall rely on ARDL modeling for the analysis.

Auto-regressive Distributed Lags (ARDL) Modeling Analysis: The regression result obtained from the quarterly periods of observations adopted is the Auto-regressive Distributed Lags (ARDL) techniques, which extracts are presented in the table of the variables as stated below. Model: Corporate Bond Duration and Immunization

Table 3: Regression Result Extract:

Dependent Variables	Independent Variable	Coefficient	T-Value	Probability Value
MYRCB (Y)	Constant (C)	0.961	0.82	0.41
	STMB (X ₁)	-0.002	-1.93 *	0.05
	LTMB (X ₂)	-0.177	-2.13 *	0.03
	IFR (X ₃)	-0.00	-0.1	0.91
$R^2 = 0.99$ $\bar{R}^2 = 0.98$ $F = 605.01$ $DW = 2.2$				

Note: The symbol of * in the above table indicates T-value that is significant at 5% level.

From the above regression result, it would be observed that the coefficient of determination ($R^2 = 0.99$) revealed that about 99% of the systematic variation in the dependent variables (Mean Yield of Corporate Bond) is demonstrated by the high R^2 values displayed in the result, really a very Statistically significant link exists between the mean yield of corporate bonds (Y), that serves as both the explanatory and the dependent variable factors (short term maturity structure, long term maturity structure of bond and inflation rate). The adjusted coefficient of determination (\bar{R}^2) with a value of 0.98 shows that about 98% of what happens to corporate bond in Nigerian bond market between 2001 to 2020 was greatly explained by short maturity structure, long term maturity structure and inflation rate.

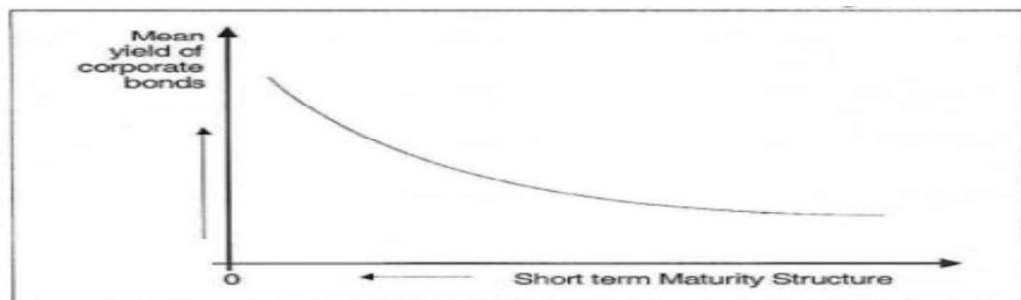
The F-test, with a computed F-value of 605.01, demonstrates that, at the 5% level of significance, there is no linear connection between the independent variables (X₁, X₂, and X₃) and the dependent variable (mean yield of corporate bond Y) as a result of the F- calculated value being higher than the crucial levels, given that the bond length and its vaccination would be best represented and studied using a non-linear regression model, it is implied that the dependent and independent variables are not linearly connected.

From the aforementioned, it would recall that the coefficient of short and long-term maturity structures of bond as they relate to the mean yield of corporate bonds

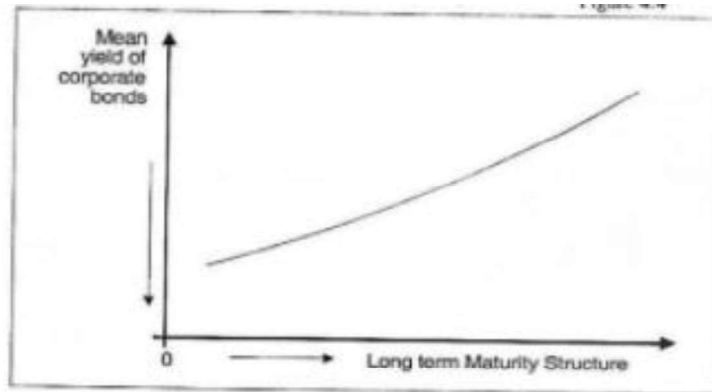
represent corporate bond duration. Therefore, the short-term maturity structure of bond duration is -0.002. This means that a 1% increase in short term maturity structure would lead to 0.002% decrease in the mean yield of corporate Bonds. The negative association between the mean corporate bond yield and the short-term maturity structure was highlighted by the t-value of -1.93, which is significant at the 5% level.

In terms of long-term maturity structure of bond and the mean yield of corporate bond, the duration value stood approximately at -0.18. This therefore indicate that a 1% increase in long term maturity structure of bond would lead to 0.18% decrease in the yield of corporate bonds. The t-test demonstrated the statistical significance of the negative association between the mean corporate bond yield and the long-term maturity structure at the 5% level.

In contrast, the yield risk (duration) of the long-term maturity structure of the corporate bond market is higher (-0.18) than that of the short-term maturity structure under (-0.002). The graphical representation of corporate bond mean yield to term structure of bond from our regression results is show as:



Explanation: The mean yield of corporate bonds and the short-term structural maturity of the bond have a negligible correlation.



Explanation: The mean corporate bond yield and the bond's long-term maturity structure have a strong positive association.

Relating corporate bonds to the concept of immunization, it was found out that short term maturity structure of bond coefficient value (-0.002) for duration equals that of inflation rate coefficient value of -0.002, and long-term maturity structure of bond coefficient value (-0.177) for duration are not equal to inflation rate coefficient value (-0.002). The rate of inflation as we known measures re-investment risk. This, therefore means that corporate bonds in the short term are immunized since the coefficient value -0.002 is equal to that of inflation rate value, and long-term maturity structure of bond are not immunized, since the coefficient value did not equal the value of inflation rate coefficient (-0.002)

The Durbin-Watson value of 2.2 shows that the model was correctly specified since it was free from the problem of auto correlation, and using the rule of thumb the values are greater than the values of the F Statistics. The regression results in all revealed that in corporate bonds, in the short-term maturity structure, the bond market were immunized against reinvestment risk which thereby corroborate or rather invalidates the works of Redington (1952), Punithavathy (2001), Adeyemi et al., (2015), Oyewunmi et al. (2017), and that of Copeland *et al*, (2005).

CONCLUSION AND RECOMMENDATIONS

As interest rates/inflation rates tend to change over time, bondholders are vulnerable to reinvestment risk and interest rate risk. The interest risk (duration) is stemming from the relationship between rate of returns (yield) and the structure of the bond, while the rate at which interest income might be invested in the future can cause reinvestment risk, at lower rate due to inflation. The study therefore examines how bondholders/ Investors/ managers of bonds can use the corporate bond duration model strategy to test

whether a particular type of bond is immunized against reinvestment risk. The conclusion that was drawn from this study is that, in the Nigerian bond market, corporate bonds, in the short term were immunized against re-investment risk, and while the long-term maturity structure bonds were not immunized against reinvestment risk. This therefore implies that bondholders, investors and managers are exposed to reinvestment risk and market risk. In order to serve as a guide against (immunized) reinvestment risk and market risk this study recommended that bond holders should strive towards equating market risk (bond duration) to the current rate of inflation/interest rate (re-investment risk) in order to achieve a specified return target in the face of changes in interest/inflation rates. This will make the Nigerian Bond Market attractive just like it is in developed economies where instruments are created to protect the bond markets and its' investors. A prominent example is the United States of America, with the Treasury Inflation Protected Security (TIPS) instrument which automatically regulates the bond market.

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