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Risk and Yield on Government Savings Bonds in Nigeria. A Time Series Study

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Abstract
This study examined the effect of risk on Government Savings Bonds in Nigeria. Time series data were sourced from Central Bank of Nigeria Statistical bulletin, publications of Nigeria Bureau of Statistics and Nigeria debt management office. Yield on saving government bond was modeled as the function of Liquidity risk measured by variation in rate of money supply, Interest rate risk measured by variation in real interest rate, Exchange rate risk measured by variation in exchange rate of Naira per US Dollar and Default risk measured by anticipated return on a bond minus the return a similar risk-free investment would offer. Ordinary least square methods of cointegration, granger causality test, unit root test and Vector error correction model. The study found that 69.4 variations in federal government savings bonds were explained by the variables included in the model. The lag selection validates the application of lag I. at lag I, the study found that the variables are positively related to federal government savings bond. The study conclude that risk determine the yield of bonds in the Nigerian bond market. We recommend that management of the Nigeria bond market should ensure that their security exposures are adequately secured through proper scrutiny of investors in order to risk associated with different bonds in the Nigeria bonds market.

Keywords: *Risk, Yield, Government Savings Bonds, Nigeria. Time Series Study*

INTRODUCTION

The Nigerian savings bond is a long-term, fixed-income security issued by the government. The primary function is to facilitate the government's borrowing needs, enabling it to fund various public expenditures. Interest payments on savings bonds are made semi-annually, and the rate is fixed at the time of issuance. This fixed rate, known as the coupon rate, ensures that investors receive a consistent income, regardless of fluctuations in the market interest rates. The price of savings bonds in the secondary market, however, can fluctuate based on changes in interest rates and other economic factors, offering opportunities for traders to capitalize on price movements. Increase in interest rate of existing bonds with lower interest rates tends to diminish, potentially leading to capital losses if the bonds are sold prior to maturity. This risk underscores the importance of understanding the inverse relationship between bond prices and interest rates, akin to a seesaw, where an increase in one results in a decrease in the other. Those who sell their bonds before maturity during a period of rising interest rates may receive less than the bond's face value,

incurring a loss. Inflation erodes the purchasing power of the fixed interest payments from bonds over time. The concept of real return which is the nominal return adjusted for inflation, is critical in understanding the impact of inflation on investments.

The risk-return tradeoff, a critical concept for every investor, It represents the relationship between the level of risk associated with an investment and the potential return it offers. Low-risk investments, such as government bonds, provide safety but modest returns, while high-risk investments, like speculative corporate bonds, offer the potential for higher returns but come with greater risk. The classical view accepts the fact that savings and investment are equal and that aggregate savings and aggregate investment are necessarily equal. They, however, held that every act of increased savings by an individual necessarily bring into existence a corresponding act of increased investments. The relationship between interest rates and the credit market delivers an average upward-sloping real term structure (Nnenna, Origin & Ubah, 2023). On average, fixing investors' expectations about future short-term rates, long-term yields are higher than short-term yields. This is because long-term bonds command a higher term premium; the larger the horizon of a bond, the more likely it will drop in value during bad states, because they have higher exposure to variations in interest rates. Long-term bonds have a higher elasticity with respect to endogenous changes in the share of net worth held by risk-tolerant investors (Chaudhryet al., 2014b).

At the risk of caricaturing the activities of private purchasers of securities and of misrepresenting some distinguished authors, it is possible to envisage the securities market. The essential unity of financial markets arises from the willingness of many lenders and borrowers to alter the maturity structure of their assets and liabilities, within relatively narrow ranges, as the structure of interest rates alters (Chen et al., 2020). Borrowers, who otherwise prefer to obtain funds for fairly long periods, are willing to shorten their commitments, provided long-term interest rates rise in relation to short-term rates. Lenders otherwise prefer to obtain the liquidity attributes of relatively short-dated instruments to lengthen the maturity of their assets, as a result of such a shift in relative rates. These reactions lowers long rates and raise short rates. Cenley (2020) affirmed that investment in bonds are among the safest in the world nevertheless he identified seven types of risks associated with it, which include inflation risk, interest rate risk default risk, downgrade risk, liquidity risk, reinvestment risk, and rip-off risk. Usually, sovereign bonds are less risky than corporate bonds.

Despite the associated risks, investment in bonds tend to stand out over stocks because of high risk of relativity of stock prices and of their potentials of higher gravity of loses. The direct and indirect risk premium effects are properties of the demand for foreign bonds given the distributions of the asset returns and wealth conditional on the information available to the investors. In order to examine how these effects work in equilibrium, consider the term structure of interest rates where some shocks to short term interest rates are not transmitted to long term interest rates and the risk premium of long term bonds is only affected by them. The term structure of interest rates, or the yield curve, is a central element in much of modern monetary and financial economics. It is also an important concept for financial institutions. Given its central role in both theory and practice, it is unfortunate that the main body of theory developed to understand the term structure the expectations hypothesis which holds that long interest rates are determined by the expected future

path of short-term interest rates plus a constant, but potentially maturity-dependent, term premium has been resoundingly rejected by large number of studies using data from different countries, time periods and maturity segments.

The relationship between risks on term structure of interest rate of different maturities is a subject that has interested economists and policy makers for decades. The most commonly discussed explanation of this relationship is the expectations theory of the term structure. The pure expectations hypothesis states that, in equilibrium, the expected returns from different investment strategies with the same horizon should be equal (Aobdia et al., 2020). The expected return from investing in an n-period bond should equal the expected return from investing in a one-period bond over n successive periods. If this theory holds then long-term rates can be expressed as a weighted average of current and expected short-term rates. More importantly, it suggests that if policy makers wish to alter long-term rates through their influence on short-term rates they must succeed in altering the market's expectations of future interest rates. From the above, this study examined the effect of risk on the yield of government treasury bond in Nigeria.

LITERATURE REVIEW

Rational Expectation Hypothesis

The expectations hypothesis of the term structure states that the interest rate on a long-term bond will equal an average of the short-term interest rates that people expect to occur over the life of the long-term bond (Mishkin, 1999). For example, if people expect that short-term interest rates will be 10% on average over the coming five years, the prediction is that the interest rate on bonds with five years yield to maturity will also be 10%. The key assumptions behind this hypothesis are that short-term and long-term securities can be treated as perfect substitutes, investors are risk neutral and the shape of the yield curve is determined by investors' expectations of future interest rates and future inflation (Michaelsen, 1965). To see how the assumption that securities with different maturities are perfect substitutes leads to the expectations hypothesis, the following two investment strategies are considered. Buy a one-year bond, hold it for one year, and reinvest the proceeds in another one-year bond, one year from now.

According to the expectations hypothesis, both strategies should yield exactly the same result, since investors are indifferent to bonds of different maturities, and bonds are perfect substitutes. The interest rate on the two-year bond must equal the average of the two one-year interest rates. For example, assume the current interest rate on the one-year bond is 7% and an investor's expectation is that the interest rate on the one-year bond next year will be 10%. If the investor pursues the strategy of buying the two one-year bonds, the expected return over the two years will equal 8.5%, which is (7%+10%)/2. The investor will be willing to hold the two-year bond only if

the expected return per year of the two-year bond is equal to or greater than 8.5%. In other words, the interest rate on the two-year bond must equal 8.5%, the average interest on the two one-year bonds. The expectations hypothesis explains why interest rates of different maturities tend to move together over time. Historically, an immediate increase in short-term interest rates tends to be higher in the future. As such, a rise in short-term interest rates will raise people's expectations of future short-term rates. In this theory long-term rates are the average of expected future short-term rates; therefore a rise in short-term rates will also raise long-term rates, causing short-term rates and long-term rates to move together over time.

Liquidity Premium Theory

Since each of the above two theories explain empirical facts that the other cannot, a logical step is to combine them, which leads to the liquidity premium theory. This theory of the term structure states that the interest rate on a long-term bond will equal an average of short-term interest rates expected to occur over the life of the long-term bond, plus a premium that responds to supply and demand conditions for that bond (Mishkin, 1999). The liquidity premium theory modifies the expectations hypothesis by assuming that investors are risk-averse; therefore they will demand a premium for long-term bonds because of interest rate risk. It is assumed that investors require a liquidity premium to induce them to lock up their funds for longer-term maturity (Howells and Bain, 2002). That is, investors must be paid an extra return in the form of an interest rate premium to encourage them to invest in long-term securities and compensate them for the increased risk (Van Zyl, Botha & Skeritt, 2003). The liquidity premium theory's main assumption is that bonds of different maturities are substitutes, but not perfect substitutes, which means that the expected return on one bond does influence the expected return on a bond of a different maturity. Liquidity premium theory also allows investors to prefer one bond maturity over another. Investors tend to prefer shorter-term bonds because these bonds bear less interest-rate risk. As such, if the investors were to hold bonds of longer maturities they must be offered a liquidity premium to induce them to do so.

Preferred Habitat Theory

In most microfinance models, the interest rate for a given maturity depends on the willingness of a representative agent to substitute consumption from today toward that maturity. The consumption based view of the term structure contrasts with a more informal preferred-habitat view, which has been proposed by Culbertson (1957), and Modigliani and Sutch (1966) and is popular within central banks and the financial industry. According to that view, there are investor clienteles for specific maturity segments, and the interest rate for a given maturity is mainly driven by shocks affecting the demand of the corresponding clientele. The term structure thus exhibits a degree of segmentation. The preferred-habitat view has been used to interpret numerous market episodes.

Conceptual Review

Risk

Risk is the potential that a chosen action or activity (including the choice of inaction) will lead to a loss. The notion implies that a choice has an influence on the outcome. Potential losses

themselves may also be called risks. There are numerous kinds of risks to be taken into account when considering capital budgeting including:

i. Corporate risk
ii. International risk (including currency risk)
iii. Industry-specific risk
iv. Market Risk
v. Stand-alone risk
vi. Project-specific risk

Each of these risks addresses an area in which some sort of volatility could forcibly alter the plan of firm managers. Market risk involves the risk of losses in position due to movement in market positions (Ahmed, 2013). There are different ways to measure and prepare to deal with risks as well. One such way is to conduct a sensitivity analysis. Sensitivity analysis is the study of how the uncertainty in the output of a model can be apportioned to different sources of uncertainty in the model input. A related practice is uncertainty analysis which focuses rather on quantifying uncertainty in model output. Uncertainty and sensitivity analysis should be run in tandem. Another method is scenario analysis, which involves the process of analyzing possible future events by considering alternative possible outcomes (Ahmed, 2013).

It might consider sub-sets of each of the possibilities. It might further seek to determine correlations and assign probabilities to the scenarios. Then it will be in a position to consider how to distribute assets between asset types. The institution can also calculate the scenario-weighted expected return. It may also perform stress testing, using adverse scenarios. While appraising projects, future cash flows are estimated using probability measures like forecasting techniques. These measures do not give a true picture of future events. To avoid uncertainty, convert expected future cash flows into certain cash flows. Certain cash flows are cash flows obtained by multiplying uncertain cash flows with a predetermined base known as certainty-equivalent coefficient. A certainty-equivalent coefficient is factor that determines the risk associated with future cash flows (Ahmed, 2013). Risky investments have a low certainty equivalent rating, hence they are avoided. This is because the probability of netting the estimated cash flows is unlikely.

A bonds return is affected by factors such as sales, investments, tax rate and cost of sales. Sensitivity analysis measures the extent to which the project's cash flows change in response to changes in one of these factors. The sensitivity analysis process involves identifying the factors that influence the project's cash flows, establishing a mathematical relationship between these factors and analyzing how a change in each of these factors affect the project's cash flows. If a project's cash flows are sensitive to changes in any of the above-listed factors, it is considered risky and hence avoided. Risk is linked with possible hazards and dangers, while in finance it is a technical matter of unpredictability in expected outcomes, both negative and positive. In other businesses and political settings, risk is closely associated with the spirit of enterprise and value creation (Power, 2007). (Ale, 2009) defined risk as “the objectified uncertainty regarding the occurrence of an undesired event, risk is inherent in any walk of life and can be associated with

every human decision-making action of which the consequences are uncertain. Over the last decades, risk analysis and corporate risk management activities have become very important elements for both financial as well as non-financial corporations. Firms are exposed to different sources of risk, which can be divided into operational risks and financial risks.

Operational risks or alternatively business risks relate to the uncertainty regarding the firm's investments and investment opportunities, and are influenced by the product markets in which a firm operates. In addition to operational risks, unexpected changes in e.g. interest rates, exchange rates, and oil prices create financial risks for individual companies. As opposed to operational risks, which influence a specific firm or industry, financial risks are market-wide risks that can affect the financial performance of companies in the whole economy. Both kinds of risk exposure can have substantial impact on the value of a firm (Ahmed, 2013). To study the effect of risk on profitability, we need to have clear understanding what risk means in former literature. The conservative definition states that risk is the possibility of a loss or failure. However, in finance literature risk usually also has an upside. Volatility of returns/income is a common measure of this. Malkiel (1982) sumed the reasoning behind this measure of risk: for an investor risk is the disappointment of not earning the expected return. Financing risk comprises of financial leverage risk and borrowing cost risk. Financial leverage means the ratio of debt to equity. If this ratio gets too high, the company has no buffer to withstand potential losses and is in effect on the brink of bankruptcy, the borrowing cost as an absolute figure is not relevant, but the spread between borrowing cost and RNOA. If the company is creating high returns on its operating assets, it can in turn afford to pay high interest rates. However, if the average interest rate surpasses RNOA, every dollar of debt generates losses for the company (Ahmed, 2013).

Systematic Risk

The risk inherent to the entire market or an entire market segment, systematic risk, also known as undiversifiable risk volatility or market risk, affects the overall market, not just a particular stock or industry. This type of risk is both unpredictable and impossible to completely avoid (Pandey, 2005). It cannot be mitigated through diversification, only through hedging or by using the right asset allocation strategy. Pandey (1993) stated that systematic risk is the relevant risk measure for assets a risk arises from the uncertainty about economic fluctuation, earthquake and changes in world energy situation. This risk affects all securities and consequently cannot be diversified away by an investor.

According to Van Horne (1989) while stating the principles of systematic risk that expected return on a risky asset depends only on that asset and systematic number of assets to a greater or lesser extent. The normalized systematic risk is of the individual risky assets. Berger and Udeu (1993) were of the opinion that the relevant measure of risk for a risky asset is its systematic risk covariance of returns with the market portfolio of a risky asset. For when the covariance (systematic risk) which is normalized beta coefficient is derived it relates the stocks' variance to market total variance.

Unsystematic Risk

Company- or industry-specific hazard that is inherent in each investment, unsystematic risk, also known as nonsystematic risk, specific risk, diversifiable risk or residual risk, can be reduced through diversification. By owning stocks in different companies and in different industries, as well as by owning other types of securities such as treasuries and municipal securities, investors will be less affected by an event or decision that has a strong impact on one company, industry or investment type. Examples of unsystematic risk include a new competitor, a regulatory change, a management change and a product recall (Brookfield, 2005).

The risk that airline industry employees will go on strike, and airline stock prices will suffer as a result, is considered to be unsystematic risk. This risk primarily affects the airline industry, airline companies and the companies with whom the airlines do business. It does not affect the entire market system, so it is an unsystematic or nonsystematic risk. An investor who owned nothing but airline stocks would face a high level of unsystematic risk. However, even a portfolio of well-diversified assets cannot escape all risk. It will still be exposed to systematic risk, which is the uncertainty that faces the market as a whole (Zeller & Stanko, 2009). Even staying out of the market completely will not take an investor's risk down to zero, because he or she would still face risks such as losing money from inflation and not having enough assets to retire. Investors may be aware of some potential sources of unsystematic risk, but it is impossible to be aware of all of them or to know whether or when they might occur. An investor in health-care stocks may be aware that a major shift in government regulations could affect the profitability of the companies they are invested in, but they cannot know when new regulations will go into effect, how the regulations might change over time or how companies will respond (Pike, 1996).

Interest Rate Risk

First, the allocation of interest rate risk affects the transmission of monetary policy. If interest rate risk is borne by banks, changes in interest rates affect bank net worth and ultimately the supply of loans via the bank balance sheet channel (Bernanke and Gertler, 1995; Jiménez et al., 2012). In contrast, if interest rate risk is primarily borne by households and firms, monetary policy transmits via borrowers' balance sheets, with consequences for consumption and investment (Auclert, 2017; Di Maggio et al., 2017; Ippolito et al., 2018). Second, the allocation of interest rate risk is important for financial stability.

Inflation Rate

Inflation is one of the most important macroeconomic indicators to analyze the economic conditions of the economy. Few studies have addressed the linkage between the stock market and inflation, Famma (1990) suggested that macroeconomic variables have projecting power for the stock exchange performance, although he did not consent to the anticipating authority of stock performance for the economy. Agawam (1981) Soenen and Hennigar (1988) measured the relationship between inflation rates and stock prices.

A common expectation is that the stock prices and inflation should be positively related. This is done with the mind that, common stocks should be a hedge against inflation because stocks represent the ownership of the real assets. Earlier on, Schwert (1981) found that consumer price index (CPI) has significant influence on stock market. This was reaffirmed by Gunasekarage et al.

(2004) using the Sri Lanka's stock market. A negative effect has been found between consumer price index and stock prices. This can be explained as the results of the higher risk of future profitability. The increase in prices level will increase the cost of production, which in turn would reduce future profitability. However, there are still some other opinions that higher price level can also have a positive effect on stock prices due to the use of equity itself as equipment for hedging inflation.

Exchange Rate

Exchange rate is the value of one currency for the purpose of conversion to another. Exchange rate movements greatly affected the stock market return volatility owing to its information content to the investors. When there are high fluctuations in the exchange rates, the exchange rates movement, there would be high movements of market return volatility. Some studies have concluded that there is a strong relationship between exchange rate movement and stock market returns volatility, while others have not. Specifically, the information content of exchange rate movement would be carried to the securities business.

The U.S. dollar and the Euro are the most traded currencies in the world (BIS, 2013). It has become as main sources for international transactions. On January 2002 the Euro became official and after the introduction the Euro appreciated against the Dollar. Important determinants of the exchange rate are the demand and supply for the currency, inflation, interest rate and the economic and political risk (Shapiro, 2013, Lipsey and Chrystal, 2007). Due to the wide worldwide usage the U.S. dollar and the Euro are accepted as the most important exchanges currencies. Many academics examine the relationship between exchange rate and stock performance for both theoretical and empirical reasons.

Interest-Rate

Governments or monetary authorities have several tools of monetary policy. The interest rate is one of them and is used in order to influence the economy. A high interest rate is an indication of a tight monetary policy. In times with high interest rates, it is more costly for firms to borrow which makes it more unattractive to invest. Not only firms, but also individuals are affected by high interest rates, since the repayments of their loans and mortgages will be cost more. Therefore, high interest rates tend to decrease demand, while low interest rates stimulate demand in the economy (Lipsey & Chrystal, 2007). Interest rate fluctuations are worldwide acknowledged as an important source of uncertainty for firms. Graham and Harvey (2001) provided evidence that fluctuations in the interest rate are the second most significant risk factor for companies. They mention the maturity match between assets and liabilities as 'important or very important'. The influence of the interest rate on the stock performance of firms has received big attention in empirical studies, yet a lot of these studies focused on financial institutions due to the particularly interest rate sensitivity of these sector Kasman et al., 2011; Memmel, 2011).

Term Structure of Interest Rate

According to this theory, a rising term structure of rates means the market is expecting short-term rates to increase. So if the two-year rate is higher than the one-year rate, rates should rise. If the curve is flat, the market is expecting that short-term rates will remain low or hold constant in the future. A declining rate-term structure indicates the market believes that rates will continue to

decline. Under this theory, the curve starts to get a little bit more bent. With an upward sloping yield curve, this theory really has no opinion as to where the yield curve is headed. It could continue to be upward sloping, flat, or declining, but the yield premium will increase fast enough to continue to produce an upward curve with no concerns about short-term interest rates. When it comes to a flat or declining term structure of rates, this suggests that rates will continue to decline in the short end of the curve given the theory's prediction that the yield premium will continue to increase with maturity. Under this theory, any type of yield curve can occur, ranging from a positive slope to an inverted one, as well as a humped curve. A humped curve is where the yields in the middle of the curve are higher than the short and long ends of the curve. The future shape of the curve is going to be based on where the investors are most comfortable and not where the market expects yields to go in the future.

The Bond Market

The concept of bond and bond market Bond is a financial debt instrument (Ogilo, 2014). A borrower issues bond as an issuer; with the financial obligation to pay back to the lender both the amount borrowed and interest with a defined time frame. The lender is regarded as the investor. As a lender (investor) he buys the bond from the issuer. Therefore, in a general simple market notion the bond issuer is the seller while the lender is the buyer. SEC (2010) specifically opines that a bond is: a generic name for a tradable loan security issued by governments and companies as a means of raising capital. The bond is an interest bearing security. It guarantees its holder both repayment of capital at a future specified date (Maturity date) and a fixed rate of interest also known as the coupon. On the other hand, bond market is interpreted as the environment where the issuance, buying and selling of financial debt securities take place (Ogilo, 2014). The bond market is alternatively called debt market in financial terminology.

Nigeria Bond Market

Bonds are fixed income financial instruments issued by governments or private corporations for the purpose of raising capital to finance projects. In essence, when an investor buys a bond, he is loaning money at predetermined interest rate to the borrowing institution. Generally, there are two categories of bonds - government bonds and corporate bonds. Governments issue bonds to fund government programs and/or meet its budget deficit. Because these bonds are backed by the government, they pay a fixed amount of interest and are, therefore, virtually risk free. Government bonds usually mature in 1 to 50 years. In some cases, interest earned is non-taxable (Okumagba, 2006). Corporate bonds are issued by business firms to raise capital and they carry higher risks than government bonds and therefore attract higher interest.

A bond market is a market in which debt instruments known as bonds are issued to raise funds, and where such instruments are traded before their maturity. In a capital market, the segment where bonds are issued and traded is generally termed as the debt market (ADP, 2000). As with most other markets, bond markets comprise primary and secondary markets. The primary market enables borrowers to raise funds by issuing securities to investors, while the secondary market provides investors with the ability to restructure their investments by altering the mix, maturity or level of holding. A crucial role of bond market is therefore to bring issuers and investors together

and to facilitate the progress of generating a continuous flow of long term funds at the right price (Okumagba, 2006).

Empirical Review

Nnenna, Origin and Ubah (2023) examined the effect of bond market on the performance of the capital market from 2000 to 2021. Time series data was collected from Statistical bulletin of Central Bank of Nigeria and was used to analyze the effect of explanatory variables (corporate and government bond market capitalization) on the dependent variable (market capitalization). Vector Autoregressive Estimates (VAR) was used to analyze the date and the result of the analysis indicates that bond market variables have positive by insignificant effect on capital market performance within the period of the study. The study recommended that the government should ensure an investor friendly bond market by putting in place measures aimed at developing a bond market to enhance capital market growth. Sanni, Kasali and Fakunmoju (2020) investigated the determinants of interest rate spread. A panel regression analysis was employed to determine the effects of bank-specific, industry-specific, macro-economic and governance risk factors on interest rate spread involving 13 selected deposit money banks in Nigeria from 2009 to 2018. The Generalized Method of Moment (GMM) approach was employed. The study established that interest rate spread is determined by bank specific and macroeconomic factors mainly for risk aversion, interest risk and operating cost, monetary policy rate and inflation. The study recommends adoption of internal resolution discipline approach by the CBN and Federal Government in curtailing excessive risk taking of systematically important banks (highly capitalized banks) that translate into high interest spread.

Omodero and Alege (2021) employed total market capitalization as the response variable to proxy the capital market, while various government bonds serve as the independent variables. The inflation rate moderates the predictor components. The research uses multiple regression technique to assess the explanatory variables' impact on the total market capitalization. At the same time, diagnostic tests help guarantee the normality of the regression model's data distribution and appropriateness. The findings reveal that the Federal Government of Nigeria's (FGN) bond is statistically significant and positive in influencing Nigeria's capital market growth. The other predictor variables are not found significant in this study. The study suggests that the Government should improve on the government bonds' coupon, while still upholding the none default norm in paying interest and refunding principal to investors when due. Muharam, Ghozali, and Arfinto (2018) examined the connection between bond market enlargement, fiscal progression and overseas asset in a number of nations. The central focus of the research was the sovereign bond. The study took samples from some developing countries in Asia, America, Europe, and Africa from 2004–2015. The econometric tools applied were vector autoregressive, vector error correction model and Granger causality. The outcome revealed that there was short-run and long-run co-integration in each sample. The study also found no basis in all countries sampled. In addition, a univariate correlation was found in Indonesia, Thailand, and Mexico.

Olaniyan and Ekundayo (2020) focused on revisiting the growth effects of government bonds in an emerging capital market employing time-series data obtained from the Nigeria Stock Exchange (NSE) annual reports for the period from 2010 to 2017, the study through the Generalised Method

of Moments (GMM) regression estimator found that the value and the number of listed government bonds' positively and significantly affect capital market growth in Nigeria, low capitalisation of government bonds negatively affects the growth of the market. Ogbebor, Ajibade, and Onoja, (2020) examined the relationship between stock, bond market and economic growth in Nigeria from 1981 to 2020, using an expo facto research design. The study employed descriptive statistics, Unit root test, Johansen co-integration test, vector error correction mechanism methods of analytical tools and inferences were made at 5% significant level. The study showed that Composite all share index and Treasury bills rate have no significant effect on economic growth of Nigeria, there is a significant effect of bonds market capitalization and Equities market capitalization on economic growth of Nigeria within the period under review. Pradhan, Arvin, Norman and Bahmani (2018) studied the dynamics of bond market development, stock market development and economic growth: Evidence from the G-20 countries to ascertain whether Granger causal relationships exist between bond market development, stock market development, economic growth and two other macroeconomic variables: inflation rate and real interest rate and found that both bond market development and stock market development are cointegrated with economic growth, inflation rate and real interest rate. The most robust result from the panel Granger causality test is that bond market development, stock market development, inflation rate and real interest rate are demonstrable drivers of economic growth in the long run.

Yener, Kun, Murat and Talat (2022) explored the relations between the development level of capital market sub-components, involving mutual/pension funds, corporate bond, stock and government bond markets, and economic growth over the period of 2006 and 2016 in Turkey. The study finds that there is a long-run cointegrating relationship between capital market development and economic growth and also a unidirectional causality running from capital market development to economic growth. Using ARDL, Markov Switching Regression and Kalman Filter models, it was also found that capital market development has asymmetric effects on economic growth where government bond market development is negatively but the aggregated index of other sub-components is positively associated with economic growth. Harrison, Salihu and Yahya (2021) studied the effect of fixed income securities on capital market growth in Nigeria over the period 2010-2020. Fixed income securities were proxied by government bond and Treasury bill while capital market growth was proxied by market capitalization. Ex post facto research design was adopted as quarterly time series data was obtained from central bank of Nigeria annual statistical bulletin. The result of the regression reveals that government bond have significant effect on capital market growth. However, treasury bills show insignificant effect on capital market growth in Nigeria. Based on the findings, the study concludes that fixed income securities affect the capital market growth in Nigeria

Hoque, Rakhi, Hassan, and Le (2020) used capital asset pricing model and non-parametric stochastic dominance approach to assess the performances of Islamic and Conventional Stock Portfolios for five industrial sectors and the market in Malaysia. The study found that both portfolios had equal productivity in the market. However, the study further disclosed that Islamic Stock Portfolio had a higher return with a lower systematic risk. The study confirmed Markowitz Modern Portfolio Theory, which advocated that portfolio mix strategy helps an investor to easily

absorb investment risk shocks, due to the varying return outcomes within the portfolio. Iwedi, Oriakpono, Barisua and Zaagha (2020) examined business risks and risk management as well as their effects on shareholders 'value using data from selected non-financial firms in the Nigerian Stock Exchange by focusing on reward systems to firm owners through dividend and other earning structures. The study employs panel data for 48 non-financial firms in the Nigerian Stock Exchange for the period 2011 to 2018. The panel data analytical framework is used in the empirical analysis with focus on the Random Effects estimation technique. The results show that in general, the effect of risk on shareholder value depends on the pattern of risk, as well as on the value being considered. The study also finds that increased business risk lowers both dividend per share and earnings per share of the firms. On the other hand, financial risks were shown to have positive impact on shareholder value, especially the value not related to dividend payout. Also, it is found that risk management based on institutional shareholding has the most effective positive impact on shareholder value. It is recommended that enterprise risk management implementation should not just be for compliance purposes among companies in Nigeria, but it must also be for the purposes of pursuing best practices and long-term survival.

Literature Gap

The expectations theory of the term structure holds that the long-term interest rate is a weighted average of present and expected future short-term interest rates. If future short rates are expected to remain constant, then the long rate will equal the short rate (plus a constant risk premium). However, if future short rates are expected to increase, then the current long rate will exceed the sum of the current short rate and the constant risk premium *so* as to yield the same expected return. Thus, the shape of the yield curve reflects the market's expectation of future short rates of interest. The expectations theory assumes that securities of varying maturities are perfect (ex-ante or expected) substitutes for one another.

The expectations theory can be re-stated to imply that expected holding period returns on bonds of all maturities are identical, or differ only by constant risk premia. Without any loss of generality, let "one period" be defined by the time to maturity of the short bond. The yield and holding return on this short bond held to maturity are, by definition, the same. The "one-period holding return on a long bond (i.e. a bond of maturity greater than one period) is the return from purchasing such a security, holding it for one period and then selling it at the prevailing price. The term premium is the difference between the expected holding return on the long bond and that on the short bond.

RESEARCH METHODS

This applies to the error correction methodology to a regression model based on the relationship between risk and term structure in Nigeria. The idea is to subject the variables to stationary test and subsequently remove the non- stationary trends by differencing before regressing. This removes the possibility of the so-called spurious regression not have considered the problem of unit roots. As a result, the econometric methodology used in those studies did not account for non-stationarity in the data. The analysis here is primarily based on Engle and Granger (1987), and Engle and Yoo (1987). The idea is to determine the order of integration of the variables, that is, we test whether they are stationary in their levels or whether they have to be differenced once or more before they become stationary. Testing for unit roots is earned out by using an Augmented

Dickey-Fuller (ADF) test. In order to examine the relationship between the dependent and the independent variables, the model for the study is hereby specified as follows:

$$FGSB = \beta_0 + \beta_1 LIQR + \beta_2 INTR + \beta_3 EXRR\ \beta_4 DFR + \beta_5 DGR + \mu \quad 1$$

A-priori, b,> 0, b_3> 0, b_3> 0, b_4<0, b_5> 0, 2

Where

FGSB = Yield on Nigeria saving bond

LIQR = Liquidity risk measured by variation in rate of money supply

INTR = Interest rate risk measured by variation in real interest rate

EXRR = Exchange rate risk measured by variation in exchange rate of Naira per US Dollar

DFR = Default risk measured by anticipated return on a bond minus the return a similar risk-free investment would offer

DGR = Downgraded risk measured by dummy variable of 1 for downgraded and 0 for no downgrade

$\phi_0\ \alpha_0$ = Constant

β_1 - β_5 = Coefficients of independent variables

μ_{it} = Error Term

A-Priori Expectation

Base on financial theories and empirical results examined in this study, the variables are expected to have a positive effect on the dependent variables. The mathematical implication is stated as follows: β_1, β_1, β_1, β_1 >0

εί = Error Term

The analysis of short-run dynamics is often done by first eliminating trends in the variables, usually by differencing. The theory of co-integration development in Granger (1981) and elaborated in Engle and Granger (1987) addressed this issue of integrating short-run dynamics with long-run equilibrium. It is important to note that the usual starting point of ECM modeling is to assess the order of integration of both the dependent and independent variables in the model. The order of integration ascertains the number of time a variable will be differentiated to arrive at stationary. Dickey- fuller (DF), Augmented Dickey-Fuller (ADF) and Sargan -Rhargava Durban-Watson (SRDW) are the widely used test for stationary for both individual time series and residual from OLS regressions. Co-integration is based on the properties of the residuals from regression analysis when the series are individually non-stationary. The original co integration regression is specified as follows:

$$A_t = \alpha_0 + \alpha_1 \beta_1 + \ell_1 \quad 3$$

Where A represents the dependent variables, β stands for the independent variable, and e_1 is the random error term. a_{nv} and $a_J$are intercept and slope coefficients respectively. To include the possibility of bi-directional causality, the reverse specification of equation 1 is considered. To provide a more defensive answer to the non-stationarity in each time series, the Dickey-Fuller (1979) regression is estimated as follows for a unit root:

$$\Delta e_t = -\lambda e_{t_{-1}} + W_t \quad 4$$

If X Equals zero e is non-stationary. As a result, A and B are not co-integrated. In other words, if X is significantly different from zero A and B is found integrated individually. Given the inherent weakness of the root test to distinguish between the null and the alternative hypothesis, it is desirable that the Augmented Dickey-Fuller (ADF) (1981) test be applied. The desirability is warranted because it corrects for any serial correlation by incorporating logged changes of the residuals. To be co-integrated, both A and B must have the same order of integration (Eagle and Granger, 1987 and Granger, 1986).The ADF regression is specified as follows:

$$\Delta e_t = \beta_o \ell_{t-1} + \sum_{j=i}^{m} \beta_j \Delta \ell_{t-1} + \mu_t \quad 5$$

Where Δ the first different operator and u is the new random error term, M is the optimum number of lags needed to obtain "white noise". This is approximated when the DW value approaches 2.0 numerically. The null hypothesis of non-co-integration is rejected, if the estimated ADF statistics is found to be larger than its critical value at 1 or 5 or 10 per cent level of significance.If A, and B, arc found to be co-integrated, then there must exist an associated error-correlation Model (ECM), according to Engle and Granger (1987). The usual ECM may take the following form:

$$\Delta G_t = \sigma_o e_{t-1} + \sum_{j=1}^{T} \sigma_1 \Delta A_{t-j} + \sum_{j=1}^{T} \theta_j \Delta B_{t-j} + V_t \quad 6$$

Where Δ denotes the different operator CM is the error correction term, *T* is the number of lags necessary to obtain white noise and V, is another random disturbance *term.* If a_0CM is significantly different from zero, then A and B have long-Run relationship, the error-correction term (e_{t-1}) depicts the extent of disequilibrium between A and B The HCM, reveals further that the change in A, not only depends on lagged changes in B, but also on its own lagged changes.

RESULTS AND DISCUSSION

Table 1: Unit Root Test

Variable		1% critical value	5% critical value	10% critical value	Order of integration	Summary
FGSB	-5.749617	-3.769597	-3.004861	-2.642242	1(1)	Stationary
DFR	-6.898034	-3.679322	-2.967767	-2.622989	1(1)	Stationary
DGR	-11.06884	-3.689194	-2.971853	-2.625121	1(1)	Stationary
EXRR	-6.718217	-3.679322	-2.967767	-2.622989	1(1)	Stationary

INTR	-9.842100	-3.679322	-2.967767	-2.622989	1(1)	Stationary
LIQR	-11.56192	-3.679322	-2.967767	-2.622989	1(1)	Stationary

Extract from E-view 9.0

The null hypothesis in these tests is that the underlying process which generated the time-series is non-stationary. This will be tested against the alternative hypothesis that the time-series information of interest is stationary. If the null hypothesis is rejected, it means that the series is stationary i.e. it is integrated to order zero. If, on the other hand, the series is non-stationary, it is integrated to a higher order and must be differenced till it becomes stationary. As can be seen from the results given in table (1), all the variables are not stationary in levels. This implies that the null hypothesis cannot be rejected and that the time-series has to be differenced. We then conduct the same tests on the first difference of the time-series. As can be seen from the test results on the first difference given in table the null hypothesis has been rejected for all the variables indicating that all variables become stationary at their first difference and are thus integrated of order zero I(0) as the variables do not require further differencing (Gujarati, 2003). The variables are all stationary at first difference and integrated in the order of 1(1).

Table 2: Co-integration Test

Series: FGSB INTR LIQR EXRR DGR DFR

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.752741	121.4243	95.75366	0.0003
At most 1 *	0.717304	79.50472	69.81889	0.0069
At most 2	0.473832	41.60322	47.85613	0.1701
At most 3	0.314809	22.33918	29.79707	0.2800
At most 4	0.274616	10.99745	15.49471	0.2117
At most 5	0.044507	1.365840	3.841466	0.2425

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.752741	41.91959	40.07757	0.0307
At most 1 *	0.717304	37.90150	33.87687	0.0156
At most 2	0.473832	19.26404	27.58434	0.3944
At most 3	0.314809	11.34174	21.13162	0.6132
At most 4	0.274616	9.631606	14.26460	0.2373
At most 5	0.044507	1.365840	3.841466	0.2425

Source: Extract from E-view 9.0

Table 2 reported the test statistics from the unit root tests. As can be seen from the table 2, reported test results are greater, in absolute terms, than the critical values both with and without trend. This suggests that the variables in are co-integrated. In other words, an error correction model is required.

Table 3: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.	Summary
INTR does not Granger Cause FGSB	30	2.01683	0.1542	No causality
FGSB does not Granger Cause INTR		2.11234	0.1420	No causality
LIQR does not Granger Cause FGSB	30	1.14656	0.3339	No causality
FGSB does not Granger Cause LIQR		0.16203	0.8513	No causality
EXRR does not Granger Cause FGSB	30	9.50836	0.0008	causality
FGSB does not Granger Cause EXRR		0.07328	0.9295	No causality
DGR does not Granger Cause FGSB	30	0.32738	0.7239	No causality
FGSB does not Granger Cause DGR		0.09617	0.9086	No causality
DFR does not Granger Cause FGSB	30	0.08353	0.9201	No causality
FGSB does not Granger Cause DFR		1.84683	0.1786	No causality

Source: Extract from E-view 9.0

Table 3 Summaries the causal relationship among the variables, there is no causal relationship among the variables except a uni-directional causality from exchange rate risk to yield on federal government suku bond.

Table 4: Error Correction Model and lag selection Criteria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FGSB(-1))	-0.097032	0.473644	-0.204864	0.8403
D(FGSB(-2))	-0.327967	0.343633	-0.954411	0.3541
D(FGSB(-3))	0.028943	0.271320	0.106673	0.9164
D(INTR(-1))	0.004654	0.002566	1.814050	0.0885
D(INTR(-2))	-0.000948	0.002146	-0.441972	0.6644
D(INTR(-3))	0.000131	0.002552	0.051482	0.9596
D(LIQR(-1))	0.002649	0.001257	2.108135	0.0511
D(LIQR(-2))	-0.000190	0.001334	-0.142600	0.8884
D(LIQR(-3))	-0.000769	0.001236	-0.621971	0.5427
D(EXRR(-1))	0.001312	0.001219	1.076582	0.2976
C	-0.040284	0.022197	-1.814860	0.0883
ECM(-1)	-1.384217	0.546582	-2.532498	0.0222
R-squared	0.818703	Mean dependent var		-0.008571
Adjusted R-squared	0.694061	S.D. dependent var		0.168473
S.E. of regression	0.093185	Akaike info criterion		-1.610927
Sum squared resid	0.138936	Schwarz criterion		-1.039982
Log likelihood	34.55297	Hannan-Quinn criter.		-1.436383
F-statistic	6.568434	Durbin-Watson stat		2.179592
Prob(F-statistic)	0.000431			

Endogenous variables: FGSB INTR LIQR EXRR DGR DFR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-659.6471	NA	7.55e+11	44.37648	44.65672	44.46613
1	-594.4506	99.96804 *	1.14e+11*	42.43004*	44.39172*	43.05760*
2	-560.5995	38.36459	1.80e+11	42.57330	46.21641	43.73876

Source: Extract from E-view 9.0

From the ECM results are presented in tables (4). The result shows the equilibrium structure of the over parameterized error correction model (ECM 1) and the estimated error correction models were a good fit. This is indicated by R-squared of 0.694061 and implies that 69.4 variations in federal government sukku bonds are explained by the variables included in the model. Moreover, the Durbin Watson (DW) Statistic also shows that the estimated models are free from the problem of positive first order serial correlation since the computed Durbin Watson value of 2.179592 is greater than the tabulated value of 1.900. The f-statistic also shows that the model is statistically significant since the f-calculated value of 6.568434 is greater than f-tabulated value of 2.42 at 95% confidence level. Apart from these diagnostic statistics, the error correcting terms are appropriately negative as the theory predicts. The error correction term shows significant correction of about 138 percent from short run disequilibrium to long run equilibrium. The lag selection validates the application of lag I. at lag I, the study found that the variables are positively related to federal government sukku bonds within the time scope of this study.

Discussion of Findings

The lag selection validates the application of lag I. at lag I, liquidity risk, exchange rate risk and default risk have negative effect on yield on federal government sukku bonds while interest rate risk and down risk have positive effect on yield on Treasury bond with the time scope of this study. The positive effect of the variables confirm our a-priori expectations and in line with the expectation theory. It is empirically in line with the findings of Nwiado and Deekor (2013) the various relationships shows little or none relationship between domestic market participation in domestic bond market and liquidity in the domestic bond market, Olaniyan and Ekundayo (2020) that the value and the number of listed government bonds' positively and significantly affect capital market growth in Nigeria, Ogbebor, Ajibade, and Onoja, (2020) that Composite all share index and Treasury bills rate have no significant effect on economic growth of Nigeria, there is a significant effect of bonds market capitalization and Equities market capitalization on economic growth of Nigeria within the period under review, the findings of Pradhan, Arvin, Norman and Bahmani (2018) result from the panel Granger causality test is that bond market development, stock market development, inflation rate and real interest rate are demonstrable drivers of economic growth in the long run, Yener, Kun, Murat and Talat (2022) that there is a long-run cointegrating relationship between capital market development and economic growth and also a unidirectional causality running from capital market development to economic growth.

Conclusion

This study examined the relationship between risk and return on government Sukku bonds. The study found that 69.4 variations in federal government sukku bonds are explained by the variables included in the model. The lag selection validates the application of lag I. at lag I, the study found that the variables are positively related to federal government sukku bonds within the time scope of this study. The ECM results are presented in tables (4). The result shows the equilibrium structure of the 70.2 variations in Treasury bill rates are explained by the variables included in the model. The lag selection validates the application of lag I. at lag I, liquidity risk, exchange rate

risk and default risk have negative effect on yield on treasury bill rate while interest rate risk and down risk have positive effect on treasury bill rate with the time scope of this study.

Recommendations

i. Investors should ensure that all the board members and executive managements amongst other stakeholders are trained to appreciate the functions and responsibilities of risk management. The study recommends that management of the Nigeria bond market should ensure that their security exposures are adequately secured through proper scrutiny of investors in order to risk associated with different bonds in the Nigeria bonds market.
ii. Their findings showed that there is a relationship between risk management and yield on different bond within the periods covered in the study. The study recommends that investors should focus more on risk management, especially on the control and monitoring of macroeconomic factors that affect risk, managers should focus more on modern risk management techniques. The study recommended that the government should ensure an investor friendly bond market by putting in place measures aimed at developing a bond market to enhance capital market growth
iii. The study recommends adoption of internal resolution discipline approach by the CBN and Federal Government in curtailing excessive risk taking of systematically important banks (highly capitalized banks) that translate into high interest spread. The study suggests that the Government should improve on the government bonds' coupon, while still upholding the none default norm in paying interest and refunding principal to investors when due.

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