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THE EFFECTS OF INTEREST RATE AND MONEY SUPPLY ON SYSTEMATIC RISK ASSOCIATED WITH RETURN IN NIGERIAN EXCHANGE

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Abstract

Stock market investors are largely compensated for taking systematic risks as idiosyncratic are controlled through effective portfolio construction but systematic risk cannot be diversified. As such, there is increasing concern among academics to understand systematic risks and its determinants in emerging markets. Hence, the need to investigate the effect of interest rate and money supply as determinants of systematic risk associated with return in the Nigerian Exchange. The study was correlational in nature, and data for the study was collected from the CBN statistical bulletin and the Nigerian Exchange. Monthly data from April, 2012 to December, 2022 were used for the analysis. The study conducted data analysis using autoregressive distributive lag model and other preliminary analysis. Result from the study revealed that money supply has positive significant effect on systematic risk. On the other hand, interest rate exhibited negative and statistically insignificant effect on systematic risk. The study came to the conclusion that money supply is a determinant of systematic risk as it can influence its behaviour significantly while interest rate can affect systematic risk but the magnitude is statistically insignificant. Therefore, the study recommended that investors should continuously study the changes in the behaviour of the determinants in order to make sound investment decision and maximize their return from the market. The government through the CBN should also ensure that they consistently improve their policies on interest rate and money supply. This will help the market to operate efficiently.

Keyword: Interest rate, money supply, systematic risk

1.0 Introduction

The returns on stock have been regarded as one of the main considerations for making investment decision in the stock market. Investors in the stock market expect a certain return consisting of capital appreciation and dividends which motivates their wealth maximization behavior. It is the basic reason why investors continue to invest in the market. Even though there is increased cautiousness in making investment decision by investors, the most important consideration in investment still remains accumulating maximum returns and minimizing risk through diversification as much as possible.

One of the most important concepts in investment theory is the relationship between risk and return. Efficient market theory states that there is a direct relationship between risk and return; the higher the risk associated with an asset the higher the return from such investment. According to Osamwonyi and Evbayiro-Osagie (2012), most assets that investors choose to invest in, whether financial or real have some exposure to risk. This relationship drives the theoretical foundation of many investment models such as the well-known Capital Asset Pricing Model.

Capital Asset Pricing Model suggested that two types of risks are associated with all companies' i.e. systematic risk and an unsystematic risk. Systematic risk is related with market while unsystematic risk is linked with an individual firm (Rowe & Kim, 2010 as cited by Iqbal & Shah, 2012). Investment in securities just like other assets has inherent risk associated with it. Investment in the Nigerian stock market also has some elements of risk which comprise of both systematic and unsystematic risk; systematic risk is known to be renowned and cannot be easily diversified. Arora et al., (2019) posited that unsystematic risk can be reduced by diversifying the portfolio; therefore, the risk that is of concern to investors is the systematic risk that cannot be diversified.

Returns on financial assets is a function of one or more risk factors that can cause changes in its prices and expected return. Managing of market risk due to adverse conditions or factors and fluctuations in the market is of great importance to investment managers (Shah, Hussain, Khan, Jacquemod, & Shah, 2020). Systematic risk still remains undiversifiable; therefore, investors will have to study the variables that are responsible for systematic risk (Pagano, 1993 as cited by Silva 2017).

Systematic risk is usually caused by certain macro-economic variables that affect the market as a whole and are usually beyond the control of any individual firm or asset. There is also a growing concern by experts that the market has increasingly become risky and the returns from these are evident from the market return which has fluctuating in recent years. Market returns for the last 10 years have been a mixed of negative and positive indices. In 2011, the average return from the market was -5.58%, while the percentage was positive for 2012, 2013 and 2014 with average return of 0.17%, 54.52% and 8.85% respectively. There was a decline in return for 2015 and 2016 with negative average return of -21.68% and -13.75% but the market rebounded with positive average return of 20.80% and 15.62% for the year 2017 and 2018. However, in 2019 and 2020 the average return for the market was -21.85% and -5.42% respectively (Nigerian Stock Exchange Report, 2021). The average return of the market for 2021 is 45.88% which indicates that the market has rebounded from the previous year. Experts have established that there is a positive relationship between risk and return, therefore, the behavior of the returns has showed that there is a need to study and understand the determinant of systematic risk associated with market returns.

Furthermore, Asafo-adjei et al., (2022) described the growing economic size and technological consequence of emerging markets among the major forces determining the global economic and financial market setting. As a result, emerging markets such as the Nigerian Stock Exchange Group are more liberalized and more accessible and are triggering rethinking of the future of equity investing in a fast-growing globalized financial market, external factors have more dominating effect more than internal factors. These external factors are mostly macroeconomic variables. These variables have been established to affect stock returns, stock market capitalization, while systematic risk has been generally ignored.

Furthermore, Oyesiji et al., (2020) posited that not only macroeconomic variables like interest rate, money supply and exchange rate affect stock market returns in Nigeria, but global macroeconomic variables can also influence the market returns greatly. While several studies have examined the influence of some major macroeconomic variables such as inflation rate (Haider et al., 2017; Subeniotis et al., 2011 and Okoro, 2017); interest rate (Musawa and Mwaanga (2017), Altinbas and Biskin (2015), Adebayo (2016) and Handrey (2015)); Money supply (Martin (2012), Picha (2017)) on various stock market performance indicators (stock

market capitalization, stock prices, stock market returns, etc). Over the last few years the interest rate in Nigeria has been on the rise from a record low of 6% in 2009 to 27.25% in 2024. Money supply according to CBN has also increased from ₦648 million in 2000 to ₦108 billion in 2024. The behaviour of the variables has been undulating over the years. Researches by several authors have established that macroeconomic variables can affect the stock market capitalization, prices, performance and returns while its effect on systematic risk have been largely ignored. Hence the need for the study to investigate the effect of interest rate and money supply on systematic risk.

Handrey (2015) establishes that various stock markets are assumed to respond differently to various macroeconomic factors. There is also a general assertion that favourable macroeconomic conditions attract investments as opposed to a poor macroeconomic environment. In addition, Asafo-adjei et al., (2022) opined that emerging markets are affected by the undulating movements of economic and stock performance of their economies which makes their systematic risk worthy of investigating. This is particularly important because Haider et al., (2017) asserted, abrupt variations and unusual movements of macroeconomic variables cause stock returns to fluctuate due to uncertainty of future gains.

It is against this backdrop that this study intends to investigate the effect of interest rate and money supply on systematic risk associated with returns in Nigerian Exchange.

The objective of the study is to investigate the effect of interest rate and money supply on systematic risk associated with return in Nigerian Stock Exchange Group. The specific objectives are as follow:

- i. To examine the effect of interest rate on systematic risk associated with return in Nigerian Exchange
- ii. To assess the effect of money supply on systematic risk associated with return in Nigerian Exchange.

H₀₁: Interest rate does not have significant effect on systematic risk associated with return in Nigerian Exchange.

H₀₂: Money Supply does not have significant effect on systematic risk associated with return in Nigerian Exchange.

2.0 Conceptual Review

Concept of Systematic Risk

According to Meng and Brooks (2018) systematic risk is all that matters in regard to investment decisions, and the primary objective is to scrutinize the relative importance of systematic risk attributed to different factors, therefore it must be disaggregated from total risk. It is well known that the riskiness of investments is related to uncertainty, which is associated with the expected outcomes from that investment.

According to Zarah (2017) systematic risk is defined as the beta and plays an important role in the diversification principle to measure the risk of securities. The study established that some risks can be eliminated through diversification strategies, these types of risks become irrelevant in the measurement of risk and they can be ignored. Relevant risk in the measurement of risk is the risk that cannot be lost through diversification; this risk is called systematic risk or beta. Therefore, systematic risk is an inherent risk, a risk that cannot be eliminated through diversification in the portfolio, the source of this risk comes from external factors (macro) such

as inflation, the announcement of changes in interest rates, and this risk affects all the (many) companies.

The Beta is used as an estimation technique because it plays a vital role in explaining the association between firm decisions and stock market. Several studies refer to beta as the most well-known measure of risk; systematic risk measured by equity beta. The equity beta, also known as “stock beta” or “market risk”, is a measure of the sensitivity of a stock's returns to the returns of the overall financial market (Biase & D’Apolito, 2012).

Interest Rate

The interest rate is one of the important ingredients of any economy, which is directly related to economic growth. Generally, interest rate is considered as the cost of capital, means the price paid for the use of money for a period of time. The central bank described interest rate as the amount charged on borrowed money, expressed as a percentage of the principal, by a lender to a borrower for the use of money. It is often expressed as a percentage of the amount borrowed (principal) for one year or any other time period- month, week, day etc. as agreed by the lender and borrower at the time of contracting the loan (CBN, 2016).

An investor has to evaluate the impact of the level and growth of interest rates, on the performance and profitability of companies of different sectors of the economy. Further, from the point of view of a borrower, the interest rate is the cost of borrowing money (borrowing rate). From a lender’s point of view, the interest rate is the fee charged for lending money (lending rate). This study operationalized interest rate using the definition of CBN.

Money Supply

According to CBN (2006) money supply is the sum of all money or monetary assets that can easily be converted to cash in the economy at a specific time. It is often referred to as money stock since it is measured at a particular point in time. Money supply is closely monitored by the monetary authorities because if the rate of increase in money supply is consistently greater than the rate of increase in total output of goods and services in the economy, there could be a general increase in the domestic prices of goods and services. Martin (2012) opined that shares and stock markets are extremely sensitive to any price-shaping information, relevant for future trends and market development. The price-shaping factors generally include macroeconomic and microeconomic factors. Kohout (2010) as cited in Martin (2012) has described money supply as one of the most important factors influencing the development of stock prices in the long term. Furthermore, Maskay and Chapman (2007) described monetary policy is one of the most effective tools that a central bank has at its disposal. The central bank uses monetary policy frequently to cause a desired level of change in real activities. These frequent changes in monetary policy are believed to have a significant effect on the stock market.

The CBN (2006) defines money supply in two ways: narrow and broad money. Narrow money (M1) is defined to include currency in circulation plus current account deposits with commercial banks. Broad money (M2) is the broader measure of money supply and it includes narrow money, time deposits and savings deposit with deposit money bank (CBN, 2016). Furthermore, broad money measures the total volume of money supply in the economy and is defined as narrow money plus savings and time deposits with banks including foreign denominated deposits. The definition of CBN is considered more appropriate for the study. Therefore, the study adopted it to operationalize money supply.

Review of Relevant literature

Al-qaisi, (2011) in their study using the Capital Assets Pricing Model and fisher theory evaluated the determinants of systematic risk in the Jordanian capital market from 2005-2009. The study investigated the effect of operating leverage, financial leverage, size, dividend yield, market capitalization, inflation rate and government deficit on systematic risk. Based on the result of the study it was found that several factors including size, financial leverage, government deficit and inflation rate significantly affect a company's systematic risk value but the contribution of financial leverage is negative. The study did not capture the long run effect of the macro-economic variables and some crucial factors.

Another research by Biase and D'Apollito (2012) investigated the main determinants behind the systematic risk of banks in Italy using data from 38 companies from 1992-2011. The study used a number of regression models to test the statistical significance of a wide range of bank-specific risk factors, bank equity and beta were the dependent variables of the study. The findings of the study indicate that bank equity beta correlates positively with bank size and with the relative volume of loans and intangible assets, and negatively with bank profitability, liquidity levels and loan loss provisions. The findings of the study do not support the traditional hypothesis that lower leveraged banks may be exposed to lower systematic risk because the results failed to prove the hypothesis.

Iqbal and Ali Shah (2013) in their study on the determinants of systematic risk explored the relationship among financial variables and systematic risk. Eight financial variables were evaluated as determinants of systematic risk. The study collected data from 93 non-financial firms listed in Karachi Stock Exchange from 2005-2009, the result shows that liquidity, market value of equity, operating efficiency, dividend pay-out and leverage are negatively associated with systematic risk while profitability, firm size and growth are positively related with systematic risk (beta). The study used convenient sampling to select the sample size; a more scientific sampling technique would have been more accurate and unbiased.

Muiruri, (2014) in his study on the estimating systematic risk in equity stocks in the Nairobi Securities Exchange examined the merged 12 sector equity securities of the companies listed at the market. The study used Capital Asset Pricing Model (CAPM) of Sharpe (1964) to vis-à-vis the market returns. Monthly data was collected from the period January 2009 through December 2012 and used model the study from Stocks of the various sectors of the NSE. A simple regression model and descriptive approach was used where stock return was taken as dependent variable while systematic risk as independent variable and used. The study found out there is a relationship between systematic risk and stock market return in sectors because systematic risk and stock market return exhibits a strong negative autocorrelation, indicating that the stock market return is a function of more variable than systematic risk. However, the study failed to use the most appropriate tool for data analysis.

Wooi and Brooks (2015) studied the components of systematic risk and their determinants in the Malaysian equity market. The study investigated how the U.S markets, Regional Markets, Major Trading partners, Size, value and liquidity determine the systematic risk in Malaysian market. Panel data was collected and correction and GARCH model was used for analysis using monthly data for the 1988–2010 periods. The study found that US and regional factors have the most significant effect among all factors considered. Even though the study

established that the US and regional markets have the most effect on the country's systematic risk, tracing the time-varying betas of the US and regional factors, the study found that they are driven by economic risk and financial risk.

Another study by Adhikari (2015) attempted to advance empirical evidence on financial factors determining systemic risk in the pre-emerging stock market of Nepal as well as to identify whether pre-emerging stock market and developed and emerging stock markets exposed to the same financial factors that determine systemic risk. The study collected data from 15 listed companies covering a 5-year period, 2009 to 2013. All regular dividend paying and actively traded companies are selected. Based on cross-sectional approach it is revealed that size and profitability are positively associated with the systemic risk, while the dividend payment is negatively related to the risk. The result from the study indicates that financial factors have significant predictive power for the systemic risk of a stock investment in Nepal. This study failed to assess the contribution of macroeconomic variables to systematic risk.

Sharif et al. (2016) examined the validity of systematic risk determinants in banking, insurance, and non-financial sectors of Pakistan. Panel data was collected for the period of 2010 to 2014. The study conducted common effect model, generalized method of moments and Two step regression model was employed to identify the impact. Common effect results identify that leverage; operating efficiency, firm size, and market value of equity have significant impact on systematic risk in the banking sector. Firm size has significant impact on insurance sector, whereas liquidity, leverage, operating efficiency, firm size, market value of equity, profitability, and dividend pay-out are significant variables in the non-financial sector. In pooled data analysis leverage, firm size, market value of equity, and dividend pay-out are significant determinants in common effect model. However, GMM indicates that profitability also has positive impact on unsystematic risk in addition to Common effect and two step regression determinants.

The study of Haider et al. (2017) examined systematic risk factors and stock return volatility to ascertain the transmission of systematic risk exhaling from macroeconomic fundamentals to volatility of stock market. The study estimated using auto regressive generalized auto regressive conditional heteroskedastic (AR-GARCH) and vector auto regressive (VAR) models. Five systematic risk factors were identified and used in the study including industrial production, real interest rate, inflation, real interest rate, money supply and exchange rate from 2000-2014. The results revealed that there exists relationship among the volatility of macroeconomic factors and that of stock returns in Pakistan. The relationship among the volatility of macroeconomic variables and that of stock returns is bidirectional; both affect each other in different dynamics. The study could have adopted more systematic risk factors. The study used a single factor model and also failed to consider the pricing influence of beta.

Beltrame et al. (2018) researched how bank asset quality interacts with the relationship between leverage and systematic risk. Their study used three leverage adjustments for sterilizing the effect of provisioning and incorporating the effect of non-performing loans and total credit risk exposure. Data analysis was done on a sample of 97 European banks from 2005 and 2016. Controlling for size, findings show the relevance of a combined effect of leverage and asset quality as a systematic risk component. Non-performing Loans are found to be one significant variable of market risk. Findings from the study established that simple leverage is pointless for verifying systematic risk and financial risk of a bank. This study also focused solely on few financial variables neglecting others important factors.

Huang (2019) investigated the changes in the systematic risk of firms listed in the Taiwan stock market as a result of the initial establishment of audit committees. The study used audit committee, corporate governance, ownership structure and family-controlled firms as explanatory variables. The study found that the variables do not have significant effect on systematic risk. This shows that the changes in systematic risk are insignificant for the overall sample of firms. Corporate governance influences changes in systematic risk for the low-growth firms. Particularly, the low-growth firms with lower insider shareholdings, with a pyramidal ownership structure, not controlled by a family, or audited by one of the Big 4 accounting firms tend to enjoy the benefits of experiencing a decline in systematic risk following the establishment of the audit committee. The study ignores some fundamental variables that could affect the outcome of the study.

Saravia et al., (2020) investigated how systematic risk varies over the lifecycle of the firm. The study collected data from DataStream from 1988 to 2014. Firm age, growth, business risk, financial leverage, operational risk, firm size and growth options were firm attributes considered by the study. The data analysis was conducted using panel regression. The findings of the study indicate that holding other determinants of beta constant, the coefficient of systematic risk tends to fall in magnitude following a nonlinear pattern as firm age increase. In addition, it also found that the volatility of market equity beta also tends to fall over the lifecycle of the firm.

Huong and Hoai, (2021) explore the relationship between Vietnam's systemic risk and the effects of macroeconomic factors including exchange rate, interest rates, and economic growth. The study collected data from the Vietnamese stock market, specifically 29 listed financial firms (commercial banks, insurance firms, and securities companies) in 9 years from 2010 to 2018. The analysis is performed in two steps including measuring systematic risk in Vietnam based on the Systemic Expected Shortfall (SES) method and providing evidence on risk determinants assessment. The study used four different estimators (OLS, REM, FEM, SGMM) and found that economic growth has a positive effect on systemic risk while the exchange rate has an inverse relationship with systemic risk in Vietnam, and the interest rate has a positive effect on systemic risk. This study should have considered more macroeconomic variables for a more robust finding.

Setiawan and An (2021) examined the individual, systematic, and systemic risk levels of large commercial banks in Indonesia and their determinants. Panel data regression was employed using random, fixed, and common effects respectively, following the results of Chow, Hausman, and LM tests. The sample covers 10 largest commercial banks for 13 consecutive years from 2006 to 2018 by both book value of total assets and market capitalization in Indonesia. Banks size, leverage, funding structure, and market-based activities are selected as the common bank-specific factors with findings indicating significant influence of bank's size on both individual and systematic risks, although in opposite directions. The results revealed significant negative impacts of both stock volatility (δ) and beta (β) on systemic risk.

Rofiqoh and Mukaffi (2021) examined the effect of systematic risk (beta) on stock prices and also find out whether interest rates and exchange rates can be used as moderating variables on the relationship of systematic risk to stock prices. Data was collected from 24 companies which was the study sample. Data analysis was conducted using descriptive analysis, Least Squares Dummy Variable (LSDV) and Moderate Regression Analysis (MRA). The results from the study showed that systematic risk (beta) has a positive and significant effect on stock prices. Interest rates and exchange rates are significantly able to moderate the relationship between systematic risk (beta) and stock prices. While exchange rates cannot strengthen the effect of

systematic risk on stock prices but instead weaken the effect of systematic risk on stock prices with the negative sign.

Asafo-adjei et al. (2022) examined the interdependence of systematic risk in twenty emerging market economies. The study used the Kalman filter-based wavelet approach to execute the objective of the study. The outcome from the contemporaneous correlations demonstrates that the degree of co-movements among the equity betas varies. While, the equity betas of United Arab Emirates (Africa and Middle East), Argentina (Americas), China (Asia), and Russia (Europe) exhibit low degrees of integration with other systematic risk returns from each sub region. The study found significant integration among systematic risks in emerging markets in the long term. However, the study is limited to the use of frequency for dependent analysis; revealing only intrinsic times not calendar times.

Based on the studied reviewed, this research has established that most studies on systematic risk focused more on internal factors while external factors such as macroeconomic variables have a far-reaching effect on the systematic risk has been largely ignored. Therefore, there is a need to have a more comprehensive assessment of the determinants of systematic risk associated with return in the Nigerian Stock Exchange Group.

Theoretical Framework

The underpinning theory for the study is the Arbitrage Pricing theory. The theory of asset pricing is a pricing model that seeks to calculate the appropriate price of an asset while taking into account systemic risks common across a class of assets. The Arbitrage Price Theory (APT) was developed by Stephen Ross in 1976 and it has been an influential form of asset price theory. The theory suggests that asset returns are driven by multiple macroeconomic factors. Arbitrage pricing theory (APT) is a multi-factor asset pricing model based on the idea that an asset's returns can be predicted using the linear relationship between the asset's expected return and a number of macroeconomic variables that affect the asset's systematic risk.

The APT model is also an equilibrium pricing model that allows for multiple risk sources. According to Wen and Tang, (2010) the APT describes the equilibrium relationship between expected returns for well-diversified portfolios and their multiple sources of systematic risk. The study found that APT is suitable to explain the relationship between identified macroeconomic variables that are risk factors and the market beta that was used to measure systematic risk. Therefore, this study adopted APT because it can be used to explain all the variable of interest and how they relate with systematic risk and return in the stock market.

3.0 Methodology

The correlational research design was adopted for this study. The study collected monthly time-series data for eleven years 2012-2022 from secondary sources. The study obtained from data on All Share Price Index and other sectoral indices from the Nigerian Exchange. This was converted to returns and the market return was regressed against each index return. The study collected monthly data on interest rate and money supply using monthly publications from the Nigeria Bureau of statistics and central bank of Nigeria. The study conducted data analysis using descriptive statistics and Autoregressive distributed lag model. The descriptive statistics showed the summary and characteristics of the variables employed in the study. Unit root analysis was also conducted to establish the stationary of the data set.

Model Specification

The study investigated the effect of interest rate and money supply on systematic risk associated with return in the Nigerian stock exchange group using the ARDL technique and evaluates the results of the regression according to some assumptions. In this model, all variables are stationary at first difference which make ARDL model most suitable technique for data analysis. In addition, the study conducted normality and multicollinearity tests, and the equation of the study model is as follows:

$$\Delta (SRISK_t) = \beta_0 + \sum_{i=1}^v \beta_{1i} (SRISK_{t-i}) + \sum_{i=1}^v \beta_{2i} (INT_{t-i}) + \sum_{i=1}^v \beta_{3i} \ln(MSU_{t-i}) + \beta_4 (SRISK_{t-i}) + \beta_5 (INT_{t-i}) + \beta_6 \ln(MSU_{t-i}) + \mu_t$$

Where SRISK, INT and MSU represent systematic risk, interest rate and money supply, respectively. A natural form of logarithmic series is indicated by ln. The first difference is shown by Δ and the optimal lag length is indicated by v. Short- run elasticity of the model are represented by β1, β2 and β3 and long-run elasticity by β4, β5 and β6. μt represents error term at time t and β0 is the intercept of the regression line.

Table 3 *Definition and measurement of Variables*

S/N	Variables	Symbol	Measurements	Source
1	Systematic risk	SRISK	Beta is calculated by regressing monthly average returns of companies against monthly average returns of market	Elbannan (2015)
2	Interest rate	INT	Measured by monetary policy rate	(Ndung’u 2012)
3	Money supply	MSU	Measured with M2 (broad money)	Haider et al. (2017)

Source: Author’s compilation, (2024)

4.0 Data Presentation and Analysis

Unit Root Test Results for Variables

This study conducted unit root tests on the variables employed to estimate the time series regression using the Augmented Dickey-Fuller (ADF) test and the result is represented in table 4.1 below

Table 4 *Unit Root Test*

ADF Unit Root Test results			
Variable	Statistics	Stationarity	Order of Integration
SRISK	-12.11***	Yes	I(0)
INT	-18.62***	Yes	I(0)
MSU	-11.91***	Yes	I(0)

Source: EViews 10 Output, 2024

Result from Table 4.1 indicates that the variables of the study systematic risk, interest rate and money supply are stationary at level. The test statistics for SRISK, INT and MSU are -12.11,-18.62 and -11.91 respectively, the variables all have a p-value of 0.00. This implies that the test statistics is significant at all conventional level. Therefore, we fail to reject the null hypothesis and accept that the data is stationary at level.

Descriptive Statistics

This section presents the result, analysis and interpretation of study variables in order to fully understand the characteristics and behavior of the data. The series was analyzed using descriptive statistics to determine the central tendency for the data (mean), the range (Minimum and Maximum), to show the least and highest value of each data series, skewness, kurtosis, and standard deviation. The normality result of all the variables was also presented and interpreted in this section. Table 4 contains a summary of the descriptive statistics

Table 5 *Descriptive Statistics of Variables*

	SRISK	INT	MSU
Mean	0.58	0.002	0.01
Std. Dev.	3.30	0.02	0.03
Minimum	-16.85	-0.13	-0.05
Maximum	20.60	0.11	0.15
Skewness	1.89	-0.66	1.63
Kurtosis	21.17	16.25	10.02
Normality	1852.39***	952.86***	322.25**
Obs.	129	129	129

Source: EViews 10 Output, 2024.

From table 5 the value of the mean for systematic risk (SRISK) is 0.58, a positive mean value suggests that the stocks or sectors in the market are moving in the same direction with the overall market. It also suggests that stocks are less volatile compared to the overall market. The range consists of a minimum value of -16.85 to the maximum of 20.60 indicating a relatively wide range for the systematic risk. The standard deviation of 3.30 further suggests a high degree of variation from the mean. The skewness and kurtosis of beta is 1.89 and 21.78 which suggests that there are more positive than negative observations of beta within the series and the series is peaked around the mean. Lastly, the Jarque-Bera normality statistics value for SRISK is 1852.39 while the p-value is 0.000, since the value of Jarque-Bera statistics is large enough and significant at 1%, it implies that the data series is not normally distributed.

The table 5 further reveals the mean value of 0.002 for interest rate series, it indicates a positive value of interest growth rate around the center of interest rate series. The minimum value is -0.13 and the is maximum value of 0.11, this implies that the value of the interest rate growth rate over time has experience high variability. The standard deviation of INT is 0.03 which suggests a high degree of dispersion around the mean value of interest rate. On the other hand, the skewness is -0.66 which indicate that there are more negative interest rate growth values than positive in the series (scores clustered to the left at the low values), this implies that the growth rate of interest rate is mostly in the negative in the period under study. The kurtosis value of 16.24 indicating that the distribution is rather peaked (clustered in the centre) than normal and it is a leptokurtic distribution, it implies that data series have a long tail.

Furthermore, the Jarque-Bera normality statistics value is 952.87 while the p-value is 0.00 meaning that the data is normally distributed.

Money supply (MSU) from the table showed a mean average value 0.01. The range of money supply growth rate has a least value of -0.05 to a maximum value of 0.15, it implies there is variability in the data series. Furthermore. The standard deviation of 0.03 also suggest a high dispersion of the values in the money supply series. The skewness is 1.63 and kurtosis 10.20 which indicate that the distribution is perfectly normal and has more positive values than negative values, and the distribution is leptokurtic and has longer tail. The Jarque-Bera normality statistics value is 322.25 while the p-value is 0.00 meaning that the data series is not normally distributed since the p-value is significant at 5%.

Correlation Matrix

The study conducted correlation analysis as a statistical technique to evaluate the strength of the relationship between the variables under study. The results of the correlation analysis are presented in Table 6, which shows both the correlation coefficient of relationships

Table 6 Correlation Matrix

	SRISK	INT	MSU
SRISK	1	-0.07	-0.003
INT	-0.07	1	-0.11
MSU	-0.003	-0.11	1

Source. EViews10

The results in table 6 shows that SRISK have negative and significant coefficients of -0.07 and -0.003 with INT and MSU respectively. This indicates that the dependent variable has a negative relationship with the independent variables although the strength of the relationship is weak. The relationship between the independent variables (INT and MSU) is negative and exhibits a weak strength with a coefficient is -0.11. This indicates that all variables are correlated and the level of association is weak below the bench mark of 0.80 as set by Hair *et al.*, (2010), thus the possibility of collinearity between the variables is minimal.

Lag Selection Results

The study conducted lag selection test to determine the appropriate lag for the model. The purpose of choosing optimal lag is to reduce residual correlation. Table 7 shows the test statistic for each of the criterion for lag selection.

Table 7 Lag Selection Results

LR Statistic	FPE Statistic	AIC	SC	HQC	Lags
NA	11.14454	5.248817	5.318134*	5.276969*	0
0.589112	11.27353	5.260311	5.352733	5.297847	1
0.986915	11.36458	5.268332	5.383860	5.315252	2
2.833621	11.27316	5.260220	5.398855	5.316525	3
0.283828	11.43309	5.274260	5.436000	5.339948	4
0.232175	11.60052	5.288734	5.473580	5.363807	5
10.35007*	10.75370*	5.212851*	5.420803	5.297308	6

Source. EViews10 Lag Selection Criteria Output, 2024

*indicates lag selected by the criterion

Table 7 shows the result of lag selection model for SRISK with corresponding lags for sequential modified (LR) test statistic, Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) respectively. From the result three of the criterion selected lag 6 for the model. The LR, FPE and AIC statistics favours lag 6. Therefore, based on the result the study selected lag 6 for the analysis of the model.

Collinearity Diagnostics

Collinearity refers to a linear relationship between two explanatory variables. Variance Inflation Factor determines the strength of the correlation between the independent variables. The study conducted VIF for all the independent variables using SRISK as the dependent variable. Table 8 contains the VIF values for the study variables.

Table 8 Collinearity Test Results

Variable	Centered VIF
INT	1.13
MSU	1.03
Mean VIF	1.08

Source: EViews10 Collinearity Test Results, 2024.

Table 8 shows that the VIF values for SRISK model of all the independent variables ranges between approximately 1.03 and 1.13. The mean VIF for all the independent variables was approximately 1.08. Based on the results in the table, the values do not predict any harm in terms of collinearity. This implies that there is no disturbing evidence of variance inflation for any of the independent variables used in this study.

ARDL Bounds Test for Co-integration Results

This study conducted ARDL bounds test for co-integration method and tested the presence of long run relationship between the variables. Table 9 shows the values for the lower bound and upper bound of the F-bound test.

Table 9 ARDL Bounds Test for Co-integration Results

F-Bound test	F-statistics	I(0)	I(1)
10%	12.85	2.63	3.35
5%		3.1	3.87
2.5%		3.55	4.38
1%		4.13	5

Source: EViews 10 Output, 2024.

The result in table 9 presented the calculated f-statistic as 12.85 for SRISK. From the result the null hypothesis for the variable cannot be rejected, since the f-statistics value is larger than the critical values. Meaning that there is no co-integration among the variables in a long run.

5.0 Test of Hypotheses

ARDL Regression Model

The study estimated the ARDL model to establish the effect of interest rate and money supply on systematic risk associated with return in the Nigerian Stock Exchange Group. Table 4.7 shows the summary of the regression model.

Table 10 ARDL Regression Model

Variable	Coefficient	Std. Error	t-Statistic
C	0.60	0.37	1.64*
SRISK(-1)	-0.09	0.09	-1.10
SRISK(-2)	-0.11	0.09	-1.23
SRISK(-3)	-0.22	0.10	-2.44**
SRISK(-4)	-0.09	0.09	-0.96
SRISK(-5)	0.04	0.09	0.42
SRISK(-6)	-0.28	0.09	-3.24***
INT	-8.52	12.39	-0.69
MSU	0.95	11.30	0.08
MSU(-1)	36.90	11.20	3.29***
R-squared	0.20		
Adjusted squared	R- 0.14		
F-statistic	3.17***		
Durbin-Watson statistics	1.87		

Source: EViews 10 Output, 2024.

From table 10 above, it can be seen that the constant, which is a measure of the average value of the dependent variable, is approximately 0.60 with a corresponding t-statistics of 1.64 which is significant at the 10%. The result from the table also revealed that dependent variable systematic risk (SRISK) has a coefficient ranging from -0.09 to -0.28 for lag 1, 2, 3, 4 and 6 while lag 5 has a positive coefficient of 0.04. At lag 1, 2, 4 and 5 the variable has a negative coefficient and is not significant at all conventional level while the variable is significant at lag 3 and 6 at 5% and 1% respectively. The coefficient of beta from the six lags also indicated that the past values of beta influence its present value.

The table also shows that the coefficient of interest rate (INT) at lag 0 is approximately -8.54 with a corresponding t-statistics of -0.69 which is statistically not significant at all the conventional levels. The negative coefficient of interest rate suggests that an increase in interest rate will result in a decrease in systematic risk although the difference is not statistically important.

The table also present the coefficient of Money supply (MSU) at lag 0 is approximately 0.95 with a corresponding t-statistics of 0.08, this implies that the coefficient is statistically not significant while MSU at lag 1 has a coefficient of 36.90 while the t-statistics is 3.30 which is statistically significant at the 1% level. This imply that Money supply has a positive effect on systematic risk.

Discussion of Findings

The study earlier hypothesized that interest rate does not have significant effect on systematic risk associated with return in the Nigerian Exchange. Result from the study has established that interest rate has a negative and not statistically significant effect on systematic risk associated with return in the Nigerian Exchange. Hence, the study failed to reject the null hypothesis. The findings from the study is in line with the findings of Alam and Uddin, (2009) and Ndung’u, (2012)while it negates the findings from John et al., (2020).

The second hypothesis stated that money supply has no significant effect on systematic risk associated with return in the Nigerian Exchange. Result from the study indicates that money supply has a positive and significant effect on systematic risk associated with return in the Nigerian Exchange. Therefore, the study will reject the null hypothesis. The findings of the study is consistent with the findings of Ouma and Muriu, (2014) and Qing and Kusairi, (2019) while the findings is in contrast with the result from Raymond, (2009) and Haider et al., (2017).

Post Estimation Test

Serial LM Test

Serial correlation, also known as autocorrelation, occurs when the regression residuals are correlated with each other. Table 11 presents summary of the results for auto-correlation test.

Table 11 Serial Correlation LM Test Result

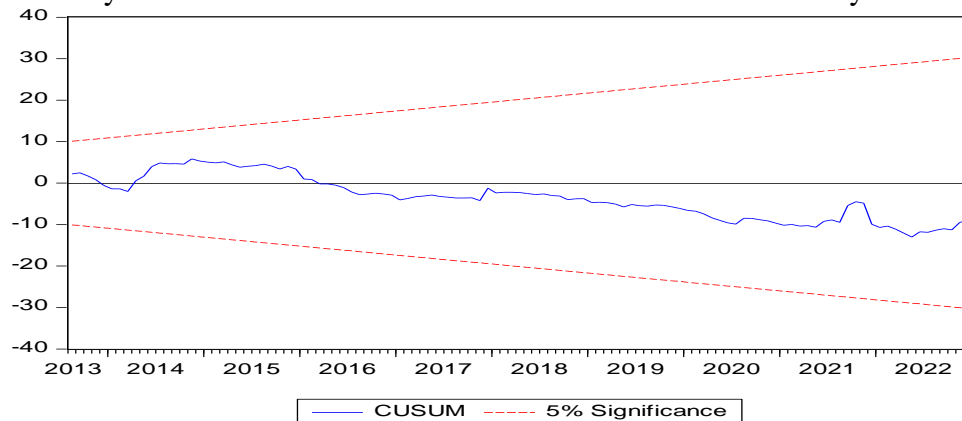
SRISK		
	Test Statistic	Prob.
F-statistics	0.54	0.78
Obs*R-squared	3.61	0.73

Source: EViews 10 Output, 2024

Result from Table 11, presented shows that the test statistics was approximately 0.54, which was found to be statistically insignificant at all conventional levels. This means that the study fails to reject the null hypothesis which states that there is no serial correlation among the residuals. This means the regression coefficients are not biased and the model is free from misspecification.

Cumulative Sum Test

Stability test was carried out on the model to establish and identify the stability of the model.



The stability test results as shown in fig 1 suggest that all long run and short run coefficients are within the bounds of critical value at 5%. Therefore, based on the result, the study failed to

reject the hypothesis and suggest that the cumulative sum of the residual has zero mean. This implies that the model is very stable and does not suffer from any structural break.

5.0 Conclusion and Recommendations

The study investigated the effect of interest rate and money supply on systematic risk associated with return on the Nigerian Exchange for the period (2012-2022) using autoregressive distributed lag method. The findings from the regression model led the study to conclude that the negative effect of interest rate on systematic risk associated with return in the Nigerian stock market is confirming the fact that Nigeria's stock market investors do not consider interest rate as an important determinant of systematic risk in the Nigerian stock market. In addition the study also concludes that the positive effect of money supply on systematic risk associated with return in the Nigerian stock market is confirming the fact that Nigeria's stock market investors respond to changes in money supply positively. This is because with more money, investors have a higher propensity to take more risk and invest in more risky assets in the market. The study recommends that the monetary Authority (CBN) should increase interest rate to stimulate the level of investment in the stock market. High interest rate increases investment in fixed income assets, this will enhance the level of response to the variable by the market risk. The investors should also adjust their portfolio in line with the monetary policy on money supply with consideration of other variables to benefit from the low risk or high return from the market. The CBN should also continue their expansionary money supply policy as it encourages more investment in the capital market and this will in the long run lead to growth in economic activities that is sustainable.

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