Systemic Risk and Stock Market Return: A Vector Error Correction Estimate from Nigeria

LENYIE, Leesi,
Department of Banking and Finance,
Rivers State University, Port Harcourt, Nigeria

DOI: 10.56201/wjfir.v7.no2.2023.pg49.76

ABSTRACT
This study examined the effect of systemic risk on the stock market return in Nigeria. Time series data were sourced from Central Bank of Nigeria statistical Bulletin from 1990-2021. Stock market return was modeled as the function of exchange rate risk, commodity price risk, equity price risk and interest rate risk. Multiple regressions were formulated to examine the effect of systemic risk on stock market return. Ordinary least square methods were adopted as data analysis methods. R-square, adjusted R-square, T-statistic, regression coefficient, f-statistic and Durbin Watson were used to examine the effect of systemic risk on stock return. The study found that systemic risk explained 62.8 percent variation in stock market return over the time covered in this study. The study found that exchange rate risk has negative and no significant effect, commodity price risk have positive and significant effect, interest rate have positive and no significant effect while equity price risk have positive and significant effect on stock market return. From the regression summary, the study concludes that systemic risk has significant effect on stock market return in Nigeria. The study recommends that systemic risk management should be considered as part of strategic plans which need to be reviewed on a more frequent basis and macroeconomics policies should directed towards stabilizing Nigerian exchange rate to avoid depreciating naira exchange rate against key currencies that exposes the firms to exchange rate risk.

Keywords*: Systemic Risk, Stock Market Return, Exchange Rate Risk, Interest Rate Risk, Inflation Risk*

INTRODUCTION

The Nigeria stock market is classified among the emerging financial market of world and one of the fast growing in Africa. In a deregulated financial market like Nigeria, stock market return depends on both monetary and macroeconomic policies. Nigerian stock market was established in 1960 for the purpose of bridging savings and investment gap and simplifies the sourcing long term fund (Anyamaobi, 2018). It constitute a network of financial institutions and investors interact to mobilize and allocate long term funds to productive investment and funds are exchanged for financial assets issued by borrowers or traded by stock holders which in turn offers access to a variety of financial instruments that enable economic agents to pool, price, and exchange risk (Akani & Imegi, 2017).

There are two kinds of risk: systematic and unsystematic risk. Both systematic and unsystematic risk affects stock prices. The risk that can be diversified is called unique risk or firm-specific risk or unsystematic risk or diversifiable risk (Puspitaningtyas, 2015). The systematic risk is also known as undiversifiable risk, which is caused by the influence of external factors on an organization. Such factors are beyond the normal control of an organization (Dedunu, 2017). However, the concern of diversified investors is the systematic risk and there is a higher rate of return for stock that has a higher systematic risk (Rowe & Kim 2010). Therefore, financial variables effects on systematic risk of common stocks are the most significant information for company to enhance shareholder's wealth

The risk-return relationship is a fundamental tenet of finance. According to the risk return theory high level of risk results into greater expected return. Logically an individual would demand a greater return for bearing higher level of risk, as explained by Markowitz (1952) as well as Fama and French (2001) investor decision is determined by the risk and return of a particular asset. The question that arises is whether the risk-return relationship can be a guide to the investment options that an investor or the industry gets into. Capital Assets pricing model uses proportional market risk explaining pricing and asset return. However the model did not explain well the observed market returns, of companies trading at stock market, this is because the model uses one factor to estimate the assets return.

Stock market returns are the aggregate weighted returns of all securities in the market. Pandey (2005) suggests that the return on a share and market index may be calculated as total return; that is, dividend yield plus capital gain. But in practice one may use capital gains/loss to calculate the return. The link between exchange rates and equity returns is based on a simple financial theory, exchange rate as an indicator of a currency as a monetary variable that affect the prices of stock in a way similar to inflation variables. When the domestic currency depreciates against foreign currencies, export product prices will decrease and, consequently, the volume of the country's export will increase, assuming that the demand for this product is elastic. The appreciation of a country's currency lowers the cost of imported goods, which in most cases constitute a large part of the production inputs for emerging market countries. According to Pebbles and Wilson (1996) an appreciating currency is generally accompanied by increases in reserves, money supply and a decline in interest rates.

However, there has been point of departure among scholars on risk return relationship. Behavioral finance researches have criticized the basic capital assets pricing model assumptions. In behavioral finance not all investors are mean variance optimizers and securities are not all analyzed by the same opinion about the economic outlook. Chen et al. (1986) in their notable work in United States of America analyzed macroeconomic financial variables using monthly data to investigate the systematic factor influence on US firm stock prices. The variables used in their study were industrial production, inflation, risk premium, term structure, market index, and consumption and oil prices. The authors found that the factors had a significant influence in the stock prices with inflation showing particularly high significance particularly in periods of high volatility.

Systemic risk can change over time as will the risk premium associated with each one. Using the wrong factor(s) or missing a significant factor in a multi-factor model can lead to inferior estimates of cost of equity. Morel (2001) opined that by using this arbitrage reasoning it can be

shown that in an efficient market, the expected return is linear combination of each factor's beta. Thus, the APT predicts that "general news" will affect the rate of return on all stocks but by different amounts. In this way the APT is more general than the CAPM, because it allows larger number of factors to affect the rate of return (Cuthbertson, 2004). Many divergent views trail the issues of stock price determination and the factors responsible. The proponents of efficient market hypothesis are of the view that stock prices would be determined primarily by fundamental factors such as earnings per share, dividend per share, payout ratio, size of the firm and dividend yield, management and diversification (Srinivasan, 2012).

However, sequel of information asymmetry, stock market information may not be available to all stakeholders at the same time. Equity risk premium is conceived as the return provided by an individual stock on the overall stock market in excess of the risk-free rate. This excess return compensates investors for taking on the relatively higher risk of the equity market. The size of the risk premium will vary as the risk in a particular stock, or in the stock as a whole, changes, that is, high-risk investments are compensated with a higher premium.

The relationship between systemic risk and stock returns has been extensively studied and documented in developed capital markets such as USA, Japan, Australia, Canada and European countries. Notable among them is one by Chen et al., (1986) on the US stock market, which set the tone for a series of recent studies within the Arbitrage Pricing Theory (APT) framework. Most of these studies relate to US and Japanese stock markets (Kaneko and Lee,1995). Fama (1981) reported a positive relationship between stock returns and macroeconomic variables. In spite of increasing migration of capital from developed market to emerging markets and associated high returns, (Ushad et al., (2008) and Osinubi (2004) emerging stock markets in developing countries like Ghana have not been well studied. In 2006 foreign equity accounted for 75.3% of the equity finance recorded in Ghana compared to 29.9% in 2001 according to Ghana investment promotion centre quarterly report (December 2007). The growing interest and the performance of emerging markets have been attributed to the conduct of sound macroeconomic policies, privatization, stock market reforms and financial liberalization (Adams and Anokye, 2008).

However, one of the most controversial points among scholars in behavioral finance is the factors that determine stock value. There has been aged long point of departure among financial economists and behavioral finance scholars on factors that determine stock market return. There are five schools of thought on stock price behaviour. These are the fundamentalist schools, the technical school, the random walk hypothesis school, the Bahavioural School of finance and macro-economic hypothesis school.

The fundamentalist believe that the value of a corporation's stock is determined by expectations regarding future earnings and by the rate at which those earnings are discounted. The fundamentalists apply present value principles to the valuation of corporate stock, using dividends, earnings, assets and interest rate to establish the price of stock. The technical school opposes the fundamentalists' arguments, and claims that stock price behaviour can be predicted by the use of financial or economic data. They submit that stock prices tend to follow definite pattern and each price is influenced by preceding prices, and that successive prices depend on each other.

According to Smith (1990), technical analysts engage themselves in studying changes in market prices, the volume of trading and investors' attitude. Both the "technical" and "fundamental" analyses have been challenged by scholars who subscribe to the random-walk hypothesis, which sees stock price movements in terms of a probability distribution of different possible outcome. The random-walk hypothesis is based on efficient market assumption that investors adjust security rapidly to reflect the effect of new information. Believers in the efficient capital market hypothesis argue that stock prices are essentially random and therefore, there is no chance for profitable speculation in the stock market. An interesting feature of random walk is the persistence of random shocks.

While the above theories are very appealing, they failed to explain financial market of the emerging countries like Nigeria. Studies on arbitrage pricing model have focused in testing the validity of the model in the emerging financial market like Nigeria (Monogbe, Edori Inivia Semion & Iki, 2016, Okorafor, 2008 and Connor and Sehgal, 2001). This study examined the effect of systemic risk on the stock market return in Nigeria.

LITERATURE REVIEW

Systematic Risk

Risk is defined as the possibility of realizing low returns or even making loss, thereby preventing you from meeting required objectives (Bodie, Kane and Marcus (2009). There are two types of risk in investments: Systematic risk and unsystematic risk (Estrada, 2002; Bodie, Kane and Marcus, 2009; Sudarsono, Husnan, Tandelilil n and Ekawati, 2012; Toth, Lancaric, Piterkova and Savov, 2014; Puspitaningtyas, 2015). The risk that can be eliminated by diversification is called unique risk or firm-specific risk or unsystematic risk or diversifiable risk (Estrada, 2002; Bodie, Kane and Marcus, 2009; Toth, Lancaric, Piterkova and Savov, 2014; Puspitaningtyas, 2015). Although systematic risk is caused by non-firm reasons, internal factors of the firms contribute to the level of the systematic risk. In other words, firm's internal factors can determine the extent of the effect of systematic risk on that firm (karakus 2017). The risk that cannot be lost through diversification is called systematic risk or beta (β) (Scott, 2009; Estrada, 2002; Anjum, 2014; Toth, Lancaric, Piterkova and Savov, 2014; Puspitaningtyas, 2015).

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) suggests 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.

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 and Chrystal, 2007).

Interest rate fluctuations are worldwide acknowledged as an important source of uncertainty for firms. Graham and Harvey (2001) provide 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).

Stock Market Return

Stock market return is the returns that the investors generate out of the stock market. This return could be in the form of profit through trading or in the form of dividends given by the company to its shareholders from time-to-time. Stock market returns can be made through dividends announced by the companies. Generally at the end of every quarter, a company making profit offers a part of the kitty to the shareholders as dividend. This is one of the source of stock market return one investor expect. The most common form of generating stock market return is through trading in the capital market. In the capital market an investor could earn stock market return by buying a stock at lower price and selling at a higher price.

Stock market returns is not fixed ensured returns and are subject to market risks. It can be positive or negative. Stock market return is not homogeneous and changes from investor-to-investor depending on the amount of risk one is prepared to take and the quality of his stock market analysis. In opposition to the fixed returns generated by the bonds, the stock market returns are variable in nature. The idea behind stock return is to buy cheap and sell dear. But risk is part and parcel of this market and an investor can also see negative returns in case of wrong speculations.

The Capital Asset Pricing Model

The Capital Asset Pricing Model is a model for pricing an individual security or a portfolio. The Capital Asset Pricing Model model was developed independently by William Sharpe (1964), and Parallel work was performed by Lintner (1965) and Mossin (1966) these model marks the birth of asset pricing theory. The CAPM suggests that the only variables that we need in calculating the expected return on security are: the risk-free rate (a constant), the expected excess return on the market, and the security's beta (a constant). The Capital Asset Pricing Model model is attractive because of its effectively simple logic and intuitively pleasing predictions relating to how it measures risk and the relation between expected return and risk. Unfortunately, the Capital Asset Pricing Model simplicity causes the empirical record of model to be poor, poor enough to invalidate the method used in the application of the model. The models empirical problems may reflect true failings or they may also be due to the shortcomings of the empirical tests, most notably, poor proxies for the market portfolio of invested wealth, which plays a crucial role in the models predictions.

Derivation of the Capital Asset Pricing Model

The Capital Asset Pricing Model is a simple linear model that is expressed in terms of expected return and expected risk. The model states that the equilibrium returns on all risky assets are a function of their covariance with the market portfolio. Under the assumptions of the Capital Asset Pricing Model, if a risk-free asset exists, every investor's optimal portfolio will be formed from a combination of the market portfolio and the risk-free asset. The precise combination of the market portfolio and the risk-free asset depends on the degree of investors risk aversion. Since investors can choose the combination of the market portfolio and the risk-free asset, then the equation of the relationship connecting a risk-free asset and a risky portfolio is:

$$E(Ri) = R_f + \frac{E(Rm) - Rf}{\sigma 2m}\ \sigma im \qquad (1)$$

Where;

E (Ri): Expected return on i^{th} portfolio.

R f: Return on the risk free asset

E (Rm) : Expected return on market portfolio

σim : The covariance between asset i and the market portfolio

σ2 m: The variance of the market portfolio

Based on the equation (3) the original CAPM equation can be derived as follows:

$$E(Ri) = R_f + [E(Rm) - R_f]\ \beta i \qquad (2)$$

Equation 4 is known as Capital Asset Pricing Model and it could be shown graphically as the security market line (SML) which means the SML fundamentally graphs the results from the capital asset pricing model (CAPM) formula. The x-axis represents the risk (beta), and the y-axis represents the expected return. The market risk premium is determined from the slope of the SML. The SML model states that stocks expected return is equal to the risk-free rate plus a risk premium obtained by the price of risk multiplied by the quantity of risk. In a well-functioning market nobody will hold a security that offers an expected risk premium of less than [E (Rm)-R f] i.

If we think E (Rm) – Rf as the market price of risk for all efficient portfolios, than, it represents the extra return that can be gained by increasing the level of risk on an efficient portfolio by one unit. The quantity of risk is often called beta, and it is the contribution of asset i to the risk of the market portfolio.

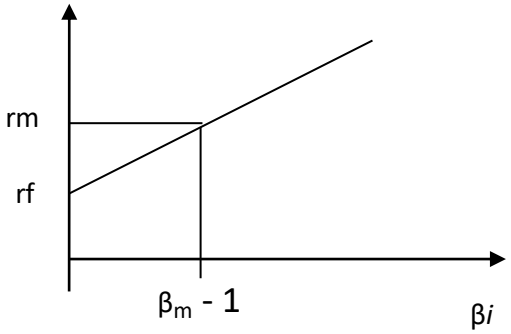


Figure 1: Security Market Line

The relationship between the single assets and the risk of the entire market portfolio can be expressed as β-coefficient. This coefficient corresponds to the ratio of the covariance of the market and the single asset to the variance of the market portfolio.

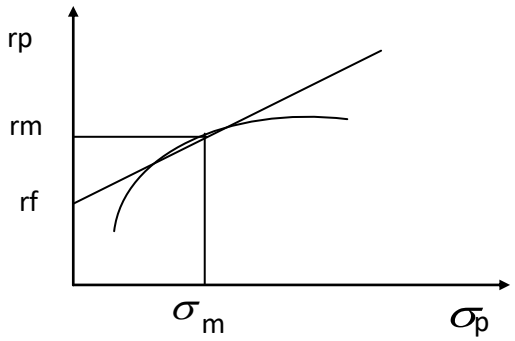


Figure 1: a broader look at the capital market line

The slope of the CML line is $\sigma = \frac{\bar{r} - rf}{\bar{r}M - rf}\sigma_{\mathrm{M}}$. The intercept of a straight line is the risk free rate, which means the risk and return of the asset portfolio when all the assets in the portfolio are invested in the riskless asset, i $Y = \frac{1}{N}\sum_{k=1}^{N}(r_{S\&Pk} - \hat{\bar{r}}_{S\&P})\ (r_{S\&Pk} - \hat{\bar{T}}A)$.The point M on the capital market line (CML) is located at the effective frontier (EF), which means that when all funds are invested in risky assets, the corresponding point of is the market portfolio. On the capital market line, all points represent a linear combination of a risk free asset and a market portfolio M. Among them, the line rf-M represents risk-free asset and market portfolio changes between 0 and 1. On the line extending from point M to the upper right, all the points represent the investment in riskless assets is negative, while the market portfolio M investment ratio is greater than 1. The weight of risk-free assets is negative, indicating that someone lend funds at risk-free interest and fully invest in risky assets.

Assumption of Capital Asset Pricing Model

To understand how capital assets are priced, a model needs to be established, which is a theory. In order to make the model simple and straightforward, the model builder must refine the very real situation and concentrate on the most important elements. This goal can be achieved by making certain assumptions about the actual situation. In order to successfully build a model, a certain degree of abstraction is required and the assumptions need to be simplified (Bodie, 2009).

Any economic model is a simplification of complex economic issues, and Capital Asset Pricing Model is no exception. The core assumption of Capital Asset Pricing Model is to treat all investors in the securities market as individuals with the same initial preferences, and the capital asset pricing model develops on the basis of the Markowitz (1952) mean-variance principle. Capital Asset Pricing Model also inherits the assumptions of securities portfolio theory. The criteria for setting hypotheses are: The assumptions made should be sufficiently simple, so that we have enough freedom to abstract our problems and achieve the purpose of modelling. With regard to the hypothesis of a theory, our concern is not whether they completely describe the reality, because no model can fully characterize the reality, the concerned that they are fully close to what we want to achieve. The Capital Asset Pricing Model assumptions are as follows (Bodie, 2009).

1. Investors evaluate the pros and cons of this portfolio through its expected rate of return and risk over a period of time.

2. Investors will never be satisfied, so when faced with the other two options of the same conditions, they will choose the one with the higher expected rate of return.

3. Investors are risk averse, so when faced with two other options that are the same, they will choose the one with the smaller standard deviation.

4. Every asset is infinitely divisible, which means investors could buy a portion of a share. 5. Investors can lend or borrow funds at a risk-free rate.

6. Tax and transaction costs are negligible.

7. All investors have the same investment period.

8. The risk-free rate is the same for all investors 9. For all investors, the information is free and immediately available

10. Investors have the same expectation that they have the same estimation of expected return, standard deviation and covariance between securities.

All investors are rationally risk-averse individuals whose aim is to maximize the expected utility of their end of period wealth. Therefore, all investors operate on a common single-period planning horizon. All investors are price-takers; so that, no investor can influence the market price by the scale of his or her own transactions.
Asset markets are frictionless and information is freely and simultaneously available to all investor. All investors have homogeneous expectations about asset returns, this mean that all investors arrive at similar assessments of the probability distribution of returns expected from

traded securities. This says that investors will not be trying to beat the market by actively managing their portfolios Distributions of expected returns are normal. All securities are highly divisible, can be traded in small packages. All investors can lend or borrow unlimited amounts of funds at a rate of interest equal to the rate of risk-free securities. Investors pay no taxes on returns and there are no transaction costs entailed in trading securities, so expected return is only related to risk.

Let (σ_M, $\bar{r}_M$) denote the point corresponding to the market portfolio M. All portfolios chosen by a rational investor will have a point ($\sigma, \bar{r}$) that lies on the so-called capital market line

$$\bar{r} = rf + \frac{\bar{r}M - T_f}{\sigma_M}\sigma, \qquad (3)$$

Implications of the Capital Asset Pricing Model

The main implication of Capital Asset Pricing Model (CAPM) is that the expected rate of return on an asset is linked to a value of β that measures the risk of that asset. The return on risky assets equals the sum of risk-free returns and risk offsets, and high yielding assets must be accompanied by high risk. The size of the systematic risk can be expressed by the systematic risk measure coefficient. The expected return rate of a stock is directly proportional to the β coefficient. It is the first time that capital asset pricing model proves the linear relationship between risk and return from a mathematical point of view. As systemic risk cannot be dispersed by constructing an asset portfolio, to attract investors to invest, investors must be given the appropriate risk compensation with the corresponding rate of return (Zhou and Liu, 2018).

Since non-systemic risk can be dispersed, you can avoid the risk of a particular company by constructing a portfolio. The CAPM theory is the core content of the modern financial theory. Its role is to consider the rationality of the prices of different listed securities by predicting the quantitative relationship between the expected return and the standard deviation of the securities. This can help prepare the listed securities for pricing, and can estimate changes in various macroeconomic variables affect the price of securities. Capital Asset Pricing Model theoretically states that in an efficient portfolio, the β coefficient describes the systematic risk of any asset, and any other factors that affect the yield on the securities have been included in the β coefficient (Zhou and Liu, 2018). Capital Asset Pricing Model deriving the relationship between the return on securities and the risk of securities with a scientific rigorous reasoning method is of great significance to the investment management industry.

If the stock market line can accurately predict the return on securities, securities analysts can use it to conduct investment analysis and make the right decisions. The Capital Asset Pricing Model can also be used for capital budgeting, calculating the required return on an investment project and using it to measure whether a new investment project is worth investing. With the continuous development of academic research, the capital asset pricing model has prevailed in the financial field for over a decade, and the controversy over its effectiveness has been endless. In any case, this reflects the significant impact of the Capital Asset Pricing Model in academia. After long-term repeated argumentation and test by academics and real investors, this theory has been widely recognized in the investment management industry (Zhou and Liu, 2018). At present, many large fund companies in the world use negative investment management methods to imitate the market portfolio to build index funds, which is based on the Capital Asset Pricing

Model. In addition, the market portfolio yield is also seen as a performance evaluation standard for active portfolio management.

Many industrial companies also use the theory of capital asset pricing for decision-making analysis of investment projects, management of investment income target and so on. The basic idea of Capital Asset Pricing Model is that all investors are price receivers, and under a given price system, they decide on their own needs for each type of securities. Since this demand is a function of price, total demand is also a function of price when we sum up all individual needs to get the total market demand. The price changes affect the demand for securities. If the total demand of each type of securities exactly meets the total supply of the market under a certain price system, the securities market will reach equilibrium.

At this time, the price will be the equilibrium price, and the rate of return will be the equilibrium rate of return. The theoretical idea of Capital Asset Pricing Model is to give the return rate of any portfolio of securities or securities by assuming the return on portfolios of known markets. In theory, the market portfolio includes not only ordinary stocks but also other types of investments such as bonds (Zhou and Liu, 2018). However, in the actual calculation process, it is generally considered that the market portfolio consists only of stocks.

The test of capital asset pricing model does not directly test the assumptions of capital asset pricing model. Instead, it tests the characteristics of the securities market line, namely, testing whether there is a positive correlation between the beta coefficient of a security or a portfolio and the expected return. Since the capital asset pricing model gives a succinct description of the relationship between the returns and risks of various assets in the capital market, if the model can successfully describe the actual conditions in the capital market, then the capital asset pricing model is undoubtedly of great importance to investors. In fact, many empirical tests have been conducted on the capital asset pricing model (Zhou and Liu, 2018).

The key issue to empirically test the capital asset pricing model is to determine the market portfolio. Market portfolio is a portfolio of all assets in the market based on their market value ratio, but it is obviously impossible for a market index to contain information on all aspects of the market. Researchers usually use the stock price index as a representative of the market portfolio.

Obviously, if the stock index cannot effectively represent the market portfolio, the quantitative study of the capital asset pricing model cannot be correctly concluded. The capital asset pricing model assumes that the system risk of the market portfolio is all its risks, that is, the nonsystematic risk is zero. If the stock index used as a market portfolio is not efficient, nonsystematic risk cannot be zero. The capital asset pricing model considers that the income of a single asset is divided into two parts, one is risk-free gain, and the other is risk premium. The risk premium is defined as the product of the system risk β of a single asset and the excess return β. The β value of the market portfolio is assumed as 1.

The empirical research on the capital asset pricing model is very rich in specific content. These tests generally include three aspects: The first is the test of the relationship between risk and return. The second is the time series capital asset pricing model test. The American scholar Sharpe (1964) research is the first example of the relationship between risk and return. Sharpe

(1964) selected 34 mutual funds in the United States as samples, calculated the standard deviation of the annual average yield and yields for each fund from 1954 to 1963, and returned the standard deviation of the fund's annual return and yield. His main conclusion is: From 1954 to 1963, the return rate of the US stock market exceeded the risk-free rate of return.

The correlation coefficient between the fund's average return and the standard deviation of its return was greater than 0.8, and the relationship between risk and return was almost linear. When examining the theory, early tests adopted a two-step regression. In the first step, the β coefficient of the portfolio is estimated using time series (Zhou and Liu, 2018). The second step is to use the cross-sectional data to conduct regression analysis of the β coefficient and the average return rate of each portfolio. The best fitting line of the observation is the stock market line.

Haugen (1986) delineates four criteria against which the actual capital markets can be empirically tested. These criteria do not distinguish among the three forms of EMH as Fama suggests, but are grouped according to the behavior of security prices and returns as well as market participants. The markets are said to be efficient if they exhibit the following characteristics.

Security Prices' Responsiveness to New Information

Security prices should respond quickly and accurately to the receipt of new information that is relevant to valuation. The empirical tests related to this criterion include the measurement of stock price response, the stock price response to the announcement of dividends and stock split, the stock price reaction to earnings reports, and the stock price reaction to positive and negative events.

Security Returns' Responsiveness to Term- and Risk-Premium

The changes in expected security returns from one period to the next should be related only to changes in the level of the risk-free interest rate and changes in the level of the market risk premium associated with the security. Returns associated with factors other than these should be unpredictable (Zhou and Liu, 2018). Under this criterion, serial correlation and cross-sectional studies and conducted.

Trading Strategies' Ability to Discriminate Profitable Investments

It should be impossible to discriminate between profitable and unprofitable investments in the future by examining the characteristics of current investments. This implies that trading rules should fail to earn abnormal returns from buying profitable stocks and selling unprofitable stocks under the efficient market conditions. In this criterion, neither contrarian nor momentum trading strategies should outperform the traditional buy-and-hold strategy.

Professional Investors' Ability to Forecast Future Earnings

There is no significant difference between the average investment performance of the well-informed and the uninformed investors. If there were, the differences in performance between and within the two groups of investors should be due to chance. There are tests of security prices and returns predictability based upon several explanatory variables such as dividend yields, term-structure of interest rate, quarterly earnings reports, calendar effect, day-of-the-week effects, price-earnings ratios effect, price-to-book ratios effect, size effect, and trading volume effect. Fama (1970, 1991), on the other hand, categorizes the empirical approaches to test markets efficiency differently using his proposed three forms of EMH as guidelines

Tests of Returns Predictability

This group is catered to test the weak-form EMH and the random-walk model which consists of the tests of independence, tests of trading rules, tests of contrarian strategies, and the cross-sectional and time-serial tests of capital asset pricing models.

Event Studies

Semi strong-form EMH and the fair-game model are tested under the event studies to see how security prices and returns adjust to the arrivals of public information related to the specific firms' past earnings performance and the general economic, political, and social conditions and events.

Empirical Review

Adedokun and Olakojo (2012) investigated the empirical validity of CAPM in the Nigerian Stock Exchange (NSE) using monthly stock values of 16 firms from the 20 most capitalized firms in Nigeria between the period of January, 2000 and December, 2009. The empirical findings indicate that CAPM is inadequate to explain the role of asset risk for the determination of expected return on investment in Nigeria's equity market. They established contrary to the hypothesis of the CAPM that higher risk is associated with higher asset return and asset price.

Philip (2021) examined the effect of systemic risk and return on equity of quoted manufacturing firms in Nigeria. Panel data was sauced from financial statement of the manufacturing firm's from and Central Bank of Nigeria Statistical Bulletin from 2010-2019. Return on equity was modeled as function of interest rate risk, exchange rate risk, equity price risk and consumer price risk. Panel data methodology was employed while fixed effects and random effects estimates were tested using the Hausman test. Panel unit roots and panel cointegration analysis were conducted on the study. The empirical results found that 83.8 percent variation on return on equity of the manufacturing firms can be explained by variation on the systemic risk indicators as formulated in the model. Interest rate risk has positive but no significant effect on the return on equity, exchange rate risk have positive and significant effect on the return on equity, equity price risk have positive and no significant effect on return on equity while consumer price risk have negative and significant effect on return on equity of the quoted manufacturing firms. From the findings, the study concludes that there is significant relationship between systemic risk and return on equity of the manufacturing firms. It recommends that systemic risk management implementation should not just be formulated but strategic and tactical measures should be put in place to absorb, retain and transfer systemic risk. Systemic risk management should be considered as part of strategic plans which need to be reviewed on a more frequent basis. Macroeconomics policies should directed towards stabilizing Nigerian exchange rate to avoid depreciating naira exchange rate against key currencies that exposes the firms to exchange rate risk.

Nguyen, Stalin, Diagne, and Aukea (2017) reviewed the basic ideas of the CAPM and APT model. It was established that the APT model has an advantage over the CAPM due to it accommodation for other factors different from market portfolio. However, the APM has an application difficulty as the factors to be used are not easy to identify. It is also established that while the CAPM places emphasis on efficient diversification and neglects unsystematic risk, the APT model neglects essential risks which is a part of systematic risk due its utilization of naïve

diversification based on the law of large number. It is also stated that despite the unrealistic assumptions of the models in the real world, the models actually provides us an accommodating valuation to some extent.

Kamran and Malik (2018) carried out a study to find out whether financial variables affect the systematic risk in sugar industry. The purpose of the study was to evaluate the relationship between financial variables and systematic risk. The study analyzed the annual data over the period of 2005-2015 from selective industry. To test the studied hypotheses simultaneously, panel tests were applied along with multiple regression analysis approach. The findings of sugar industry showed that liquidity, leverage (insignificant), operating efficiency, dividend payout, and chin model are negatively related while profitability and Tobin q (insignificant) are positively related with Systematic risk. The regression results show that significant association of liquidity, profitability, operating efficiency, growth, dividend payout and chin model are in line with earlier studies. The study further revealed that the studied variables have decisive impact for determinants of Systematic risk.

Dedunu (2017) studied the Financial Variables Impact on Common Stock Systematic Risk. The purpose of the study was to evaluate the impact of financial variables on systematic risk of common stock. To achieve the goal of the study, selected 50 companies from CSE including manufacturing sector, beverage food and tobacco sector and hotel sector companies for the period of 2009-2016. The study selected dividend payout, profitability, liquidity and leverage as financial variables. Descriptive statistics, correlation analysis and regression analysis were used to test the variables. Regression results showed that dividend payout had a negative significant relationship with systematic risk while profitability, liquidity and leverage had a positive relationship. Pearson Correlation analysis showed insignificant effect of all the variables on systematic risk (beta). Also, profitability and liquidity had a positive relationship with systematic risk and the dividend payout and leverage represented a negative correlation with beta.

Puspitaningtyas (2017) carried out research on estimating systematic risk for the best investment decisions on manufacturing company in Indonesia. The purpose of the paper was to evaluate the influence of the financial information on the systematic risk of stock of manufacturing companies listed on the Indonesia Stock Exchange for a period of five years from January 2011 to December 2015. The collected data was analyzed using multiple linear regression analysis to show that at the 0.05 level only variable sized companies can significantly influence systematic risk. The study revealed that financial leverage, liquidity, and profitability do not affect the systematic risk.

Nawaz, et al (2017) studied financial variables and systematic risk. The objective of the study was to determine the relationship between financial determinants and systematic risk of cement industry. Five financial variables were utilized as components, i.e. industry size, operating efficiency, liquidity, profitability, and financial leverage in this study. Six years data from 2008 to 2013 have been collected from Karachi Stock Exchange. The outcome of 29 cement industries revealed that there is a significant relationship between operating, efficiency, industry size and profitability with 181 systematic risks and the result of the study is similar to past studies while there is insignificant relationship between liquidity and financial leverage systematic risk (beta).

Karakus, (2017) researched on the determinants of affecting level from systematic risk: evidence from Bist 100 companies in Turkey. The purpose of the study was to investigate the impact of

accounting variables on systematic risk of firms. Data were collected from 58 companies from BIST-100 Index for the period between 2006 and 2015 and panel data analysis was employed. The results of the study showed that there is a significant and positive effect of asset turnover, asset size, previous term equity to total debt and previous term cash ratio on systematic risk. However, there is a negative effect of profitability, cash ratio, equity to total debt, and previous term debt to total assets on systematic risk. The study also determined that previous term beta, consumer price index, and previous term GDP per capita negatively affects the systematic risk and significantly increases the explanatory power of the model.

Sharif, Hamid, Khurram, and Zulfiqar (2016) carried out a study on factors effecting systematic risk in isolation vs. pooled estimation: empirical evidence from banking, insurance, and non-financial sectors of Pakistan. The basic purpose of the financial manager is to maximize the wealth of shareholder by minimizing the risk. The study covered the period of 2010 to 2014 using panel data for common effect model, generalized method of moments and two step regression models. The study concluded that there is variables significance changes from sector to sector in individual spectrum but market value of equity and leverage has negative impact on systematic risk in a pooled regression, whereas profitability, firm size and dividend pay-out has positive effect on systematic risk.

Salari (2015) carried out an analysis of systematic risk impact of common stock on financial ratios of accepted plants in Tehran stock exchange. The main purpose of the research was to investigate the relation between systematic risk of common stock and financial ratios of accepted plants in Tehran Stock Exchange using capital asset pricing model (CAPM). To do so, 226 plants whose required data for four-year period of research (2006-2009) were selected. Study was carried out on 8 independent variables (financial ratios) and also systematic risk was considered as dependent variable. Moreover, Hypotheses test was done based on simple and multi variable Regression. Statistical significance of the models was done in accordance with F and t statistics. Ultimately, concluded outcome showed that there is significant relation between research variables (Current ratio, Quick ratio, Liabilities to total assets ratio) and systematic risk.

Adhikari (2015) investigated on the Determinants of Systemic Risk for Companies Listed on Nepal Stock Exchange. The study aimed at advancing empirical evidences 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. Data from 15 listed companies for a period of 5years, 2009 to 2013 was tested and the study showed that profitability and size are positively related with the systemic risk, whereas the dividend payment is related negatively with systematic risk. The results therefore indicated that financial factors have significant predictive power for the systemic risk of a stock investment in Nepal.

Kumar, Rahman and Akhtiar (2015) studied the Determinants of Systematic Risk: Empirical Evidence from Pakistan's Banking Sector. A sample of 17 banks out of total 22 listed on Karachi Stock Exchange were selected and studied over the period 2006 to 2012. Panel data analysis techniques of Pooled OLS, Fixed Effects and Random Effect models were used to analyze data and the study concluded that loan portfolio quality and profitability significantly positively affect the systematic risk while liquidity is significantly and negatively affect the systematic risk.

Mulli (2014) studied the effect of financial performance on systematic risk of stocks listed at the Nairobi securities exchange. The study sought to establish the effects of firms' financial performance on systematic risk. The study used 20 companies that were continuously traded between 2009 and 2013 excluding the financial institutions. The data was analyzed using regression analysis and concluded that financial performance measure; total assets turnover, current ratio and net profit margin had a positive but statistically insignificant effect on beta while debt to assets ratio had a positive and statistically significant effect on beta coefficient. The study recommends that since debt ratio had a positive and significant effect on beta coefficient managers should be aware of the increasing effect of systematic risk on the cost of capital due to leverage. It also recommends that since assets turnover, liquidity and net profit margin did not have a significant effect on beta managers should not focus on managing operational efficiency, liquidity and profitability as measures of altering the companies systematic risk exposure.

Oke (2013) applied the capital asset pricing model to the Nigerian stock market using weekly stock returns from 110 companies listed on the Nigerian stock exchange (NSE) from January 2007 to February 2010. The study undermines the CAPM's predictions that higher risk (beta) is associated with a higher level of return and that the intercept should be equal to zero when estimating SML. The claim by the CAPM that the slope of the Security Market Line (SML) should equal the excess return on the market portfolio is also not supported by this study. This in effect, invalidates the prediction of the CAPM as far as Nigeria is concerned.

Adedokun and Olakojo (2012) investigated the empirical validity of CAPM in the Nigerian Stock Exchange (NSE) using monthly stock values of 16 firms from the 20 most capitalized firms in Nigeria between the period of January, 2000 and December, 2009. The empirical findings indicate that CAPM is inadequate to explain the role of asset risk for the determination of expected return on investment in Nigeria's equity market. They established contrary to the hypothesis of the CAPM that higher risk is associated with higher asset return and asset price.

Dzaja and Aljinovic (2013) test the CAPM using data from Romania, Hungary, Bulgaria, Serbia, Poland, Turkey, Czech Republic, and Bosnia and Herzegovina. They use monthly returns from the period of January 2006 to December 2010. Based on regression analysis, they find that higher yields do not mean higher beta. Also by applying the Markowitz portfolio theory they determine the efficient frontier for each market, and find that the stock market indices do not lie on the efficient frontier and therefore cannot be regarded as a good proxy for the market portfolio, as is usually assumed. The authors conclude that the CAPM beta alone is not a valid measure of risk.

Reddy and Thomson (2011) use quarterly returns to test the CAPM on the JSE for the period from June 1995 to June 2009. They use regression analysis to test the validity of the model on both individual sectoral indices and portfolios constructed from the indices according to their betas. They conclude that, on the assumption that the residuals of the return-generating function are normally distributed the CAPM could be rejected for certain periods, though the use of the CAPM for long-term actuarial modeling in the South African market can be reasonably justified.

Hasan et al. (2013) used monthly stock returns on the Bangladesh Stock Exchange for the period from January 2005 to December 2009. The all share price index (DSI) is used as the proxy for the market portfolio and the Bangladesh 3 month government treasury bill as the risk free asset.

The results of the coefficients of squared beta and unique risk indicate that the expected return-beta relationship is linear in portfolios and that firm specific risk has no effect on the expected return of the portfolios. The intercept terms for the portfolios are not significantly different from zero. These findings support the validity of CAPM.

Hussain and Islam (2017) examined the validity of Capital Asset Pricing Model in the Indian context. They test the validity of CAPM Indian 63 companies which are listed in National Stock Exchange from the 2003 to 2015. They use Fama and McBeth model and create 4 hypotheses. They use time-series Regression for beta estimation. They conclude that their results show the absence of relationship between beta and risk therefore they finally conclude that CAPM is not for National stock exchange for the 2003 to 2015 turnover.

Gahe et al (2017) examined capital asset pricing model testing in West Africa economic and monetary Union Stock Market in Ivorian Listed Firms. They actually define the validity of CAPM for the West African Economic and Monetary Union from using 20 companies' monthly basis data which are listed in IVOIRE. They divided into two parts one is estimation of mean and 2nd one is time series regression. They use some statistical parameters to test the hypotheses is rejected or not. The result shows that there is no relationship between high risk and the high level of return within the testing turnover. And some hypotheses are not getting the best results.

Al-Afeef (2017) examined capital asset pricing model, theory and practice from USA. The study described the impact of stock beta and market return. The researcher chooses the Amazon companies which is listed in S&P 500 from the turnover 8 years (2009 to 2016). Researcher chooses the multiple regression models to test the different variables. He test the three hypotheses all hypotheses are null hypotheses are rejected and alternative hypotheses are accepted. These results shows the significant results and CAPM can apply efficient markets and huge companies.

Tsuji (2017) examined a non-linear estimation of the capital asset pricing model of Japanese Automobile Industry Firms. The authors investigated the non-linear CAPM from the automobile Industry these are Suzuki, Toyota, Nissan, Mazda, Mitsubishi and Honda Motor Corporation using the monthly basis data from 1989 to 2017. They define that if distribution of stock return is fat-tail non-linear CAPM is too much effect. If stock return is normally distribution non-linear CAPM also effects. Next step is to test the Wald test, it is estimate standard CAPM and our non-linear CAPM, if in this stock return distribution is fat-tail and the Wald test is estimation of non-linear CAPM reliable than the Wald test estimation is standard linear CAPM.

Akani (2013) studied the relationship between inflation rate, interest rate, money supply on aggregates stock prices in Nigeria from 1985-2011 using Granger causality, Johansen co-integration and Vector Error Correction Model. Findings revealed that changes in the variables exists significant impact on aggregate stock price.
Hutabarat and Naomi (2016**)** aimed to measure and analyze companies listed in Pefindo25 at Indonesian Stock Exchange using Capital Asset Pricing Model. The sample used is 25 companies listed at Pefindo index. Based on the results of the study, it can conclude that after analyzing the companies listed in the Indonesian Stock Exchange using Capital Asset Pricing Model that based on Beta analysis, the companies have the type of stocks that are aggressive and defensive with positive and negative return. The company with aggressive beta shows that the

company tends to face higher risk, as JPFA find itself with positif return 15.47% expected return. And companies with defensive type of stocks tend to have positive return such as: FISH, STTP, AISA, APLN, and others since they are not sensitive to market changes. It is recommended for further research to look on this CAPM method in analyzing the stock investment.

Afolabi, Njogo, Areghan, Olugbenle and Olusesi (2017) examined the effect of capital asset pricing model (CAPM) for the Nigerian stock exchange using monthly stock values of 20 listed firms for the period of ten years (January 2006- December 2015) covering the periods and the aftermath of the 2008/2009 global economic crisis. In order to enhance the precision of the beta estimates and reduce the statistical problems that arise from measurement errors in individual beta estimates, the securities were combined into portfolios. This study employed simple ordinary least square (OLS) regression technique and found no conclusive evidence for the application of capital asset pricing model (CAPM) in the Nigerian Stock Exchange.

Yunita (2018) analyzed and compared the accuracy level of the CAPM and APT model in determining the expected return. The Mean Absolute Deviation (MAD) was used to determine the eligible stocks to be selected for analysis under the two models. For the CAPM model, eighteen (18) eligible stocks were selected while sixteen (16) stocks were selected for APT model, and these companies are listed on the Jakarta Islamic Index. The data for analysis were generated from through the website for the period 2014-2018. The factors utilized under the APT model are Inflation, Exchange rate, Composite Stock Exchange Price Index and BI Rate. The result of the comparison between the two models suggested that there is no significant difference between the accuracy of the CAPM and APT model in estimating the stock return of the companies selected. However, the APT model is suggested to be a more accurate model as it is said to have high accuracy rate than CAPM.

Dini, Jajang and Euis (2020) aimed to determine (1) capital asset pricing model, and company stock prices in the Nikkei 225 Index technology sector; (2) capital asset pricing model on the company's stock prices in the Nikkei 225 index technology sector. The technique of data collection is done through secondary data, namely data obtained from the study of documentation and literature. The method used is descriptive method with census approach method. The population and sample of this study were the technology sector companies of the Nikkei 225 Index in 2016-2018. There were 57 companies in 2016-2018. The data analysis technique used is panel data regression analysis with a ratio measurement scale. Based on the results of the research and the results of data processing, it is shown that (1) Capital Asset Pricing Model in the technology sector company Nikkei 225 Index shows fluctuating results each year and effective in determining efficient and inefficient stocks for investors to use in making investment decisions. The company's stock price in the technology sector, the Nikkei 225 index shows an increase in average stock prices each year; (2) Capital Asset Pricing Model has a significant positive effect on Stock Prices.

Akani and Lucky (2014) examined the relationship between money supply and aggregate stock prices in Nigeria using time series data from 1980 – 2012, Dickey Fuller Unit Root Test, Engle-granger and Johansen-Joselinus method of co-integration in a Vector Error Correction Model setting. Empirical results demonstrated that there exists a long-run relationship between Currency in Circulation (CR) and Demand Deposit (DD) and Aggregate Stock Price, Time

Deposit (TD), Savings Deposit (SD) and Net Foreign Assets (NFA) have negative relationship with aggregate stock prices.

Akani, Okonkwo and Ibenta (2016) examined the effects of monetary policy on capital market activities using evidence from Nigeria Economy, 1980 – 2013. The purpose of this study is to investigate the nature of the relationship between monetary policy instruments as our independent variables proxied by Broad Money Supply (M2), Liquidity Ratio (LIR), Interest Rate (INTR), Monetary Policy Rate (MPR) and Treasury Bill Rates (TBR) while the dependent variable capital activities are represented by All Share Price Index (ASPI) and Market Capitalization (MC). In course of this study, secondary data were sourced from the Central Bank of Nigeria Statistical Bulletin, the granger causality test and the Johansen co-integration test in a Vector Error Correction Model (VECM) setting were employed. The empirical result demonstrate that there exists a long-run equilibrium relationship between monetary policy tools such Broad Money Supply (M2), Liquidity Ratio (LIR), Interest Rate (INTR), which has a positive significant effect on Market Capitalization (MC) while Monetary Policy Rate (MPR) and Treasury Bill Rates (TBR) has negative and insignificant relationship on Market Capitalization (MC). In model II, the results shows that the independent variables have positive and significant relationship with the dependent variables of All Share Price Index (ASPI) except Monetary Policy Rate (MPR). The model summary revealed an R2 of 75% in model I and R2 of 94% in model II meaning that there is a strong and positive relationship between the dependent and independent variables during the period. The study also shows that there is no bi and uni directional causality running from the dependent and independent variables in the models except a uni directional causality running from Money Supply (M2) to Market Capitalization (MC) in model I. It was recommended that Monetary Policy tools should be used for the purpose of enhancing efficient capital market.

Oke (2013) applied the capital asset pricing model to the Nigerian stock market using weekly stock returns from 110 companies listed on the Nigerian stock exchange (NSE) from January 2007 to February 2010. The study undermines the CAPM's predictions that higher risk (beta) is associated with a higher level of return and that the intercept should be equal to zero when estimating SML. The claim by the CAPM that the slope of the Security Market Line (SML) should equal the excess return on the market portfolio is also not supported by this study. This in effect, invalidates the prediction of the CAPM as far as Nigeria is concerned.

Aruna and Warokka (2013) carried out a study on the Systematic risk and accounting determinants: a new perspective from an emerging market. The purpose of the study was to examine the influences of basic accounting determinants on Indonesian manufacturing industry's systematic risk in the most-recent period, 2005-2007, in order to capture the latest market's perspectives and preferences. The study used firm size, current ratio, debt to total asset ratio, Long-term Debt to Total Asset (LDTA) ratio and growth as variables for accounting determinants and beta as the variable for systematic risk and 15 top and most-traded Indonesian manufacturing firms' stocks were investigated. The results showed that no accounting determinants influence the systematic risk at all. It demonstrated the market behavior that paid less attention to the financial statement information, and seemed to focus more on technical analysis in making an investment decision. It absolutely highlighted on how to manage a market that is seemingly sensitive to non-fundamental factors, i.e., macroeconomic rumors and market sentiment the main drivers of technical analysis.

Mardini (2013) analyzed the Determinants of Systematic Risk in the Jordanian Banking Sector. The research provided more determinants of the systematic risk surrounding banks. Consequently, several regression models were employed to test whether there are statistical significant relations among various financial indicators and systematic risk (beta). The results revealed that there is a positive correlation between bank equity beta and bank size, leverage ratio and the volume of loans whereas it correlates negatively with liquidity levels, bank profitability and loan loss provisions.

Akpo, Hassan and Esuike (2015) examined the CAPM and APT model, their assumptions and possible reconciliation of the two models. The CAPM model is stated to be attractive based on its powerful and intuitive predictions of the relationship between expected return and risk. However, risk do not remain stable overtime hence a limitation to the model. The APT model is known for its accommodation for not only expected returns but also uncertain returns in arriving at the total return of an asset. Though the two models are known to be conflicting in assumptions, there are apparent agreements. The two models agree that investors can borrow and lend at risk free rate and that are no transaction costs, taxes or restrictions on short selling. However, the research appears to be in favor of the APT model as it recommended that investors and other investment companies should embrace a multifactor model as stock returns are affected numerous factors such as expectation about future levels of real GNP, expectations about future interest rate and expectation about future level of inflation.

METHODOLOGY

This study used quasi-experimental research design approach for the data analysis. This approach combines theoretical consideration (a prior criterion) with the empirical observation and extract maximum information from the available data. It enables us therefore to observe the effects of explanatory variables on the dependent variables. Data for this study were the annual time series data ranging from 1986 through 2021 which were presented in tables. The data include time series of Nigeria exchange rate, real interest rate and inflation rate as predictor variables while stock market return was used as dependent variable. This was because the data required mainly secondary data on systemic risk as reported by Central Bank during the period 1987 – 2021.

Model Specifications

Thus, we express the model as follows;

SMR = f (EXRR, CPR, IRR, EPR) (4)

Transforming equation 4 to econometric method, we have:

$$SMR = \alpha + \beta_1 EXRR + \beta_2 CPR + \beta_3 IRR + \beta_4 EPR + \mu \quad (5)$$

Where

SMR = Stock market return

EXRR = Exchange rate risk proxy by variation in Naira exchange rate per US dollar

CPR = Commodity price risk proxy by variation in inflation rate

IRR= Interest rate risk proxy by variation in real interest rate

EPR = Equity price risk proxy by variation in stock market all share price index

μ = Error Term
$\beta_1 - \beta_4$ = Coefficient of Independent Variables to the Dependent Variable
β_0 = Regression Intercept

Testing of Research Hypothesis

The focus of this study was to evaluate macroeconomic variables and the effect on Nigeria stock market return. In other words, changes in stock market return depend on changes in components of the macroeconomic variables.

SMR = f (EXRR, CPR, IRR, EPR) (3.5)

H0: $\alpha = 0$
H1: $\alpha \neq 0$
At 5% level of significance
Note: H0 is the null hypothesis that the parameter of the macroeconomic variables is not significant and Ha is the alternative hypothesis that the macroeconomic variables parameter influences changes in Stock market return.

Methods of Data Analysis

In order to estimate the regression model, E-views econometrics and statistical package will be used. The procedure involves specifying the dependent and independent variables; in this case, stock market return is the dependent variable while macroeconomic risk is the independent variables.

The main tool of analysis is the Ordinary Least Squares (OLS) using the multiple regression method for a period of 33 years, annual data covering 1986– 2019. Statistical evaluation of the global utility of the analytical model, so as to determine the reliability of the results obtained were carried out using the coefficient of correlation (r) of the regression, the coefficient of determination (r^2), the student T-test and F-test.

(i) **Coefficient of Determination (r^2) Test:** This measure the explanatory power of the independent variables on the dependent variables. R^2 gives the proportion or percentage of the total variation in the dependent variable Y that is accounted for by the single explanatory variable X. The higher the R^2 value the better. For example, to determine the proportion of monetary policy to private sector funding in our model, we used the coefficient of determination. The coefficient of determination varies between 0.0 and 1.0. A coefficient of determination says 0.20 means that 20% of changes in the dependent variable are explained by the independent variable(s). Therefore, we shall use the R^2 to determine the extent to which variation in macroeconomic variables are explained by variations in stock market return variables over the periods covered in this study.

(ii) **Correlation Co-Efficient (R):** This measures the degree of the relationship between two variables x and y in a regression equation. That is, it tries to establish the nature and magnitude of the relationship when two variables are been analyzed. Thus correlation co-efficient show whether two variables are positively or negatively correlated. That is, it takes the value ranging from – 1, to + 1.

(iii) **F-Test:** This measures the overall significance. The extent to which the statistic of the coefficient of determination is statistically significant is measured by the F-test. The F-test can be done using the F-statistic or by the probability estimate. We use the F-statistic estimate for this analysis.

(iv) **Student T-test:** measures the individual statistical significance of the estimated independent variables. This is a test of significance used to test the significance of regression coefficients (Gujurati, 2003). Generally speaking, the test of significance approach is one of the methods used to test statistical hypothesis. A test of significance is a procedure by sample results are used to verify the truth or falsity of a null hypothesis (Ho) at 5% level of significance.

(v) **Durbin Watson Statistics:** This measures the collinearity and autocorrelation between the variables in the time series. It is expected that a ratio of close to 2.00 is not auto correlated while ratio above 2.00 assumed the presence of autocorrelation.

(vi) **Regression coefficient:** This measures the extent in which the independent variables affect the dependent variables in the study.

(vii) **Probability ratio:** It measures also the extent in which the independent variables can explain change to the dependent variables given a percentage level of significant.

ANALYSIS AND DISCUSSION OF FINDINGS

Table 1: Presentation of Ordinary Least Square Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXRR	-6.899347	1.357108	-5.083861	0.0000
CPR	4.536590	1.237686	3.665379	0.0014
IRR	3.073145	1.024907	2.998463	0.0068
EPR	1.769105	0.715656	2.472006	0.0221
C	-0.265454	0.494501	-0.536812	0.5970
R-squared	0.944157	Mean dependent var		-0.436929
Adjusted R-squared	0.928202	S.D. dependent var		9.741477
S.E. of regression	2.610243	Akaike info criterion		4.969082
Sum squared resid	143.0807	Schwarz criterion		5.302133
Log likelihood	-62.56714	Hannan-Quinn criter.		5.070899
F-statistic	59.17585	Durbin-Watson stat		2.310555
Prob(F-statistic)	0.000000			

Source: Extract from E-view 9.0

The ordinary least square results presented in table 4.2 indicate that 92.8 per cent variation in Nigeria stock market return was traced to systemic risk, this implies that the model explained significant proportion of variation in stock market return while less than 7.5 per cent was explained by factors not captured in the regression model. The model test proved that the model is statistically significant from the probability value of the f-statistic, the Durbin Watson statistic proved the presence of serial autocorrelation among the variables. Beta coefficient of the variables indicates that all the variables have positive and significant effect on stock market return except exchange rate risk with negative effect on stock market return. The presence of autocorrelation enables us to present error correction model results in table 4.3 below.

Table 2: Presentation of Error Correction Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXRR(-1))	-0.405403	1.301604	-0.311464	0.7587
D(CPR(-1))	5.746692	2.201065	2.610869	0.0167
D(IRR(-1))	0.276244	2.770006	0.099727	0.9216
D(EPR(-1)	4.825360	2.811488	2.616301	0.0116
ECM(-1)	0.509446	2.343465	3.204420	0.0045
C	12466.41	6612.059	1.885405	0.0740
R-squared	0.765162	Mean dependent var		-6297.944
Adjusted R-squared	0.682968	S.D. dependent var		37697.50
S.E. of regression	21225.79	Akaike info criterion		22.99878
Sum squared resid	9.01E+09	Schwarz criterion		23.37941
Log likelihood	-313.9829	Hannan-Quinn criter.		23.11514
F-statistic	9.309287	Durbin-Watson stat		1.673290
Prob(F-statistic)	0.000040			

Source: Extract from E-view 9.0

The error correction results presented in table 4.3 indicate that 68.2 per cent variation in Nigeria stock market return was traced to systemic risk, this implies that the model also explained significant proportion of variation in stock market return while less than 31.8 per cent was explained by factors not captured in the regression model. The model test proved that the model is statistically significant from the probability value of the f-statistic, the Durbin Watson statistic proved the presence of serial autocorrelation among the variables. Beta coefficient of the variables indicates that all the variables have positive and significant effect on stock market return except exchange rate risk with negative effect on stock market return. The error correction coefficient proved that the variables systemically adjust at the speed of 50.9 per cent.

Discussion of Findings

The estimated regression model found from the results presented in table 4.3 that 68.2 percent variation in stock market return was explained by systemic risk as modeled in the multiple regression, the f-statistic and probability found that the model is statistically significant while the Durbin Watson statistic found the absence of serial autocorrelation among the variables in the time series. the regression results found that commodity price risk have positive and significant effect, interest rate risk have positive but no significant effect, equity price risk have positive and

significant effect while exchanges rate risk have negative and no significant effect on stock market return in Nigeria stock market. The positive effect of the variables confirms our a-priori expectation of the study and validates theories such as the capital assets pricing model and portfolio theory. The negative effect of exchange rate on stock market return contradicts our a-priori expectations and could be blamed on high rate naira exchange depreciation against other currencies.

Empirically, the findings confirm the findings of Mulli (2014) that financial performance measure; total assets turnover, current ratio and net profit margin had a positive but statistically insignificant effect on beta while debt to assets ratio had a positive and statistically significant effect on beta coefficient, the findings of Oke (2013) that the slope of the Security Market Line (SML) should equal the excess return on the market portfolio is also not supported by this study, the findings of Adedokun and Olakojo (2012) established contrary to the hypothesis of the CAPM that higher risk is associated with higher asset return and asset price, the findings of Dzaja and Aljinovic (2013) that higher yields do not mean higher beta and the findings of Reddy and Thomson (2011) that, on the assumption that the residuals of the return-generating function are normally distributed the CAPM could be rejected for certain periods, though the use of the CAPM for long-term actuarial modeling in the South African market can be reasonably justified.

CONCLUSION AND RECOMMENDATIONS

Conclusion

From the findings, the probability coefficient of 0.7587 which is outside the acceptance region, therefore the study conclude that there is no significant relationship between exchange rate risk and stock market return in Nigeria. The study found a probability coefficient of 0.0167 which is within the acceptance region, therefore the study conclude that there is significant relationship between commodity price risk and stock market return in Nigeria. From the findings, The probability coefficient of 0.9216 which is outside the acceptance region, therefore the study conclude that there is no significant relationship between interest rate risk and stock market return in Nigeria. The study found a probability coefficient of 0.0116 which is within the acceptance region, therefore the study conclude that there is significant relationship between equity price risk and stock market return in Nigeria

Recommendations

i. Systemic risk management should be considered as part of strategic plans which need to be reviewed on a more frequent basis and macroeconomics policies should directed towards stabilizing Nigerian exchange rate to avoid depreciating naira exchange rate against key currencies that exposes the firms to exchange rate risk.
ii. Nigeria exchange rate per US dollar should be well structured and defined. Policies to leverage the depreciation naira exchange rate should be formulated and there is need to strengthen Nigeria bilateral, unilateral and multilateral trade and investment relationship for better naira exchange rate that will enhance Nigeria stock market.
iii. The monetary authorities should enhance its policies to manage the inflation pressure in the economy the further increase the stock market return

iv. Quoted companies should embrace a multifactor model as stock returns are affected numerous factors such as expectation about future levels stock prices and expectations about future interest rate and expectation about future level of inflation.

REFERENCES

Adedokun, A.J. & Olakojo, S.A. (2012). Test of capital asset pricing model: Evidence from Nigerian Stock Exchange. *Journal of Economics Theory*, 6(4- 6), 121-127.

Afolabi, T. G.; Njogo, B. O; Areghan, I. A., Olugbenle, A.H., & Olusesi, H.O. (2017). Testing the capital asset pricing model (CAPM): The case of the Nigerian securities market. *International Business Management, 4,(3), 239- 242.*

Akani, H. W & Imegi, J. C. (2017). Monetary Policy Transmission Mechanism and Liquidity Of Capital Market: A Time Series Study From Nigeria: 1981-2016. *IOSR Journal of Economics and Finance (IOSR-JEF), 8(5), 01-24.*

Akani H. W. (2013). Analysis of Macroeconomic Aggregates on Stock Price in Nigeria: An Application of co-integration and causality Test. *International Journal of Academic Research. 1 (3),56-79.*

Akani, H. W., & Lucky, A. L. (2014). Money Supply and Aggregate Stock Prices in Nigeria: An Analysis of Co-Integration and Causality Test. *Research Journali's Journal of Finance, 2 (10), 1 – 24.*

Akani, H. W., Okonkwo V. I., & Ibenta, S. N. (2016). Empirical Analysis of Monetary Policy on Capital Market Activities: Evidence from Nigerian Economy, *Journal of Accounting and Financial Management 2 (3), 82 – 111.*

Akintola-Bello, O. (2004). *Stock market behaviour and performance*. Lagos: Arbitrage Consulting Group.

Akpo, E.S., Hassan, S, & Esuike, B.U. (2015). Reconciling the Arbitrage Pricing Theory (APT) and the Capital Asset Pricing Model (CAPM) Institutional and Theoretical Framework. *International Journal of Development and Economic Sustainability, 3(6), 17-23.*

Al-Afeef, M. A. (2017). Capital asset pricing model: Theory and practice: Evidence from. *International Journal of Business and Management, 12, (8), 34-54.*

Alqurran, A. A. (2016). Validity of capital assets pricing model: Empirical evidences from Amman Stock Exchange. *Journal of Management Research, 8 (9), 1790-1798.*

Anghel, M. G., & Paschia, L. (2013). Using the CAPM model to estimate the profitability of a financial instrument portfolio. *Annales Universitatis Apulensis Series Oeconomica, 15(2), 541-551*

Anyamaobi, C. (2018). Monetary policy and the performance of Nigeria capital market: A time variant analysis. *European Journal of Accounting, Auditing and Finance Research, 6(6), 22-43.*

Bilgin, R., & Basti, E. (2011). A test of the validity of capital asset pricing model in Istanbul stock exchange. *Euro Economic, 4(30), 98-108.*

Bilgin, R., & Basti, E. (2014). Further evidence on the validity of CAPM: the Istanbul Stock Exchange Application. *Inzinerine Ekonomika-Engineering Economics, 25(1), 5-12.*

Bornholt, G. (2015). The failure of the capital asset pricing model (CAPM): An update and discussion. *Abacus*, 49(S1), 36-43.

Cagnetti, Arduino (2002). Capital Asset Pricing Model and Arbitrage Pricing Theory in the Italian Stock Market: An Empirical Study. *Unpublished working paper*.

Choudhary, K. (2010). The CAPM evidences from the Indian equity market. *Eurasian Journal of Business and Economics, 6, 127-138.*

Choudhary, K., & Choudhary, S. (2010). Testing capital asset pricing model: empirical evidences from Indian equity market. *Eurasian Journal of Business and Economics, 3(6), 127-138.*

Claus, J. & Thomas, J. (2001). Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets. *The Journal of Finance*, 56(5), 1629-1665.

Dini, D., Jajang, B., & Euis, R. W. (2020). Effect of capital asset pricing model on stock prices. *Asian Journal of Economics, Business and Accounting, 13(3), 1-11.*

Dzaja, J., & Aljinovic, Z. (2013). Testing CAPM on emerging markets of the central and Southern Europe. *Central Operational Research Review, 4, 164-175.*

Engle, F.R. & Granger, C.W.J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing, *Econometrica*, 55(2), 251-276.

Fama, E. F., & French, K.R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33, 3-56.*

Fama, E.F. & French, K.R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427-465.

Fama, E.F. & French, K.R. (2002). The equity premium. *The Journal of Finance*, 57(2), 637-659.

Fama, E.F. & French, K.R. (2004). The capital asset pricing model: Theory and evidence. *Journal of Economic Perspectives*, 18(3), 25-40.

Fama, E.F. & French, K.R. (2012). Size, value, and momentum in international stock returns. *Journal of Financial Economics*, 105(3), 457-472.

Francis, M. H., & Naomi, R. (2016). Capital Asset Pricing Model Method: An analysis of pefindo 25 companies risk and return Listed At Indonesia Stock Exchange. Prosiding Seminar Nasional INDOCOMPAC Universitas Bakrie, Jakarta. 2-3 Mei 2016

Hasan, Z., Kamil, A.A., Mustafa, A., & Baten, A. (2013), Analyzing and estimating portfolio performance on the Bangladesh stock market. *American Journal of Applied Sciences, 10(2), 139-146.*

Ilo, B.M. (2015). The Projected Utilization of Initial Public Offer (IPO) Proceeds in Nigeria, Acta Universitatis Danubius. Œconomica, 11, (4),72-85.

Islam, S. H. (2017). Is the capital asset pricing model valid in the. *Pacific Business Review International, 9(7), 509-541*

Jecheche, P. (2011). An empirical Investigation of the capital asset pricing model: Studying stocks on the Zimbabwe stock exchange. *Journal of Finance and Accountancy, 3(1),789-799.*

Kapi,l C, S. C. (2010). Testing capital asset pricing model: empirical evidences from Indian equity market. *Eurasian Journal of Business and Economics, 3 (6), 127-138.*

Khan, M., Gul, M., Khan, N., Nawaz, B., & Sanaullah, (2012). Assessing and testing the capital asset pricing model (CAPM): A study involving KSE-Pakistan. *Global Journal of Management and Business Research, 12(10), 33-38.*

Köseoğlu, S.D., & Mercangoz, B.A. (2013). Testing the validity of standard and zero beta capital asset pricing model in Istanbul stock exchange. *International Journal of Business, Humanities and Technology, 3(7), 58-67.*

Lintner, J. (1965). The valuation of Risk Assets and the Selection of Risky Investment in Stock Portfolio and Capital Budget, *Review of Economic and Statistics*,2(2), 13-37.

Loukeris, N. (2009). An empirical evaluation of CAPMs validity in the British Stock Exchange. *International Journal of Applied Mathematics and Informatics, 3(1), 1-8.*

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77-91.

Markowitz, H. (1959). *Portfolio selection: Efficient diversification of investments.* New York, United States: Wiley & Sons, Inc.

Michailidis, G., Tsopoglou, S., Papanastasiou, D., &Mariola, E. (2006). Testing the capital asset pricing model (CAPM): The case of the emerging Greek securities market. *International Research Journal of Finance and Economics, 4(2), 79 – 91.*

Michailidis, G.; Tsopoglou, S.; Papanastasiou, D. & Mariola, E. (2006). Testing the capital asset pricing model (CAPM): The case of the emerging Greek securities market. *International Research Journal of Finance and Economics*, 4(3),79 – 91.

Muzir, Bulut Şengül (2010). The Prediction Performance of Asset Pricing Models and Their Capability of Capturing the Effects of Economic Crises: The Case of Istanbul Stock Exchange. *İşletme Araştırmaları Dergisi, 3(2),*3-24.

Ohlson, J.A., & Juettner-Nauroth, B.E. (2005). Expected EPS and EPS growth as determinants of value. *Review of Accounting Studies*, 10(4), 349-365.

Oke, B.O. (2013). Capital Asset Pricing Model (CAPM): Evidence from Nigeria. Research *Journal of Finance and Accounting*, 4(9), 17-26.

Oke, J. & Olakojo, S. A. (2012). Test of capital asset pricing model: Evidence from Nigerian Stock Exchange. *Journal of Economics Theory, 6(4- 6), 121-127.*

Olakojo , S. A. & Ajide, K. B. (2010). Testing the capital asset pricing model (CAPM): The case of the Nigerian securities market. *International Business Management, 4, 239- 242.*

Olarewaju, O.M., Migiro, S.O. , & Sibanda, M. (2017). Operational diversification and financial parameters for regulated public utilities, *Journal of Financial Research*, 10(4), 227-238.

Pettway, R.H. & Jordan, B.D. (1987). APT vs. CAPM estimates of the return generating function performance of Sub-Saharan Africa commercial banks: *Static and Dynamic Approach, ACTA*

Philip, U. (2021). Systemic risk and return on equity of quoted firms: A panel data study from Nigeria. *International Journal of Business & Law Research, 9(2), 48-58*

Reddy, T.L., & Thomson, R.J. (2011). The capital asset pricing model: The case of South Africa. *South African Actuarial Journal, 11, 43-84.*

Roll, R. (1977). A critique of the asset pricing theory's tests; Part I: On past and potential testability of the theory. *Journal of Financial Economics, 4, 129-176.*

Ross, Stephen A. (1976). The arbitrage pricing theory of capital asset pricing. *Journal of Economic Theory*, 13(4), 341-360.

Sharpe, F. (1964). Capital assets prices: A theory of market equilibrium under conditions of risk. *Journal of Finance, 19(3), 425-442.*

Sharpe, W. (1963). A simplified model for portfolio analysis. *Management Science*, 9(2), 277-293.

Sharpe, W.F. (1964). Capital asset prices: a theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), pp. 425-442.

Sous, M. T. (2016). Testing the validity of capital assets pricing model: Evidence from Palestinian Exchange Market. *Journal of Accounting, Finance and Economics, 6, 99-107*.

Theriou, N.; Maditinos, D.; Chatzoglou, P. & Aggelidis, V. (2005). The cross- section of expected stock returns: An Empirical Study in the Athens Stock Exchange. *Managerial Finance*, 31 (12), 58-78.

Tsuji, C. (2017). A non-linear estimation of the capital asset pricing model: *The Case of. Finance and Accounting, 3(2), 694-709.*

Yunita, I. (2018). Analysis and accuracy level comparison between capital asset pricing model (capm) and arbitrage pricing theory (apt) in determining the expected return. *International Journal of Scientific and Research Publications*, 8(5), 468-473.

Zhang, L., & Li, L (2012). The investment CAPM. *European Financial Management*, 23 (4), 545-603

Zhou, T.,& Liu, H. (2018). Empirical study on CAPM model on China stock market. *Master Thesis in Business Administration, Jonkonp University, China*

Zimy, S., Yannick, H. (2017). Capital asset pricing model testing in West Africa economic and monetary union stock market: The case of Ivorian listed firms. *International journal of research granthaalayah, 5(2),309-315.*