

Macroeconomic Environment and Stock Price Movement in Nigeria: An Evaluation of Fama's Model of Efficient Market

John Obot Udoidem

Department of Banking and Finance
University of Uyo, Uyo, Nigeria
Email: judoidem@yahoo.com
Phone: 08028380632

Bassey Ime Frank

Email: basseyifrank@uniuyo.edu.ng
Phone: 08033723995

Boniface Christopher Ekanem

Department of Insurance and Risk Management
University of Uyo, Uyo, Nigeria
Email: bonifacekanem@gmail.com
Phone: 08068804453)

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Abstract

The study examined the link between macroeconomic environmental dynamics and stock price movements in Nigeria using Fama's model of efficient market approach. The macroeconomic climate posed issues for Nigerian stock markets. The buying power of local currency occasionally impacted unfavourable changes in the majority of macroeconomic variables. In this study, an ex post facto research design was used. The study looked at certain macroeconomic variables and the evolution of Nigerian stock prices between 1985 and 2021. To test the hypothesis, quantile regression estimates of the Fama-French three-factor coefficient were derived. The findings showed that the interest rate and stock price movement have a negative and negligible association. Additionally, a strong and positive correlation was observed between the exchange rate and changes in stock prices. It was recommended that in order to promote stock market activity and, by extension, enhance stock prices in Nigeria, a suitable monetary policy and a sufficient amount of money supply must be implemented. Also, well-diversified portfolios that mirror the entire market portfolio should be recommended to investors to protect themselves against stock price volatility. This would serve as a guide to protect them against shocks resulting from the macroeconomic environment.

Keywords: Interest Rates. Inflation Rates. Exchange Rates, Unemployment Rates, Market Capitalization, Efficient Market, Fama's Model.

1.1 Introduction

Forecasting the stock price movement direction is a crucial decision by investors to evaluate the worthwhile values attached to the stocks. This prediction is easy in a microeconomic environment but seems to be more difficult in a macroeconomic economic environment. This is because factors emanating from the macroeconomic environment are unpredictable and uncontrollable. Based on this development, investors utilize different analytical instruments to evaluate investment prospects and thus arrive at well-informed stock selection decisions. Fundamental analysis is frequently utilized to generate medium and long-term predictions of stock price trends. This is a top-down method that commences with an examination of the national and international economies, then to industry factors, and ends with a thorough examination of company variables. Specific macroeconomic variables,

sometimes known as fundamental factors, are included in this study. The selection of macroeconomic variables is based on investors' perception that monetary policy and macroeconomic developments have a significant influence on how stock values fluctuate (Nasseh & Strauss, 2000). This implies that macroeconomic dynamics may operate as decisive elements in shaping investors' investment choices. Today, the financial disposition of many organizations has been plagued by a lack of understanding of the issues surrounding the movement of stock prices and the macroeconomic dynamics that influence them.

The idea that the macroeconomic environment has an impact on stock price movement in Nigeria has been confirmed by some studies that looked into the macroeconomic dynamics of stock price movement in developing and emerging markets (Mousa et al., 2012; Allahawiah & Al Amro, 2012; Uwuigbe, et al., 2012). According to some, the most significant macroeconomic determinants of stock prices include the rate of inflation, the GDP, interest rates, monetary policy, investor behaviour, and currency rates (Osamwonyi, 2003). The claims made by proponents of macroeconomic theory frequently state that key macroeconomic variables including the money supply, GDP, interest rates, exchange rates, and inflation rate affect stock prices. The common consensus among investors is that macroeconomic factors significantly impact stock prices (Aldin et al., 2012). The main thrust of the argument is that investors heavily consider the difficulty and accuracy of predicting stock price movements when making investment decisions (Wang et al., 2011). According to the macroeconomic theories underlying stock market price movement, market capitalization and business values are significantly impacted by the relationships between macroeconomic factors and stock market prices for companies that are quoted on stock exchanges. Due to this, investors may become doubtful about the companies' ability to succeed. As a result, there may be a short- and long-term decline in stock prices. Consequently, information about the impact of macroeconomic factors on the stock market prices of companies listed on the stock exchanges, which they trade is necessary for investors in the Nigerian Stock Exchange. Therefore, it becomes necessary for investors in Nigeria to understand how certain macroeconomic variables, such as the money supply, Gross Domestic Product (GDP), interest rate, exchange rate, and inflation rate, affect Nigerian stock prices (Olowe, 2007). Since various factors have been reported by prior studies, the debate over the macroeconomic environmental factors influencing the movement in stock prices is not definitive. This necessitates additional empirical research, which could help comprehend how to forecast stock price movement in Nigeria and the main macroeconomic environmental dynamics influencing it using Fama's model of an efficient market.

Moreover, Fama Eugene put forth the Fama model of market efficiency in 1965. Market efficiency refers to the extent to which the price an investor pays for a financial instrument (stock, bond, or other security) accurately and completely reflects information about the inherent worth of that particular asset or the value of the corporation that issued the security. Information available to investors trading in the market is an important phrase in the concept of market efficiency. According to this theory, the market stock price reflects all information that is now accessible, including information from the past, such as earnings from the previous quarter or year, information from the present, and information about upcoming events that have been announced but have not yet happened, like shareholders' meetings. Details that may be logically deduced, such as the fact that prices will reflect investor beliefs before the events transpire, such as the widespread opinion that interest rates will rise soon or that the government deficit will widen. When new information becomes available, the market must react swiftly to ensure efficiency. In terms of how rapidly and broadly information is shared, it is obvious that the Internet has improved market efficiency.

Previous research on this problem was primarily motivated by Ross's (1976) Arbitrage Pricing Theory (APT). The models encompass a range of macroeconomic factors, including monetary ones like interest rates, inflation, exchange rates, unemployment rates, and, as well as actual economic factors like oil prices and production. Changes in stock prices are correlated with macroeconomic dynamics, according to empirical data from the majority of economies (Diacogiannis et al., 2001;

Muradoglu et al., 2000; Mukhopadhyay & Sarkar, 2003; Wongbampo & Sharma, 2002; Robert, 2008; Gan et al., 2006). Among the developing stock exchanges, the Nigerian Stock Exchange (NSE) is confronted with obstacles that impede its effectiveness, long-term expansion, and advancement. Nigeria is still plagued by inflation and the central bank is exerting tremendous effort to bring the inflation rate down to a single digit. Along with unemployment, population growth, poverty, and currency depreciation relative to the dollar, Nigeria's economy faces other challenges. These elements have the direct or indirect potential to impact the nation's market capitalization and economic stability. The buying power of local currency can occasionally be impacted by unfavourable changes in the majority of macroeconomic dynamics. The depreciation of the naira impacts the Nigerian stock market trade by raising the expense of stock trading. Inflation results from the dollar's devaluation since it impacts the nation's macroeconomic stability. In essence, long-term macroeconomic stability may spur investors to make optimistic investments, which could quicken the stock exchange's growth and performance. Research on the influence of macroeconomic environmental dynamics on stock prices in Nigeria is crucial for investors and policymakers alike, as there is currently disagreement over the existence of a causal relationship between macroeconomic dynamics and stock price movement in the Nigerian stock market. Using Fama's efficient market model, this study aims to investigate the relationship between the macroeconomic environment and Nigerian stock price movement.

2.0 Literature Review

2.1 Conceptual Review

The relationship between macroeconomic environmental factors and changes in Nigerian stock prices was investigated in this section.

2.1.1 Relationship between Stock Price Movement and Interest Rate

Time, default risk, capital productivity and inflation rate are a few factors that affect interest rates (Chandra, 2004). Interest rate changes promote speculative activity and the substitution of money market and stock market securities. According to Kevin (2000), the nation's organized financial sector's interest rates are kept within the intended range by monetary policy. The rates for the unorganized financial sector, on the other hand, are not governed and are prone to large swings depending on the supply and demand of funds in the market. An investor needs to evaluate the impact of rising interest rates on firm productivity and profitability, as well as the rate and direction of these rates' rise across the economy. Chandra (2004) posits that a rise in interest rates has an adverse impact on stock prices due to the reduction of corporate profitability and the escalation of the discount rate imposed on equity investors. The performance of the organization is therefore expected to suffer from an increase in interest rates. According to Smith's 1990 analysis of the US economy, stock prices rise immediately (and sometimes even sooner) in response to statements by Chase Manhattan about a drop in its prime lending rate or by the Federal Reserve regarding interest rate or discount rate cuts. Additionally, according to Douglason (2010), there is a positive correlation between stock prices and short-term interest rates and a negative correlation with long-term interest rates.

One of the key macroeconomic factors that has a direct bearing on economic growth is interest rates. Interest rates are typically thought of as the capital cost, or the amount paid to use money for a specific amount of time. The cost of borrowing money, as seen from the perspective of the borrower, is the interest rate (borrowing rate). The interest rate, often known as the lending rate, is the cost associated with making a loan. An efficient market is what savvy investors always seek to invest in. Few individuals can make tremendous profits in an inefficient market, which undermines the faith of the general public in the market. In such instances, people move their capital from the share market to the bank if the interest rate that banks offer to depositors rises (Alam & Uddin, 2009). As a result, there will be less demand for shares, which will drive down share prices, and vice versa. Conversely, an increase in the interest rate that banks charge their depositors will compel the lending rate to rise as well. A rise in loan rates causes a reduction in economic investment, which is another factor

contributing to a decline in share price, and vice versa. Thus, share price and interest rate have an inverse connection in theory.

2.1.2 Relationship between Stock Price Movement and Inflation Rate

According to Davis & Kutan (2003), there is a reciprocal relationship between the business sector and the rate of inflation. Some industries tend to prosper while others tend to suffer. The connection between inflation and stock prices has been investigated by researchers. Specifically, data from Mousa (2012) shows a negative correlation between stock prices and the Consumer Price Index's expected and unexpected components. Common stock is seen to be an effective inflation hedge. Al Oshaibat & Majali (2016) contend that because of the way inflation interacts with the tax code, a rise in the rate of inflation lowers share prices. According to Amadi & Odubo (2002), a significant portion of the share price fall can be accounted for by the aforementioned effect. The roots of this effect are the tax on nominal capital gains and the depreciation technique known as the "historical cost," both of which reduce the net return on stocks as inflation increases (Bai, 2014).

An additional contention posits that investors undervalue stock during periods of inflation due to their failure to account for capital gains on debt and their pricing of shares to yield an Earning Price Ratio that may be more in line with nominal than real interest rates (Adusei, 2014). In summary, the correlation between the inflation rate and stock prices is negative.

The relationship between inflation and stock prices is among the most significant issues that come up when evaluating equity markets. It is a widely held belief that as prices rise, business earnings and share prices rise along with them (Al Mukit, 2013). Whether this is a fiction or a fact is debatable. Investors often use experiences from the immediate aftermath of the two World Wars to assess the effect of inflation on stock market values. These eras in Europe were characterized by sharp monetary devaluation. But at the time, investors were much less impacted by currency reforms and inflation than, say, holders of cash or fixed-income instruments, some of whom lost all of their invested capital. So, are investors shielded from the risks of inflation? Economic logic would seem to indicate that they might be. After all, growing prices translate into increased corporate sales revenues and profits, assuming costs do not increase much more dramatically. In this context, it is frequently emphasized that a share is founded on an underlying physical capital stock, which is an actual thing with a value that is not subject to inflation. As a result, the company's nominal value ought to increase in tandem with an overall price increase. A price increase should raise both earnings per share and share prices proportionately since equities relate to real capital and the (real) earnings potential produced from it (Alam & Uddin, 2009). In this instance, due to the adjustments made for price inflation, both future dividend payments and stock prices or more specifically, the "redemption value," would be inflation-proof. However, historical evidence indicates that this is not always the case, therefore it is important to examine this claim critically. It is widely acknowledged that there exists a strong correlation, or line of movement, between price indices and profits and stock indices over extended periods, such as a century. But in the short and medium term, things can change significantly (for example, in ten years). In actuality, there was an inverse relationship between inflation rates and stock prices during the turbulent economic shifts of the 1970s, 1980s, and 1990s (Amata et al., 2016).

2.1.3 Relationship between Stock Price Movement and Exchange Rate

The cost of a unit of a particular currency in relation to other currencies is known as exchange. The exchange rate of the naira against the foremost global currencies has a significant impact on the performance and profitability of sectors and enterprises that are either large importers or heavy users of imports (Osamwonyi & Evbayiro-Osagie, 2012). A nation's foreign commerce determines its exchange rate, which is closely correlated with its balance of payments. The number of external reserves and the balance-of-payments deficit typically have an impact on how the exchange rate affects the behaviour of stock prices. Exchange rates and stock prices are positively correlated, according to

the theoretical postulation. Maku & Atanda (2010) demonstrate a positive correlation between stock prices and the declining value of the Naira.

Determining the correlation between exchange rates and stock prices holds significance for several reasons. First, it might have an impact on fiscal and monetary policy choices. A thriving stock market is said to boost overall demand (Bai, 2014). The interest rate and the real exchange rate will be the targets of contractionary fiscal and expansionary monetary policy if this is significant enough. Policymakers occasionally support lower-priced currencies to stimulate the export industry. They ought to know if a policy like that would cause the stock market to drop. Second, the exchange rate's trajectory can be forecast using the connection between the two markets. Multinational firms will profit from this in controlling their exposure to overseas contracts and exchange rate risk, which will stabilize their earnings. Third, investment funds' portfolios increasingly contain currency as an asset. Understanding how currency rates relate to other assets in a portfolio is essential to the fund's performance. According to the mean-variance approach to portfolio analysis, the portfolio's variance implies the expected return.

As a result, a precise assessment of a portfolio's variability is required. Estimating the association between exchange rates and stock prices is necessary for this. When exchange rates or stock prices are the trigger variable, how much of a difference is there in the correlation's magnitude? Finally, predicting a crisis may be made easier with a grasp of the relationship between stock price and exchange rate. The Asian Financial Crisis of 1997 is said to have been exacerbated by the connection between the stock and currency markets, according to Ito & Yuko (2004) and Khalid & Kawai (2003), among others. The precipitous decline in the value of the Thai baht is thought to have set off the devaluation of other currencies in the area, ultimately resulting in the stock market collapse. Understanding the nature of this interaction between the two markets would enable action to be taken before a crisis gets out of control.

2.1.4 Relationship between Stock Price Movement and Money Supply

Controlling the money supply has historically been the primary duty of the central monetary authority of any individual economy since it has an impact on economic activity (Osamwonyi & Evbayiro-Osagie, 2012). The money supply is categorized as a leading indicator by Kevin (2000). M1 is money in circulation plus demand deposits, whereas M2 is money in circulation plus near-money, including time deposits. For this investigation, the researchers used M2. Numerous research that used data from developed nations came to the intriguing conclusion that money growth had a negative impact on stock prices (Daferighe & Charlie, 2012). In this regard, the consensus is that money growth alone, unless it is matched by an increase in the output of goods and services, sets off an inflationary spiral in the economy and drives down stock prices because rational economic agents diversify their wealth holdings from financial assets (like stocks and shares) to real (tangible) assets. To protect financial assets from the depleting effects of inflation, this method is frequently used (Udegbumam & Oaikhenan 2002). In line with the widely accepted opinion, we anticipate that changes in this variable will have a negative and substantial impact on stock values, especially considering the rapid expansion of Nigeria's money supply.

2.2 Theoretical Underpinnings

The Arbitrage Pricing Theory and Fama's Efficient Market Theory serve as the foundation for this investigation. But as will be seen below, Fama's Efficient Market Theory served as the study's foundation due to its most relevance.

2.2.1 Arbitrage Pricing Theory

To explain asset returns by several risk variables, an economist by the name of Ross developed the Arbitrage Pricing Theory in 1976. This multifactor model is known as the Arbitrage Pricing Theory (Ross, 1976). That factor structure is consistent with the stochastic nature of capital asset returns is a

belief shared by all investors in this multifactor model. According to Ross (1976), there is little opportunity for arbitrage across a static portfolio of assets when equilibrium prices are present since the expected returns on the assets are almost directly proportionate to the loading factors or beta. To put it another way, the expected returns on a financial asset can be written as a linear function of several macroeconomic dynamics or theoretical market indices, where the beta coefficient of each factor indicates how susceptible it is to fluctuations. Accurate security pricing will be determined by the model-derived return rate, and the price of the security must match the discounted predicted annual price rate. Given the above, it is clear that the fundamental tenet of arbitrage pricing theory is that a variety of macroeconomic factors, including the money supply, interest rate, inflation rate, unemployment rate, and exchange rate, influence how stock prices move. This makes the theory pertinent to the current investigation.

2.2.2 Fama's Theory of Market Efficiency

Fama first proposed this theory in 1970. According to Fama (1970), the capital market's primary purpose is to distribute ownership of the economy's capital stock. Based on the premise that security prices at any given time "fully reflect" all available information, the theory states that an efficient market is a market where stock prices give a precise sign for the allocation of resources. Put otherwise, a market in which enterprises can decide what to produce and invest in, and investors can select among the securities that represent ownership of the firm's activities. A market is deemed "efficient" when prices consistently "fully reflect" the available information. In analyzing Fama's article previously mentioned, Sharpe (1964) stated as follows: the thesis is this - in a healthy market, capital asset (securities) prices will represent forecasts based on all pertinent and available information. According to Fama (1970), the capital market is efficient if no trader in the market has monopolistic control over information and if all securities prices accurately represent all available market information. He then presents a trichotomization of information - all public information is included in the semi-strong form; all insider information is included in the strong form; and all information that can be obtained by looking at a historical series of security prices is included in the weak form. Under three groups of market studies, he structures his discussion using this trichotomy (Schwartz, 1970).

2.3 Review of Empirical Studies

Okoi et al. (2022) conducted a study on the macroeconomic factors influencing the growth of the Nigerian stock market. The research examined the relationship, both short and long run, between the endogenous variable - development of the stock market and the exogenous variables - trade openness, inflation, economic growth, and banking sector development). A desk survey approach was used to gather annual data. Initial tests were conducted to determine stationarity qualities, and then the ARDL error correction regression model and the Autoregressive Distributed Lag (ARDL) test were employed. After the analyses were completed, it was found that trade openness, domestic credit to the private sector, and GDP have a long-term negative effect on the development of Nigeria's stock market, while in contrast, the inflation rate and the total value of shares traded had a long-term positive effect on the growth of the Nigerian stock market. The findings indicated the following as important factors influencing the growth of the Nigerian stock market: ratio of trade openness, total value of traded stock, ratio of domestic credit to the private sector, and stock market liquidity.

Matadeen (2017), using a different approach, examined the macroeconomic factors that determine the stock market growth. There were 14 Sub-Saharan African nations included, and 28 years (1989–2016) were covered. Panel Vector Error Correction Model (PVECM) and descriptive statistics were applied. It was discovered that the major long-term factors that drive African region market development were investment, economic expansion, banking development, and stock market liquidity. The study also found that while there is a short-term bidirectional relationship between the stock market and banking development, long-term stock market development complements banking development.

It was suggested that to prevent the African region from experiencing volatility in liquidity, prudent steps should be taken to fortify the stock market and stabilize the political climate.

Barakat et al. (2016) investigated the stock market performance and macroeconomic factors in Egypt and Tunisia, two growing economies, between 1998 and 2014. The deposit rate serves as a stand-in for interest rates, the CPI serves as a stand-in for inflation, the local currency to USA dollar exchange rate serves as a stand-in for exchange rates, the money supply is represented by M2, and the stock market is represented by the market index. According to the research, there is a causal relationship between the money supply, interest rate, market index, consumer price index (CPI), and exchange rate concerning Egypt. Except for the CPI, which has no correlation with the market index, Tunisia's situation is similar. According to the findings, the stock market and the four macroeconomic factors are co-integrated in both countries.

Acquah-Sam (2016) focused on macroeconomic factors that will strengthen Ghana's capital market and lessen the difficulties in obtaining funding for the country's most disadvantaged citizens. The study made use of secondary data from 2001 to 2011. For the investigation, a least squares multiple regression model was employed. Interest rates, GDP growth, FDI, gross capital creation, inflation, and capital market liquidity were the independent variables, and market capitalization was the dependent variable. Principal Component Analysis (PCA), Structural Equation Modeling (SEM) via Path Analysis, and testing of variable interactions were utilized to assess the linear relationship. It was found that treasury bill rates, or interest rates had a beneficial impact on capital development in Ghana. Inflation and foreign direct investment, on the other hand, were not significant in the estimated equation. It was suggested that Ghanaian policymakers prioritize infrastructure development to support actual income growth and stock capital development.

Using data from Nigeria Breweries Plc, Inyama & Nwoha (2014) examined the connection between macroeconomic factors and the movement of share prices in the Nigerian brewery industry. The macroeconomic variables that are used span the years 2000-2012 and include the interest rate, inflation rate, GDP, exchange rate, and share price. Ordinary least squares and Granger causality were used to examine the data. The results showed that real GDP, inflation, and exchange rates had a positive but insignificant influence, while interest rates had a small and negative impact. These findings illustrated the link between macroeconomic indicators and stock prices. Furthermore, macroeconomic factors accounted for only 13% of the share price swings.

Daferighe & Charlie (2012) employed a basic OLS regression technique to investigate the impact of inflation on the performance of the Nigerian stock market using time series data spanning twenty years, from 1991 to 2010. The inflation rate was used in a regression study together with several stock market performance metrics, including market capitalization, turnover ratio, percentage change in the All-share Index, and total value traded ratio. Except for TOR, which showed a positive correlation, the results showed that these factors had a negative correlation with inflation in convergence to an initial expectation.

Using time-series data, Oseni & Nwosa (2011) used the AR (k)-EGARCH (p, q) technique to investigate the volatility of macroeconomic variables and the stock market. They also used the LA-VAR Granger Causality test to examine the relationship between the volatility of macroeconomic variables and the stock market in Nigeria from 1986 to 2010. Macroeconomic indices like real GDP, inflation, interest rates, and stock market volatility were all used in the study. The data indicated a bi-causal association between stock market volatility and real GDP volatility rather than a causative relationship between stock market volatility and the volatility of interest rates or inflation rates. According to the study, stock prices are not a significant factor in explaining the interest rate or the rate of inflation.

Asaolu & Ogunmuyiwa (2010) looked into the possibility that changes in macroeconomic variables could be the cause of fluctuations in the price of Nigerian stocks. Numerous macroeconomic indicators were included in the analysis, including industrial output, interest rates, fiscal deficit, currency rates, and foreign capital influx. The average share price of 25 listed Nigerian companies,

which are involved in the manufacturing, banking, insurance, services, and real estate sectors, was the dependent variable, though. The other factors were exogenous variables. The average share price was determined between 1986 and 2007. Using time series data from 1986 to 2007, several econometric analyses, including the Granger Causality test, the Augmented Dickey-Fuller (ADF) test, co-integration, and the Error Correction Method (ECM), were performed. The findings showed that there is little correlation between stock prices and macroeconomic variables in Nigeria and Stock prices during the sample period were determined to be granger-cause only by exchange rate. Accordingly, the study claims that stock price swings cannot be accounted for by macroeconomic factors and that stock prices in Nigeria are not a leading indication of macroscopic variables.

Wing et al. (2005) used time series data from January 1982 through December 2002 to investigate the long-run equilibrium linkages between the major stock indexes of Singapore and the United States using a subset of macroeconomic variables. The findings of the co-integration test suggested that, in contrast to the US, where there is no such relationship, Singapore's stock prices generally exhibit a long-run equilibrium relationship with the interest rate and money supply (M1). However, their research is not nation-specific.

Maysami et al. (2005) looked into the possibility of a long-term cointegrating relationship between stocks listed dual both the Singapore and US stock markets. Additionally, they utilized Johansen's (1988) VECM to examine if there was a greater degree of comovement between the sectoral stock indexes of Singapore and the United States in the case of the S&P 500 Electronics (Semiconductor) Price Index and the Electronics Price Index of the Stock Exchange of Singapore. Although their findings supported the long-term co-integrating sectoral linkages, they also found evidence of short-term disequilibria in the values of companies with dual listings, suggesting the possibility of short-term arbitrage opportunities.

Ying (2000) assessed the macroeconomic indicators into two groups, the money supply and interest rates, to evaluate the effects of these variables on the Straits Times Industrial Index (STII). He showed that while the money supply does not consistently affect the STII, interest rates do have a big impact on the STII throughout a monthly investment horizon. The research, however, did not account for other variables or compute the STII on a daily or weekly investment horizon to determine whether the money supply does affect the STII.

3.0 Methodology

The study used an ex post facto research design. The study examined a few macroeconomic environmental variables as well as changes in Nigerian stock prices between 1985 and 2021. The Central Bank of Nigeria Statistical Bulletin was the source from which the time series data were taken. Stock price movement, as measured by market stock capitalization, served as the dependent variable. Macroeconomic factors including the interest rate, money supply, exchange rate, unemployment rate, and inflation rate, were chosen as the independent variables.

The hypothesis was tested using estimates of the Fama-French three-factor coefficients that came from quantile regression. When analysts or investors are making investment decisions, the empirical quantile regression estimates of the Fama-French three-factor model provide a more thorough and lucid picture of the varied effects of predictors on response variables (Maiti, 2021). Quantile regression was first presented by Koenker, Jr. & Bassett in 1978. It is predicated on the conditional quantile functions. With the provided independent variables, quantile regression calculates the dependent variables' conditional median or quartile. The changes in the designated quantile from one unit changes of the corresponding predictor variables are indicated by the quantile regression coefficients of the independent variables. Quantile regression has greater robustness and has an effective outlier capture mechanism. The median estimator in quantile regression that lowers the total of the absolute errors is used to estimate the conditional median function. To define the link between the variables in the study's hypothesis, the quantile regression technique was employed by earlier writers like Rios-Avila & Maroto, 2020; Maiti, 2021, and is adopted by the research

3.1 Fama's Model of Efficient Market

Fama (1970) assumed an efficient market in the classical theory of finance. Since there are no equities that are overpriced or undervalued in this market, active investment strategies have no place. According to this idea, models provide accurate estimates of market prices because they are grounded on the rational behaviour of investors. In this instance, historical events are the cause of all price volatility (Minović, 2013). The Efficient Market Hypothesis (EMH), as proposed by Fama in 1970, is as follows: All information that is available to the public determines the total current market prices (semi-strong form); all information, including insider information, determines current market prices (strong form); only prices and data from the past determine the total current market prices; current prices are memory-free, independent, and equally distributed among securities (weak form) (Hoguet, 2005).

Following Fama's (1970) theory, a market is deemed efficient if it is not possible to make an extraordinary profit by trading based on the information provided. As a result, trading based on information that is readily available to the public makes it impossible to achieve unusual profits. The model is provided mathematically as:

$$E(P_j, t + 1 | \zeta_t) = 0 \quad (3.1)$$

Where $P_{j,t+1}$ denotes the difference between the security's true price at moment $t+1$ and its projected price given the information set ζ_t . Investors cannot beat the market and no undervalued or overvalued stocks at moment t if expectation, as determined by formula (3.1), is equal to zero. We can treat the stochastic process $P_{j,t+1}$ in this situation as a fair game (Andrikopoulos, 2007). The genuine abnormal profit can be calculated as the difference between the actual price of security j at moment $t+1$ and the predicted price of the same security given the existing data set, or:

$$p_{j,t+1} = P_{j,t+1} - E(P_{j,t+1} | \zeta_t) \quad (3.2)$$

where $P_{j,t+1}$ is the price of security j in moment $t+1$, and E is the expectation operator. According to Fama's (1970) efficiency theory, information flows only affect current prices, and market prices are a reflection of the best underlying values of an organization's core assets. According to Andrikopoulos (2007), this theory suggested the existence of a random walk, a stochastic process with independent, equally distributed binomial randomized variables.

Based on the above Fama's efficient market model, our study uses Fama-French three factor quantile regression model as: $R_{Pt} - R_{Ft} = a + b(R_{Mt} - R_{Ft}) + s \text{SMB}_t + \text{LMH}_t + \epsilon_t$

Where, LMH replicates the risk factor in returns, SMB mimics the risk factor in stock price movement. Value s and LMH represent the portfolio's sensitivity to the LMH and SMB factors, respectively, in terms of sensitivity coefficients. In the Fama French three-factor (FFTF) regression (Maiti, 2019a & 2020b; Maiti & Balakrishnan, 2018, 2020; Sehgal et al., 2012; and others), we employed Small Minus Big (SMB) and Low Minus High (LMH), which are replicating portfolios for stock prices and value components, respectively. Mimicking portfolios are created by applying the methodology proposed by Fama-French (1993).

The equation is linearized in a quantile regression model as:

$$\text{MCAP}_t = \beta_0 + \beta_1 \text{INTR}_t + \beta_2 \text{EXRT}_t + \beta_3 \text{INFR}_t + \beta_4 \text{UNER}_t + \beta_5 \text{MSM2}_t + \epsilon_t$$

Where; MCAP = stock price movement proxied by market stock capitalization (dependent variable); INTR = interest rate; EXRT = exchange rate; INFR = inflation rate; UNER = unemployment rate; and MSM2 = broad money supply (independent variables).

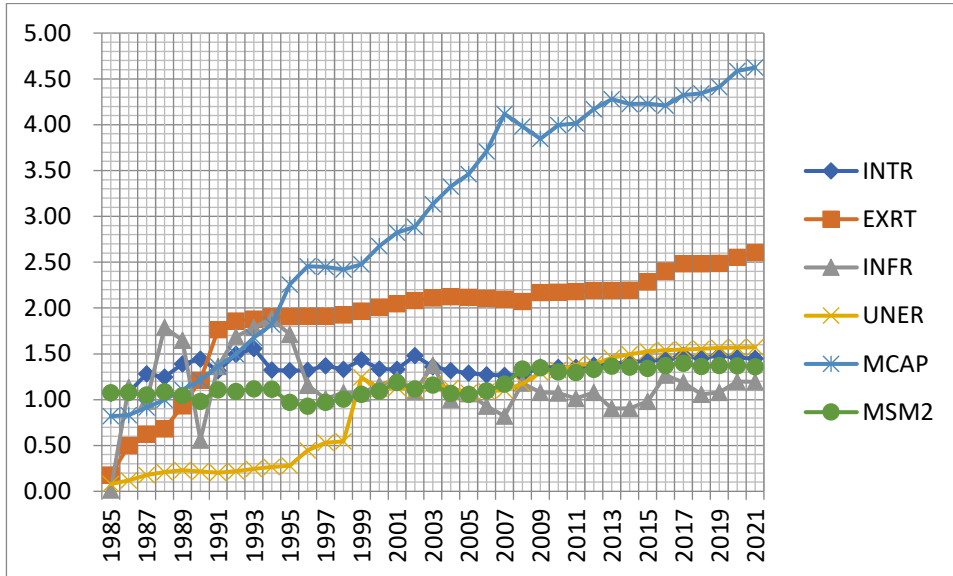
4.0 Empirical Results

4.1.1 Trend Analysis

This presents the trend of interaction between all of the explanatory variables and the dependent variable. The purpose of this graph is to visually represent the relationship between these variables so that the reader can infer the expected nature of the relationship. When these variables are jointly analyzed for a combined causality of the explanatory variables on the dependent variable, a causality relationship between them is likely to be found. The graph will show whether changes in the dependent

variable are associated with changes in the explanatory variables. Furthermore, this study will guarantee that the assumptions of linearity, co-movement, and stationarity of variables, which are prerequisites for the execution of a statistical test of significance in a regression analysis, have not been broken.

Figure 1: Interactions between macroeconomic factors and stock prices movement in Nigeria from 1985 - 2021



It is observed in Figure 1 how the trend of stock price movement, money supply, interest rate, exchange rate, inflation rate, and unemployment rate is changing. It demonstrates that the explanatory variables are most likely maintaining a very stable trend, with changes in the trend more likely to result in a commensurate shift in the stock price movement. Hence, the assumption of conventional linear regression is not violated in this case.

4.1.2 Bivariate Correlation Matrix

Table 1: Bivariate Correlation among variables

		MCAP	INTR	EXRT	INFR	UNER	MSM2
MCAP	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	37					
INTR	Pearson Correlation	.605	1				
	Sig. (2-tailed)	.150					
	N	37	37				
EXRT	Pearson Correlation	.944**	.518**	1			
	Sig. (2-tailed)	.001	.001				
	N	37	37	37			
INFR	Pearson Correlation	.016	.138	-.244	1		
	Sig. (2-tailed)	.973	.416	.145			
	N	37	37	37	37		
UNER	Pearson Correlation	.566	.454**	.908**	-.397*	1	
	Sig. (2-tailed)	.186	.005	.000	.015		
	N	37	37	37	37	37	
MSM2	Pearson Correlation	.026	.382*	.794**	-.246	.909**	1
	Sig. (2-tailed)	.956	.020	.000	.143	.000	
	N	37	37	37	37	37	37

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Table 1 shows that the macroeconomic environmental factors maintained positive correlations with stock price movement in Nigeria as revealed by their respective correlation coefficients.

4.2 Testing of Research Hypothesis

The data was analyzed and the study's hypothesis was tested using the Fama-French three-factor quantile regression model. The hypothesis was that there was no significant relationship between the macroeconomic environment and the stock price movement in Nigeria. A negative correlation between interest rates and stock price movement was found in Table 2's empirical results, with a negative coefficient of -169.0478 for interest rates. Additionally, the exchange rate's coefficient of 103.8320 shows a positive correlation with changes in stock prices. An inflation rate coefficient of -14.61019 suggests a negative correlation with changes in stock values. A coefficient value of -86.35565 indicates that the unemployment rate and stock price movement continued to have a negative relationship. On the other hand, money supply and the relationship remained positive, as indicated by the 967.1421 coefficient value. Based on statistical significance, the only variables that significantly relate to the movement of stock prices in Nigeria are the exchange rate and the money supply, as indicated by their respective p-values of 0.0001 and 0.0408. The conclusion reached was that there is no meaningful correlation between the macroeconomic environment and changes in stock prices in Nigeria since they do not have enough evidence to refute the null hypothesis based on the analysis results. With a good Pseudo R² value of 0.629, the variables in the model collectively explained roughly 62.9% of the variations in the movement of stock prices in Nigeria, with variables outside the model accounting for 37.1% of the changes. Stock analysts and investors now have access to a wealth of additional information regarding market efficiency and the various effects of predictor variables, including stock price movement and macroeconomic environmental factors. These results stem from the quantile regression results mentioned above. Because of this, investors can greatly reduce the risks associated with their investments that stem from the macroeconomic climate.

Table 2: Fama-French three factor quantile regression output

Dependent Variable: MCAP
Method: Quantile Regression (Median)
Date: 11/25/23 Time: 22:29
Sample: 1985 2021
Included observations: 37
Huber Sandwich Standard Errors & Covariance
Sparsity method: Kernel (Epanechnikov) using residuals
Bandwidth method: Hall-Sheather, bw=0.29156
Estimation successfully identifies unique optimal solution

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7064.021	5499.436	1.284499	0.2085
INTR	-169.0478	194.0675	-0.871077	0.3904
EXRT	103.8320	23.93623	4.337861	0.0001
INFR	-14.61019	52.54027	-0.278076	0.7828
UNER	-86.35565	238.3505	-0.362305	0.7196
MSM2	967.1421	452.4835	2.137408	0.0408
Pseudo R-squared	0.629298	Mean dependent var	8065.158	
Adjusted R-squared	0.569508	S.D. dependent var	11089.97	
S.E. of regression	5029.818	Objective	53783.83	
Quantile dependent var	1359.300	Restr. objective	145086.6	
Sparsity	10287.18	Quasi-LR statistic	71.00314	
Prob(Quasi-LR stat)	0.000000			

According to the Appendix, the residual's normality is shown by the Jarque-Bera (JB) value of 1.50, which corresponds to a p-value of 0.47. This value is greater than 0.05, meaning that the residual is normally distributed and not statistically significant. Lastly, the quantile process estimate test graphs in the Appendix's figures illustrate the model's stability and aid in determining it during the estimating process. The alternative hypothesis of an erroneous quantile regression model is opposed by the null hypothesis, which states that the quantile regression model fits the data well. The smooth blue lines show the residual errors and the dotted lines indicate 5% Bartlett standard error bound. It can be seen clearly that the blue line did not move outside the bound, hence the null hypothesis where the quantile regression model fits the data well is accepted and hence the parameter estimates in this model are stable over time. In all, the result can be considered valid and reliable for both policy decisions and predictive analysis.

4.3 Discussion of Findings

The study used Fama's model of efficient market approach to investigate the relationship between macroeconomic environmental factors and stock price movements in Nigeria. The empirical results showed that the interest rate had a negative coefficient of -169.0478, indicating a negative relationship with stock price movement. This finding is consistent with the findings of (Inyiama & Nwoha, 2014; Adebowale & Akosile, 2018; Abraham, 2012) that the interest rate had a negative and insignificant effect on the movement of stock prices. Additionally, the exchange rate had a positive coefficient of 103.8320, the inflation rate had a negative coefficient of -14.61019, and the interest rate had a negative relationship with stock price movement. Daferighe & Charlie (2012) obtained a similar result that inflation had a negative relationship with stock price movement. The analysis results indicate that there

is no significant relationship between the macroeconomic environment and stock price movement in Nigeria. The unemployment rate, on the other hand, maintained a negative relationship with the movement of stock prices, as shown by a coefficient value of -86.35565. The money supply maintained a positive relationship, as seen by a coefficient value of 967.1421. These findings are consistent with the finding of Nkechukwu, et al. (2013) that M2 has a significant long-run positive effect on stock prices. This result is in line with Okoro's (2017) conclusion that the performance of the Nigerian stock market could not be predicted by the money supply, interest rate, inflation rate, and exchange rate alone. The study concluded that stock prices in Nigeria do not serve as a leading indicator of macroeconomic variables and that macroeconomic factors are not able to adequately explain movements in stock prices. Ayunku (2019) also discovered that the Nigerian stock market is not sensitive to shifts in macroeconomic variables, making it riskier to forecast stock values and returns based on shifts in macroeconomic performance. Asaolu & Ogunmuyiwa (2010) discovered that the only factor that consistently correlated with stock prices during the study period was the exchange rate. They also observed that there was only a modest association between stock prices and macroeconomic variables in Nigeria. This suggests that stock prices in Nigeria do not serve as a leading indicator of macroeconomic variables and that macroeconomic factors are not able to adequately explain movements in stock prices.

5.1 Conclusion and Recommendations

Using Fama's efficient market approach model, the study looked at the relationship between macroeconomic environmental factors and movements in Nigerian stock prices. This required looking at the model's predictions as well as the statistical importance of macroeconomic environmental factors on changes in stock prices. Additionally, the Fama-French (1993) approach was used in the construction of the mimicking portfolios model. Finally, a three-factor quantile regression model based on the Fama-French model was used in the investigation. The research discovered a negative correlation between interest rates and stock price movement, with a value of -169.0478. Additionally, a positive correlation between the exchange rate and stock price movement is indicated by the coefficient of 103.8320 for the exchange rate. A correlation between the inflation rate and stock price movement of -14.61019 is evident. A coefficient value of -86.35565 indicates that the unemployment rate and stock price movement continued to have a negative relationship. The money supply, on the other hand, continued to have a positive relationship, as indicated by a coefficient value of 967.1421. Only the money supply and exchange rate have a statistically meaningful relationship with changes in Nigerian stock prices. In addition to the variables employed in the study and the ones identified by Fama and French, the results also suggested the existence of other factors. This can be seen in the 0.629 Pseudo R-squared value, which indicates that variables outside of the model account for 37.1% of the variances in the movement of Nigerian stock prices, compared to around 62.9% of the variations. Based on this finding, it was determined that there is no meaningful correlation between the Nigerian stock market movement and the macroeconomic climate. This translates to an environment where macroeconomic variable volatility undermines stakeholder and investor trust.

The research produced several policy recommendations. First, measures to moderate interest rates, exchange rates, inflation rates, unemployment rates, and money supply against unfavourable variations should be developed and put into action. A suitable monetary policy and a sufficient money supply are required to stimulate the Nigerian stock market and, in turn, raise stock values.

To increase stock market stability, the exchange rate-which serves as a pass-through variable for the domestic financial markets-must be carefully regulated. A stable naira regime can significantly help the stability of the stock market and the ultimate rise in stock prices in Nigeria, as this study has demonstrated the crucial role that exchange rates play in the movement of stock prices.

A degree of inflation control that benefits the stock market should be achieved. Interest rates ought to be raised to promote investment in Nigeria and raise stock market profits. This is because higher investments will lead to more fluctuation in stock prices and an increase in stock returns.

Additionally, investors are advised to build extremely diversified portfolios that mirror the entire market portfolio as a hedge against stock price volatility. This will serve as a guide to help them avoid shocks from the macroeconomic environment.

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