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Multi-Factor Asset Pricing Model and Financial Assets Returns in the Nigerian Stock Market

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Abstract

Research Objective: This study focused on examining the effect of the Multi-Factor Asset Pricing Model on financial assets returns in the Nigerian stock market from 1990 to 2022.

Methodology: Secondary data were sourced from the Central Bank of Nigeria, Nigeria Bureau of Statistics, and World Bank publications. The data were analyzed using the error correction mechanism (ECM) technique, with fiscal policy variables (government expenditures, GDP per capita, inflation rate, interest rate) as exogenous factors and market capitalization as the endogenous variable.

Findings: The Johansen cointegration tests revealed a long-run relationship between the Multi-Factor Asset Pricing Model and financial asset returns. The study also found that short-run disequilibrium in financial asset returns could be corrected at a rate of 37.43% in the long run.

Conclusion: The Multi-Factor Asset Pricing Model is a key determinant of financial asset returns in the Nigerian stock market.

Recommendations: The study recommends that the government and its agencies should implement policies to boost per capita income, improve fiscal policy execution, manage interest rates, and reduce inflation to enhance security returns in the Nigerian stock market.

Keywords: *Multi-Factor, Financial Assets, Returns.*

1.0 Introduction

The adoption, testing and eventual application of theoretical models in economic analysis have taken a center stage in every literature especially in the area of finance and therefore, cannot be overemphasized. This, according to Oyetayo and Adeyeye (2017) can be attributed to the fact that many investors and analysts have now spotted the significance of these models in establishing the performance of equity stocks in relation to systematic risk. Notably in finance, the two most common models that readily come to mind in this regard are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) also known as

the multi-factor asset pricing model. It has been observed that these two models are offshoots of the Efficient Market Hypothesis (EMH) and an integral part of the Modern Portfolio Theory.

According to Rosenberg (1981), *ab initio,* the Capital Asset Pricing Model (CAPM) provided a good theoretical background for testing market efficiency. Market efficiency efficiency on the other hand refers to the degree to which market prices reflect all available, relevant information. If markets are efficient, then all information is already incorporated into prices, and so there is no way to "beat" the market because there are no undervalued or overvalued securities available. Thus, an efficient capital market is one in which stock prices adjust rapidly to the arrival of new information and therefore, the current prices of securities reflect all information about the security, (Reilly & Brown 1999). However, the assumptions of the capital asset pricing model were later proven to be weak and unrealistic to accurately describe what happens to the real world. Capital asset pricing model is a one factor model designed from which stock returns are predicted. This implies that only variables whose beta factor (slope) explains the changes in security returns is the market portfolio return for all assets. On this background, Chen and Fang (2009) observed that Overtime, the empirical testing of the capital asset pricing model has resulted in several conflicting results.

Theoretically and empirically, the limitations in the application of the capital asset pricing model as evidenced by its unrealistic assumptions paved the way for some other equilibrium models like the multi-factor asset pricing model also known as the arbitrage pricing theory (APT) to become relevant in empirical applications. This theory developed by Ross (1976) introduced several factors as a source of systematic risk to security returns as against the single variable with the single beta in the case of capital asset pricing model. Arbitrage pricing theory (APT) is a multi-factor asset pricing model based. It's based on the idea that an asset's returns can be predicted using the linear relationship between the asset's expected return and a number of macroeconomic variables that capture systematic risk, (Adam, 2024). Unlike the CAPM, which assumes markets are perfectly efficient, APT assumes markets sometimes mispriced securities, before the market eventually corrects and securities move back to fair value.

The theory assumes that market action is less than always perfectly efficient and therefore occasionally results in assets being mispriced- either overvalued or undervalued for a brief period of time. According to Ola (2018), it thrives on the assumption that stock movements are affected by non-correlated common factors and a precise factor that is totally autonomous of other factors.

Ndugbu, Duruechi and Iwundu (2024) noted that the arbitrage pricing theory is a simple model with two pricing identifications and gives researchers the opportunity to choose whatever factors that can provide the finest elucidation for the data. In the same vein, empirical studies on APT have always been tested using two broad approaches, (Monogbe &

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Iki 2016). These include the factor analytical or statistical arbitrage pricing model and the equilibrium model known as the macroeconomic variable model. The macroeconomic variable model requires the arbitrage choice of a range of variables by economic institutions. The foregoing suggests that investors and financial analysts generally believe that macroeconomic variables have great influence on security prices (Aldin, Dehnavi and Entezari, 2012).

The debates amongst macroeconomic theorists have often been that security prices are determined by some fundamental macroeconomic variables or factors. Such factors like the interest rate, inflation rate, exchange rate and money supply. The crux of the argument is that an accurate prediction of security price movements is a very challenging and important issue which the investors extensively regard in their investment decisions (Wang, Zhaang and Guo, 2011). The macroeconomic hypotheses of security market price movement advocates that the interactions among macroeconomic variables and the stock market prices for listed companies on the stock markets have consequential effects on both market capitalization and company's valuations. Therefore, potential investors/investors in the Nigerian capital market need information on the influence of macroeconomic variables on the security market prices for companies listed on the Nigerian capital market where they participate. The proponents of APT postulated endless streams of macroeconomic variables with specific assumptions of which its effect on returns on capital asset is questionable to a large extent. Furthermore, a number of empirical studies have examined arbitrage pricing theory and stock valuation in Nigeria with conflicting results using different variables. Therefore, it is important to evaluate empirically the relative impact of some selected purely macroeconomics on stock returns in the Nigerian stock market.

2.0 Review of Related Literature

It is worthy of note that the single factor capital asset pricing model and some multi-factor asset pricing models are not able to predict the expected rate of return accurately to help investors determine which stocks to include in their portfolios to avoid selling undervalued or buying overvalued stocks. Hence, developing an accurate and valid pricing model can help investors in the financial markets to increase their profits and benefit the economy in which they invest, (Mohammed, 2019). According to Sekreter (2017), an alternative for the capital asset pricing model is the arbitrage pricing theory otherwise known as the multi-factor asset pricing model, because the theory contains set of macroeconomic variables assumed to replace the systematic risk in the capital asset pricing model without specifying which factors to use. APT rests on the assumption that equity price is influenced by limited and non-correlated common factors totally independent of the other factor, (Eriki & Ebooige 2012).

According to Alam (2022), Arbitrage pricing theory (APT) is a multi-factor asset pricing model based on the idea that an asset's returns can be predicted using the linear relationship

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between the asset's expected return and a number of macroeconomic variables that affect the asset's systematic risk. The APT aims to pinpoint the fair market price of a security that may be temporarily incorrectly priced. However, market action should eventually correct the situation, moving the price back to its fair market value. To an arbitrageur, temporarily mispriced securities represent a short-term opportunity to profit virtually risk-free. The APT is a more flexible and complex alternative to the Capital Asset Pricing Model (CAPM). The APT suggests that the returns on assets follow a linear pattern. An investor can leverage deviations in returns from the linear pattern using the arbitrage strategy. Arbitrage is the practice of the simultaneous purchase and sale of an asset on different exchanges, taking advantage of slight pricing discrepancies to lock in a risk-free profit for the trade. However, the APT's concept of arbitrage is different from the classic meaning of the term. In the APT, arbitrage is not a risk-free operation – but it does offer a high probability of success. What the arbitrage pricing theory offers traders is a model for determining the theoretical fair market value of an asset. Having determined that value, traders then look for slight deviations from the fair market price, and trade accordingly. Gur and Zhenyu (2016) observed that the Arbitrage Pricing Theory is a one-period model in which every investor believes that the stochastic properties of returns of capital assets are consistent with a factor structure. Ross (1976) argued that if equilibrium prices offer no arbitrage opportunities over static portfolios of the assets, then the expected returns on the assets are approximately linearly related to the factor loadings or betas. Ross' formal proof showed that the linear pricing relation is a necessary condition for equilibrium in a market where agents maximize certain types of utility.

Similarly, it is important to note that the financial market in the midst of such factors like social, political, and environmental factors to a reasonable extent, is one of the major determinants of economic growth. This is in recognition of the vital role played by these institutions in the process of economic growth and development. Thus, Iwundu (2024), observed that the measurement of the sophistication of an investment climate of an economy is based on its financial system, especially the aspect of attracting foreign investors. The stock market is a mechanism through which funds can be mobilized from long-term lenders in exchange for financial assets issued by the borrowers. It provides a platform for government and productive ventures to obtain funds for new and existing projects, expanding and modernizing industrial and commercial ventures. The market impact on economic activities through the creation of liquidity. Thus, the stock market makes the interaction of both the surplus unit and deficit unit possible in a country through the financial intermediaries and channel aggregate savings into preferred investments for the purpose of economic growth and development, (Adenuga, 2010). According to Popoola (2014), a viable equity market can serve to make the financial system more competitive and efficient. Without an equity market, companies have to rely on internal finance through retained earnings. Large and well-established enterprises are in a privileged position because they can make an investment

from retained earnings and bank borrowings, while new companies do not have easy access to finance without being subjected to the scrutiny of the stock market, big firms get bigger and for the emerging smaller companies, retained earnings and fresh cash injections from the controlling shareholder may not be able to keep pace with the needs for more equity financing which only an organized market place could provide. Moreover, despite facing adversities, the Nigerian equity market showcased a remarkable 45.89% growth in 2023 compared to 19.98% growth recorded in 2022. This was driven by strategic government policies and resilient quarterly performances by companies. (norrenberger.com, 2024).

Theoretical Review

Theories as regards the application and testing of equilibrium models in contemporary finance literature abounds. Notable among these theories are – the arbitrage pricing theory, modern portfolio theory, capital asset pricing model and the efficient market hypothesis. However, the theoretical underpinning of this work is the arbitrage pricing theory or the multi-factor asset pricing theory. The theory was propounded by a renowned economist, Ross (1976) as a result of much criticisms occasioned by the shortcomings or weaknesses embedded in the Capital Asset Pricing Model (CAPM). According to Gilles and Leroy (1990), the theory relates the expected rate of return on a sequence of primitive securities to their own factor sensitivities, suggesting that factor risk is of great importance in asset pricing. The theory states that there is a linear relationship between a security's return and some specified factors. The core idea of the arbitrage pricing theory is that only a small number of systematic influences the long -term average returns of securities. The first ingredient of Ross's arbitrage pricing theory is a factor model. Multi-factor models allow an asset to have not just one, but many measures of systematic risk. Each measure captures the sensitivity of the asset to the corresponding pervasive factor. If the factor model holds exactly and assets do not have specific risk, then the law of one price implies that the expected return of any asset is just a linear function of the other assets' expected return (Anyamaobi & Okaro 2022). According to Mark-Egart (2020), arbitrage pricing theory provides analysts and investors with a high degree of flexibility regarding the factors that can be applied to the model. The number and different types of factors that are used are up to an analyst's choice. In the APT, arbitrage is not a risk-free operation – but it does offer a high probability of success. What the arbitrage pricing theory offers traders is a model for determining the theoretical fair market value of an asset. Having determined that value, traders then look for slight deviations from the fair market price, and trade accordingly.

There are many divergent views on arbitrage pricing models and returns on financial assets in the Nigerian stock market. The efficient market hypothesis school of thought was of the view that stock market asset returns will be determined basically by fundamental factors such as macroeconomic factors, retention rate, size of the firm, dividend payout, management, political factors, psychological factors and diversification etc. (Srinivasan, 2012). However,

sequel to information asymmetry, capital market information may not be available to all stakeholders at the same time. This is why Khan (2009) opined that the source of the information asymmetry is the superior knowledge that managers have about company's prospects, while investors in the companies are made up of the uninformed group.

Consequently, the shortcomings of Efficient Market Hypothesis saw the entrance of the Arbitrage Pricing Theory. The multifactor model as opined by Arowoshegbe and Imafidon (2010) is based upon the assumption that many macroeconomic variables such as inflation rate, interest rate, exchange rate, money supply, gross domestic product and unemployment rate are involved in the determination of risk and return relationship.

Empirical Literature Review

Related empirical research works that examined the multi-factor pricing model viz-a-viz returns on financial assets in the Nigerian stock market abound. Though, a number of empirical research works in this regard seem inadequate in their numbers with conflicting results.

Anyamaobi and Okaro (2022) examined arbitrage pricing theory and stock returns of quoted manufacturing firms in Nigeria, 1987 to 2019. Times series data was used with the aid of the ordinary least square regression (OLS) technique. The real gross domestic product, inflation rates, exchange rates, real interest rates and treasury bill rates were used as the independent variables and the return on manufacturing index as the dependent variable. The result revealed that Treasury bill rate, inflation rate, and exchange rate have a positive relationship on the manufacturing sector stock return. While the real gross domestic product and real interest rate have a negative relationship on manufacturing sector stock return. However, the joint test showed the existence of a significant relationship between macroeconomic variables and stock returns.

Iwegbu and Adeoye (2020), studied the effect of inflationary expectations on stock market returns during the financial crisis era and the post- financial crisis era in Nigeria, using quarterly data spanning the periods 2007Q1 to 2018Q4. The Autoregressive Distributed Lag (ARDL) model was used as a method of data analysis. The result revealed that a long run relationship exists among the variables and inflationary expectations are key determinants of stock market returns in Nigeria.

Anjaly and Malabika (2021)) studied the influence of macroeconomic variables on stock market performance in India between the periods 2005 to 2021. Macroeconomic variables employed in this regard included industrial production index, interest rates, exchange rates, inflation rates and money supply. The data was analyzed using Auto Regressive Distributed Lag (ARDL) model to examine the positive or negative effect of macroeconomic variables on stock market return in India. The study found that industrial production, interest rate and exchange rate have long term negative effects on stock returns. More specifically, the

exchange rate has a significant effect on the stock market performance. However, inflation rate has a negative short -term effect on stock market returns. While money supply exhibits an insignificant relationship with stock market returns.

Budonyefa (2020) examined multi factor arbitrage pricing theory viz-a-viz investment performance and selected macroeconomic variables in the Nigerian capital market from 1988 to 2017. The data collected includes, earning per share, a proxy for investment performance constituted the dependent variable, inflation rate risk, interest rate risk, exchange rate volatility risk, money supply rate of change, real gross domestic product and treasury bill rate are used as the independent variable were subjected to ordinary least regression model (OLS). The result revealed that inflation rate risk, interest rate risk, exchange rate volatility risk, money supply rate of change, real gross domestic product and treasury bill rate related positively with investment performance. They concluded on the basis of their findings that investment performance in the Nigerian capital market does not toe the line of the objectives of the arbitrage pricing theory as the selected macroeconomic risk factors do not strongly explain investment performance.

Umuoru and Iweriebor (2017) examined an econometrics test of arbitrage pricing and its volatility in the Nigerian equities market using quarterly time series data on forty-two stocks listed in the Nigeria stock exchange for the period 2010 to 2014. The researcher made use of EGARCH model to analyze the data which made use of inflation rate, money supply rate and Treasury bill rate as independent variables and stock return as dependent variable. The result revealed that money supply rate has a significant positive outcome on stock return, while Treasury bill rate with inflation rate had significant negative outcome on stock return.

Khudoykulov (2017) verified the application of arbitrage pricing theory on stock return for the period 2009 to 2014 using Athen's stock market as a case study. They examined thirty-one (31) companies quoted on the Athens stock exchange with the highest market capitalization. The data collected included market capitalization which constituted the dependent variable, and macroeconomic factors as independent variables were subjected to the APM Model. The findings revealed that the arbitrage pricing theory was invalid for the Athens stock exchange.

Alex (2018) examined the empirical relationship between macroeconomic factors (namely; inflation rate, money supply and exchange rate) and stock returns in Nigeria for the period 2000 to 2016. The data collected were analyzed using pairwise econometric techniques. The outcome of the study revealed that macroeconomic factors can be used to predict stock market returns in Nigeria.

Tobira and Agbam (2017) investigated the suitability of the pre-specific macroeconomic Arbitrage Pricing models in explaining the behavior of stock returns and the number of risk factors that command risk premiums in Nigerian Equity Market. The study employed Ordinary Least Square technique for pre-specified macroeconomic variables using monthly

data on the macroeconomic factors over the period January 2002 to December 2014. The result of the empirical validity of the pre-specified macroeconomic variable model showed that all the eight (8) factors: capitalization, lending rate, deposit rate, interest rate differentials, inflation rates, exchange rate, crude oil prices and treasury bill significantly influence the variations in average stock return. However, some of these risk factors (inflation rate, capitalization, deposit rate and interest rate differentials risk premium) were inversely related to average return. Conversely, an increase in treasury bill, crude oil prices, exchange rate and lending rate affects average return positively. The mean of these variables were all positive implying that their first difference displays increasing tendency like the stock return; significantly different from zero, implying that investors are rewarded for assuming these macroeconomic risks.

Monogbe, Edori and Iki (2016) verified the application of arbitrage pricing theory in the Nigerian capital market using macroeconomic variables as the determinants of returns of the companies chosen. In pursuance of this objective, five companies were chosen which include Okitipupa oil palm, Mobil oil plc, Forte oil plc, Fidelity bank plc and Aluminum extrusion industry plc. The data collected include, return on security which constitutes the dependent variable, interest rate, exchange rate and inflation rate which constitute the independent variables for the period 1986 to 2014. The data collected were subjected to ordinary least square (OLS) regression analysis, Arch and Garch Model. The output of their findings showed that interest, inflation and exchange rate were not statistically fit in explaining returns on investment in the companies studied. This puts a question mark on the applicability of Ross arbitrage pricing theory in justifying returns on stocks in the Nigerian context of the capital market.

Terfa (2015), examined the relationship between the stock and selected macroeconomic variables in Nigeria for the period 1985 to 2008. The all-share index was used as the dependent variable while inflation rates, interest rates and exchange rates and treasury bill rates were the independent variables. The data collected were subjected to error correction model (ECM) analysis. The study found that macroeconomic variables were negatively related to the stock market in the short run.

Sulaiman, Syed, Irfan and Saba (2012) examined the variability of the arbitrage pricing theory in case of Karachi stock exchange for the period January 1985 to December 2008. The data collected include, stock return which constitute the dependent variable, gold reserve, bullion price, international petroleum price, exchange rate, industrial index of production, quasi money, money market rate and consumer price index which constitutes the independent variables. The analytical procedure adopted in this study was the Johansen cointegration and the error correction model (ECM) to test the validity of the arbitrage pricing theory. The study found that quasi money, industrial index of production, exchange rate, petroleum price, domestic interest responded negatively and statistically significant with stock returns.

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However, bullion price and inflation rate showed a negative insignificant relationship with stock returns.

The reviewed empirical literature showed a dearth of empirical studies on multi-factor pricing theory on developing countries like Nigeria. In respect to data, none of the empirical studies reviewed covered up 2022 using such macroeconomic variables like the per capita income, fiscal policy (government expenditure), inflation rate and interest rate in relation to stock returns or prices (represented by the market capitalization) in the Nigerian capital market.

3.0 Methodology

The study made use of quasi–experimental research design. Macroeconomic variables identified through literature and used in the research were inflation rates (inf), interest rates (int), gross domestic product per capita income (pci) and government expenditure (gex). The market capitalization was used to measure securities return which was modeled as a function of the selected microeconomic variables. The data for this study were extracted from the publications of the Central Bank of Nigeria Statistical Bulletin of 2022 and World Bank publications 2022.

The study adopted error correction mechanism (ecm) approach to cointegration analysis to model security returns in relation to macroeconomic factors in the Nigerian economy. This will provide an answer to the question as to whether there is a long run relationship between security returns and macroeconomic variables in Nigeria.

Model Specifications

One way of linking macroeconomic variables and security returns is through the multi-factor pricing theory where multiple risk factors can explain asset returns (Ross, 1976). This is because the concept explains the relationship between security returns and macroeconomic variables. Therefore, the model of the study is as specified below:

mcap = f(gex, pci, inf, int) ……(I)

The above functional model can be given econometric form as:

$\text{Log(mcap)} = \beta_0 + \beta_1\text{Log(gex)} + \beta_2\text{Log(pci)} + \beta_3\text{Log(inf)} + \beta_4\text{Log(int)} + \mu_t$……..(II)

Where,

mcap = market capitalization

gex = fiscal policy-government expenditure

pci = gross domestic product per capita income

inf = inflation rate

int = interest rate

β_0 = constant

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μ_t, λ_t= error term

β_1- β_4, = coefficients or slope of the variables

A priori Expectations

$\beta 3 < 0$. This implies that negative relationships are expected between inflation rate (inf) and security returns.

$\beta 1 > 0$, $\beta 2 > 0$, $\beta 4 > 0$

These imply that positive relationships are expected between gross domestic product per capita income (pci), government expenditure (gex), interest rate (int) and security return.

Data Estimations and Results

Summary of ADF Unit Root test result

Variables	ADF t-statistic	ADF critical value @ 5%	Probability values	Decision
logmcap	-4.395085	-2.960411	0.0016	1(1)
loggex	-7.899594	-2.960411	0.0000	1(1)
logpci	-4.906739	-2.960411	0.0004	1(1)
Ioginf	-4.737684	-2.963972	0.0007	1(1)
Logint	-6.764690	-2.960411	0..0000	1(1)

Sources: e-views output

The ADF unit root test analysis was employed to ascertain the stationarity of the variables used in the study. The summary result as shown above revealed that all the variables of the study were integrated or stationary at first differencing, 1(1). This result informed the decision to adopt the Johansen cointegration and the error correction mechanism (ecm) techniques as the tool of analysis.

Johansen Cointegration test Result

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Date: 06/10/24 Time: 05:07
Sample (adjusted): 3 33
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: INF_ MCAP PCI GEX INT
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.791171	122.8964	88.80380	0.0000
At most 1 *	0.705154	74.34299	63.87610	0.0051
At most 2	0.453088	36.48260	42.91525	0.1892
At most 3	0.323129	17.77511	25.87211	0.3592
At most 4	0.167329	5.676620	12.51798	0.5024

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.791171	48.55337	38.33101	0.0024
At most 1 *	0.705154	37.86039	32.11832	0.0089
At most 2	0.453088	18.70749	25.82321	0.3254
At most 3	0.323129	12.09849	19.38704	0.4061
At most 4	0.167329	5.676620	12.51798	0.5024

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Sources: eviews output.

The trace and max-eigenvalue tests from the Johansen cointegration test results indicate two (2) cointegrating equations at the 0.05% level of significance. This confirms the existence of a long run relationship between gdp per capita income (pci), government expenditure (gex), interest rates (int), inflation rates (inf) and market capitalization (mcap). In other words, there is a long run relationship between multi-factor pricing theory and financial assets returns in the Nigeria capital market.

Error Correction Mechanism (ECM) test

Dependent Variable: D(MCAP)

Method: Least Squares

Date: 06/17/24 Time: 01:48

Sample (adjusted): 1991 2022

Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.053887	0.034168	1.577128	0.1269
D(GEX)	0.566054	0.290775	1.946708	0.0624
D(PCI)	0.594014	0.209927	2.829624	0.0089
D(INT)	-0.185245	0.257809	-0.718538	0.4788
D(INF)	-0.023842	0.109727	-0.217281	0.8297
ECM(-1)	-0.374301	0.164490	-2.275520	0.0314

R-squared	0.792215	Mean dependent var	0.109375
Adjusted R-squared	0.656102	S.D. dependent var	0.142239
S.E. of regression	0.130666	Akaike info criterion	-1.064983
Sum squared resid	0.443914	Schwarz criterion	-0.790158
Log likelihood	23.03974	Hannan-Quinn criter.	-0.973887
F-statistic	12.146864	Durbin-Watson stat	1.809931
Prob(F-statistic)	0.001434		

Sources: eviews output

The error correction mechanism (ecm) test result above was appropriately signed with a negative coefficient result of -0.374301 with a significant t-statistic of -2.275520. This implies that short-run disequilibrium can be corrected in the long run at the speed of 37.43%.

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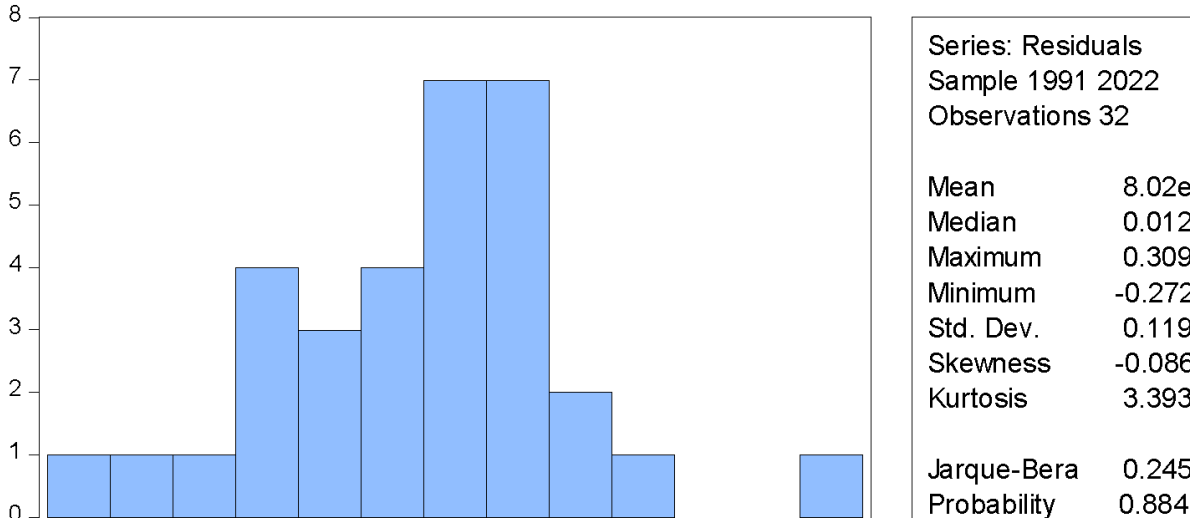
Thus, it can be inferred that multi-factor pricing theory significantly influences financial assets returns in the Nigeria stock market.

Diagnostic tests

Normality test result.



Sources: eviews output

The jarque-Bera probability value from the above test result is 0.884403, which is greater than 0.05 (5%) level of significance. It follows that the residuals of the model are normally distributed. This is in line with apriori expectations.

Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.195450	Prob. F(2,24)	0.3200
Obs*R-squared	2.899059	Prob. Chi-Square(2)	0.2347

Sources: eviews output

The above table revealed that the probability values of the F-statistic and Obs*R –squared of 0.3200 and 0.2347 respectively is greater than the 5% level of significance. This shows the absence of serial correlation in the model.

Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

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F-statistic	0.397438	Prob. F(5,26)	0.8460
Obs*R-squared	2.272116	Prob. Chi-Square(5)	0.8104
Scaled explained SS	1.794884	Prob. Chi-Square(5)	0.8767

Sources: eviews output

The above output revealed that the probability values of the test statistic were all greater than the 5% level of significance. This depicts that the errors of the model are not heteroscedastic but homoscedastic overtime. In other words, the residual errors have constant variance.

Discussion of Results:

This study examined multi-factor asset pricing theory and financial assets returns in the Nigerian stock market. Multi-factor asset pricing theories were captured by such variables as fiscal policy (government expenditures), gross domestic product per capita income, interest rates and inflation rates while financial assets returns were represented by market capitalization of all financial instruments traded in the Nigerian stock market. Ideally, we expect such variables like per capita income, government expenditures and interest rates to have a positive effect on market capitalization because an improvement in any of these indicators is expected to boost investors' confidence, encourage more investment in financial assets and by extension financial assets returns in the stock market. On the other hand, inflation rate is expected to have a negative effect on financial assets returns because of its adverse effect on investors' investments and returns on financial assets. In nutshell, the belief that these identified variables play significant roles in the determination of financial assets returns in the Nigerian stock market cannot be far-fetched. In the same vein, results of empirical investigations on this front as revealed by the trace and max-eigenvalue tests from Johansen cointegration result for long run analysis revealed that there exist long run relationship between the variables of the study (gross domestic product per capita income, government expenditure, inflation and interest rates) and market capitalization. In other words, mult-factor asset pricing theory has a significant impact on financial assets returns in the Nigerian capital market. The error correction mechanism result for the determination of speed of adjustments in the event of any disequilibrium in the short run showed that such disequilibrium in the short-run can be significantly corrected at the speed of 37.43%. Thus, it can be inferred that multi-factor pricing theory significantly influences the returns on financial assets in the Nigeria stock market. However, it is important to note that in the short run only gross domestic product per capita income influences financial assets returns. This shows that the standard of living of the citizenry plays a significant role in the determination of their preferences to investments especially in financial assets. This was ascertained using the probability value of the residual 0.0089, which is less than the 5% level of significance. On a general note, Anyamaobi and Okaro (2022), studied the effect of arbitrage pricing theory on

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stock returns of quoted manufacturing firms in Nigeria for the period 1987 to 2019. Their findings revealed that a long- run relationship exists between arbitrage pricing theory and stock returns which is in agreement with the findings of this study which found that multi-factor pricing theory had a long- run relationship with stock market returns. Similarly, Udo, Odey and Jacob (2022) modeled the effects of inflation rate, gross domestic product, money supply and exchange rate on all-share index for the period 1985 to 2020. Their findings revealed that a long -run relationship exists between macroeconomic factors and all-share index which is in agreement with the findings herein.

4.0 Conclusion and Recommendations

This study was carried out to examine the effect of multifactor pricing model/theory on financial assets returns in the Nigerian stock market. This is in recognition of the various financial models that have been employed to examine the effect of multi-factor models on financial asset returns and the gap or debate created therein. The study used such variables as government expenditures, gross domestic product per capita income, interest rates and inflation rates which were regressed against market capitalization as an aggregate of all financial assets returns in the Nigerian stock market. The error correction mechanism (ecm) technique was employed to analyze the data. Findings revealed that there is a long run relationship between the selected macroeconomic variables and market capitalization. Also, the speed of adjustments in the case of any disequilibrium in the short run was appropriately and negatively signed with a significant t-statistic. This led to the conclusion of the existence of a long run relationship between multi-factor asset pricing models and financial assets returns in the stock market. In other words, multi-factor asset pricing models have a significant effect on financial assets returns in the Nigeria stock market. This findings corroborates or is in conformity with the findings of Anyamaobi and Okaro (2022), Udo, Odey and Jacob (2022), Iwegbu, Alex (2018) and Adeoye (2020) but negates the findings of Budonyefa (2020) and Khudoykulov (2017).

Based on the findings of the study, the following recommendations were made:

1. Regulatory authorities should continue to evolve policies that would spur per capita income, encourage effective and efficient implementation of fiscal policies, interest rates and also reduce inflation. This will enhance security returns in the Nigerian stock market.

2. Regulatory authorities in Nigeria should further strengthen its policies/laws on market abuses. Periodic review of such laws that would from time to time checkmate unethical developments and penalize defaulters will further boost investors' confidence and as well returns on financial assets.

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3. There should be synergy among all tiers of government and regulatory authorities in the implementation and promotion of macroeconomic policies. Stability of macroeconomic policies cannot be overlooked bearing in mind that investments tend to flow away from an unstable and unsecured economy. This will help promote stock market transparency and further enhance financial assets returns in the market.

4. Professionalism in the execution of macro-economic policies in Nigeria should be enthroned. This invariably enhances governance quality in the stock market, boosts investment in the stock market among other benefits.

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Appendix

Data set on market capitalization, government expenditures, gross domestic product per capita income, interest rates and inflation rates in Nigeris 1990 - 2022

Years	mcap	gex	pci	int	inf.

	#'b	#'b	US$	%	%
1990	16.30	60.3	567.5	18.50	7.4
1991	23.10	66.6	609.4	15.50	13.01
1992	31.20	92.8	519.6	17.50	44.59
1993	47.50	191.2	551.9	26.00	57.17
1994	66.30	160.9	762.4	13.50	57.03
1995	180.40	248.8	1302.6	13.50	72.8
1996	285.80	337.2	1673.9	13.50	29.27
1997	281.90	428.2	1765.1	13.50	8.53
1998	262.60	487.1	1871.8	13.50	10
1999	300.00	947.7	494.1	18.00	6.62
2000	472.30	701.1	563	14.00	6.93
2001	662.50	1018	583.1	20.50	18.87
2002	764.90	1018.2	733.5	16.50	12.88
2003	1,359.30	1226	786.8	15.00	14.03
2004	2,112.50	1504.2	992.7	15.00	15.0
2005	2,900.06	1919.7	1250.4	13.00	17.86
2006	5,120.90	2038	1652.2	10.00	8.23
2007	13,181.69	2450.9	1876.4	9.50	5.39
2008	9,562.97	3240.8	2227.8	9.75	11.58
2009	7,030.84	3453	1883.9	6.00	12.54
2010	9,918.21	4194.6	2280.1	6.25	13.74
2011	10,275.34	4712.1	2504.9	12.00	10.83
2012	14,800.94	4605.3	2728	12.00	12.22
2013	19,077.42	5185.3	2976.8	12.00	8.5
2014	16,875.10	4587.4	3201	13.00	8.05
2015	17,003.39	4988.9	2679.6	11.00	9.01
2016	16,185.73	5858.6	2144.8	14.00	15.7
2017	21,128.90	6456.7	1941.9	14.00	16.5
2018	21,904.04	13786.9	2125.8	14.00	12.1
2019	25,890.22	15535.5	2334	13.50	11.4
2020	38,589.58	17557.4	2074.6	11.50	13.25
2021	42,054.50	19965	2065.8	11.50	16.95
2022	51,188.87	24431.21	2162.6	16.50	18.85

Sources: Central Bank of Nigeria Statistical Bulletin, 2022
World Bank Publications, 2022

Logs of Data Set Used for the study

Logmcap	Loggex	Logpci	Logint	Loginf

1.2	1.780317	2.753966	1.267172	0.866878
1.4	1.823474	2.784902	1.190332	1.114277
1.5	1.967548	2.715669	1.243038	1.649237
1.7	2.281488	2.74186	1.414973	1.757168
1.8	2.206556	2.882183	1.130334	1.756103
2.3	2.39585	3.114811	1.130334	1.86237
2.5	2.527888	3.22373	1.130334	1.466423
2.5	2.631647	3.246769	1.130334	0.930949
2.4	2.687618	3.272259	1.130334	1
2.5	2.976671	2.693815	1.255273	0.820858
2.7	2.84578	2.750508	1.146128	0.840733
2.8	3.007748	2.765743	1.311754	1.275772
2.9	3.007833	2.8654	1.217484	1.109916
3.1	3.08849	2.895864	1.176091	1.147058
3.3	3.177306	2.996818	1.176091	1.176091
3.5	3.283233	3.097049	1.113943	1.251881
3.7	3.309204	3.218063	1	0.9154
4.1	3.389326	3.273325	0.977724	0.731589
4.0	3.510652	3.347876	0.989005	1.063709
3.8	3.538197	3.275058	0.778151	1.098298
4.0	3.622691	3.357954	0.79588	1.137987
4.0	3.673214	3.39879	1.079181	1.034628
4.2	3.663258	3.435844	1.079181	1.087071
4.3	3.714774	3.47375	1.079181	0.929419
4.2	3.661567	3.505286	1.113943	0.905796
4.2	3.698005	3.42807	1.041393	0.954725
4.2	3.767794	3.331387	1.146128	1.1959
4.3	3.810011	3.288227	1.146128	1.217484
4.3	4.139467	3.327522	1.146128	1.082785
4.4	4.191325	3.368101	1.130334	1.056905
4.6	4.24446	3.316934	1.060698	1.122216
4.6	4.300269	3.315088	1.060698	1.22917
4.7	4.387945	3.334976	1.217484	1.275311

Sources: Author's Computations