Stock portfolio and stock return in Nigeria capital market

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Abstract

The study of risk-return relationship and impact on efficient portfolio selection provides valuable insights for both individual and institutional investors in selecting stocks that offer optimal returns with minimal risk. The study examines dynamics of return and risk to portfolio selection for optimal stock return in Nigeria capital market during period January 2013 to December 2022, employing Ordinary Least Squares (OLS) regression method. The study employs a 2 x 3 size-sort methodology to create 30 size-sort portfolios. Source of data for study were gotten from Nigeria exchange group (NGX), Securities and Exchange Statistical Bulletin, and Central Bank of Nigeria (CBN). The findings result reveal small capitalized portfolios performs better with higher returns than big capitalized portfolios showing size effect, while market premium is significant statistically for all portfolios with positive coefficients beta. Hence, it can be recommended that investors should consider small capitalized stocks to build portfolios and considers market premium as an important risk factor to be considered when evaluating variation of stock returns in Nigeria.

Keywords: Capital Asset Pricing Model, Capital Market, Market Premium, Portfolio Selection, Stock Return.

***JEL Classification Codes*:** G120, G110, G140

1. Introduction

The quest into how investors make decisions for portfolio selection and asset prices determination are concepts that has remained unresolved in finance. Heilmann, Vergara-Fernández and Szymanowska (2023) opined capital asset pricing model (CAPM) is a fundamental framework in economics and finance for evaluating investor behavior under conditions of risk and return relationship while Salim and Kristanti (2024) highlight that security selection and portfolio management are vital factors to be considered when making investment decision to achieve efficient portfolio and optimal returns in relation to risk levels. CAPM evolution started from concept of utility maximization and return maximization to mean-variance concept. Utility maximization concept emphasize, satisfaction is a key factor when making choice while return maximization concept explain deriving optimal return with minimal cost is a factor when making investment choice and mean-variance concept emphasize stock return is measured mean and variance value of asset. Elbannan (2015) opined that research work of Mossin (1966), Lintner (1965) and Sharpe (1964), independently introduced CAPM by extending Markowitz (1952) modern portfolio theory and diversification of assets in which CAPM of Sharpe (1964) and Lintner (1965) identified two main factors affecting cross section of stock return: market premium and beta. Beta explains market portfolio sensitivity in relation to excess return while market factor is risk factor for explaining stock return variations. Zarifhonarvar (2023) emphasized that CAPM is most sought theoretical model for explaining risk and return interplay in capital market.

Nigeria capital market being an emerging market is characterized with high volatility, high turnover, illiquidity, low participation, and information inefficiency. The high volatility nature of capital market has made evaluation of assets and selection of portfolios to invest on a herculean task. Every investor's objective lies in attaining optimal returns with selecting asset and portfolios that gives minimum risk. Prediction of stock portfolio that gives optimal stock returns is significantly important in investment selection and stock trading strategy for emerging markets (Dogo & Aras, 2022). Abdeldayem and Darwish (2018) opined that foundation of modern financial theory is rate of return determination and risk identification. Correctness in identifying most suitable portfolio selection that could give optimal return would be of great importance in field of finance, however, this assertion is yet to be harmonized by scholars as regard best portfolio selection for optimal return. The study goal is to identify best portfolio that gives best stock returns

in Nigeria capital market. Markowitz (1959) identified the best way to manage risk in security investment is by aggregating securities to form a portfolio in a way to diversify varying risk of securities to compensate for each other with aim of achieving optimal return from assets aggregated. For this study, portfolios are constructed by intersection of market capitalization with: value factor, investment factor, profitability factor, momentum factor, age factor, interest rate factor, inflation rate factor, exchange rate factor and firm age factor to form a 30 size-portfolios using 2 by 3 matrix size sort. The study purpose is to show how risk premium and portfolio selection can help researchers and investors not only to explain stock return variation but can also be used as a tool for investment evaluation, investment selection, and investment trading strategy. The remainder of the study proceeds as follows: section two literature review, section three research methodology, while section four results and discussion, section five conclusions and recommendation.

2. Literature review

Capital market is a tool for economic growth promotion through capital allocation and financial intermediation for investment opportunities to promote economic efficiency in any country. However, capital market is fundamentally a volatile market influenced by factors from market factors, non-market factors, cognitive factors, government factor, social and ethical factors that can affect investors' returns on their investments. Capital Asset Pricing Model is an anchor model in finance for explaining interplay of market risk and future asset returns. CAPM is generally used in estimating cost of capital, asset pricing models and measuring portfolio performance making it a fundamental concept in corporate finance, economics, and investment valuation.

Asset pricing models evolved from research work of Mossin (1966) Sharpe (1964) and Litner (1965) which resulted to introduction of capital asset pricing model. Perold (2004) opined that first identified model in finance for pricing risk in investment and how it affects stock return is capital asset pricing model. There are assumptions that must hold for CAPM to work: all investors are risk averse, market is perfectly competitive, there are no transaction costs or taxes, homogeneous views of security returns, and risk free interest rate borrowing and lending.

Modern portfolio theory (MPT) was formulated on assumption that all investors are risk averse by Markowitz (1952) explaining theoretical findings about portfolios, risk, and diversification in

relation to different asset classes. According to Fabozzi, Gupta, and Markowitz (2002) opined that Markowitz groundbreaking work of Modern portfolio theory established framework for building portfolios based on portfolio returns maximization and risk minimization while Suheyli (2015), Andreas and Basana (2021) opined MPT identifies systematic risk and unsystematic risk in relation to maximizing portfolio returns while avoiding risk. MPT consider total risk (diversifiable risk and undiversifiable risk) in a market as a foundation for building portfolio by aggregating assets with various weight of risk and return to form portfolio. The main advantage of MPT in portfolio building is that it allows for compensation of asset with low risk returns with asset class with high risk return to give an optimal return. Hence, Markowitz work is built on parlance that never put all your eggs in one basket and identified two sources as determinant of investor portfolio selection: portfolio expected return and risk.

Empirical review

Oke (2013) examined capital asset pricing model in Nigeria using ordinary least regression with monthly data from period 2007 to 2010. The study findings invalidate CAPM as a model for stock return prediction in Nigeria. Nyangara, Ndlovu, and Tyavambiza (2016) examined validity of CAPM for Zimbabwe Stock Exchange (ZSE) from March 2009 and February 2014. The study findings revealed market premium is statistically significant and lack of size effect is evident in ZSE. Offiong, Riman, Mboto, Eyo, and Punah (2020) investigated CAPM in Douala Stock Exchange for period April 2009 to August 2017 using OLS regression method. The study findings revealed market premium is statistically significant for securities categorized as portfolios while for individual securities, market premium is an insignificant factor. Meah and Bhuiya (2023) investigated CAPM in Chittagong Stock Exchange (CSE) using 10 different sector indexes spanning period July 2016 to June 2019. The study adopts ordinary least square regression and findings showed CAPM is not valid for all 10 distinct sector indices of Chittagong Stock Exchange. Thalassinos, Khan, Ahmed, Zada, and Ihsan (2023) explored applicability CAPM and multi-factor models in Pakistan market for period June 2010 to June 2020 using Fama-MacBeth's regression methodology. Findings revealed small capitalized stocks possess better returns than big capitalized stocks and CAPM was a valid model for explaining stock return variation. Latunde, Akinola and Dare (2020) analyzed CAPM for Deutsche bank energy commodity for period year 2014-2018. The study findings revealed the higher return of commodity, the higher risk of

commodity. Salim and Kristanti (2024) evaluated performance of portfolios using CAPM spanning period 2018 and 2023 in Indonesia. Findings showed single index model portfolios gives higher returns than CAPM and portfolios with active strategies gives greater returns than passive strategies portfolios while the statistical test results revealed insignificant market premium. Mutinda and Langat (2024) analyzed return and risk interplay for diversified portfolio of nine companies within S&P 500 index daily stock returns data spannin January 2019 to December 2023. The study revealed higher beta values is exhibited by stocks in technology and finance sectors than stocks in healthcare.

3. Methodology

This study aims to empirically evaluate optimal portfolio selection strategies that yield highest returns in Nigeria capital market. The statistical approach employed is ordinary least squares (OLS) regression, with adjusted R-squared (R^2) to assess performance of selected portfolios. The dataset comprises monthly returns for financial and non-financial firms listed on Nigerian Exchange Group (NGX) from January 2013 to December 2022. Data were sourced from Nigerian Exchange Group, Central Bank of Nigeria, and Securities and Exchange Commission. The study population includes firms listed on Nigerian Exchange Group with sample size of 100 financial and non-financial firms.

Portfolio construction

This section outlines method used for the study portfolio construction. The study adopts mimicking portfolios strategy to create dependent and independent variables using a 2x3 matrix size-sort approach. Market capitalization serve as proxy for size factor, book-to-market value ratio for value factor, pre-tax profit and depreciation for profitability factor, change in total assets for investment factor, change in stock returns for momentum factor, and age of the firm since incorporation for the age factor. Stocks were classified as small and big size categories on 20th and 80th percentiles of market capitalization. Similarly, stock returns based on size category (market capitalization) were intersected with proxy variables for value, profitability, investment, momentum, and age, and grouped on 30th, 40th, and 30th percentiles to form portfolios. The independent variable is market premium proxied by subtraction of risk-free rate from market return. The dependent variable

consists of 30 size-sort portfolios, constructed by intersecting size factor with value, profitability, investment, momentum, and age factors.

Model specification

The study adopts regression model and adjusted R^2 based on research work of Thalassinos, Khan, Ahmed, Zada, and Ihsan (2023) to identify if market factor can explain variation of stock returns and portfolio performance in Nigeria capital market. Thalassinos, Khan, Ahmed, Zada, and Ihsan (2023) investigated CAPM and other pricing model for Pakistan market using 32 sort-size portfolios. The study findings revealed that small capitalized portfolios have higher returns than large capitalized portfolios. This study would adopt monthly stock return and 30 size-factor portfolios to validate if result findings would align with Thalassinos, Khan, Ahmed, Zada, and Ihsan (2023). Hence, to address our study the following models were formulated:

$$Er_i - Rf_i = Rf_i + \beta[Rm_i - Rf_i] + \varepsilon_i \quad (1)$$

Where:

$Er_i - Rf_i$ excess return of a portfolio i,

Rf_i risk-free rate,

Rm_i market portfolio returns and

ε_i error term.

$$\beta = \frac{\text{Cov (Ri,Rm)}}{\text{Var (Rm)}} \quad (2)$$

Where: β represents beta coefficient ($\beta > 1$ signifies portfolio is more volatile than market, while $\beta < 1$ indicates portfolio is less volatile than market). $\text{Cov}(Ri, Rm)$ covariance between portfolio return and market return, and $\text{Var}(Rm)$ variance of market return.

4. Results and discussions

Table 1 presents descriptive statistics for market premium and portfolio returns. The study reveal portfolio returns and market premium possess negative mean values except big capitalized old firm portfolio (BO) with positive mean value of 0.0003. For size-value portfolios, small capitalized low value (SL) portfolios has highest negative mean of -0.0045. Across size-investment portfolios, big capitalized medium (BM) portfolio possess peak mean value of -0.0041. Across size-momentum

portfolios, big capitalized winners (BW) portfolio possess peak mean value of -0.0027. Across size-profitability portfolios, small capitalized weak (SW) portfolio possess peak mean value of -0.0036 while market premium has mean value of -0-0009

Table 1. Descriptive statistics of portfolios and market premium

SIZE-VALUE PORTFOLIO

	Mean	Median	Maximum	Minimum
SH	-0.0058	0.0032	0.3811	-0.7324
SM	-0.0071	-0.0004	0.3813	-0.6915
SL	-0.0045	0.0032	0.4135	-0.7381
BH	-0.0056	0.0008	0.3294	-0.6583
BM	-0.0060	0.0019	0.2935	-0.6412
BL	-0.0058	0.0036	0.3218	-0.6803

SIZE-INVESTMENT PORTFOLIO

	Mean	Median	Maximum	Minimum
SC	-0.0083	-0.0031	0.3672	-0.7051
SM	-0.0055	0.0020	0.3861	-0.7101
SA	-0.0045	0.0056	0.4157	-0.7365
BC	-0.0062	0.0015	0.3097	-0.6585
BM	-0.0041	-0.0023	0.3276	-0.6578
BA	-0.0095	-0.0031	0.3642	-0.6809

SIZE-MOMENTUM PORTFOLIO

	Mean	Median	Maximum	Minimum
SW	-0.0037	0.0060	0.3847	-0.7270
SM	-0.0054	0.0012	0.3967	-0.6992
SL	-0.0090	-0.0013	0.3830	-60.7276
BW	-0.0027	0.0043	0.3439	-0.6397
BM	-0.0055	0.0037	0.3256	-0.6663
BL	-0.0098	-0.0008	0.3193	-0.6838

SIZE-PROFTABILITY PORTFOLIO

	Mean	Median	Maximum	Minimum
SR	-0.0089	-0.0018	0.3584	-0.7267
SM	-0.0059	0.0017	0.3790	-0.7026
SW	-0.0036	0.0058	0.4295	-0.7271
BR	-0.0069	-0.0020	0.3045	-0.6787
BM	-0.0048	0.0047	0.3039	-0.6583
BW	-0.0060	0.0053	0.3755	-0.6439

SIZE-AGE PORTFOLIO AND MARKET PREMIUM

	Mean	Median	Maximum	Minimum
SO	-0.0035	0.0044	0.4135	-0.6539
SM	-0.0051	0.0016	0.3870	-0.7208
SY	-0.0099	0.0044	0.3718	-0.7758
BO	0.0003	0.0025	0.3401	-0.6321
BM	-0.0065	-0.0019	0.3763	-0.6462
BY	-0.0106	-0.0058	0.3094	-0.6976
MRKT	-0.0009	-0.0034	0.6090	-0.5177

4.1 Regression results

Table 2 presents regression results for stock portfolios and market premium. All the portfolio regressions are statistically insignificant with P > 0.05 while market premium is statistically significant for all portfolios with P <. 0.05 and positive beta coefficient values. The Size-value portfolio, all the regression coefficients have negative coefficients except small capitalized medium (SM) portfolio with coefficient of 0.0000, adjusted R^2 of 100%. Size-investment portfolio, all the regression coefficients have negative values while small capitalized aggressive (SA) portfolio has the highest adjusted R^2 of 52.68%. Size-momentum portfolio, all the regression coefficients have negative values while small capitalized medium (SM) portfolio has the highest adjusted R^2 of 50.67%. Size-profitability portfolio, all the regression coefficients have negative values while small capitalized weak (SW) portfolio has the highest adjusted R^2 of 55%. Size-age portfolio, all the regression coefficients have negative values except big capitalized old (BO) portfolio with positive regression coefficient of 0.0007 while small capitalized young (SY) portfolio has the highest adjusted R^2 of 46.08%.

Table 2. Regression estimates of CAPM

SIZE-VALUE	Regression Coeff.	Adj. R2	Prob.	Market Premium Coeff.	Market Premium Prob.
SH	-0.0052	0.4664	0.4787	0.5917	0.0001
SM	0.0000	1.0000	0.5493	1.0000	0.0001
SL	-0.0039	0.4835	0.5935	0.6126	0.0001
BH	-0.0052	0.1477	0.5826	0.3478	0.0001
BM	-0.0057	0.1405	0.5422	0.3316	0.0001
BL	-0.0054	0.1957	0.559	0.3948	0.0001
SIZE-INVESTMENT					
SC	-0.0078	0.4139	0.3092	0.5496	0.0001
SM	-0.0049	0.4465	0.5071	0.5727	0.0001
SA	-0.0039	0.5268	0.5758	0.6320	0.0001
BC	-0.0059	0.1461	0.5218	0.3350	0.0001
BM	-0.0038	0.1529	0.6851	0.3473	0.0001
BA	-0.0091	0.2750	0.2926	0.4573	0.0001
SIZE-MOMENTUM					
SW	-0.0032	0.4198	0.6798	0.5678	0.0001

SM	-0.0049	0.5067	0.482	0.5998	0.0001
SL	-0.0084	0.4450	0.2621	0.5771	0.0001
BW	-0.0024	0.1416	0.8007	0.3331	0.0001
BM	-0.0051	0.1722	0.579	0.3669	0.0001
BL	-0.0095	0.1877	0.2965	0.3790	0.0001
SIZE-PROFITABILITY					
SR	-0.0084	0.4155	0.2755	0.5567	0.0001
SM	-0.0054	0.4169	0.4806	0.5581	0.0001
SW	-0.0030	0.5500	0.6588	0.6414	0.0001
BR	-0.0065	0.1718	0.4834	0.3684	0.0001
BM	-0.0044	0.1622	0.6323	0.3547	0.0001
BW	-0.0056	0.1811	0.5492	0.3825	0.0001
SIZE-AGE					
SO	-0.0029	0.4397	0.696	0.5732	0.0001
SM	-0.0045	0.4557	0.5374	0.5766	0.0001
SY	-0.0093	0.4608	0.2262	0.6109	0.0001
BO	0.0007	0.1653	0.9439	0.3686	0.0001
BM	-0.0062	0.1308	0.5374	0.3403	0.0001
BY	-0.0102	0.1319	0.2933	0.3328	0.0001

4.2 Discussion of findings

Big capitalized old firms (BO) portfolio has positive mean value and positive regression coefficients implying that big capitalized old firm stocks tend to have the highest expected stock returns and positive movement in relation to market. This can be related to years of existence of such firms, experience in strategy, profitability, board experience, operations and management executive experiences. All the portfolios have negative coefficients and are statistically insignificant, this implies CAPM cannot explain variation of stock returns for all portfolios, however, market premium is significant statistically for portfolios with positive beta coefficients, indicating market premium is crucial for stock return variation in line with Sharpe (1964) and positive beta indicates that as the market is performing positively, the stock portfolio return will move positively with the market return. In the context of portfolio optimization, portfolios composed of small-cap stocks exhibit higher adjusted R^2 values and higher beta coefficients compared to large-cap portfolios. This suggests that small-cap portfolios outperform their large-cap counterparts, consistent with the findings of Thalassinos, Khan, Ahmed, Zada, and Ihsan (2023).

5. Conclusion and Recommendation

Selecting different stocks with varying level of risk and return to form a portfolio has been an inconclusive task amongst scholars and finance experts. This study offers a new insight as regards power of portfolio selection for evaluating stock return in Nigeria capital market. Findings showed all portfolios are statistically insignificant while market premium is statistically significant for all portfolios, beta coefficients of portfolios are negative and statistically insignificant which indicates CAPM cannot explain stock return variation, this result is in contrast to Offiong, Riman, Mboto, Eyo, and Punah (2020) while coefficients of market premium are positive indicating market premium has positive relation with market portfolio.

Also, the small capitalized portfolios have higher adjusted R^2 compared to big capitalized portfolios which is in agreement with Fama and French (1993) size effect, implying that small capitalized portfolios have better portfolio optimization and return than big capitalized portfolios. Policy makers and regulatory authorities should formulate policies that would promote participation and patronage of market for competitive advantage in global deposits in term of portfolio management, foreign portfolio investment and returns for existing and prospective investors to make an informed investment decision.

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