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Risk-Return Relationship in the Nigerian Stock Market: Comparative between Fama-French Five-Factor Model and Higher Moment Fama-French Five-Factor Model

Abstract. The study looked at the relationship between risk and return in the Nigerian stock market using Fama-French five-factor model and Higher Moment Fama-French five-factor model. The employed 90 companies' stocks that are frequently traded out of the sample size of 113 companies' stocks. The monthly stock prices, market index, risk-free rate (which was substituted with the rate on Treasury bills), ownership shareholdings, market capitalization, book value of equity, earnings before interest and taxes, and total assets were the data used in this study. The entire sample period covered from 2005-2020. The data was extracted from the Nigerian Group of Exchange (NGX) website, the Central Bank of Nigeria (CBN) website, and the Standard and Poor (S&P) database. The Fama-MacBeth two-step regression method was employed. It was found that systematic risk has significant negative effect on return while unsystematic risk has significant positive effect on return. The study concluded that the long standing view of hypothesised positive relationship between risk and return does not hold in the Nigerian stock market and the assumption that market risk is the only determinant of return is invalidated. Also, systematic coskewness risk is an important risk factor in the Nigerian stock market and higher moment FF5F model and CoFF5F model is superior to FF5F model. The study recommended that the investors should focused on how their investment return co-move with other dimension of risk such as unsystematic risk, systematic cokewness risk, systematic cokurtosis risk and non-market risk apart from the systematic risk.

Keywords: Risk, Return, Fama-MacBeth two-step regression, French Five-Factor model, Higher Moment Fama-French Five-Factor model.

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Співвідношення ризик-прибуток на нігерійському фондовому ринку: порівняння між п'ятифакторною моделлю Фама-Френча і п'ятифакторною моделлю Фама-Френча із вищим моментом

Анотація. Це дослідження присвячене вивченню зв'язку між ризиком і прибутковістю на фондовому ринку Нігерії за допомогою п'ятифакторної моделі Фама-Френча і п'ятифакторної моделі Фама-Френча з вищим моментом. Для дослідження було використано акції 90 компаній, якими часто торгують, а розмір вибірки склав 113 акцій компаній. Місячні ціни на акції, ринковий індекс, безризикова ставка (яка була замінена ставкою казначейських векселів), частка акцій власності, ринкова капіталізація, балансова вартість акцій, прибуток до сплати відсотків і податків, а також загальна сума активів були даними, які автори використали для вивчення в цьому дослідженні. Весь вибірко́вий період охоплює 2005-2020 рр. Дані були взяті з веб-сайту Nigerian Group of Exchange (NGX), веб-сайту Центрального банку Нігерії (CBN) і бази даних Standard and Poor (S&P). Для аналізу використано метод двоетапної регресії Фама-Макбета. Було встановлено, що систематичний ризик має значний негативний вплив на прибуток, тоді як несистематичний ризик має значний позитивний вплив на прибуток. Дане дослідження підтверджує, що позитивний зв'язок між ризиком і прибутком не діє на нігерійському фондовому ринку, а припущення про те, що ринковий ризик є єдиним визначальним фактором прибутку, є недійсним. Крім того, систематичний ризик перекоосу є важливим фактором ризику на нігерійському фондовому ринку, і моделі FF5F з вищим моментом і модель CoFF5F перевершують модель FF5F. Це дослідження рекомендує, щоб інвестори зосередилися на тому, як прибутковість їхніх інвестицій співвідноситься з іншими вимірами ризику, такими як несистематичний ризик, ризик систематичної асиметрії, систематичний ризик перекоосу та неринковий ризик, окрім систематичного ризику.

Ключові слова: ризик, прибуток, двоетапна регресія Фама-Макбета, п'ятифакторна модель Фама-Френча, п'ятифакторна модель Фама-Френча з вищим моментом.

1. INTRODUCTION

The study of risk-return relationship has attracted the interests of many scholars in this modern social-economic society. The earlier researchers such Sharpe (1964), Lintner, (1965), Treynor (1965), Mossin, (1966), among others argued persuasively that there is linear relationship between risk and return and that systematic risk was the prime determinant of expected return while the idiosyncratic risk could be completely eliminated through diversification and as such investors were not rewarded for such risk. These propositions led to emergence of capital asset pricing model. However, this convention was far from reality because the nature of risk and return takes different nature. In view of this, the thought of replacing the CAPM with more attractive models in examining risk-return relationship has become a ranging issue right from time in Finance. Thus, the doctrine of CAPM proponents that beta is the only relevant risk influencing return had been questioned empirically and refuted drastically by several researchers such as Roll

(1977), Fama & French (1993), Cahart (1997), Fama & French (2015) and this has led to emergence of asset pricing theory (APT), Fama-French three-factor model, Four-Factor model and Fama-French Five-factor model respectively. This contradicting evidence has driven researchers to augment the original CAPM with additional explanatory factors, and to seek completely different factors and explanations for the behavior of stock returns.

In 2015, Fama and French published a study expanding the three-factor model with two additional factors; profitability and investment. This asset pricing model has been confirmed as a superior model of establishing risk-return relationship by many researchers such as Zhong (2017) Kumari, Mahakud & Hiremath (2017), Zaremba & Maydybura (2019), Detzely, Duartez, Kamarax, Siegel & Sunk (2019) among others. This is because the introduction of profitability and investment factors significantly explains asset return. Despite, superiority of Fama-French Five-Factor model, very

limited studies has applied it to examine risk-return relationship in Nigerian stock market. Thus, this present study bridges the gap and contributes to existing body of knowledge by examining risk-return relationship in Nigeria with Fama-French Five-Factor model.

In spite of this, co-skewness and co-kurtosis have been identified as important determinants of asset return. This is because an asset with negative skewness decrease the probability of obtaining extreme values in the right tail of distribution when incorporated into portfolio while a positive coskewness increase the probability of obtaining extreme values in the right tail of distribution when incorporated. Also, an asset with large kurtosis increases the probability of obtaining undesirable infrequent extreme values of portfolio's return when incorporated into portfolio and vice versa. In relation to this importance, many researchers such as Moreno & Rodriguez (2009), Naktnasukanjn (2014), Oyedeko, Zubairu & Samson (2021) among others have incorporated the coskewness and cokurtosis factor into asset pricing model in examining risk and return relationship. In view of this, the researcher is inspired to incorporate coskewness and cokurtosis in to five-factor model in order to form seven moment factors model which could also be referred to higher moment Fama-French Five-Factor model. Thus, the study examines the relationship between risk and return using higher moment Fama-French Five-Factor model. The study tests whether coskewness and cokurtosis risk factors increase the explanatory power of Fama-French Five-factor model. More so, the study confirms if coskewness and cokurtosis are significantly priced or not within the context of Nigerian stock market.

The contribution of this paper to the existing body of knowledge is three folds. First, an examination of the risk-return relation with Fama-French five-factor model and Higher Moment Fama-French Five-Factor Model within the context of Nigerian stock market. Second, to confirm the superiority between Fama-French five-factor model and Higher Moment Fama-French Five-Factor Model. Third, the study confirmed if coskewness and cokurtosis are significantly priced or not within the context of Nigerian stock market. In view of this, the remainder of this study proceeds as follow; section two documents the literature review, section three details the methodology, section four presents the results and section five proffers the conclusion.

2. LITERATURE REVIEW

This section presents the review of relevant literature related to this study which include but not limited to Miralles-Quiros & Miralles-Quirós (2016) acknowledged the role of idiosyncratic risk in the asset pricing process in Spain. The study employed Fama-MacBeth two-step regression approach, Brennan, Chordia and Subrahmanyam's model and Merton's model which account for disinformation risk premium and the relationship between idiosyncratic risk and expected return. It was revealed that there is existence of a net positive idiosyncratic risk premium for the whole sample as well as volatile and stable periods. The study

concluded that investors require a positive risk premium because they are unable to avoid idiosyncratic risk through diversification or it requires a high cost. The study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious. Afolabi, Njogo, Areghan, Olugbenle & Olusesi (2017) examined the effect of capital asset pricing model (CAPM) for the Nigerian stock exchange (NSE). It was found that there is no statistically significant correlation between the average excess return on a portfolio and estimated beta of the portfolio. The study concluded that the assumption of CAPM is not valid in the NSE. However, the study only tests the intercept and slope hypotheses neglecting other assumptions of CAPM. Kumari, Mahakud & Hiremath (2017) studied whether firm-specific factors explain idiosyncratic volatility in the Indian stock market. The findings demonstrated that idiosyncratic volatility is significant and that cross-sectional return variations of firms are connected with firm-specific factors. The study concluded that the Indian stock market has an under-diversification of portfolios. However, the study fails to run autocorrelation, normality, and ARCH LM tests to determine whether or not the homoscedasticity assumptions are accurate. Zhong (2017) conducted studies on the idiosyncratic volatility (IV) puzzle in the Australian equity market. It was documented that there is a negative relation between idiosyncratic volatility and stock returns only exists amongst the most overpriced stocks. The study concluded that the negative IV effect in the overpricing group is more difficult to correct, thus dominating the population and giving rise to a negative relation between idiosyncratic volatility and stock returns. However, the result of the estimates may be biased because the model was not subjected to the following diagnostic test Breusch-Godfrey Serial Correlation LM Test, Heteroskedasticity Test and Ramsey RESET Test. Chiang & Zhang (2018) documented the risk-return relations in Chinese equity markets with an emphasis on aggregate and sectoral markets TARCH-M model was used as the estimation techniques. It was found that there is presence of positive risk-return trade-off under idiosyncratic risk-return, local downside risk-return, and global risk-return relations. It was concluded that that the investment sentiment has a predictive power in explaining the stock returns. However, the pre-estimation test of conducting TARCH-M model was not conducted.

Zaremba & Maydybura (2019) acknowledged the relationship between idiosyncratic risk and expected returns in US. It was documented that buying (selling) long (short) legs of the anomaly portfolios with the highest idiosyncratic volatility produces monthly abnormal returns which is significant. It was concluded that the effect of idiosyncratic volatility cannot be subsumed by any other established anomaly return predictor, such as momentum or seasonality. One of the weaknesses of the study is that it fails to test the assumptions of independence, homogeneity of variance, and normality of the model. Detzely, Duartez, Kamarax, Siegel & Sunk (2019) examined the pricing of volatility outside the original time period and under more recent

asset-pricing models. The study found that none of the more recent asset-pricing models consistently accounts for the pricing of aggregate-volatility risk. In addition, the difference in abnormal returns between stocks with high and low idiosyncratic volatility decreases but remains significant out of sample. However, the study fails to subject the models to diagnostic tests. Thus, the result of the estimates may be biased and spurious.

Castañeda, Montoya & Noreña (2020) evaluated the relationship between the idiosyncratic risk, systematic risk and other factors in relation to the expected returns of the companies belonging to MILA and BM & FBovespa in the period 2009-2016. It was revealed that there is a positive and significant relationship between the expected returns and the idiosyncratic and systematic risk for both markets. The study concluded that the idiosyncratic volatility is more significant in BM & FBovespa market while the systematic risk is more significant in MILA. However, the study fails to conduct the normality, linearity and heterogeneity tests in order to establish the appropriateness of the model. Li (2020) examined the unsystematic volatility from a mis-specified model which contains information of the hedge portfolio in Merton's (1973) Intertemporal Capital Asset Pricing Model in Canada. The study found that neither equal-weighted idiosyncratic volatility (EWIV) nor value-weighted idiosyncratic volatility (VWIV) can forecast stock market returns but they are strong predictors of stock market returns over short-term and long-term horizons. The study concluded that EWIV and VWIV together are linked to state variables that capture time-varying investment opportunities and they can both serve as proxy for the conditional covariance risk in the ICAPM. However, the study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious. Ruan (2020) assessed the relationship negative relation between the cross-section of equity option returns and the equity's VOV. Fama-French two step regression was used and it was revealed that there exist a significant negative relation between equity option returns and the volatility-of-volatility (VOV) having controlled for numerous existing option and stock characteristics such as size, value, momentum and liquidity. The study concluded that high-low return spread on option portfolios sorted on VOV cannot be explained by standard risk factors, and survives double sorting using a variety of control variables. However, the study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious.

Dwarika, Moores-Pitt & Chifurira (2021) investigated the volatility dynamics and the risk-return relationship in the South African market. The study employed GARCH models family-GARCH-M, EGARCH and APARCH with different probability distributions governing the model's innovations. The findings revealed strong persistent levels of volatility and a positive risk-return relationship in the South African market. Thus, it can be concluded that a fair amount of volatility can attract

investors to seek a superior return in the South African market. However, the study fails to test the error distributional assumptions under Gaussian, Student-t and the Generalized Error Distribution in order to determine the appropriate model. Wang, Chen & Lo (2021) examined risk return trade-off from 28 countries, covering a wide range of advanced and emerging markets. It was documented that the positive risk-return relation for both advanced and emerging economies strongly varies with the business cycle. The study concluded that the risk-return relationships are considered eminent when the earning warning indicators, financial and macroeconomic variables are considered. However, the study fails to subject the methodology to the following pre-estimation tests such as hausman test, poolability test and breauch pagan lagragian multiplier test in order to determine the appropriate model for estimation. Tan, Xiao, Huang & Zhou (2021) analyzed the risk-return trade-off and leverage effect in China and US stock markets. It was found that Chinese investors bear high risk without obtaining corresponding risk premium while in the US market, a positive risk-return trade-off exists for the whole sample but negative relation after financial crisis. The study concluded that American stock markets provide investors with more profit opportunities while investments in Chinese emerging markets considered much more risky. However, the study fails to conduct information criteria such as Akaike information criterion, Bayesian information criterion and likelihood ratio in order to select appropriate ranks and lags of the model.

It is explicit from the literature reviewed that most of these studies examined the relation between risk and relationship using several asset pricing model but none of these studies used higher moment FF5F model most especially with the context of Nigerian stock market. Therefore this present study intends to fill the gap in knowledge and contribute to the literature on risk-return relationship in Nigeria by examining risk-return relationship in Nigerian using FF5F model and higher moment FF5F model. Also, the study compare the superiority between these two models and test whether the introduction of coskewness and cokurtosis risk factors are significantly priced or not. Thus, the study formulates the null hypothesis as follow:

H0₁: Risk has no significant relation on return in the Nigerian stock market.

H0₂: Higher moment FF5F is not superior to FF5F model in examining risk-return relationship in Nigerian stock market.

H0₃: Coskewness and Cokurtosis are not significantly priced in the Nigerian stock market.

To test the formulated hypotheses, the study is anchored on modern portfolio theory. The theory emphasized that every investor seeks to maximize their utility (satisfaction) by maximizing expected return and minimizing risk (variance).

3. RESEARCH METHODOLOGY

The study's population covers all 161 businesses registered on the Nigerian Stock Exchange (NSE) as of December 2020, and an expo-factor research design was employed. Purposive sampling was employed throughout the study period. Sample size of 113 companies' stock selected through Krejcei & Morgan Table (1970). 90 regularly traded stocks were used. The monthly stock prices, market index, risk-free rate (which was substituted with the treasury bill rate), ownership shareholdings, market capitalization, book value of equity, earnings before interest and tax, and total assets were the data used in this study. The entire sample period covers from 2005 to 2020. The information was obtained from the websites of the Nigerian Group of Exchange (NGX), the Central Bank of Nigeria (CBN), and Standard and Poor. The two-step Fama-MacBeth regression method was applied. Consequently, the model chosen for this investigation is as follows:

$$R_{i,m(t)} = \log P_{i,m(t)} - \log P_{i,m(t-1)} \quad 3.1$$

Where $R_{i,m(t)}$ denotes the return on security say (i) and market return say (m) at time t, $P_{i,m(t)}$ represents the current price of security say (i) and current market price say (m) while $P_{i,m(t-1)}$ represents the previous price of security say(i) and the last price market say (m). This method of computing return followed the approach of Gbadebo and Oyedeko (2021), Zubairu and Oyedeko (2017). The Fama-French Five-factor model was specified in both first and second-pass regression. The first-pass regression is specified below:

$$R_{it} - R_{ft} = a_i + b_i(R_{mt} - R_{ft}) + S_i(SMB_t) + h_i(HML_t) + u_i(RMW_t) + v_i(CMA_t) + e_{it}. \quad 3.2$$

Where $R_{it} - R_{ft}$ is the excess return of the asset over and above the treasury-bill rate. $R_{mt} - R_{ft}$ is the excess return of the value-weighted index over and above the risk-free rate, SMB_t is the size factor premium, HML_t is the value factor premium, RMW_t is the profitability factor premium, CMA_t is the investment factor premium, a_i is the intercept, b_i is the regression parameter, S_i is the loaded factor of the size, h_i is the loaded factor of the value, u_i is the loaded factor of the profitability, v_i is the loaded factor of the investment and e_{it} is the residual term. SMB this is the difference of equal weighted average of small stock mimicking portfolios or portfolios with small market capitalisation stocks returns and the big stock portfolios or portfolios with big market capitalisation stocks returns. HML is the difference of equally weighted average of high book to market ratio stock mimicking portfolios returns and the low book-to-market ratio stock portfolios returns. RMW is the difference between average stock returns of the robust and weak portfolio. CMA is the difference between Conservative (low investment) and Aggressive Portfolio (high investment). The two-pass regression is in line with Zhong (2017). This is express in equation 3.3.

$$r_i = a_0 + a_1 b_{mi} + a_2 b_{si} + a_3 b_{hi} + a_4 b_{ui} + a_5 b_{vi} + a_6 \quad 3.3$$

Where r_i is the individual securities return, b_{mi} is market risk, b_{si} the size risk factor of individual securities, b_{hi} is the value risk factor of individual securities, b_{ui} is profitability risk factor of individual securities, b_{vi} is the investment risk factor of individual securities, a_2 represents the coefficient of size risk factor, a_3 represents coefficient of value risk factor, a_4 is the coefficient of profitability risk factor, a_5 is coefficient of investment risk factor, a_0 is the intercept and a_1 is coefficient of the market risk. The model can be transformed to co-skewness FF5F by introducing the systematic co-skewness risk and this stated below:

$$r_i = a_0 + a_1 b_{mi} + a_2 b_{si} + a_3 b_{hi} + a_4 b_{ui} + a_5 b_{vi} + a_6 b_{ski} + w_i. \quad 3.4a$$

Where b_{ski} is the coskewness risk factor of individual securities, a_6 represents coefficient of coskewness risk factor. The coskewness is measure as:

$$b_{sk} = \frac{Cov(R_i, R_m^2)}{E[(R_m - E(R_m))^3]} \quad 3.4b$$

Where β_{sk} is the sensitivity of asset return to skewness in the market, R_i is the excess return which is $(R_i - R_f)$, R_m^2 is the square of excess market return which is $(R_m - R_f)^2$ and $E(R_m)$ represents mean of the market return. Also, the model can be transform to higher moment by introducing systematic co-kurtosis risk and the model is specified below:

$$r_i = a_0 + a_1 b_{mi} + a_2 b_{si} + a_3 b_{hi} + a_4 b_{ui} + a_5 b_{vi} + a_6 b_{ski} + a_7 b_{kti} + w_i \quad 3.5a$$

Where b_{skt} is the cokurtosis risk factor of individual securities, represents coefficient of cokurtosis risk factor. The cokurtosis is measure as:

$$bkt = \frac{Cov(R_i, R_m^3)}{E[(R_m - E(R_m))^4]} \quad 3.5b$$

This study sorted the portfolio on the basis of 2x2 which in line with Fama-French (2015). Data was sorted based on size and book to market ratio, size and operating income, size and investment. This procedure is summarize in Table 3.1.

Table 3.1. Portfolio Factors and Their Components

Sort	Break points	Factors and components
2*2 sorts on	Size: Median	SMB = (SH + SL + SR + SW +SC + SA)/6 - (BH+BL+BR +BW + BC+BA)/6
	Value: Median	HML= (SH+BH)/2 - (SL +BL)/2
	Profitability: Median	RMW=(SR+BR)/2 - (SW +BW)/2
	Investment: Median	CMA= (SC + BC)/2 - (SA+ BA)/2

Note: big (B) and low (L) market capitalization, high (H) and low (L) value, robust (R) and weak (W) profitability and conservative (C) and aggressive (A) investment.

Source: Author's Computation, (2022).

4. RESULTS AND DISCUSSION

This section presents the descriptive statistics, interpretation of result and discussion of findings. The study start with estimation of the model and diagnostic tests.

Table 4.1. Descriptive Statistics

Stat	AVR	B	S	H	R	C01	CKT	CSK	ID5F
Mean	0.0140	0.7178	-0.0978	-0.3586	0.1303	0.1803	0.7559	0.6791	0.1656
Med.	0.0110	0.7492	-0.1222	-0.3604	0.1582	0.0879	0.4287	0.5613	0.1324
Max.	0.0925	2.0136	2.0784	9.2819	8.1219	8.6963	8.1652	4.0548	0.7770
Mini.	-0.0067	-0.1992	-4.7910	-12.716	-5.9377	-3.3408	-0.0079	0.0123	0.0470
St.Dev	0.0169	0.4070	0.8074	1.8303	1.2488	1.2702	1.2734	0.7128	0.1243
Skew.	2.7413	0.5007	-1.9355	-1.8597	1.3767	4.1196	4.1012	2.3523	3.1021
Kurt.	12.246	3.5902	14.374	32.637	26.536	28.904	23.031	10.958	13.068
J.Bera	433.32	5.0679	541.32	3345.7	2105.8	2771.0	1757.0	320.5	524.48
Prob.	0.0000	0.0793	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Authors' Computation, (2022).

The results in Table 4.1 show the average values of average return, and estimated risk premium. It is obvious that average return tends to rise with market premium, profitability premium, investment premium, unsystematic risk, systematic coskewness risk and cokurtosis risk. The size and value premiums, on the other hand, tend to decline during the course of the sampling. The return value ranges from -0.006740 to 0.092572, suggesting that there are patterns for capital losses and gains during the study period in market trading activity. This shows that there are active securities on the market. The market premium has values between -0.199242 and 2.013677. The co-skewness tends to be less volatile than the market at some points in time, but more volatile at other points in time, according to the value premium, which ranges from -4.791040 to 2.078426. This is implied by the fact that the profitability value ranges from -5.937704 to 8.121966. The value of the investment premium lies between -3.340886 and 8.696328. The kurtosis and

skewness of the asset return ranges from -0.0079 to 8.1652 and 0.0123 to 4.0548 respectively. The value risk premium is the variable with the highest standard deviation, according to the table, while the average return has the lowest standard deviation. Looking at the score of skewness, it reveals that all the unsystematic risk are positively skewed, as well as systematic risk, profitability risk premium, investment risk premium and average return while the size and value risks premia are negatively skewed. The scores of kurtosis show that the variables are platykurtic in nature and they are not normally distributed as show by the associated probability values of the Jarque bera and this justify the introduction of higher moment of return. The study goes on to conduct the correlation analysis after describing the characteristics of the variables in terms of their average return for each portfolio and estimated risk premium in order to demonstrate whether or not the assumption of multicollinearity is supported by the variables.

Table 4.2. Correlation Analysis

	B	S	H	R	C01	CKT	CSK
B	1	-0.49643	-0.2753	0.0907	0.4218	0.6215	0.0354
S	-0.4964	1	0.6365	-0.4981	-0.2365	-0.3999	-0.4707
H	-0.2753	0.6365	1	-0.6341	-0.1417	-0.1781	-0.2265
R	0.0907	-0.4981	-0.8341	1	0.2311	0.0571	0.0552
C01	0.4218	-0.2365	-0.1417	0.2311	1	0.7410	0.6155
CKT	0.6215	-0.3999	-0.1781	0.0571	0.7410	1	0.0645
CSK	0.0354	-0.4707	-0.2265	0.0552	0.6155	0.0645	1

Source: Authors' Computation, (2022).

The output of the correlation matrix shows that there is no perfect collinearity among the variables. The highest coefficients of correlation among the variables exist between the cokurtosis risk and investment risk. This is strong but does not indicate perfect collinearity between the variables. Thus, the study refutes the problem of multicollinearity among the variables. The variables can be subjected to further estimation.

Table 4.3. Result on Systematic Risk and Expected Return

Variables	FF5F	CoFF5F	HMFF5F
a	0.0136 (3.3754) [0.0011]	0.0318 (0.0044) [0.0000]	0.0280 (0.0047) [0.0000]
b	-0.0019 (-0.3652) [0.7159]	-0.0735 (0.0122) [0.0000]	-0.0411 (0.0198) [0.0413]
s	-0.0008 (-0.0008) [0.8881]	-0.0022 (0.0049) [0.6457]	-0.0043 (0.0049) [0.3875]
h	-0.0040 (-1.0294) [0.3062]	-0.0006 (0.0033) [0.8541]	-5.33E-05 (0.0032) [0.9870]
r	-0.0045 (-1.2429) [0.2173]	0.0018 (0.0032) [0.5683]	0.0018 (0.0031) [0.5620]
c	0.0050 (3.0941) [0.0027]	-0.0040 (0.0019) [0.0432]	-0.0062 (0.0022) [0.0061]
Csk		0.0517 (0.0082) [0.0000]	0.0008 (0.0261) [0.9742]
ckt			0.0204 (0.0099) [0.0434]
R ²	0.1936	0.4521	0.4789
Adj-R ²	0.1456	0.4125	0.4344
P(F-Stat)	0.0024	0.0000	0.0000
Diagnostic Test			
LM Test	3.0669 [0.0519]	9.5839 [0.1481]	9.2077 [0.0561]
BPG Test	13.086 [0.1226]	4.6562 [0.5886]	7.2886 [0.3995]
J.B	724.4187 [0.0000]	121.5930 [0.0000]	53.5643 [0.0000]

Note: FF5F, CoFF5F and HMFF5F mean Fama-French five-factor, Coskewness Fama-French five-Factor and Higher moment Fama-French Five-factor respectively.

Source: Author's Computation, (2022).

The result of the FF5F estimation shows that the coefficient of alpha is 0.0136 and the associated P-value is 0.0011 which is less than 5 per cent level of significance. This refutes the assumption of the intercept that it should not be significantly different from zero or be at equilibrium with risk free rate. Also, the market systematic risk has a coefficient of -0.0019 with an associated probability value of 0.7159. This shows that the systematic risk is not significantly priced. This negates the slope hypothesis and positive risk-return trade-off. The co-efficient of non- market factors such as size, value, profitability and investment are -0.0008, -0.0040, -0.0045 and 0.0050 with associated probability values of 0.8881, 0.3062, 0.2173 and 0.0027 respectively. Thus, this implies that the size, value, and profitability risks have negative and insignificant effect on return but investment risk has significant positive effect on return. In addition, the estimation of coskewness FF5F revealed that the coefficient of alpha is 0.0318 with a probability value of 0.0000 which is less than 0.05 level of significance. This negates the intercept hypothesis. More so, the result shows that the coefficient of systematic risk, size, value, profitability, investment and systematic coskewness risks are -0.0735, -0.0022, -0.0006, 0.0018, -0.0040 and 0.0517 with corresponding probability values 0.0000, 0.6457, 0.8541, 0.5683, 0.0432 and 0.0000 respectively. This shows that systematic risk, and investment risk have significant negative effect on return while size and value risks have insignificant positive effect on return. The result also shows that profitability risk has insignificant positive effect on return while systematic coskewness risk has significant positive effect on return. Under, the higher moment FF5F model, the coefficient of alpha, systematic risk, size, value, profitability, investment, systematic coskewness risk and systematic cokurtosis risk are 0.0280, -0.0411, -0.0043, -

5.33E-05, 0.0018, -0.0062, 0.0008, and 0.0204 which correspond with the probability values are 0.0000, 0.0413, 0.3875, 0.9870, 0.5620, 0.0061, 0.9742 and 0.0434 respectively. This means that alpha value and systematic cokurtosis risk have significant positive effect on return while profitability and systematic coskewness risk have insignificant positive effect on return. However, the result revealed that systematic risk and investment risk have significant negative effect on return while size and value risks have insignificant negative effect on return. The adjusted co-efficient of determination reveals that the explanatory power of higher moment FF5F improves compare to FF5F and Co-skewness FF5F. Apart from this, it is evidenced that the probability of F-statistics are significant at 5 per cent for each pricing models and by implication, the models are significance at 5 per cent. In view of this, the higher moment FF5F model is superior in examining the relationship between the risk-return relationship with an emphasis on systematic risk.

Thus, the study conducts the diagnostic tests to validate the model and deduced generalization from the model. Serial correlation, heteroskedastic test and normality test to verify the efficacy of the cross-sectional version of the model. The study reveals that the residuals of the models comply with the assumption of no autocorrelation assumption because their associated probability values of the statistics are larger than 0.05 under each models. This complies with the a priori expectation of the models. The assumption of homoscedastic is not violated under each models because the probability values of the statistics are larger than 0.05. This implies that the residuals of the models are constant over the time. However, the normality assumption does not hold under each models because the probability values are lesser than 0.05.

Table 4.4. Unsystematic Risk and Expected Return

Variables	FF5F	HMFF5F	HMFF5F
1	2	3	4
α	-0.0070 (0.5324) [0.0072]	0.0001 (0.0038) [0.972]	0.0001 (0.0127) [0.0127]
b	0.0014 (0.5324) [0.5958]	-0.0190 (0.0089) [0.0371]	-0.0205 (0.0127) [0.1126]
s	-0.0033 (-1.0439) [0.2995]	-0.0034 (0.0030) [0.2638]	-0.0033 (0.0031) [0.2907]
h	0.0026 (1.2505) [0.2146]	0.0029 (0.0020) [0.1574]	0.0029 (0.0020) [0.1623]
r	0.0039 (1.9365) [0.0562]	0.0048 (0.0020) [0.0175]	0.0048 (0.0020) [0.0179]
c	-0.0015 (-1.6084) [0.2146]	-0.0034 (0.0012) [0.0062]	-0.0033 (0.0014) [0.0222]

1	2	3	4
Csk		0.0145 (0.0060) [0.0188]	0.0171 (0.0167) [0.3079]
Ckt			-0.0011 (0.0066) [0.8684]
IDFF5F	0.1235 (14.695) [0.0000]	0.1112 (0.0096) [0.0000]	0.1117 (0.0101) [0.0000]
R ²	0.7761	0.7908	0.7908
Adj- R ²	0.7599	0.7729	0.7702
P(F-Stat)	0.0000	0.0000	0.0000
Diagnostic Test			
LM Test	8.9409 [0.1769]	2.7395 [0.2542]	2.9313 [0.2309]
BPG Test	2.4462 [0.2943]	10.8602 [0.1448]	12.6602 [0.1241]
J.B	2.5022 [0.2861]	2.2414 [0.3260]	2.2508 [0.3245]

Source: Author's Computation, (2022).

Evidence from the FF5F result indicates that the alpha value is negative and significantly at 5 per cent while systematic risk is positive but insignificant at 5 per cent and this implies that the market risk is not significantly priced but display a positive risk-return trade-off. The coefficients of size, value, profitability and investment risks are -0.0033, 0.0026, 0.0039 and -0.0015 which have corresponding probability values of 0.2995, 0.2146, 0.0562 and 0.2146 respectively. This means that size and investment risks have insignificant negative effect on return while value and profitability risks have insignificant positive effect on return. In addition, the coskewness FF5F model reveals that alpha value, systematic risk, size, value, profitability, investment, systematic coskewness risk are 0.0001, -0.0190, -0.0034, 0.0029, 0.0048, -0.0034, and 0.0145 which have corresponding probability values of 0.972, 0.0371, 0.2638, 0.1574, 0.0175, 0.0062 and 0.0188 respectively. This denotes that alpha value, and value risk have insignificant positive effect on return while profitability risk and systematic coskewness risk have positive significant effect on return. On the other hand, systematic risk and profitability risk have significant negative effect on return while size risk has insignificant negative effect on return. The estimation of the higher order FF5F shows that the alpha value is positive and significant at 0.05 which implies that the constant hypothesis does not hold. The coefficients of systematic risk, size, value, profitability, investment, systematic coskewness and systematic cokurtosis risks are -0.0205, -0.0033, 0.0029, -0.0033, 0.0048, 0.0171, and -0.0011 which have corresponding probability values of 0.1126, 0.2907, 0.2907, 0.1623, 0.0179, 0.0222, 0.3079 and 0.8684. This means that systematic risk, size, and systematic cokurtosis risks have insignificant negative effect on return while investment risk has significant negative effect on return. However, value and systematic coskewness have insignificant positive effect on return

while profitability risk has positive significant effect on return. Furthermore, the result of unsystematic risk has significant positive effect on return under each of the models. The adjusted co-efficient of determination reveals that coskewness FF5F improves the explanatory power of FF5F model but the explanatory power of the higher moment does not improve when systematic cokurtosis was introduced. This suggests that coskewness FF5F is superior among the three asset pricing model. More so, the probability values associated each model indicates that joint coefficients of unsystematic risks, non-market risk and market risk are distinguishable from zero. In view of this, the study conducts the diagnostic test. The result shows that the residuals of the models comply with the assumption of no autocorrelation assumption because their associated probability values of the statistics are larger than 0.05 under each models. This complies with the a priori expectation of the models. The assumption of homoscedastic is not refuted under each models because the probability values of the statistics (F-statistic and Chi-squared) are larger than 0.05. This implies that the residuals of the models are constant over the time. Moreover, the models conforms to the normality hypothesis because the probability values are larger than 0.05.

DISCUSSION OF FINDINGS

Evidence from the analysis reveals that systematic risk has significant negative effect on return under the CoFF5F and HMFF5F while the systematic risk has insignificant negative effect on return under FF5F. However, the explanatory power of HMFF5F is superior compare to other asset pricing. Thus, the study interprets the estimation of HMFF5F that systematic risk has significant negative effect on return. This validates the slope hypothesis but contradicts positive risk-return trade-off hypothesis in the Nigerian stock market. This conform to the findings of Afolabi et al. (2017), who

documented negative relationship between systematic risk and expected return within the context of Nigerian stock market.

Also, the study documents that the unsystematic risk has positive and significant relationship with the expected return in the Nigerian stock market. The explanation for this is that unsystematic risk is significantly priced in the Nigerian stock market and investors are rewarded for such risk. The result violates the assumption of CAPM which proposed that unsystematic risk could completely eliminated through diversification and as such investors are not rewarded for such risk. The implication is that unsystematic risk can be substantially reduced or neutralized by diversification to the point that it can be omitted in evaluating riskiness of a well-diversified portfolio. In view of this, some previous studies also negate the convention of unsystematic risk and these include but not limited to Miralles-Quiros & Miralles-Quirós (2016) who found positive relationship between idiosyncratic risk and expected return in Spain. Also, Chiang & Zhang (2018) established the positive relationship between unsystematic and return in Chinese equity markets.

More so, it is evidenced from the findings that CoFF5F and HMFF5F have higher explanatory power and they are superior to FF5F when examining systematic risk-return relationship in the Nigerian stock market. This is because under the CoFF5F, the introduction of systematic coskewness is significant priced in the Nigerian stock market and it explains the variation of asset return by improving the explanatory power of FF5F by 26.69 per cent. Under the HMFF5F, the introduction of systematic cokurtosis command premium in the Nigerian stock

market because it explains the variation in the asset return by improving the explanatory power of CoFF5F by 2.19 per cent. In addition, the result of the effect of unsystematic risk under the FF5F, CoFF5F and HMFF5F reveals that CoFF5F model has the highest explanatory power among the other two asset pricing model.

5. CONCLUSIONS

This study confirms that a positive relationship between risk and return does not hold in the Nigerian stock market because the market is influenced by different events in Nigeria, which has an either positive or negative shock. Also, the assumption that market risk is the only determinant of return is invalidated because the market risk does not fully represent assets risk in the Nigerian stock market. The study concludes that systematic coskewness risk is important in the Nigerian stock market because it commands a risk premium, and investors are rewarded for taking such risk. Higher moment FF5F model and CoFF5F model is superior FF5F model in evaluating risk-return relation in the Nigerian stock market. Thus, the study recommends that the investors should be focused on how their investment return co-moves with other dimensions of risk, such as unsystematic risk, systematic cokewness risk, systematic cokurtosis risk and non-market risk apart from systematic risk.

One of the limitations of the study is that the findings on the Nigerian stock market as a whole without considering the individual sectors in the market, and these findings may not be applied to some sectors because of some individual sector effects. So, further studies should be carried out on the risk-return relationship within the sectors in the Nigerian stock market.

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