EFFECT OF SHORT SELLİNG ON RİSK AND RETURN İN THE NİGERİAN STOCK MARKET

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Abstract: *The study looked at the effect of short selling on risk and return in the Nigerian stock market. Purposive sampling was employed throughout the study period 2005 to 2020 to determine the sample size for the stocks of 113 companies' stock. The monthly stock prices, market index, risk-free rate, ownership shareholdings, market capitalization, book value of equity, earnings before interest and taxes, and total assets were the data used in this study. The sub-sample period, 2005–2008, 2009–2012, 2013–2016, and 2017–2020, were covered by the study. 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 the short selling strategy has a negative and insignificant effect on returns in the Nigerian stock market. On the other hand, it has been documented that short selling has a negative but significant effect on risk in the Nigerian stock market. The study concluded that short-selling strategies could be used as investment strategies that could promote efficiency if properly monitored and regulated in the Nigerian stock market. If not, they could lead to price pressure and volatility in the Nigerian stock market. The study recommended that a well-regulated short selling investment strategy promotes stock market efficiency through an increased liquidity and minimized volatility in the Nigerian stock market.*
Keyword: *Short selling, Return, Risk, Fama-MacBeth two-step regression, Nigerian stock market*

Introduction

Short selling is a crucial tool in the stock market because it boosts market performance, contributes to price discovery (toward fundamental values that all information should be reflected in), and provides liquidity to cut down on transaction costs (Kim, 2020). As a result, short selling is permitted in the majority of stock markets around the world when the financial market is functioning normally. However, during market crises, short selling may be accompanied by a poor attitude toward investing, which could result in a sudden decline in stock prices, an unnecessarily high level of volatility, and eventually a stock market crash. This supports the findings of Jain et al. (2013) that one of the causes of the financial crisis of 2007/2008 was short sellers' activities in the financial markets, which increased market volatility and, in some cases, destabilized the markets, leading to a ban on short selling in some markets. Additionally, despite the fact that institutional investors are frequently the main participants in short selling, due to the informational disparity between individual and institutional investors, individual investors may still be harmed by institutional investors' short sales. Due to these factors, despite being crucial to raising market quality, short selling frequently receives a bad rap.

Despite the negative impact, short selling is still a very risky and aggressive investment strategy used by traders in the financial markets. This is because short sellers are occasionally perceived as dishonest and callous individuals who are out to destroy businesses and drive down stock prices. According to Velde (2019), buying a stock with the hope that it will rise in value and then selling it at a higher price to make a profit within a short time frame is known as taking a long position in the stock. Short selling is a riskier investment position. Short selling can be used for speculative, arbitrage, and hedging purposes to generate large profits quickly, avoid market mispricing issues, and off-set trading positions to lessen the impact of potential losses (Velde, 2020).

Furthermore, academics and traders contend that short-sellers serve to stabilize security prices by selling stocks when they surpass fundamental values, thus assisting in the correction of market overreaction. According to Rahim (2018), limited short-selling prices convey negative information, resulting in overpriced stock prices. As a result, the unrestricted ability to sell short plays a critical role in determining stock prices and market efficiency. In light of this, the impacts of short-selling activities on the stock market have been investigated in both developing and developed countries by researchers across the globe. Some of the researchers include but are not limited to (Bohl, Reher & Wilfling, 2016; Lee & Wang, 2016; Chague, De-Losso & Giovannetti, 2019; Wu & Zhang, 2019; Hu & Chi, 2019; Sahin & Kuz, 2020). The findings of these studies revealed mixed findings because some of the studies documented positive effects on return and negative effects on risk, while some of the studies showed that short selling reduces profitability and increases risk. It is, however, still unclear the extent to which short selling activities have impacted the risk and return. Thus, this study attempts to shed new light on this hotly debated issue by examining the effect of short selling on the risk and return in the Nigerian stock market.

The contribution of this paper to the existing body of knowledge is three folds. First, an examination of the effect of short selling on risk and return within the context of Nigerian stock market. Second, the estimation approach is conducted using Fama-MacBeth two step regression approach under the Fama and French Five factor model. Third, the study considered effect of short selling as a useful tool of investment performance strategy under the long and short period. 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.

Literature Review

Zhu, Duan, Sun and Tu (2019) investigated the relation between short selling and momentum in USA. The Fama-French three factor regression model was used and it was documented that a consistent momentum strategy that buys lightly shorted winners and sells heavily shorted losers exhibits strong short-term momentum and no long-term reversal. The study concluded that stocks with more binding short-sale constraints have sting effect on momentum while a risk-managed version of the consistent momentum appears to be crash-proof. However, the study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious. Chague et al. (2019) Using market-wide data from the Brazilian stock lending market at the deal level examined the short-selling skill of institution and individual. Panel data regression was used and it was

documented that strong evidence of short-selling skill for institutions and individuals and skilled short-sellers present out-of-sample performance persistence. The study concluded that skilled short-sellers do not display the disposition effect, liquid, high-volatility, and losing stocks, and to initiate a short position before earnings announcements. 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. Hendershott, Kozhan and Raman (2019) assessed effect of short selling in corporate bonds to forecasts future bond returns. The study employed Fama-MacBeth two stage regressions as the estimation tool. The study found that short selling predicts bond returns where private information is in high-yield bonds and when informational uncertainty is higher. The study concluded that bond short sellers contribute to efficient bond prices and those short sellers' information flows from stocks to bonds but not from bonds to stocks. However, the study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious.

Baidoo (2019) researched the impact of stock short selling on the volatility of the US stock market and its sectors. The study used a multivariate DCC GARCH Model on the NYSE US 100 Index. It has been proven that investing in a few select companies on the market reduces market volatility and increases short selling activity reduces market risk. Portfolio managers can raise their shorting position, resulting in a larger projected return with less risk, according to the findings. One of the study's flaws is that it does not run diagnostic tests to determine the model's fitness. Zhu, Duan, and Tu (2019) evaluated the impact of trend in short selling on a cross-section of stock returns. The estimation technique employed was Fama-MacBeth regressions, and it was found that equities with a falling (rising) trend in their short selling have significant and positive (negative) anomalous returns. Positive abnormal returns also have bigger absolute values and are more durable. According to the findings of the study, market players underreact to public information on short interest, and short sellers are sophisticated investors.

Kim (2020) recognized the impact of short selling on market efficiency, volatility, and pricing. The estimating techniques used in the study were the Granger causality test, impulse-response analysis, and variance decomposition. The estimation revealed that short selling improves market efficiency by lowering trading expenses. Furthermore, it was discovered that short selling has no meaningful effect on stock volatility or price. This analysis confirms that short selling increases market quality while having no detrimental impact on volatility or pricing. As a result, it was established that short selling has a constructive role in improving market quality without raising volatility or decreasing average prices. However, no pre-estimation test, such as the unit root test, was documented to confirm the granger causality test's appropriateness

Goyenko and Schultz (2020) examined the relation between short selling costs, idiosyncratic volatility and stock returns. Fama-french two step regression was used and the idiosyncratic was estimated from the standard deviation residuals from Fama-french three factor and Fama-French-Carhart model. The study found that stocks with high idiosyncratic volatility are likely to be hard-to-borrow than stocks with low idiosyncratic volatility and in absence of hard-to-borrow stocks, the relation between idiosyncratic volatility and stock returns disappears. The concluded that that the relation between idiosyncratic volatility and returns is primarily a relation between ability to short and returns. However, the study fails to subject the models to diagnostic tests and the result of

the estimates may be biased and spurious. Luoa, Nib and Tianc (2020) proposed and tested a financial constraint hypothesis that short selling trigers corporate insiders' incentive to avoid taxes for funding investment opportunities. Regression analysis was employed and it was found that the deregulation of short sales significantly reduces firms' cash effective tax rates and effective tax rates. The study concluded that in emerging markets with lax law enforcement and ineffective shelters from downside risk, short-sale deregulation induces firms to engage in more aggressive tax avoidance activities because avoiding taxes is cost-effective for them in mitigating the downward price pressure of short selling. However, the study fails to test the assumptions of independence, homogeneity of variance, and normality of the model. Nia and Yin (2020) explored unintended real effects of allowing short selling in an emerging market with an emphasis on concentrated ownership and weak investor protection. The study adopted difference-in-differences regression as the estimation tool. The study revealed that that the removal of short-sale bans induces firms to adopt more conservative investment and financial policies, which contributes to reduced risk-taking and decreased firm performance. The study concluded that that short selling can result in value losses by inducing firms to forgo profitable risky projects in a representative emerging market such as China. However, the study fails to test the assumptions of independence, homogeneity of variance, and normality of the model. In Chinese market, Chen, Chou, Liu, and Wu (2020) looked at how short selling costs were affected by deregulation of the practice. The study used difference-in-difference regression analysis which revealed that bank loan spreads for treated firms dramatically decrease when compared to control firms. The investigation came to the conclusion that after the prohibitions on short-selling were loosened, pilot enterprises' bank loan costs were much lower. The study, however, does not show if the model is properly specified. Ye, Zhou and Zhang (2020) examined the impacts of two forms of leveraged trading—margin trading and short selling—on the trading liquidity of individual stocks in China. Regression analysis was used and it was found that trading liquidity for relevant stocks generally improves after restrictions on leveraged trading are removed but margin trading and short selling have opposite impacts on liquidity. The study concluded that that short sellers are informed traders in China and that short selling reduces stock liquidity because of the increased risk of adverse selection faced by uninformed traders. However, the study fails to test the assumptions of independence, homogeneity of variance, and normality of the model. Hackney, Henry and Koski (2020) explored the effect of either informed or arbitrage short selling on equity markets. The study found that convertible arbitrage short selling is associated with negative contemporaneous returns and positive future returns in the stock market and it is consistent with temporary price pressure from uninformed arbitrage trading. The study concluded that firm-specific characteristics related to the cost of short selling similarly affect both informed and arbitrage short selling while deal-specific characteristics capturing hedging demand also strongly determine convertible arbitrage short selling. However, the study fails to test the assumptions of independence, homogeneity of variance, and normality of the model.

In a special policy environment in Korea during the 2008 global financial crisis, Eom, Hahn, and Sohn (2021) looked at changes in volatility and market quality surrounding the shorting prohibition. Ordinary least regression was used. It has been established that the shorting prohibition reduced liquidity or increased volatility, and that the patterns of volatility and market quality were consistent across non-financial and

financial equities once the ban was lifted. As a result, the study came to the conclusion that the shorting ban is ineffective in reducing rising volatility and worsening liquidity, and that the 2008 global financial crisis' increased uncertainty—rather than the short sale ban—is more likely to blame for the declining market quality that followed the ban. However, this methodology does not take into account the linear regression assumptions of linearity, homoscedasticity, and independence, which might raise the variance in the error term and the estimate's output. Sahin and Kuz (2021) investigated the effects of short selling on the price discovery process in the Borsa Istanbul (BIST). The study employed the Fama-MacBeth regressions with Newey-West standard errors as an estimation technique. It was confirmed from the study result that the short selling improves information efficiency of price discovering process by reducing the information delay. The study concluded that a ban on short sale may lead to overvaluation and reduced liquidity through supporting stocks artificially. However, the study fails to subject the models to diagnostic tests and the result of the estimates may be biased and spurious. Chena, Da, and Huang (2021) evaluated how effectively short selling is distributed among equities and its impact on overall price movement. Cross sectional regression analysis was used in the study, and it was suggested that short selling efficiency had better predictive power than aggregate short interest because it lessens the impact of noise in short interest. The analysis came to the conclusion that low short selling efficiency causes a considerably positive relationship between beta and stock returns, whereas high short selling efficiency appears to cause a negative slope in the security market line. However, the methodology does not take into account the linear regression assumptions of linearity, homoscedasticity, and independence, which may raise error term variance and impact the output of the estimate. In Taiwan, Tsai, Chang, and Tsai (2021) investigated the connection between lottery choice and retail short selling. The analysis method employed was a two-step Fama-MacBeth regression. According to the study, Taiwanese retail short-sellers can forecast stock prices and outperform the market when trading stocks that are predominantly held by retail investors who like lottery-style payouts. The study came to the conclusion that short-sellers involve experts in the process of making money through short-selling. The study does not, however, put the models through diagnostic tests like the assumption of normality and the assumption of serial correlation, among others. As a result, the model estimation's outcome may be inaccurate and biased. Previati, Galloppo, Aliano, and Paimanova (2021) looked into how various bank prices respond to a restriction on short sales depending on the nation and stock market conditions. The study used difference-in-difference regression analysis was employed for the estimation, and it was discovered that banks respond differently to ban limits mostly because to variations in their core variables. Thus, it was established that negative volatility rose in some nations whereas short-selling regulations had no impact on the volatility of financial equities. One of the methodology's flaws is that the study does not verify whether the additive structure of the model is accurate or not. Dang (2021) used monthly data from the NASDAQ 100 from February 2000 through December 2020 to investigate the impact of short selling on market efficiency. The dynamic conditional correlation (DCC) model is used to find dynamic relationships between the variables being studied. According to the findings, a high level of short selling can reduce illiquidity and volatility. During the 2008 financial crisis, this relationship deteriorates. Short selling does not destabilize the stock market, according to the study. However, the study fails to undertake a pre-estimate test to determine whether or not the model is adequate for estimation.

Short selling has been identified as an active investment strategy that plays an important role on risk role for a firm's performance among developed, emerging and developing economies. Specifically, studies outside Nigeria (Bohl, et al., 2016; Lee & Wang, 2016; Chague, et al., 2019; Wu & Zhang, 2019; Hu & Chi, 2019; Sahin & Kuz 2020 among others) have examined the impact of short selling on stock return. Short selling is a legitimate trading strategy on the floor of Nigerian Group of Exchange which investors used to profit from a decline in the price of the assets between their sales and repurchase (NGX outlook, 2012; 2021). However, none of these past studies were documented in Nigeria despite the fact that the short selling has been recognized in the Nigerian stock market as important investment strategy. Also, evidence from past studies revealed that very few studies have examined the effect of short selling on the risk and return. Therefore this present study intends to fill the gap in knowledge and contribute to scanty literature on the effect of short selling on the risk and return in Nigeria. To fill in the gap in knowledge and contributes to scanty literature within the Nigerian context. Thus, the study formulates the null hypothesis as follow:

H0: Short selling has no significant effect on risk and return in the Nigerian stock market.

To test the formulated hypothesis, 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).

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 methodology was employed to conduct the study. Purposive sampling was employed to determine the sample size through Krejcei and Morgan (1970) Table. The sample size for 113 companies' stocks selected but 90 regularly traded companies' 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 whole sample period covered from 2005- 2020 which was grouped in to sub-sample period; 2005–2008, 2009–2012, 2013–2016, and 2017–2020, were covered by the study. The data was obtained from the websites of the Nigerian Group of Exchange (NGX), the Central Bank of Nigeria (CBN), and Standard and Poor. The study used ordinary least square through two-step Fama-MacBeth regression method. Consequently, the baseline model chosen for this investigation was Five-Factor Fama and French model and this is specified as follows:

$$R_{it} - Rf_t = a_i + b_i(Rm_t - Rf_t) + S_i(SMB_t) + h_i(HML_t) + u_i(RMW_t) + v_i(CMA_t) + \varepsilon_{it} \quad \text{.....3.1}$$

Where: R_{it} -Rf_t is the excess return of the individual assets. Rm_t - Rf_t is the excess market return, 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 ε_{it} is the residual term. This model is augmented by incorporating short selling and that led to the equation 3.2

$$R_{it} - Rf_t = a_i + b_i(Rm_t - Rf_t) + S_i(SMB_t) + h_i(HML_t) + u_i(RMW_t) + v_i(CMA_t) + f_i(SH_t) + \varepsilon_{it} \quad \text{.....3.2}$$

Where: DR_t is the simulation drawdown premium, f_i is the loaded factor of the drawdown. These model specifications take a lead from the Maximum drawdown-CAPM specified by Baghdadabad and Glabadanisdis (2012) having controlled for size, value, profitability and investment factors. To capture the effect of drawdown on risk in the Nigerian stock market, the drawdown incorporated in the Glosten, Jagannathan and Runkle Generaized Autorregressive Conditional Heteroscedaticity (GJR-GARCH). This showed the effect of short selling on risk in the Nigerian stock market and presence of asymmetric information. The model is expressed in equation 3.3.

$$h_t = a_0 + \sum_{i=1}^{n} a_{1j} h_{t-j} + \sum_{i=1}^{m} a_{2i}\varepsilon_{t-i}^2 + a_{3i}M_{t-i}\varepsilon_{t-1}^2 + \theta_1 SH_t + \varepsilon_t \quad \text{.....3.3}$$

Where a_1, a_2, a_3 are the parameters to be estimated. The conditional volatility is positive when $a_1 > 0$, $a_1 \geq 0$, $a_1 + a_3 \geq 0$, $a_2 \geq 0$, i = 1…., n and m =1….,q, if $\varepsilon_t < 0$, and otherwise 0. ε_{t-1} is the ARCH term while h_{t-1} is the GARCH term. The sum of the coefficient of ARCH and GARCH terms measures the level of persistence in volatility. The volatility is persistent when $a_1 + a_2 \geq 1$. The $a_3M_{t-1}\varepsilon^2_{t-1}$ was introduced in to the GARCH framework to measure the asymmetric effect that is, volatility's response to new information. It proves that when there is negative news, volatility rises, but when there is good news, volatility falls. As a result, M_{t-1} serves as a dummy variable with a value of 0 to 1; it is 1 when t is negative (indicating good news), and 0 when t is positive (an indication of bad news). If the parameter a_3 is significantly different from zero, an asymmetric effect exists; otherwise, it does not. SHt is the short selling premium and qi is the loaded factor of the short selling. These model specifications take a lead from Goyenko and Schultz (2020). The study includes the short selling variable in to the GJR-GARCH in order to show the effect of short selling on risk in the Nigerian stock market. The model is specified in equation 3.16

$$h_t = a_0 + \sum_{i=1}^{n} a_{1j} h_{t-j} + \sum_{i=1}^{m} a_{2i}\varepsilon_{t-i}^2 + a_{3i}M_{t-i}\varepsilon_{t-1}^2 + \theta_1 SH_t + \varepsilon_t \quad \text{.....3.4}$$

The study capture short selling with shorting cost and this is in line with the study of Akbas, Boethmer, Erturk and Sorescu (2013). The study will use level of institutional ownership as a measure for shorting costs because it is correlated with the supply of lendable shares and this conforms to the approach of Akbas, et al. (2013).

Results and Discussion

The result is depicted in Table 1, which reveals the average values of average return, estimated risk premia-market, size, value, profitability, investment, and short selling. It is clear that market risk premium, profitability risk premium, investment risk premium, and short selling all tend to increase average return. On the other hand, the size risk premium, and value risk premium, have a tendency to decrease during the sampling. The return values range from -0.006740 to 0.092572, which implies that there are tendencies to make losses and capital gains on the market's trading activities within the sample period. This indicates that there is a presence of active securities on the market. The values of the market

risk premium range from -0.199242 to 2.013677, and this suggests that investors are not always rewarded. The values of the size risk premium range from 2.078426 to -4.791040, and this implies that investors are not always rewarded for the size of their portfolio. The value risk premium has a minimum value of -4.791040 and a maximum value of 2.078426. This implies that at some point in time, the co-skewness tends to be less volatile than the market, but at other times it tends to be more volatile than the market. The profitability risk premium value ranges from -5.937704 to 8.121966 and this implies that the investment risk premium values range from -3.340886 to 8.696328. More so, short selling has a maximum value of 2.572793 and a minimum value of -4.256864, and this implies that the short selling strategy may not generate a constant return over time.

	AVR	B	S	H	R	C01	SHT
Mean	0.014080	0.717871	-0.097828	-0.358627	0.130323	0.180324	1.74E-16
Median	0.011067	0.749233	-0.122264	-0.360414	0.158229	0.087921	0.330584
Max.	0.092572	2.013677	2.078426	9.281946	8.121966	8.696328	2.572793
Mini.	-0.006740	-0.199242	-4.791040	-12.71657	-5.937704	-3.340886	-4.256864
Std.Dv.	0.016928	0.407010	0.807487	1.830331	1.248830	1.270236	0.995585
Skew	2.741394	0.500754	-1.935529	-1.859732	1.376769	4.119644	-1.481299
Kurt.	12.24622	3.590288	14.37403	32.63727	26.53697	28.90493	6.832025
J.Bera	433.3256	5.067970	541.3263	3345.758	2105.892	2771.068	87.98027
Prob	0.000000	0.079342	0.000000	0.000000	0.000000	0.000000	0.000000

Source: Author's computation, (2022)

The standard deviation in the Table indicates that the value risk premium is the most volatile among the variables, while the least volatile variable among the variables is the average return. Looking at the score of skewness, it reveals that all the systematic risk, profitability risk premium, investment risk premium, and average return are positively skewed, while the size, value risk, and short selling are negatively skewed. The scores of kurtosis show that the variables are platykurtic in nature and they are not normally distributed, as shown by the associated probability values of the Jarque-Bera being close to zero. Having described the characteristics of the variables both in their average return for each portfolio, estimated risk premia, and short selling, the study proceeds to conduct the correlation analysis to show whether the assumption of multicollinearity is refuted among the variables or not.

Table 2 Correlation Analysis on Risk Premia and Investment Strategies

Variables	B	S	H	R	C	SHT
B	1	-0.4964	-0.2753	0.0907	0.4218	-0.0735
S	-0.4964	1	0.8365	-0.4981	-0.2365	0.0079
H	-0.2753	0.8365	1	-0.8341	-0.1417	0.0189
R	0.0907	-0.4981	-0.8341	1	0.2311	-0.0270
C	0.4218	-0.2365	-0.1417	0.2311	1	0.1208
SHT	-0.0735	0.0079	0.0189	-0.0270	0.1208	1

Source: Author's Computation, (2022)

The result shows the correlation coefficients in-between each of the following: risk premia, and short selling. The first column shows the correlation between market risk premium, size risk premium, value risk premium, profitability risk premium, investment

risk premium, and short selling. The first pair has a correlation coefficient of -0.4964, the second pair has -0.2753, the third pair is 0.0907, the fourth pair is 0.4218, the fifth pair has -0.0735. The implication of this is that the market risk premium moves in the same direction as the profitability risk premium, and investment risk premium but the market risk premium moves in the opposite direction with size risk premium, value risk premium, and short selling. The second column reveals that the size risk premium is linearly correlated with the value risk premium, and short selling, but the size risk premium moves in the opposite direction to the market risk premium, profitability risk premium, and investment risk premium.

The correlation coefficients in the third column show that the value risk premium has linear correlation with size risk premium, and short selling, but it has negative correlation with market risk premium, profitability, and investment risk premia. The fourth column shows the correlation coefficient with the following coefficient values; 0.0907, -0.4981, -0.8341, 0.2311, and -0.0027. This signifies that profitability risk premium moves in the same direction as market risk premium and investment risk premium, but it moves in the opposite direction with size risk premium, value risk premium, and short selling. The fifth column of the correlation matrix shows that the investment risk premium moves linearly with the market risk premium, profitability risk premium and short selling, but it moves in the opposite direction with the size risk premium, and value risk premium. The result shows that short selling has linear correlation with size risk premium, value risk premium, and investment risk premium, but it has negative correlation with market risk premium, and profitability risk premium. The result shows that the coefficients of correlation among the variables are very low except in the cases of 0.8365 and -0.8341, and this implies that the assumption of multicollinearity can be refuted. This simply means the variable can be estimated in the specified models. The estimation of the effect of short selling on return is carried out under both the whole sample and the sub-periods. The result of the estimation is presented in the following Tables.

Table 3 Short Selling and Expected Return

Variables	FF5F[1]	FF5F[2]	FF5F[3]	FF5F[4]	FF5F[5]
α	0.0143	0.0338	-0.0142	-0.0009	-0.0099
	(3.5789)	(5.6161)	(-3.3942)	(-0.4551)	(-2.9128)
	[0.0006]		[0.0000]	[0.0011]	[0.6502]	[0.0046]	
b	0.0032	-0.0225	0.0073	-0.0052	0.0073	
	(-0.6101)	(-3.8146)	(0.4669)	(-1.3691)	(1.2129)	
	[0.5434]		[0.0003]	[0.6418]	[0.1746]	[0.2287]	
s	-0.0006	0.0415	-0.0146	5.23E-06	0.0467	
	(-0.1021)		(5.3224)	(-0.8366)	(-0.0033)	(-4.4772)	
	[0.9188]		[0.0000]	[0.4052]	[0.9973]	[0.0000]	
h	-0.0044	0.0021	-0.0061	-0.0034	0.0339	
	(-1.1427)		(0.3987)	(-1.1142)	(-1.8278)	(3.4079)	
	[0.2564]	[0.6911]	[0.2684]	[0.0712]	[0.0010]	
r	-0.0051	0.0054	0.0091	0.0034	0.0102	
	(1.4056)	(0.9819)	(1.6358)	(1.1848)	(1.5955)	
	[0.1635]	[0.3290]	[0.1056]	[0.2395]	[0.0001]	
c	0.0055	0.0327	0.0027	-0.0140	0.0070	
	(3.3791)	(7.5386)	(1.3604)	(-4.8503)	(0.1691)	
	[0.0011]	[0.0000]	[0.1774]	[0.0000]	[0.1145]	
Sht	-0.0027	-0.0017	0.7063	0.0024	0.0002	

	(-1.6287)	(-0.7911)	(1.3604)	(1.7631)	(0.1691)
	[0.1072]	[0.4311]	[0.1774]	[0.0815]	[0.8661]
R2	0.2186	0.6703	0.706393	0.7897	0.8234
Adj-R2	0.1621	0.6464	0.685169	0.7745	0.8103
P(F-Stat)	0.0018	0.0000	0.000000	0.0000	0.0000

Note: The figures in parentheses () are the standard error and the one in square brackets [] are the probability values. FF5F1, FF5F2, FF5F3, FF5F4 and FF5F5 represents Five-factor model under whole sample, 2005-2008 sub-period, 2009-2012 sub-period, 2013-2016 sub-period and 2017-2020 sub-period respectively.
Source: Author's Computation, (2022)

Under the whole sample, the FF5F model shows that the coefficient values of alpha, systematic risk, size risk, value risk, profitability risk, and investment risk are 0.014384, 0.003208, -0.000604, -0.004466, -0.005120, and 0.005574, which correspond with the probability values of almost 0, 54, 91, 25, 16, and 0 percent, respectively. This means that alpha value and investment risk have significant and positive effects on return, while size, value, and profitability risks are negative and insignificant, and systematic risk has a positive but insignificant effect on return. The probability value of the F-statistic is 0.001866 and this shows that the model is significant at 0.05. The estimation of the FF5F model under 2005 to 2008 sub-period shows that the coefficients of alpha, systematic risk, size risk, value risk, profitability risk, and investment risk are 01.033848, -0.02255, 0.041575, 0.002134, 0.005463, and 0.032738, which correspond to 0, 0, 0, 69, 32, and 0 percent, respectively. This indicates that the alpha value, size, and investment risks have positive and significant effects on return, but the systematic risk has a negative but significant effect on return, and value risk has a positive but insignificant effect on return. The model is significant at 0.05 because the corresponding probability values of F-Statistic is 0.00000.

The estimation of the FF5F model under 2009 to 2012 sub-period shows the coefficients of alpha, systematic risk, size risk, value risk, profitability risk, and investment risk are -0.014298, 0.007341, 0.006106, 0.009105, and 0.008261 with corresponding probability values of 0, 64, 40, 26, 10, and 10 percent, respectively. It appears that alpha value has a negative but insignificant effect on return, while size and value risks have negative and insignificant effects on return, and systematic, profitability and investment risks have a positive but insignificant effect on return. It is seen that the probability value of the F-statistic is 0.000000 which less than 0.05. This suggests that all the model is significant. The report under the FF5F model under 2013-3016 sub-period clearly shows that the coefficients of alpha, systematic risk, size risk, value risk, profitability risk, and investment risk are -0.000952, -0.005240, 5.23E-06, -0.003442, 0.003471, and -0.014098, which correspond with the probability values of 65, 17, 99, 7, 23, and 0 percent respectively. This means that the alpha value, systematic, and value risks have a negative and insignificant effect on return, while the size, profitability, and investment risks have a negative but significant effect on return. The model is significant at 0.005 because the associated probability values of 0.000000 which is less than 0.05.

The coefficients of alpha, systematic risk, size risk, value risk, profitability risk, and investment risk are -0.009945, 0.007347, 0.046761, 0.033987, 0.010217, and 0.007083 which correspond with the probability values of almost 0, 22, 0, 0, 0 and 11 respectively. The alpha value has a negative but significant effect on return while size, value, and profitability have significant effect on the return and systematic risk and

investment risk have a positive but insignificant effect on return under the 2017 to 2020 FF5F model. The probability value of the F-statistics is 0.000 which is significant at 0.05. Having interpreted the result of the estimation, the study presents the diagnostic tests to validate the models.

Table 4 Diagnostic Tests

Statistics	FF5F Whole	FF5F (2005-2008)	FF5F (2009-2012)	FF5F (2013-2016)	FF5F (2017-2020)
LM Test (F-statistic)	2.1263 (0.0911)	0.0443 (0.9566)	0.3520 (0.7043)	0.5607 (0.5730)	0.2598 (0.7719)
Chi-squared	4.4895 (0.0725)	0.0984 (0.9520)	0.7755 (0.6786)	1.2290 (0.5409)	0.5750 (0.7501)
BPG Test (F-statistic)	2.0051 (0.0741)	0.4758 (0.8245)	2.3395 (0.0689)	0.8583 (0.5291)	1.7015 (0.1312)
Chi-squared	11.3940 (0.0769)	2.9927 (0.8098)	13.0192 (0.0727)	5.2582 (0.5111)	9.8503 (0.1311)
Normality Test (Jarque Bera)	479.9499 (0.0000)	0.7496 (0.6874)	0.1126 (0.9452)	4.8770 (0.0872)	0.0959 (0.9531)

Source Author's Computation, (2022)

Table 4.7 reveals that the residuals of the models comply with the assumption of no autocorrelation assumption because their associated probability values of the statistics (F-statistic and Chi-squared) 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 (F-statistic and Chi-squared) are larger than 0.05. This implies that the residuals of the models are constant over the time. However, the normality assumption hold under each models except under whole sample because the probability value is lesser than 0.05 but under the sub-periods the probability values are larger than 0.05. Having documented the findings of the study on the estimation of short selling on return, the study proceeds to examine the effect of short selling on risk. The study employs the GJR-GARCH model to estimate the effect of drawdown on risk in the Nigerian stock market. This method is chosen because it also reveals the effect of asymmetric information on the risk. Thus, for proper estimation the study conducts some pre-estimation tests before fitting the data for estimation under whole sample and sub-periods sample. The study documents the effect of short selling on risk after studying the effect of short selling on return in the Nigerian stock market. The study employs the GJR-GARCH model to estimate the effect of short selling risk in the Nigerian stock market. This method is chosen because it also reveals the effect of asymmetric information on the risk. Thus, for proper estimation the study conducts some pre-estimation tests before fitting the data for estimation under whole sample and sub-periods sample.

Table 5 Pre-estimation Test on GJR-GARCH Model

Statistics	**Whole Sample**	**2005-2008**	**2009-2012**	**2013-2016**	**2017-2020**
Normality	1375.299	442.1290	26.9199	0.47314	101.7025
	(0.0000)	(0.0000)	(0.0000)	(0.7893)	(0.0000)
Unit root	-13.64754	-9.116133	-7.1348	-6.0483	-7.0179

	(0.0000)		(0.0000)		(0.0000)	(0.0000)	(0.0000)			
Q-Sat	20.130		16.193		16.964		8.8307		16.812	
		(0.028)			(0.094)	(0.075)		(0.548)		
(0.079)										
Arch Effect	33.47632		15.0298	10.2113	1.4143		1.2455			
	(0.0000)		(0.0001)	(0.0014)	(0.2343)	(0.2644)				

Note: The figures in square brackets [] are the probability values.
Source: Author's Computation, (2022)

Table 4 reports that the normality assumption is rejected under the whole sample period and sub-periods as shown by the probability values of less than 0.05. However, the unit root tests show that the null hypothesis is rejected at the 0.05 level of significance since the P-value is less than 0.05. This implies the whole sample and sub-sample returns have no unit root, i.e., stationary. The study presents the autocorrelation using the Ljung-Box Q-Statistic test since it is assumed to be more powerful due to its consideration of the overall correlation coefficients from lags. The p-values from the Q-Statistic test are not significant for all lags under the sub-periods except for the whole sample. The results show persistence in return series and the presence of serial correlation over the whole period, which is an indication of non-random returns in the whole sample period.

The probability (chi-square) of the observed R-square in the Table is based on a 5 per cent significance level to reject or accept the null hypothesis of the ARCH effect. The p-value of the observed R-square is 0.0007 under the whole sample, which is less than 0.05, and this implies that the residuals of the Nigerian stock market return have an ARCH effect. This complies with the assumption of estimating the GJR-GARCH model. The result reveals that the p-value of the observed R-square is 0.0001, which is less than 0.05, and this means that the residuals of the stock market volatility have an arch effect in the sub-period 2005 to 2008. Similarly, the arch effect is also present under the 2009 to 2012 sub-period since the associated P-value of the observed R-square is less than 0.005. However, this contradicts the results under the periods of 2013 to 2016 and 2017 to 2020 because the associated P-values are larger than 0.05. The results indicate that the returns of the whole sample and sub-period of 2005 to 2008 violate the homoscedasticity assumption, which suggests that innovations in the returns are heteroscedastic, and these tests allow the returns to be modeled on the GJR-GARCH model, which assumes that the variance of the errors is not constant. However, the GJR-GARCH is not applicable to the sub-periods of 2013 to 2016 and 2017 to 2020. Thus, the study presents the effect of short selling on risk in the Nigerian stock market using the GJR-GARCH model.

Table 6 Short Selling and Risk

Variable	**whole sample**	**2005-2008**	**2009-2012**
Constant	0.0001	0.0019	0.0003
	(4.87E-05)	(0.0001)	(0.0002)
	[0.001]	[0.0000]	[0.1458]
Sht	-0.0005	0.0024	0.0017
	(0.0002)	(6.9E-104)	(0.0005)
	[0.0246]	[0.0000]	[0.0028]
ARCH(Alpha1)	0.0664	0.3974	-0.2190

	(0.0323)	(0.1408)	(0.0730)
	[0.0398]	[0.0048]	[0.0027]
GARCH(Beta1)	0.9227	0.5668	1.0115
	(0.0287)	(0.0215)	(3.3E-103)
	[0.0000]	[0.0000]	[0.0000]
GJR(Gamma1)	-0.1477	-0.3695	-0.1718
	(0.0482)	(0.1794)	(0.4027)
	[0.0022]	[0.0395]	[0.6697]
Diagnostic			
ARCH	1.6743	0.9074	0.0041
	[0.1957]	[0.3408]	[0.9485]
Q-Statistic	5.4638	13.532	10.005
	[0.858]	[0.195]	[0.440]

Note: The figures in parentheses () are the standard error and the one in square brackets [] are the probability values.
Source: Author's Computation, (2022)

The result shows that the shot selling strategy has a negative but significant effect on risk, and the Nigerian stock market exhibits persistence shock under the whole sample. However, under the sub-periods, short selling has a positive and significant effect on risk in the Nigerian stock market. The coefficient of gamma has a negative but significant effect on the whole sample and 2005 to 2008 sub-period, and this suggests the presence of an asymmetric effect on the whole sample period and 2005 to 2008 sub-period. Thus, the presence of a negative asymmetry effect reveals that positive shocks or good news associated with short selling strategies increase stock market volatility more than a negative shock under the whole sample and 2005 to 2008 sub-period. However, the result of the 2009 to 2012 sub-period reveals that short selling has a negative symmetry effect on stock market return, which means the stock market volatility response to good news or bad news associated with a drawdown is the same. As part of the study, diagnostic tests were performed, and it was discovered that the model was fit and that meaningful generalization could be drawn from it. After conducting the estimation, proper interpretation was done, and the interpretation was used to test the formulated hypotheses in the following sub-sections.

H03: Short selling has no significant effect on risk and return in the Nigerian stock market.

The study separates this hypothesis into two, which are that tactical asset allocation has no significant effect on return and tactical asset allocation has no significant effect on risk in the Nigerian stock market. The findings of the study revealed that tactical asset allocation has a positive but insignificant effect on return in the Nigerian stock market. The result of the whole sample period aligns with the result of the sub-periods sample, and both sample periods confirm that the introduction of tactical asset allocation does not command a premium in the Nigerian stock market. Thus, the null hypothesis that tactical asset allocation has no significant effect on return cannot be rejected. On the other hand, the estimation of GJR-GARCH reveals that tactical asset allocation has a negative but significant effect on risk under the 2005 to 2008 sub-period, but that tactical asset allocation has a positive but insignificant effect on risk under the whole sample. However, tactical asset allocation had a negative and insignificant effect on risk from 2009 to 2012. Thus, the study cannot conclusively reject the null hypothesis that tactical asset allocation has no significant effect on risk in the Nigerian stock market.

Discussion of Findings

On the other hand, it has been documented that short selling has a significant effect on risk in the Nigerian stock market. The whole sample shows a significant but negative effect of short selling on volatility, and this conforms to the apriori expectation that when short selling is effectively implemented, it will have a significant effect on the stock market through the minimization of volatility. On the other hand, the result of the sub-periods shows that short selling has a positive and significant effect on stock market return volatility in the Nigerian stock market. The explanation for this is that short selling triggers volatility, and this may have a destabilizing impact on the Nigerian stock market during the periods. This sub-period is also characterized by a turbulent global financial crisis, and this may be part of the reason why the introduction of short selling serves as a disadvantage rather than a vital investment strategy that promotes market efficiency. The result of the study is discussed in relation to previous studies, which include but are not limited to Zhu et al. (2019) documented that an increase in short selling has a negative but significant effect on return, and this contradicts the findings of this study. Also, the findings of Mohd et al (2016) confirmed that volatility significantly increased after the introduction of short selling in the Malaysian stock market, which conforms to the findings of this study. The findings of this study are in line with the findings of Bohl et al. (2016), who documented that the financial crisis was accompanied by an increase in volatility persistence and that this effect was particularly pronounced for those stocks that were subject to short selling constraints. On the contrary, Baidoo (2019) affirmed the negative relationship between short-selling activities and stock market volatility in the US market. Also, Kim (2020) found that short selling has a negative and insignificant effect on stock return volatility in the Korean stock market. Similarly, Dang (2021) documented that a high level of shorting leads to greater volatility in the USA.

Conclusion and Recommendations

Furthermore, the study concluded that short-selling strategies could be used as investment strategies that could promote efficiency if properly monitored and regulated in the Nigerian stock market. If not, they could lead to price pressure and volatility in the Nigerian stock market. The study recommended that a well-regulated short selling investment strategy promotes stock market efficiency through an increased liquidity and minimized volatility in the Nigerian stock market. Thus, the Nigerian stock market regulator should always review rules and regulations guiding short selling activities.The assumption of MPT excludes the short-selling strategy. However, based on the findings of the study, it was concluded that a short-selling strategy could enhance the efficiency of the stock market through the minimization of volatility. In addition, investors may use it to enhance investment performance through the maximization of return and minimization of risk. Empirically, this study supports the proposition that short selling could also increase return and spread risk, which is in tandem with the proposition of MPT. Thus, short selling should be included as one of the assumptions of MPT. The accessibility of high frequency data, such as daily data, hourly data, etc., on the NGX, is a major limitation, and this is due to poor data management in the sector. The study was carried out in Nigeria. Further studies should be replicated by comparing Nigeria with other Sub-Saharan African countries to

see whether the effect of these strategies on risk and return is replicated. The study focused on the Nigerian stock market as a whole. Further studies should be carried out on the effects of investment strategies on risk and return within the sectors of the Nigerian stock market. This will allow researchers to compare the results of the findings with individual or sectoral individual effects on the output of the result. The study is limited to monthly data; therefore, future studies can make use of high-frequency data, such as daily data, for the same period of coverage to see whether the result findings will be different from this study's findings.

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