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An Examination of the Existence of Momentum Profit in the Nigerian Market using the Modified Cahart Four-Factor Model

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Abstract: We examine whether the predictability of future returns from past returns is due to the presence of anomaly in Nigeria stock market using monthly returns of 60 equity stocks that were actively traded for the period of Jan 2012 to June 2016. Using the modified Cahart four-factor model with requisite value weight to test for momentum profits against the market factors performance. We document that the momentum profit exceeds that of the market factors and that non-market factors outperform that of the market factors. Financial analysts and researchers in predicting and formulating dependable risk-return of stock and portfolio could rely on this apparent superior model, as it provides a better explanatory power.

Key-words: Value premium; Momentum Premium; Three-factor model; Four-factor model; JEL classification: G12

1 Introduction

The capital market plays a very important role in the economic development process by providing a means of raising long-term finance to assist companies to expand and modernise in the sense of been up to date in technology. It equally provides a means of allocating the nations' real and financial resources between various industries and companies. It measures the confidence level of investors, financial analysts and all other interested parties in the economy, as an important economic barometer. The industrial managers can obtain the current cost of capital through its pricing mechanism, which is an important issue in determining the level and rate of investment. On the foreign scene, it provides the facilities for foreign businesses to offer their shares to Nigerian investors thereby giving them ownership stake in foreign companies and encourage the inflow of foreign capital when foreign companies and investors invest in domestic securities. The capital market creates an avenue for government to finance economic development project and privatise its erstwhile state-owned companies. It is a medium to

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promote transparency and good accounting and management practices through adequate disclosure of relevant information for investors to make well-informed decisions, to mention but a few.

Three Factor Model

They further emphasized that variation in firm size causing changes in average returns and that of book/market ratio also. While the variations of size is positively related to variations in the market's beta, that of book-to-market ratio exhibits a variation that is negatively related to variation in market betas. They concluded that investor in stocks should also consider size and book-to-market ratio as indicators of factors that are undesirable. They have other signs than one source of non-diversifiable risk and this is the birth of multi factors model.

The investors are generally influenced by high returns realised in the stock market, which encourage them to gain more profit with minimal risk. It is therefore not surprising that many investors commit much of their funds to portfolio of assets that this market can offer without interference since the managing of the investment with less supervision has been shifted to an agency gives adequate return. The capital market serves as the avenue where many corporate bodies seek solution to their equity problems. Even, during some financial reformations in the system, the role of the market cannot be overemphasised. But, due to the downturn in the economy, it has caused the market to encounter low patronage from investors in equities, bonds and development stocks, among others. Borrowing or sourcing of funds has witnessed drastic departure from what a viable market has to provide in support of the economy. The downturn started from the shock of the global recession in 2007 to 2008, which caused investors to lose ₦1.97 trillion and has made many to shift their investment focus (Adedokun and Olajoko, 2012).

2 Problem

Appraising the risk exposure of different assets traded in a capital market could be traced to the mean-variance framework of Markowitz (1959), which was the foundation for capital asset pricing model (CAPM) propounded by Sharpe (1964) and Linter (1965). However, the development of CAPM has witnessed several transformations through critical tests and analysis of real-life situations. Several researchers such as Black (1972), Merton (1973), Banz (1981), Fama and French (1992), Campbell and Vuolteenacho (2004),

have unequivocally criticised the model to the point of rejection and thereby developing alternative models, which also have their inherent flaws or shortcomings. The most celebrated of these criticisms is that the single factor model (or CAPM) has failed in a real world's application due to its unrealistic assumptions. For instance, the assumption that the financial markets are frictionless with no cost is not defensible in the true sense. Likewise, the assumptions of riskless rate of borrowing or lending and absence of tax on profit are not popular in the capital markets. The homogenous nature of all investors is not in practice because not all of them are rational. There are some noise traders that invest irrationally, which do not optimize a mean-variance objective. On the balance, Fama and French (1992) suggested that CAPM exhibits a poor explanatory power. They found that in a sample of covering 1963-1990 period, the relationship between average return and beta (β) disappears. Banz (1981) asserted that other variables besides β may be significant statistically in forecasting the risk premium of an asset, which leads to the modified CAPM model by Black (1972).

Many researchers in recent past have probed into the pricing and risk of stocks in recent years using various techniques and models to assert the best ways and methods in finding factors that could affect returns and risk of stocks. One, is that capital assets pricing model (CAPM) has not been conclusively validated in Nigeria. Though a few employed CAPM single-factor model to determine its predictive power on stocks returns and risk in the market (Oke, 2013; Adedokun and Olakojo, 2012); Osamwonyi and Asien, 2012; Abdullahi, Lawal and Ibrahim, 2011; and Olakojo and Ajide, 2010) that is weak in explaining the variation in risk and return of the market. Oke (2013) applies the CAPM single-factor model to the Nigerian Stock Exchange (NSE) market, which invalidates its basic assertion, whereas, building a momentum portfolio into it would have accounted for the validation of the model in the result. Abdullahi, *et al* (2011) empirically evaluates the Nigerian stock market's average returns. They assert a low level of return in the market, which also is a result of not employing momentum strategy. Also, Osamwonyi and Asien (2012) adopt the Sharpe-Lintner version as proposed by Campbell, Lo and Mackinlay (1997) for their studies to test the effect of capitalisation in the market, which indicate that a positive significant relationship exists between high capitalisation security return and the measured market betas. Their evidence was not in

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affirmative of the stance of CAPM in Nigeria, which may be due to the techniques employed in their work by using the single-factor model. It is hereby noted that all these studies done on validating CAMP produced contradictory results and were weak in determining the factors that affect returns on stocks in the NSE.

From the aforementioned, it is necessary to establish empirically the presence of momentum with the aim of providing evidence to the investors that the capital market is profitable and not too risky and that they could gain from the anomalies that exist in the market with the use of momentum and winner-loser interrelationship. It will also give the opportunity to explore the relationship between the momentum effect and risk in evaluating the sensitivity of momentum returns. This is split into four components namely: One, the return on a broad market portfolio. Two the difference between the return on a portfolio of small stocks and the return on a portfolio of big stocks. Three the difference between the return on a portfolio of high-book-to-market stocks. Finally, the return on a portfolio of low-book-to-market stocks, which defines the risk premium.

The advantage of technical analysis to determine momentum in the market includes the opportunity to test for size and value using book-to-market which has been tested individually using CAPM single factor model. As noted earlier, there is no conclusive stance concerning the validity of CAPM in Nigeria. So also, the evidence of momentum patterns constitutes an important feature of financial markets and current research has been inconclusive about the source of the anomaly. This information will be helpful for financial analysts and researchers in predicting and formulating dependable risk-return of stock and portfolio. It will also provide financial advisors the needed information in counselling their respective clients on the profitability of portfolio of stock listed on the NSE. Standing from policy makers point of view, this study can be a useful tool for them to implement an appropriate policy. It can help them to make correct decisions in helping the stock market. Besides, it also helps to predetermine, stabilize or avoid volatility in stock returns.

The main aim of this study, therefore, is to test the explanatory power of CAPM using momentum factor in predicting the required rates of return and risk in the Nigerian capital market; and more importantly, to assert the following:

(i) To what extent does momentum effect exist in the Nigerian capital market?

(ii) Why do market factors perform better than non-market factors?

Section one contains the general introduction and section two is the review of literature. While section three explains the methodology to be employed in the study, section four contains data analysis and presentation of results and section five brings the study to a logical conclusion with some essential policy recommendations.

3 Literature Review

Bhatnagar and Ramlogan (2012) investigated the performance of CAPM compared to the Fama-French three-factor model. Looking into the explanatory variations of the two on the London Stock Exchange listed stocks, the results of the analysis using ordinary least square regression found beta to be insignificant statistically at 5% level of significance. Both size-effect and value-effect were found statistically significant, indicating that the results of Fama-French three-factor model explains the returns on stock of UK during the period.

Cakici and Tan (2012) also examined the usefulness of the four-factor model by investigating the size, value and momentum effects of 18 emerging European countries, which they divide into three regions using monthly data of stocks returns of January 1990 to December 2011. They asserted that there is a strong effect of value in all emerging European stock markets and no momentum effect in Eastern European countries where stock markets were just starting and most of their structures are gradually developing. Moreover, this is the period of accession for some countries like Czech Republic, Hungary and Poland to the European Union.

Foye, Mramor, and Pahor (2013) studied the cross-sectional returns of European Union's new members using a three-factor model from June 2005 to July 2012. In the research, they used weekly stock returns data of around 150 stocks from different eight Eastern European stock markets. The outcome of the study asserts a poor explanatory power of the model on emerging markets. However, even when there was adjustment, the three-factor model still poorly fits to the data and thus was insufficient to explain cross-sectional variation in stock returns.

Cakici and Tan (2014) looked into the effects of value, size and momentum on 23 other developed equity markets in the UK for the period 1990 January to 2012 March. The study adopted Fama and French (2012) methodology to analyse the 23

developed stock markets indicating the following four non-market factors namely: the market portfolio, the value factor of the portfolio, the size factor of the portfolio, and the momentum of the portfolio. The empirical evidence from the study does not indicate any form size premia in all the stock markets, projecting that over the length of the study, the size factor was not significant in explaining changes in stock returns in all the selected stock markets. Though value premium (HML) indicates a positive relationship between the stock returns and variables in the markets and was highly significant some of the stock markets.

Grinblatt, Jostova, Petrasek and Philipov (2016) documented the differences between investment philosophy and skill of hedge funds and that of mutual funds. Hedge funds that follow momentum strategies do not outperform their benchmark but mutual funds managers exploit the momentum anomaly, though they lack trading skills. Kholkin and Haug (2016) studied the Norwegian equity mutual funds using monthly observations to predict the returns with certainty of degree of precision using some risk factors like firm-size and book-to-market and other factors. The result shows that 14 funds of the momentum factor of Jegadeesh and Titman (1993) and Cahart (1997) explained the variation of returns with a precision of 97%. On the other hand, such risk factors like small-minus-big, high-minus-low, up-minus-down, liquidity, oil market risk-adjusted return, and market volatility, do not explain any significant returns variations compared to basic CAPM.

Choi, Fedenia, Skiba and Sokolyk. (2017) studied 72 countries using institutional investors to investigate whether investment strategies can result in the adjustment of excess risk and to boost return. The evidence of the study was in contrast of the traditional asset pricing theory, but support the theory of information advantage that concentrated investment strategies has in excess risk adjusted returns. Soni (2017), in his study, analyzed the returns of various asset classes to know whether they are correlated in risk characteristics and establish a positive relation between risk and return. The result indicates that there is strong positive relation between individual classes of assets and when a portfolio is properly diversified, its risk can be mitigated to a large extent, especially an asset that has a potential for higher return.

In Nigeria, Osamwonyi and Asein (2012) documented that a positive significant relationship exists between security return and the calculated market betas, though they adopted the Sharpe-Lintner version as proposed by Campbell, Lo and Mackinlay (1997) using 14 most capitalized firms in the NSE from 2001 to 2005. Arewa, Onafalujo and Nwakanma (2015) examined the significance of risk factors in the CAPM with higher-order co-moments using a two-pass methodological technique of Fama and Macbeth. The stock prices of 53 companies out of the 207 listed in NSE for a sample period January 2003 to December 2011 were analysed. Their study augments the Fama-Macbeth model using unconditional and conditional information. The unconditional test reveals that only the co-skewness risk is priced while the covariance and co-skewness demonstrate weak relationship with asset returns; while the conditional test shows that all the risk factors in the up-market are not priced but the covariance and co-skewness risk play significant role in explaining asset returns in the down-market phase. However, the conditional information improved the descriptive ability of the model.

Oke (2013) tested the CAPM on the Nigerian stock market using weekly data of 110 firms quoted on the NSE from the period of 2007 January to 2010 February. The securities were formed into portfolios and the evidence from the study invalidates the CAPM's assertion that higher level of return is associated with a higher risk (*beta*) and that the intercept should be equal to zero when measuring the security market line (SML). The proposition that the slope of SML by CAPM must be equal to the market portfolio's excess return is also refuted by the result. Adedokun and Olakojo (2012) empirically tested the validity of CAPM employing the methodology of Sharpe and Linter and using monthly stock data value of 16 firms for the period between January 2000 and December 2009. They found that CAPM was not sufficient to explain asset risk and return. The study follows the line of Osamwonyi and Asien (2012) and identifies deficiencies for likely error in model specification that might arise due to the use of proxies for variables.

Abdullahi, Lawal and Ibrahim (2012) investigated the mean return in the Nigerian stock market from 2000 to 2004 using weekly data. They employed mean return model to study the quoted companies' stock returns. The result of the study concluded that estimated mean return on investment in equity in the Nigerian capital market was low relatively in comparison to the returns that developed world capital markets exhibit. They further conclude that the low level of stock returns in the Nigerian stock market is a common attribute among most emerging stock markets in the developing world

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(Abdullahi, 2011; Daniel, Titman and Johnwei, 2001 and Korajezyk, 1996).

From the above, it could be seen that this study is necessary since the various works done on validating CAMP are with single factor, which has a poor explanatory power to determine the factors that affect returns on stocks in the NSE. Also, using the advantage of technical analysis to determine momentum in the market seems elusive, as the strategy is not commonly used by researchers and analysts in order to profit. Moreover, investors deliberately pursue investing strategies in momentum funds by ranking funds based on momentum profits since empirical evidence has it that funds with high momentum exposure persistently enjoy cash flows that are positive.

These necessitate exploring with the instrument of time-series and cross-section to determine the hypothesis that the presence of momentum profits; and the non-usual apportionment of stock returns to determining the strategy's relative-strength. It is also in line with the concerted effort of Harvey and Siddique (2000) on explaining the cross-sectional variation of expected returns. This will enable fund investors to be able to identify superior fund managers with their cash flows, who have investment skills and can identify momentum investment styles.

4 Method and Data

This section describes the method adopted in investigating the evidence of momentum and risk premium in the Nigerian capital market. Secondary data for analysis consists of raw prices extracted from the selected quoted companies in the Nigeria. The daily market prices of each of the selected firms' ordinary shares from January 2012 to June 2017 were used to compute the required monthly average market prices for the target 66 months under review. Also, the equity price appreciation or depreciation was used to compute the actual rates of returns of the respective firms while the NSE's all-share index (ASI) and Treasury Bill rates were used as proxies for the rate of returns of the market and risk-free rate of return respectively.

4.1 Model Specification

The study adopts the proposition of Carhart (1997) of four-factor model, which is an expansion of Fama-French (1996) three-factor model by an additional one factor, momentum of one year in stock returns. Thus, we postulate a one-pass regression model of the following format:

$$R_p - R_{ft} = \beta_0 + \beta_{im}R_{mt} - R_{ft} + \beta_{is}SMB + \beta_{ih}HML + \beta_{imt}WML + \varepsilon_{it} \quad \cdots(1)$$

where

$R_p - R_{ft}$ = the monthly excess returns of the portfolio

$R_{mt} - R_{ft}$ = the premium of the market, representing market excess return and the risk-free interest rate.

SMB = the difference of equal monthly weighted average of small stock portfolios (or portfolios with small market capitalisation stocks returns) and the big stock portfolios (or portfolios with big market capitalisation stocks returns). It indicates the size premium.

HML = the difference of equally weighted average of high book-to-market ratio of stock portfolio returns and the low book-to-market ratio of stock portfolios returns. It indicates the value premium.

WML = the difference of equally weighted average of the winner portfolio returns (or portfolio of stocks with highest previous returns) and the loser portfolio returns (or portfolio of stocks with lowest previous returns). It indicates momentum factor or earning premium.

$\beta_{im}, \beta_{is}, \beta_{ih}$ and β_{imt} = the slopes of the one-pass regression, which is the risk-factor sensitivities. β_0 is the intercept of the model (which is called "four-factor alpha") and ε_{it} is the stochastic error term.

Momentum is the difference of the highest performing firm's equal weighted average and the lowest performing firm's equal weighted average, lagged by one month (Carhart, 1997). But this study employs the value weighted average as proposed by Cremers, Petajisto, & Zitzewit, (2012). There is momentum if the previous 12-month average of returns of a stock is positive. The four-factor model could be used by an investor for its portfolio holding as well as for an active management and mutual fund evaluation model.

4.2 Conditional CAPM Specification

In the two-pass regression, we investigate whether the cross-sectional explanatory strength of the Fama-French three-factor model in explaining the portfolios sorted on size and book to market ratio.

$$\hat{r}_i = \gamma_0 + \gamma_1\beta_{mi} + \gamma_2\beta_{si} + \gamma_3\beta_{hi} + \varepsilon_i \quad \cdots(2)$$

To have empirical stance in refuting or otherwise accepting the CAPM, the study proceeds to the conditional test of CAPM using the methodology of Pettengill, Sundaram and Mathur (1995); the conditional CAPM specification allows the basis

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for comparing the usefulness or applicability of the model in two market phases. Thus, below are the modified specifications:

$$\hat{r}d = \beta_0 + (1-\partial)\beta_m(R_{mt}-R_{ft}) + (1-\partial)\beta_s(SMB-R_{ft}) + (1-\partial)\beta_h(HML-R_{ft}) + (1-\partial)\beta_c(WMLO-R_{ft}) + \omega_t \cdots (3)$$

where $\partial = 1$, if $R_{mt} - R_{ft} > 0$ and $\partial = 0$, if $R_{mt} - R_{ft} < 0$

5 Data Analysis and Results

This section focuses on the results of statistical values computed on the factor portfolios and market portfolio. The Table 1 describes the right-side (explanatory) variables based on their mean, standard deviation, minimum/maximum, the skewness and kurtosis values of their distributions.

Table 1: Descriptive Statistic Results

Statistic	RM	SMB	WMLO	HML
Mean	0.002567	0.2029	0.56947	0.225363
Maximum	0.329621	3.08850	6.392367	3.565022
Minimum	-0.53682	-0.4352	-0.0020	-0.78547
Std. Dev.	0.132281	0.6101	1.37381	0.691657
Skewness	-1.08817	3.1512	2.79812	2.766434
Kurtosis	6.929238	13.246	10.1116	11.89829
Jarque-Bera	50.43846	361.788	204.733	274.4805
Probabilit	0.0002925	2.54E-05	0.062638	0.00103584

Source: Author's Computation

As shown in Table 1 above, none of the portfolios is without negative minimum return. Value portfolio (HML) has the lowest minimum value, followed by market portfolio (RM), while winner's (WMLO) portfolio has a minimum value that is approximately zero. The winner's portfolio has the highest maximum value, which could be traced to August 2016. Looking at the mean values, market portfolio performs very low at almost 0.00 percent. Winner's portfolio takes the lead with sample mean value of 57 percent; value portfolio has about 22 percent. However, the market portfolio has the lowest standard deviation/risk, while winner' portfolio exhibits the highest standard deviation. The riskiest portfolios are the winner and value portfolios. They also have the highest return. Therefore, the convention that non-market portfolios perform better and riskier than the market portfolio is valid in this context. With the exception of the market portfolio, the other portfolios are positively skewed and more highly leptokurtic. This suggests that they have more panorama than the market portfolio. However, the JB statistics are significant in each of the portfolio variables, and thus, there is evidence to confirm that the returns of these portfolios are non-Gaussian. An attempt is made in Figure 1 to make this descriptive analysis visual by using the line graph.
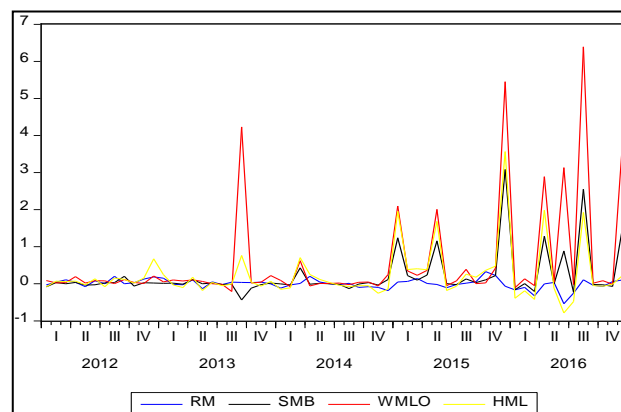

Fig.1: Line Graph showing the Distribution of Portfolios' Returns
Source: Author's Computation

The line graphs in Figure 1 above show the distribution pattern of the four portfolio returns. Obviously, through the sampling period, the return of winner portfolio rises higher than the return of the other portfolios. The value and size portfolios are also performing better when compared to the market portfolio. Notably, the market return hardly rises above 0 percent and in some cases, it goes below 0 percent. So disturbing that the market return seems to be inactive in some of the months under investigation. This is just an evidence that the market portfolio is a portfolio of low returns, and investors can diversify to the winner portfolio, which promises better returns.

5.1 Correlation between Factor and Market Portfolios

Before running the cross-sectional regression, the check for multicollinearity was done by computing the correlation coefficients between the factor portfolios and the matrix is presented in Table 2.

Table 2: Correlation Matrix

tau-a	RM	SMB	WMLO	HML
RM	1			
SMB	0.216949	1		
WMLO	0.071186	0.519774	1	
HML	0.545763	0.474576	0.353672	1

Source: Author's Computation

The values of the Kendall's tau correlation coefficients in Table 2 shows that all the factors are positively but weakly correlated. For example, the correlation coefficient between market portfolio and size factor portfolio is 22 percent, between market and winner is 7 percent, and between

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market and value records about 55 percent. This suggests that there is a likely absence of multicollinearity between each pair of these variables. In addition, the weak correlation coefficients confirm that the Nigerian stock market has large absorptive capacity; while the positive sign shows that an increase in one portfolio return could lead to an increase in the return of the other.

5.2 Determination of Market Factor and Non-Market Factors' Performance

This is based on the size and level of significance of the factors in the cross-sectional specification of the CAPM's four-factor model. An estimation of the joint coefficients of these factors and their p-values are reported in tables 3 and 4.

Table 3: Wald Test based on Non-Market Factors

Test Statistic	Value	df	Probability
F-statistic	2112	(3, 54)	0
Chi-square	6336	3	0

Source: Author's Computation

As indicated above, the F and X^2 statistics are 2112 and 6336 respectively. The associated p-values are 0 percent. In view of this result, the joint coefficients of the non-market factors are distinguishable from zero. It means there is influence running from the size, value and momentum factors to the average return.

Table 4: Wald Test based on the Market Factor

Test Statistic	Value	Df	Probability
t-statistic	-0.287	54	0.7752
F-statistic	0.082	(1, 54)	0.7752
Chi-square	0.082	1	0.7741

Author's Computation

As shown in Table 4 above, t-statistic is insignificant, the F and X^2 values have corresponding p-values that are larger than 10 percent. It implies that the null hypothesis that covariance risk is not different from zero cannot be rejected. The covariance/market risk does not significantly influence the average return, and investors may not receive significant premium. Therefore, the study confirms that non-market risks command better risk premium than market factor. Hence, identification of factor portfolios in Nigerian stock market is necessary to justify the existence of non-diversifiable risk.

5.4 Momentum effect in the Nigerian Capital Market

The momentum strategy has been examined widely in the advanced countries. In a bid to extend the existing knowledge, we decide to verify the efficacy of this trading strategy in Nigerian stock market. We examine these effects in low and high portfolio betas, and also, on market conditions of low and high return. The results are summarized below:

Table 5: Test of Momentum Effects

Low Portfolio Stock Beta			High Portfolio Stock Beta		
Factor	Coeff	P-value	Factor	Coeff	P-value
Mom	-0.32	0	Mom	0.767	0
C	0.0854	0.092	C	0.012	0.6441

Low Market Stock Return			High Market Stock Return		
Factor	Coeff	P-value	Factor	Coeff	P-value
Mom	0.501	0.0001	Mom	-0.123	0.2869
C	0.35	0.1001	C	0.012	0.6441

Source: Author's Computation

The coefficients of the momentum factor in low portfolio beta, high portfolio beta, low stock market return and high stock market return are -0.32, 0.767, 0.51 and -0.123 respectively. Their corresponding p-values are zero except in the case of high stock market return. However, when market condition depicts high return, the evidence of momentum cannot be traced. Furthermore, the strength of the coefficients reveals that the momentum effects is strong in the portfolio with high beta and market condition with low return. Surprisingly, the momentum effect is inverse in the low beta portfolio as well as in the high return market condition. These are not good conditions for investors to invest in the winner portfolio. Alternative the conditions that are preferable are when beta are high and low return market condition. For further confirmation, we test the momentum effects in the overall market condition. The results are presented in Table 6.

Table 6: Test of Momentum in the Overall Market Condition

Factor	Coeff	P-Value
Mom	0.522	0
C	0.133	0.0987

Source: Author's Computation

The momentum effects shown in Table 6 has a coefficient of about 52 percent and it is significant at 1 percent level, and the constant term is insignificant at 5 percent level. This suggests that momentum factor accounts for 52 percent changes

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in average return. For the fact that the constant term is insignificant, it means that the momentum factor is a good description of excess return in Nigeria.

5.5 Market and Non-market Factors across Portfolios and Markets

The CAPM four-factor model comprises of covariance risk, size risk, value risk, and momentum risk. None of these risks can be reduced by diversification, and as such, investors must receive premiums for taking them. It is considered necessary to price these factors in the two market conditions, and in the beta classified portfolios. The results are shown in Table 7.

Table 7: Test of Market and Non-market Effects

Low Portfolio Stock Beta			High Portfolio Stock Beta		
Factor	Coeff	P-value	Factor	Coeff	P-value
Market	-0.0241	0.1528	Market	0.0288	0.0365
Size	-0.2529	0	Size	0.485	0
Value	0.07848	0.0271	Value	0.401	0
Mom	-0.6623	0	Mom	0.078	0.023
C	0.00	0.58	C	0.032	0.055
Low Market Stock Return			High Market Stock Return		
Factor	Coeff	P-value	Factor	Coeff	P-value
Market	-0.0030	0.845	Market	-0.02	0.104
Size	0.18514	0	Size	0.006	0.921
Value	0.12834	0.0001	Value	-0.07	0.382
Mom	0.475694	0	Mom	-0.05	0.747
C	0.058	0.096	C	0.014	0.139

Source: Author's Computation

All the factors in the high beta portfolio are significant and the slope of coefficients are positive. Nevertheless, the magnitude of the size, value and momentum risks are respectively larger than the covariance risk. This is an indication that non-market factors perform better than the market factor in a high beta portfolio. In the low beta portfolio, the covariance risk is negative and insignificant, while all the non-market risks are significant, but it is only value risk that commands positive risk premium; whereas, in the low return market condition, it is only the non-market factors that are positive and significant. The market factor is insignificant and negative; meaning that investors do not receive reward for market risk when the returns are low. Both the market risk and non-market risks are not significantly priced when market condition is characterized with high returns. This looks like a puzzle that demands further explanation.

6 Findings

There is evidence in this study to suggest that momentum effect is present in the market with low stock return and high/low beta portfolios. However,

market with high stock return does not exhibit momentum effects. Additional evidence shows that portfolio with high beta and low return market condition have stronger momentum effects than low beta portfolio or high return market condition. Surprisingly, low beta portfolio and high return market condition have negative momentum effects. These are not good conditions for investors to invest in a winner portfolio. In the aggregate market conditions, the full potential of the momentum effect is realistic, suggesting that the momentum factor is a good description of excess return in Nigeria for the overall market condition. Likewise, size effect is found to be significantly priced in both low and high beta portfolios. In the overall market condition, the size effect is present. It is also noticed that the size effect is stronger in high beta portfolio and low return market condition than their counterpart portfolio and market condition. In view of this, unsystematic risks can be reduced significantly in size portfolios with respect to low or high beta, and investors diversifying across the portfolios are rewarded. To the contrary, the value effects are priced in low beta portfolios; but they appear insignificant in high beta portfolios. Lastly, it is established that in high beta portfolios, the non-market factors perform better than the market factor. While, in the low beta portfolios, the market risk is negative and insignificant, but all the non-market risks are significant. However, it is only value risk that commands positive risk premium. The results look different in the low return market condition, in which it is only the non-market factors that are positive and significant. The market factor is insignificant and negative, meaning that investors do not receive reward for market risk when the returns are low. Both the market risk and non-market risks are not significantly priced when market condition is characterized with high returns.

7 Conclusions

In conclusion, the momentum or Carhart factor is a good explanation of average return of low and high beta portfolios. Also, the factor is significantly important in determining expected return of a market that exhibits consistently low return throughout a definite period. However, the Carhart factor fails to explain mean return of a market that displays consistent stream of high return. The study also concludes that the momentum factor is stronger in describing average return of high beta portfolio than low beta portfolio.

In addition, the size factor governs average return of all market conditions (either when the return of

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the market is low or high) and low or high beta portfolio. The size factor risk is a non-diversifiable risk in any conditions of the market, and whether a portfolio has low or high beta, size factor still commands significant risk premium. While momentum factor can be discounted in high return market condition, the market rewards investors for assuming size risk. In this study, we conclude that in a high beta portfolio, the non-market factors perform better than the market factor. Covariance risk is non-priced risk and negatively influencing the return of low beta portfolio.

Lastly, the Nigerian stock market has large absorptive capacity, far below the marginal level, and highly characterized with thin trading or inactive scripts that cut across all the sectors of the equity market.

8 Recommendations

Based on the aforementioned conclusions/findings, the following recommendations are hereby suggested:

- Under favourable/unfavourable market conditions, investors should diversify their investments away from covariance portfolio to size, value and winners' portfolios. Re-weighting of assets in non-market portfolio should be encouraged as well as reducing the assets in covariance portfolio held by investors.

- In a market condition that exhibits low returns, investors should prefer holding winners' portfolio to other characteristic portfolios. However, size portfolio should be considered the best in a market with high return for considerable time limit.

- The risk component of covariance portfolio should be discounted, while the non-market risks should form the fulcrum of diversification.

- The government through the appropriate authority should provide bail-out funds to the capital market to ensure that the market is adequately liquid; so that the incidence of thin trading can be addressed. Additionally, the flotation charges and listing requirements should be lessened to allow frequent quotations in the market.

- One of the major limitation to this study is the use of book to market ratio for the measure firm characteristics of which it was recently suggest that operating profit is more robust in predicting average returns in the cross-

sectional analysis than return on book equity Fama and French (2014) and the study of Aharoni, Grundy, and Zeng (2013) also show that asset growth at the firm level is a better and more theoretically motivated predictor than asset growth per share.

References:
[1] Abdullahi, I. B. (2011). Sectoral Analysis of Risk and Returns of the Quoted Firms in the Nigerian Capital Market. Unpublished Ph.D. Thesis, Department of Accounting and Finance, University of Ilorin, Nigeria.

[2] Abdullahi, I. B., Lawal, W. A., & Ibrahim, R. O. (2012). An Empirical Estimation of Average Return in the Nigerian Stock Market. International Journal of Social Sciences and Education, 2(1), pp. 32-38.

[3] Adedokun, J. A., & Olajoko, S. A. (2012). Test of Capital Asset Pricing Model: Evidence from Nigeria Stock Exchange,. Journal Economic Theory, 6(4 -6):121-127.

[4] Aharoni G., Grundy B., and Zeng Q., (2013), Stock Returns and the Miller Modigliani Valuation Formula: Revisiting the Fama French Analysis. Journal of Financial Economics, Vol.110 No.2, pp 347-357.

[5] Arewa, A., Onafalujo, A. K., & Nwakanma, P. C. (2015). Empirical Proof of the CAPM with Higher Order Co-moments in Nigerian Stock Market: The Conditional and Unconditional Based Tests. Journal of Applied Finance and Banking, 5(1): 51-162.

[6] Banz, R. W. (1981). The Relationship between Return and Market Value of Common Stocks. Journal of Financial Economics,9(1):.3-18.

[7] Bhatnagar, S. C., & Ramlogan, R. (2012). The Capital Asset Pricing Model Versus The Three Factor Model: A United Kingdom Perspective. International Journal of Business and Social Research, 2(1):51-65.

[8] Black, F. (1972). Capital Market Equilibrium with Restricted Borrowing. Journal of Business, 7: 444-454.

[9] Cakici, N., & Tan, S. (2012). Size, Value, and Momentum in Emerging Market Stock Returns. (Working Paper). Fordham University.

[10] Cakici, N., & Tan, S. (2014). Size,Value and Momentum in Developed Country Equity Returns: Macroeconomic and Liquidity Exposures. Journal of International Money & Finance, 44:179-209.

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Arewa Ajibola, Fatoki Olarenwaju Isola

[11] Campbell, J. Y., & Vuolteenaho, T. (2004). Bad Beta, Good Beta. American Economic Review, 94(5):1249.

[12] Campbell, J. Y., Lo, A. W., & MacKinlay, A. C. (1997). The Econometrics of Financial Markets. Princeton, NJ: Princeton University Press.

[13] Carhart, M. M. (1997). On persistence in Mutual Fund Performance. Journal of Finance, 52: 57-82.

[14] Choi N., Fedenia M., Skiba H., Sokolyk T. (2017). Portfolio Concentration and performance of institutional investors worldwide Journal of Financial Economics, Vol. 123, issue 1, 189-208

[15] Cremers, M. A., Petajisto, A., & Zitzewit, E. (2012). Should Benchmark Indices Have Alpha?, Revisiting Performance Evaluation. Critical Finance Review, 2012, 2: 1–48.

[16] Daniel, K., Hirschleifer, D., & Subrahmanyam, A. (1998). A Theory of Overconfidence, Self-Attribution and Security Market Under and Overreactions. Journal of Finance, 53 pp. 1839–1886.

[17] Fama, E., & French, K. (1992). The Cross-section of Expected Stock Returns. Journal of Finance, 47(3): 427-465.

[18] Fama, E., & French, K. (2012). Size, Value and Momentum in International Stock Returns. Journal of Financial Economics, 105: 457-472.

[19] Foye, J., Mramor, D., & Pahor, M. (2013). A Respecified Fama and French Three Factor Model for the New European Union Member States, Journal of International Management and Accounting, 24: 3-25.

[20] Grinblatt M., Jostova G., Petrasek L., Philipov A. (2016). Style and Skill: Hedge Funds, Mutual Funds and Momentum. Working Paper, 3:26

[21] Harvey, C., & Siddique, A. (2000). Conditional Skewness in Asset Pricing Tests. Journal of Finance, Vol. 55(3), pp. 1263-1295.

[22] Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. Journal of Finance, 48, pp. 65-91.

[23] Kholkin, K., and Haug, E. (2016). Analyzing risk and returns of Norwegian equity mutual funds (Master's thesis, Nord universitet).

[24] Korajezyk, R. (1996). A Measure of Stock Market Integration for Developed and Emerging. The World Bank Economic Review Vol. 10.

[25] Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. Review of Economics and Statistics, Vol. 47 (1), pp. 13-37.

[26] Makowitz, H. (1959). Efficient Diversification of Investment. Cowles Foundation. Monograph No. 16 New York.

[27] Merton, R. (1973). An Intertemporal Capital Asset Pricng Model. Econometrica, 41(5): 867-887.

[28] Oke, B. O. (2013). Capital Asset Pricing Model (CAPM): Evidence from Nigeria,. Research Journal of Finance and Accounting, 4(9):pp 17-26

[29] Olakojo, S. A., & Ajide, K. B. (2010). Testing the Capital Asset Pricing Model (CAPM): The Case of Nigeria Securities Market, International Business Management 4:239-242.

[30] Osamwonyi, I. O., & Asein, E. I. (2012). Market Risk and Return: Evidence from Nigeria Capital Market, Asian Journal of Business Management 4(4):367 - 372.

[31] Penttenglli, G. N., Sundaram, S., & Mathur, I. (1995). The Conditional Relation between Beta and Returns, Journal of Financial and Quantitative Analysis, 30(1):101-116.

[32] Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. Journal of Finance 19(3):425-442.

[33] Soni R. (2017). Designing a Portfolio Based on Risk and Return of Various Asset Classes. International Journal of Economics and Finance, 9(2): pp. 142-149.