Fama and French 5-Factor Model and Stock Prices: Empirical Evidence from Nigeria

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DOI: 10.56201/ijssmr.v10.no3.2024.pg10.29

Abstract
This study examined the effect of Fama and French 5-Factor model and stock market return of quoted firms in Nigeria. Data were sourced from financial statement of quoted 52 quoted firms. Stock market return of the quoted firms were modeled as the function of debt-equity ratio, market size measured as volume of sales, earnings yield, trading activities measured by average volume of trading on the stock, book value of equity, dividend yield, earnings volatility and earnings per share. Panel data ordinary least square was used as data analysis methods. The study found that 74 and 50.7 percent changes in stock market return of the quoted firms were explained by variation in the independent variables, the study found that debt equity ratio has negative effect on stock market return while market size, earnings yield and trading activities have positive effect on stock market return and that dividend yield and earnings volatility has negative effect on stock market return while book to equity value and earnings per share have positive effect on stock market return. The study recommend that government and policy makers should design and implement more stringent rule where firms will be compelled and monitored on providing high quality financial reporting, so as to be reporting earnings that reflect their actual performance. Prospective investors should not only focus on huge returns for investing in smaller capitalized or high levered firms; rather, further analysis need to be carried out to tradeoff between risk and returns. The government should fine turned the stock market policy and institute a consistent policy plan to mobilize surplus funds from abroad, which would be injected into the capital market for significant development. The government and the securities exchange commission should create a special fund called "stabilization securities fund" to stabilize the market in the presence of external shocks.

Keywords: *Fama and French, 5-Factor Model, Stock Prices, Earnings per share, Dividend Yield, Book Value of Equity*

INTRODUCTION

Standard asset pricing theory suggests a direct relationship between expected excess returns and risk. The rate of return on an investment is weighted by the perceived risk in undertaking such an investment. This implies a direct relationship between market risk and return for the reason that risk-averse investors require additional compensation for assuming extra risk. Thus, it is unambiguous that risk-return relationship is a fundamental concept in investment decision making and that it is accepted as the cornerstone of rational expectations asset pricing models. Many researchers have investigated the

relationship between expected return and conditional variance of aggregate wealth. This has led to a long tradition of theoretical and empirical work on relationship between risk and return. This comes as no surprise given that this fundamental trade-off is a long standing phenomenon in investments analysis and is the foundation of financial economics (Leon, Nave & Rubio, 2005; Leesi, & Umasom, 2023). Merton (1973) intertemporal capital asset pricing model (ICAPM) predicts a positive relationship between the conditional mean and variance of market returns. The important Fama-French 5-factor model shows that market, size, value, operating profitability and investment adequately capture the returns of stock market. Though there are many more factors that can affect the returns and one of them is momentum. Momentum can be a factor or an anomaly and momentum strategy is 5 often chosen by investors and thus many researched it and confirmed that it produces significant returns.

There are many studies on Fama and French 5-factor model. Daniel and Titman (1997) criticized the research of Fama and French (1993) and suggesedt the characteristics model. Fama and French showed that the cross-sectional variation in expected returns can be explained by only size and value factors. Daniel and Titman (1997) found that it is more characteristics rather than factor loadings that determine expected returns and also there are more than two characteristics that are important. Their results also indicate that value stocks comove because of their sensitivities to similar factors and not because of a unique factor. Davis, Fama and French (2000) found that the value premium in average stock returns is robust. The 3- factor model explains the value premium better than the characteristics model of Daniel and Titman (1997), in their 68-year period and there is no evidence against the fact that value loading determines expected returns. They believe that the evidence of Daniel and Titman (1997) in favor of the characteristics model is due to their short sample period. If they omit the period examined by Daniel and Titman (1997) the intercepts of their regressions could hardly be close to the zero-intercepts that the risk model gives. Carhart (1997) extended Fama and French's (1993) three-factor model to a four-factor model including the momentum factor, alongside the size, value and market factors. It appeared that Carhart's model explains more of the variation in average stock returns than the original Fama and French (1993) 3-factor model. Rouwenhorst (1998) exhibited his results about momentum strategies and finds that an internationally diversified portfolio with a long position in medium-term winners and a short position in medium-term losers generated a return of 1% monthly. This outperformance is present in all markets, it holds across size and lasts for about one year, but this relationship is negatively correlated with size.

Blackburn and Cakici (2017) focused on momentum and study returns from a variety of developed markets. They interestingly find significant returns in a strategy that goes long in long-term losers and short in short-term winners, a result that holds over the entire sample period and the majority of markets. Griffin (2002) examined different versions of the Fama and French three-factor model in international datasets and individual securities. He finds that none of the models completely captures the variation in average returns but domestic versions of the model do a better job than international and global versions of the 3-factor model. Fama and French (2012) examined if empirical asset pricing models capture factor patterns in international average returns. In their dataset they have 23 international markets divided in four regions, North America, Europe, Japan, and Asia Pacific, and they are trying to examine if asset pricing is integrated across these four regions. They are trying to detail the size,

value and momentum patterns in average returns for developed markets and to examine how well the 3-factor and Carhart's 4-factor model capture average returns for portfolios formed on combinations of size, value and momentum. They also use global factor models to explain global and regional returns. They extend their range of markets with cost the reduced size of the sample. Their results indicate that there are common patterns in developed markets. There are value premiums and there is a momentum premium in all regions except Japan.

The global models do not sufficiently explain average returns on regional portfolios Titman, Wei and Xie (2004) foun that the level of a firm's investment has an effect on the firm's stock. More specifically, there is a negative relationship between abnormal capital investment and stock returns. Novy-Marx (2013) identified the profitability factor as he finds that profitable stocks generate significantly higher returns than unprofitable stocks. He also finds that, controlling for profitability, value strategies perform better. In their research Watanabe, Xu, Yao and Yu (2013) examined if the value effect in international stock markets is consistent with the results in the U.S. and evaluate the possible economic causes of the value factor. They find that the value effect exists in international equity markets and that there are large differences of this effect in the countries that they examine. The effect is stronger in markets that are more informationally efficient. Subsequently, Fama and French (2015) added profitability and investment factors to their initial three-factor model, as they identify evidence that stock returns are related to these 5 factors and they introduce the five-factor model which is the base of this research.

Fama and French (2017) tried the model internationally and they find that average stock returns of three out of four regions they use (North America, Europe, and Asia Pacific) increase with B/M ratio and profitability. They also find the expected negative relationship between returns and investment. In Japan this investment-average returns relationship is weak but the relationship between average returns and B/M ratio is strong. Kewei Hou, Andrew Karolyi, Bong-Chan Kho (2011) used a sample period from 1981 to 2003 with a large number of stocks. They are searching for the firm-level characteristics that have great explanatory power over the variation of stock returns. They find that the value factor has great explanatory power. This factor is based on C/P and not on B/M and this is consistent both for cross-section and time-series tests. To this power of C/P adds a medium-term stock-price momentum. They discover that local and international versions of multifactor models have low pricing errors and the lowest rejection rate. Additionally, they notice that C/P is linked to a global covariance risk factor. Finally, they identify that momentum and C/P matter more as global risk factors than as characteristics, both in a local and a foreign level.

Bekaert, Hodrick, and Zhang (2009) used linear factor models in order to capture the international return comovements. They found that an APT model and a factor model with similar global and regional Fama-French factors perform well. They use country specific portfolios and find that global market integration is more important than the regional one. In addition, testing for within-country and within-industry returns they conclude that despite globalization there are still international diversification benefits. De Moor and Sercu (2013) documented the size effect for international stocks for the time period 1980-2009. They find that the unexplained returns can be linked to a dividend-yield factor. The two factors they use, one as in Fama and French for size and the second for small stocks, seem to be consistently correlated with this dividend yield factor. Karolyi and Wu (2018) proposed a

new multi-factor asset pricing model based on, among others, size, value and momentum characteristics and they test it for 46 developed and emerging markets. The main difference is in the way that they build their factor portfolios because they use a partial-segmentation approach that captures the variation in international stock returns and achieves low pricing errors and rejection rates compared to conventional methods. While findings of the above studies are well established, the failed to capture the problem of the developing African financial market like Nigeria, this study therefore examined the effect of Fama and French 5-factor model on stock market return in Nigeria.

LITERATURE REVIEW

Fama-French Five-factor Model

Fama and French (2015) augmented the Three-factor model by adding an operating profitability and investment factor, thereby creating the Five-factor model. The profitability factor reflects the tendency of high profitability stocks to outperform low profitability stocks, and the investment factor reflects the tendency of low investment stocks to outperform high investment stocks. As Fama and French assert in their 2006 paper, a company's future stock returns can be estimated through its future discounted dividends, so if one firm has the same expected dividends as another, but lower price, it should have higher price growth in the future and hence higher returns. Modigliani and Miller (1961) showed that the market value of a company is equal to the discounted equity earnings minus the change in book equity, and this creates the following equation, which should hold, even in the presence of information inefficiencies and irrational behavior:

$$MtBt=\Sigma E[Yt+s-(Bt+s-Bt+s-1)]/(1+r)s\infty s=1Bt \qquad (1)$$

Where

Y is earnings, B is book value, r is expected stock returns and M is market value. This leads to three statements:

Holding everything else fixed except r, a higher B/M (book-to-market) leads to higher returns.

Holding everything else fixed except r, a higher dB/B (change in book equity, or investment) leads to lower returns.

Holding everything else fixed except r, a higher Y/B (earnings over book equity, or profitability) leads to higher returns.

The role of book-to-market according to Fama and French is clear enough by now, but here we see how new factors determine the returns on a stock, at least in theory. Expected earnings of a company are not directly observable of course, so a proxy is needed (assuming that the role of expected earning is not absorbed by other variables that are already included in the mix). Fama and French also test the validity of this equation and their results are substantially encouraging: the equation seems to represent a true relationship. Another problem with this paper is in the choice of proxies: the authors use the percentage change in book equity as a proxy for investment and the ratio of earnings over book equity as a proxy for profitability, and they seem to cause problems of collinearity. Fama and French solve these problems by changing and correcting measures: they use asset change as a measure of investment, a lagged book-to-market and two different measures of firm stability and default probability (Piotroski, 20002 & Ohlson, 1980) as explanatory variables. This seems to solve the technical problems, but the problem of the real causes of these effects remains unsolved and again, this may be a subject matter more related to behavioral economics.

In his 2013 paper, Novy-Marx proposed an alternative measure of profitability, which he calls "gross profitability" and measures as the ratio of gross profits to total assets. His results are significant: according to his paper, gross profitability not only has a relevant role in explaining returns, but it has as big an effect as book-to-market's and is also complementary to it, meaning they proxy for different risk factors. This is the "other side of value" that he talks about: while in conventional value strategies we finance the acquisition of inexpensive assets by selling expensive assets, here the investor sells unprofitable assets to buy profitable assets. In this way, a strategy based on profitability is seen as a growth strategy, which can be used to hedge against the risks of a value strategy. As in many other studies, small stocks represent an anomaly and are always very difficult to predict. Aharoni, Grundy and Zeng (2013; Leesi, 2023). also expand the 2006 paper by Fama and French by conducting their research at a firm level instead of the per-share level used by the original authors. They start from the Modigliani-Miller firm valuation equation as well, and then estimate a similar model as in the Fama-French paper. Their results are slightly better, as they manage to obtain a coefficient for investment that is negative and significant, which Fama and French could not. All the other results confirm the Fama-French research.

These expansions led Fama and French to the creation of a new model that included profitability and investment as risk factor together with the "historical" β, size and book-to-market. In order to do this, they proxy the two new risk factors by finding the returns on two portfolios: RMW and CMA. RMW (Robust Minus Weak) and is long on stocks with high profitability and short on stocks with low profitability, while CMA (Conservative Minus Aggressive) is long on stocks with low investment and short on stocks with high investment. The regression equation that describes the model is built as follows:

$$Rit=ait+b1t(Rmt-RFR)+b2tSMBit+b3tHMLit+b4tRMWit+b5tCMAit \quad (2)$$

As far as the "old" variables are concerned, the authors are able to find the same patterns that they did in 1993. It should be noted that according to Fama and French themselves, book-to-market, profitability and investment are correlated: firms with high book-to-market tend to have low profitability and investment, while the opposite is true for low-book-to-market firms. This is why it is suggested that HML may be redundant and RMW and CMA may account for the value effect, so they authors introduce another variable called HMLO (HML Orthogonal), which is constructed by summing up the intercepts and errors in the regression of HML on Rm-RFR, SMB, RMW and CMA. However, the results that Fama French obtain are significant and follow the expectations: small and profitable firms with non-aggressive investment policies and high book-to-market seem to have the highest returns. The test statistic that Fama and French use (developed by Gibbons, Ross and Shanken in 1989) rejected the hypothesis that the 5-Factor model captures all the patterns, but nonetheless the patterns are there, as the authors show, and their cross-sectional regressions still manage to explain the better part of the variation in average returns. According to Bender and Nielsen (2010), it is based on 13 indicators:
Size (market capitalization);

Size Non-Linearity
Currency Sensitivity (correlation with the reference currency's fluctuations);
Leverage (debt/equity ratio);
Volatility (standard deviation of stock price);
Earnings Yield (earnings/price ratio);

Trading Activity (average volume of trading on the stock);
Momentum;
Growth (book equity growth);
Value (book-to-market);
Dividend Yield
Earnings Variation

Stock Market Return

Stock market return is the returns that the investors generate out of the stock market. This return could be in the form of profit through trading or in the form of dividends given by the company to its shareholders from time-to-time. Stock market returns can be made through dividends announced by the companies. Generally at the end of every quarter, a company making profit offers a part of the kitty to the shareholders as dividend. This is one of the source of stock market return one investor expect. The most common form of generating stock market return is through trading in the capital market. In the capital market an investor could earn stock market return by buying a stock at lower price and selling at a higher price.

Stock market returns is not fixed ensured returns and are subject to market risks. It can be positive or negative. Stock market return is not homogeneous and changes from investor-to-investor depending on the amount of risk one is prepared to take and the quality of his stock market analysis. In opposition to the fixed returns generated by the bonds, the stock market returns are variable in nature. The idea behind stock return is to buy cheap and sell dear. But risk is part and parcel of this market and an investor can also see negative returns in case of wrong speculations.

Issahaku et al. (2013) opined that in stock market, the investors' invest their savings with an expectation of earning some income. This income may be termed as "stock returns" which may be in the form of profits earned from trading of shares or the dividends received. These dividends may be paid to the shareholders out of the profits earned; may be quarterly, half yearly, yearly. The stock prices or returns are bound to be affected by various risks occurring within a country and also events occurring across the world. Stock returns are very sensitive to political unrest in the country, economic crises, natural disasters like earthquake, cyclones and floods movements in international oil prices, inflation effects, changes in Government policies, norms and regulations and so on. It is known that stock prices or returns follow a random walk. It is a difficult task to predict or forecast the future returns.

Market Efficiency Theory

Efficient-market hypothesis (EMH) was prounded by Fama (1953). The theory asserted that financial market is "informationally efficient". There are three major forms of the hypothesis: "weak", "semi-strong", and "strong". Weak EMH claims that prices on traded assets (for example, stock bonds, or property) already reflect all past publicly available information. Semi-strong EMH states that prices reflect all publicly available information and that prices instantly change to reflect new public information. Strong EMH additionally claims that prices instantly reflect even hidden or "insider" information. Efficient market theory implies that market will react quickly to new information. Thus, it is important to know when the accounting report first became publicly known. The accounting report is informative only if it provides data not previously known by the market.

Stock market thrives on information. This is because information plays an essential role in reducing the investors' challenges in the capital market. Information is important to investors in helping them evaluate investment opportunities to decide how to allocate their savings. In addition, it is also important because it enables investors to monitor whether their resources have been used wisely by managers. Markets where information is irregular give opportunities for investors who are more informed to take advantage of those who are less informed, and make it more expensive for investors to buy or sell a security without affecting its price.

As a result of the important role of information to the market, stock exchanges word-wide, set listing and post-listing requirements for companies seeking quotation. For instance in Nigeria, the post-listing requirements of the NSE laid emphasis on the timely release of information. Quoted companies are required to provide the market with information about their operations to the public. This information includes quarterly, half-yearly and yearly financial accounts. However, the investors in Nigeria have suffered untold hardship due to lack of regular and reliable information from the listed companies on NSE (Goddy, 2010; Leesi, 2023).

In Nigeria, Nigerian stock market is efficient in the weak form and follows a random walk process (Olowe, 1999 & Okpara, 2010; Akani & Lucky,2014). The implication is that all information conveyed in past patterns of a stock's price is reflected in the current price of the stock. Therefore, it is ineffectual to select stocks based on information about recent trends in stock prices. Olowe (1999) uses data of an end of the month quoted stock prices of 59 randomly selected from January 1981 to December 1992 on the Nigeria stock exchange and employs a sample autocorrelation test. The study concluded that the Nigeria stock market appeared to be efficient in the weak form. Kukah, Amoo and Raji (2006) focused their study on market indices in local currencies rather than prices of individual stocks. They use the capitalization weighted index of all listed stocks. They use both parametric and non-parametric test in determining the efficiency of the Nigerian stock market, according to them, the results of the parametric tests show that the Nigerian capital market is weak form efficient while the parametric tests showed that the market is not weak - form efficient. Their results are somewhat mixed.

Capital Asset Pricing Model (CAPM)

The CAPM is a model for pricing an individual security or a portfolio. The CAPM model was developed independently by William Sharpe (1964), and Parallel work was performed by Lintner (1965) and Mossin (1966) these model marks the birth of asset pricing theory. The CAPM suggests that the only variables that we need in calculating the expected return on security are: the risk-free rate (a constant), the expected excess return on the market, and the security's beta (a constant). The CAPM model is attractive because of its effectively simple logic and intuitively pleasing predictions relating to how it measures risk and the relation between expected return and risk. Unfortunately, the CAPM simplicity causes the empirical record of model to be poor, poor enough to invalidate the method used in the application of the model. The models empirical problems may reflect true failings or they may also be due to the shortcomings of the empirical tests, most notably, poor proxies for the market portfolio of invested wealth, which plays a crucial role in the models predictions. The CAPM is built on the model of portfolio choice developed by Harry Markowitz (1959). The Markowitz model is often known as a "mean-variance model", it describes the relationship between risk and the expected return of an asset under the conditions of market equilibrium in a capital market where all investors undertake

optimal portfolio selection. The model assumes investors are not risk takers and that they care only about the mean and variance of their one-period investment return when choosing among portfolios.

Derivation of the CAPM

The CAPM is a simple linear model that is expressed in terms of expected return and expected risk. The model states that the equilibrium returns on all risky assets are a function of their covariance with the market portfolio. Under the assumptions of the CAPM, if a risk-free asset exists, every investor's optimal portfolio will be formed from a combination of the market portfolio and the risk-free asset. The precise combination of the market portfolio and the risk-free asset depends on the degree of investors risk aversion. Since investors can choose the combination of the market portfolio and the risk-free asset, then the equation of the relationship connecting a risk-free asset and a risky portfolio is:

$$E(Ri) = R_f + \frac{E(Rm) - Rf}{\sigma 2m}\ \sigma im \qquad (3)$$

Where;

E (Ri) : Expected return on i^{th} portfolio.
R f : Return on the risk free asset
E (Rm) : Expected return on market portfolio
σim : The covariance between asset *i* and the market portfolio
σ2 m: The variance of the market portfolio
Based on the equation (3) the original CAPM equation can be derived as follows:

$$E(Ri) = R_f + [E(Rm) - R_f]\ \beta i \qquad (4)$$

Equation 4 is known as Capital Asset Pricing Model and it could be shown graphically as the security market line (SML) which means the SML fundamentally graphs the results from the capital asset pricing model (CAPM) formula. The *x*-axis represents the risk (beta), and the *y*-axis represents the expected return. The market risk premium is determined from the slope of the SML. The SML model states that stocks expected return is equal to the risk-free rate plus a risk premium obtained by the price of risk multiplied by the quantity of risk. In a well-functioning market nobody will hold a security that offers an expected risk premium of less than [E (Rm)-R f] i.

If we think E (Rm) – Rf as the market price of risk for all efficient portfolios, than, it represents the extra return that can be gained by increasing the level of risk on an efficient portfolio by one unit. The quantity of risk is often called beta, and it is the contribution of asset *i* to the risk of the market portfolio. In other words, it is the correlation of the asset *i*'s return with the return on the market portfolio. If everyone holds the market portfolio, and if beta measures each security's contribution to the market portfolio risk, then it's no surprise that the risk premium demanded by investors is proportional beta.

Analysis Theory of Equity Price

Baker and Harlem (1973) argued that investors are primarily concerned with expectations about the future, considering earnings projection and historical data to be of high interest to investors. Financial practitioners employ variety of tools and methods to achieve better results of their decision making in investment. There are an endless number of investment strategies that are very different from each other, yet almost all use the fundamentals (McClure, 2010).The selection of an investment will start with fundamental analysis and the unique nature of capital market instruments forces investors to depend strongly on fundamental factors in their investment decisions (Suresh, 2013; Lucky, Akani &

Anyamaobi, 2015; Davies, & Lucky, 2018). Fundamental analysis is the cornerstone of investing. In fact, some would say that you are not really investing if you aren't performing fundamental analysis. McClure (2010) stated that fundamental analysis is a method of evaluating a security by attempting to measure its intrinsic value by examining related economic, financial and other qualitative and quantitative factors. He submitted that fundamental analysts attempt to study everything that can affect the security's value, including macroeconomic factors like the overall economy and industry conditions and individually specific factors like the financial condition and management of companies. The term simply refers to the analysis of the economic well-being of a financial entity as opposed to only its price movements.

Technical Analysis Theory of Equity Price

With a view to making equity investment decision, investor needs to understand the stock market behaviour and stock price trend in the stock market and ask why the stock market behaves in a certain way. For investors not to go wrong in investment decision, investors need to develop a bird's view over the market and analyze every factor why the stock market behaved in a certain way with tools and techniques. According to Keerti and Gururaj (2013) one of the tools that may be used by the investor for the analysis of the stock market behaviour and stock price trend in the stock market is technical analysis. Keert and Gururaj (2013) state that technical analysis helps to study the market action, primarily through the use of charts, for thie purpose of forecasting future price trends. The movement of the scrip price and its behaviour can be explained in a more illustrative form by using the technical analysis. It provides better nsight to make decisions on the stock investments. It considers only the actual price behaviour of the market or instrument.

Keert and Gururaj (2013) submit that technical traders believe that there are no reasons to analyze a company's fundamentals because these are all accounted for in the stock's price. Cory, Chad and Casey (2015) state that technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity and that it is based on three assumptions: 1) the market discounts everything, 2) price moves in trends and 3) history tends to repeat itself. Murphy (1999) claims that technical analysis maintains that all information required about a stock is reflected already in the price of the stock and that Investors' emotional responses to price movements lead to recognizable price chart patterns.

Rational Expectation Theory

Rational expectation theory was founded by Robert Lucas in 1970. This highly mathematical theory dominated all economic thought in the 70s and early 80s, so much so that Lucas attracted a broad following of disciples who raised him to cult leader status. This viewpoint expects individuals to weigh all available evidence, including information concerning the probable effects of current and future economic policy, when they formulate their expectations about future economic events such as the probable future inflation rate (Gwartney & Stroup, 1987).

Tesfatsion (2015) opined that rational expectations have two basic forms: weak-form rational expectations and strong-form rational expectations. Weak-form rational expectations imply that whatever information people have, they make optimal use of this information in forming their expectations. However, strong form rational expectations suggest the use of all available information

in forming expectations. In both forms there is no restriction placed on information. Rational expectations are equivalent to fundamental analysis or a semi strong form of the efficient market hypothesis.

It implies that the best forecast of a future variable can be made if a forecaster uses all available and relevant information, the latest statistical data and the best available economic models. Therefore, there is no systematic error in forecasting. The errors are random. The theory of rational expectations and the EMH implies that expectations in financial markets are equal to optimal forecasts using all available information. Current security prices in a financial market will be set so that the optimal forecast of a security's return rate using all available information equals the security's equilibrium return rate. Believers in Rational Expectations insist that the only type of changes in economic variables is unexpected changes that affect the return on the stock market (Tesfatsion, 2005). The efficient markets hypothesis has been described in the literature as the cornerstone of modern financial theory, the centerpiece of neo-classical financial theory, and resting at the heart of rational expectations macroeconomics. However, several Post Keynesian critiques of the efficient markets hypothesis have challenged the normative implication that efficient market prices give the right incentives for the firms' production and investment decisions and for investors' portfolio decisions. Institutional support for the Post Keynesian challenges is offered by observing that Veblenian stock markets, heavily influenced by folk psychology and subject to episodes of speculative inflation that end in financial crises, reinforce the existing critique of the efficient markets hypothesis within the Post Keynesian literature (Raines & Charles, 1996).

Empirical Review

Fama and French (2015) compared the performance of the Five-factor model to the three-factor. Fama and French use factor spanning regressions to test for factor redundancy. Model performance is primarily evaluated with the GRS F-test and performance statistics based on Jensen's alpha. The sample covers July 1963 to December 2013. To test how sensitive the results are to different factor definitions, the factors are constructed using three different sorting schemes: 2x2, 2x3 and 2x2x2x2. The test portfolio sets are created using two different sorting schemes: 5x5 for the size-B/M, size-profitability, size-investment and 2x4x4 for the size-B/M-profitability, size-B/M-investment and size-profitability-investment portfolio sets. The results show that the value factor becomes redundant once the profitability and investment factor are added. Fama and French (2015) argue that the value factor, due to market capitalization being sensitive to forecasts of earnings and investment, may be a "noisy proxy" for expected returns. Model performance does not seem to be affected by the factor construction method and they therefore choose to continue using the 2x3 factor construction scheme as it is commonly used in the literature. Overall, the Five-factor model outperforms the Three-factor model regardless of the factor construction method. The Five-factor model's primary problem is that it has trouble explaining the returns of small sized stocks, especially small sized stocks with high investment and low profitability.

Njiforti and Akaolisa (2010) investigated whether the Nigerian stock market has experience a speculative bubble using unit root test, cointegration and GARCH on a time series data for banks from 2008 to 2009. The result reveals speculative bubbles in most of the banks and insurance companies

(i.e., the price-dividend ratio, share prices and dividend were non-stationary). Fama and French (2017) used a similar methodology to their 2015 study on a U.S. sample, Fama and French evaluate the performance of the Five-factor model in four regions in the developed markets: North America, Europe, Japan and Asia Pacific. The main difference is that they use a shorter sample period which covers July 1990 to December 2015. The performance of the Five-factor model is compared to the performance of the Three-factor model and a Five-factor model that excludes the investment factor. The results show that the size and investment factors are redundant in Europe and Japan. The size factor is the only redundant factor in Asia Pacific. In general, the Five-factor model outperforms the Three-factor model in all regions except Japan. In Japan, all three models produce insignificant GRS statistics for all sets of portfolios. In Europe, the main problem for the Five-factor model is explaining the returns of the size-investment sorted portfolio set. This is most likely due to the size and investment factor being redundant in that region. Similar to their study in 2015, Fama and French conclude that the primary problem of the Five-factor model is that it is not capable of explaining the returns of small stocks that have similar returns to those with low profitability and high investment.

Fama and French (2018) analyzed different versions of the Six-factor model's performance, which adds momentum to the Five-factor model. In addition, an alternative definition of the profitability factor is tested, using cash profitability instead of operating profitability. Furthermore, Fama and French test a new performance metric proposed by Barillas and Shanken (2016). This performance metric is the max squared Sharpe ratio of the intercepts from LHS factor return regressions and is mainly used to compare nested and non-nested models. The max squared Sharpe ratio is closely related to the GRS F-test, however, the GRS statistic is not suited for the comparison of non-nested models as it causes an upward bias for models that include more factors. Non-nested models are models that use distinct factors, meaning that the models do not use the same factor definitions. The sample contains data from the U.S. stock market between July 1963 to June 2016. The factor spanning regressions indicate that the momentum factor adds explanatory power to the Five-factor model. Cash profitability is found to outperform operating profitability when analyzed using the Barillas and Shanken metric. A Six-factor model which combines the market and size factor with the small stock spread factors (meaning factors created only using small sized companies) HMLS, RMWS, CMAS, and WMLS outperforms the other models with regards to the max squared Sharpe ratio statistic proposed by Barillas and Shanken. However, Fama and French conclude that this does not justify a permanent switch to these new factor definitions as the base Six-factor model also performs well, overall, the Barillas and Shanken statistic correlates with the GRS statistic, which is not surprising as they are closely related.

Cakici, Fabozzi and Tan (2013) examined size, value and momentum effects are examined in 18 emerging markets divided into three regions: Asia, Eastern Europe and Latin America. The authors use monthly stock data between January 1990 to December 2011. Factor and portfolio summary statistics as well as factor spanning regressions are used to analyze the factor effects in the emerging markets, global markets and the U.S. In addition, two sets of portfolios (5x5) sorted on size-B/M and size-momentum is analyzed using the CAPM, Three-factor model and Carhart model. The performance of the asset pricing models are also compared using factors created with local, global and U.S. data, which tests for market integration. The GRS F-test, Jensen's alpha based performance metrics as well as a GMM-based test-statistic are used to evaluate and rank the performance of the different models. GMM (Generalized Method of Moments) is used to test for non-normal and serially auto-correlated error

terms. The purpose of the GMM statistic is to control the significance level of the GRS statistic. The authors find a statistically significant value effect in all three regions in the emerging markets, with the big sized value premia being slightly larger than the small sized value premia. The reverse is found in the U.S. and global developed markets, where the small sized value premia is larger than the big sized value premia. The momentum effect is found to be significant in all regions except Eastern Europe. The momentum premia are found to be larger in small sized stocks compared to big sized stocks. This pattern of momentum premia regarding size is consistent with results found in the developed markets. Performance evaluation shows that the use of global and U.S. constructed factors decreases the explanatory power of local returns (i.e returns in different regions of the emerging markets). These results indicate that the emerging markets are not fully integrated with the developed or global markets. The Carhart model, which includes the momentum factor, is found to be comparatively successful in explaining the returns of the size-momentum sorted portfolios, especially in Asia. However, overall the momentum factor does not seem to add explanatory power. The GMM results indicate that the significance level of the GRS statistic is robust for local factors and a majority of the results using U.S. and global factors. The empirical review above was mainly foreign studies; this study examined the case of Nigeria stock market.

METHODOLOGY

This study examined Fama and French 5-factor model and stock market return of quoted firms in Nigeria; secondary data were used. Ex-post facto research design was employed in obtaining, analyzing and interpreting the relevant data. The rationale for the variety is that ex-facto research design allows the researcher the opportunity of observing one or more variables over a period of time (Uzoagulu, 1998). Specifically, panel data were adopted in data analysis. Data were sourced from Nigeria Exchange Group Factbook.

To obtain the observed values on the expectation of the impact of financial structure on firm performance, panel data survey over a ten year period will be employed. Panel data structure allows us to take into account the unobservable and constant heterogeneity, that is, the specific features of each quoted firm. The researcher will employ pooled Ordinary Least Square (OLS), Fixed Effects and Random Effects regression models to test the various hypotheses. Pooled OLS regression technique is popular in financial studies owing to its ease of application and precision in prediction (Alma, 2011). The rationale for adopting Fixed Effects and Random Effects models estimator as additional test is to enable the researcher control time contrast and time invariant variables, and thereby control for the effect of the unobserved heterogeneity in the dataset. Ujunwa (2012) opines that coefficient of estimations are reliable when regression parameters do not change over time and do not differ between various cross-sectional units. Therefore, when the regression estimation differ widely between the two models (Fixed and Random Effects models), the adoption of Hausman test will be essential. Panel data over the period from 2008-2017 is used and in line with notable literature, such as the work of Majumdar and Chhibber (1999), Zeitun and Tian (2007), and Onaolapo and Kajola (2010), firm's performance measure was regressed on each of the variants of financial structure and other control variables holding other factors that may affect firm's performance not included in the equation constant. These analytical techniques will enable the researcher attain justifiable and robust results.

$$Y = \beta_0 + \beta_{1Xit} + \mu \quad (5)$$

Where Y = Dependent Variable
β_{1Xit} = Independent variable
β_0 = Regression Intercept
μ = Error Term

Disaggregating Equation 3.1 to form the multiple regression models, we have

$$SMR = F(DER, MS, EY, TA) \quad (6)$$

$$SMR = F(BVE, DY, EV, EPS) \quad (7)$$

Transforming equation 3.2 to econometrics form, we have

$$SMR = \beta_0 + \beta_1 DER + \beta_2 MS + \beta_3 EY + \beta_4 TA + \mu \quad (8)$$

$$SMR = \beta_0 + \beta_1 BVE + \beta_2 DY + \beta_3 EV + \beta_4 EPS + \mu \quad (9)$$

Where

SMR = Stock Market Return
DER = Debt equity ratio
MS = Market size measured by volume of sales
EY = Earnings Yield
TA = Trading activities measured by average volume of trading on the stock
BVE = Book value of equity
DY= Dividend yield
EV = Earnings volatility
EPS = Earnings per share
μ = Error Term
$\beta_1 - \beta_4$ = Coefficient of Independent Variables to the Dependent Variables

β_0 = Regression Intercept

Statistical Approach

Coefficient of Determination (R^2): This is used to measure the extent to which the independent variables in the model can explain changes on the dependent variable.

T-Test: This is used to measure the significance of the independent variables to the dependent variable and the hypothesis was tested at 5% level of significance and at 95% confidence interval. The hypothesis for this test is stated as follows:

Null I hypotheses: H_0:$\beta = 0$, (Statistically not significant)
Alternate hypotheses; H_1:$\beta \neq 0$. (Statistically Significant)

And the decision rule states that "H_0" should be rejected when i-statistics is greater than the critical value, but when the T-statistics is lower than the critical value, the "H_0" is accepted with its conclusion.

F-Test: This is used to find out the overall significance of the regression model at 5% level of' significance. The hypothesis for this test is stated as:

Null Hypotheses; H_0: β_1-$\beta_6 = 0$ (all slope coefficients are equal to zero)
Alternative Hypotheses: H_0: β_1-$\beta_6 \neq 0$ (all slope coefficients arc not equal to zero)

The decision rule for this test is that "H_0" should be rejected when F-statistics is greater than the critical value of F. hut when the F-statistics is lower, then the 'H0" is accepted while the Hi is rejected.

Test of Autocorre1ation

The Durbin Watson statistics is used in this research to test for the presence of autocorrelation. When there is presence of autocorrelation, the First order autoregressive scheme will be employed to correct ii. The hypotheses states that:

H_0: P = 0 (There is serial independence in the errors)

H_1: P> 0 (There is first order (AR) positive autocorrelation.

When the Durbin Watson Statistics (DW-Stat) is lesser than lower Durbin Watson (D_L), the null hypothesis (H_0) is being rejected hut if the Durbin Watson statistics is greater than the upper Durbin Watson (D_u), the null (H_0) is then accepted.

ANALYSIS AND DISCUSSION OF FINDINGS

Table 4.1: Test of Appropriate Model

Model I: $SMR = \beta_0 + \beta_1 DER + \beta_2 MS + \beta_3 EY + \beta_4 TA + \mu$			
Redundant Fixed Effects Tests			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	29.113420	(14,131)	0.0000
Cross-section Chi-square	212.063003	14	0.0000
Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.800963	4	0.5917
Model II: $SMR = \beta_0 + \beta_1 BVE + \beta_2 DY + \beta_3 EV + \beta_4 EPS + \mu$			
Redundant Fixed Effects Tests			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.183778	(14,129)	0.0053
Cross-section Chi-square	17.887950	14	0.0019
Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.911213	4	0.0029
Cross-section random	22.884302	4	0.0074

Source: E-View 9.0

Our study used the likelihood ratio test to choose between the Pooled effect model and the fixed effects model as how in table 1 above. The fixed effects model is better than pooled effect that the results of the likelihood ratio test were significant (p-value< 0.0000 for the two models. This result means that we reject the Pooled effect model and choose the fixed effects model for this study. To make a choice between the fixed effects model and the random effects model, we utilized the Hausman test as shown in the table above. The hypotheses of the test are as follows:

The fixed effects model is more appropriate than the random effects model. As the result found that the results of this test were significant. Hence, we reject the null hypothesis and conclude that the fixed effects model is the most appropriate of the three models.

Table 2: Regression Results

Model I: $SMR = \beta_0 + \beta_1 DER + \beta_2 MS + \beta_3 EY + \beta_4 TA + \mu$ Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DER	-0.431333	0.196606	-3.159371	0.0036
MS	0.562643	0.332211	2.693631	0.0027
EY	0.646850	0.645710	2.001764	0.0083
TA	0.517922	0.199983	3.589660	0.0064
C	3.080554	5.295812	2.581696	0.0018
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.771967	Mean dependent var		8.840000
Adjusted R-squared	0.740635	S.D. dependent var		15.14409
S.E. of regression	7.712568	Akaike info criterion		7.041475
Sum squared resid	7792.366	Schwarz criterion		7.422822
g likelihood	-509.1106	Hannan-Quinn criter.		7.196404
F-statistic	24.63774	Durbin-Watson stat		0.900415
Prob(F-statistic)	0.000000			

Model I: $SMR = \beta_0 + \beta_1 DER + \beta_2 MS + \beta_3 EY + \beta_4 TA + \mu$ Random Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DER	0.000360	0.193989	0.001858	0.9985
MS	0.556890	0.330383	1.685591	0.0940
EY	0.640537	0.639247	1.002018	0.3180
TA	0.074334	0.196770	0.377771	0.7062
C	2.831749	6.418567	0.441181	0.6597

	Effects Specification			
			S.D.	Rho
Cross-section random			14.23186	0.7730
Idiosyncratic random			7.712568	0.2270
	Weighted Statistics			
R-squared	0.027044	Mean dependent var		1.493153
Adjusted R-squared	0.000204	S.D. dependent var		7.681398
S.E. of regression	7.680613	Sum squared resid		8553.814
F-statistic	1.007611	Durbin-Watson stat		0.800958
Prob(F-statistic)	0.405640			
	Unweighted Statistics			
R-squared	-0.004586	Mean dependent var		8.840000
Sum squared resid	34328.89	Durbin-Watson stat		0.215006

Table 3: Regression Results

Model II: $SMR = \beta_0 + \beta_1 BVE + \beta_2 DY + \beta_3 EV + \beta_4 EPS + \mu$ Fixed Effect Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BVE	0.069439	0.078318	0.886638	0.3769
DY	-3.037969	0.133258	-3.284928	0.0062
EV	-3.068869	0.079820	-4.862802	0.0098
EPS	0.108208	0.258839	0.418053	0.6766
C	12.46775	2.108777	5.912311	0.0000
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.728721	Mean dependent var		13.56399
Adjusted R-squared	0.507147	S.D. dependent var		3.082479
S.E. of regression	3.071445	Akaike info criterion		5.201530
Sum squared resid	1216.957	Schwarz criterion		5.586307
Log likelihood	-365.9132	Hannan-Quinn criter.		5.357864
F-statistic	3.058785	Durbin-Watson stat		2.141696
Prob(F-statistic)	0.001021			

Model II: $SMR = \beta_0 + \beta_1 BVE + \beta_2 DY + \beta_3 EV + \beta_4 EPS + \mu$ Random Effect Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BVE	0.074665	0.062911	1.186837	0.2373
DY	-0.046489	0.120103	-0.387079	0.6993
EV	-0.029694	0.062392	-0.475922	0.6349
EPS	0.041612	0.218677	0.190290	0.8494
C	12.29426	1.895581	6.485745	0.0000
	Effects Specification			
			S.D.	Rho
Cross-section random			0.716391	0.0516

Idiosyncratic random		3.071445	0.9484
	Weighted Statistics		
R-squared	0.014281	Mean dependent var	10.93945
Adjusted R-squared	-0.013292	S.D. dependent var	3.016819
S.E. of regression	3.037990	Sum squared resid	1319.802
F-statistic	0.517935	Durbin-Watson stat	1.973491
Prob(F-statistic)	0.722667		
	Unweighted Statistics		
R-squared	0.016505	Mean dependent var	13.56399
Sum squared resid	1373.693	Durbin-Watson stat	1.895393

Source: E-View 9.0

Discussion of Findings

From table 2 the study found that 74 percent changes in stock market return of the quoted firms were explained by variation in the independent variables, the mode was statistically significant when evaluated using f-probability. The Durbin Watson proved the absence of serial autocorrelation. The study found that debt equity ratio has negative effect on stock market return while market size, earnings yield and trading activities have positive effect on stock market return. From table 3 the study found that 50.7 percent changes in stock market return of the quoted firms were explained by variation in the independent variables, the mode was statistically significant when evaluated using f-probability. The Durbin Watson proved the absence of serial autocorrelation. The study found that dividend yield and earnings volatility has negative effect on stock market return while book to equity value and earnings per share have positive effect on stock market return. We expected a positive relationship between the variables which implies that the positive relationship between the variables confirm the expectations of the results and in support of the theory and other assets pricing theories such as arbitrage pricing theory. Empirically, the findings are in line with other studies such as Cai, Chen, Hong and Jiang (2018) whose study found ample evidence of the existence of leverage effect. Sungh and Kishor (2016) used EGARCH to analyse stock returns volatility effect on BRIC (Brazil, Russia, India, and China) markets and recorded a significant difference in the stock return volatility across the markets, Anusakumar, Ali and Woori (2015) that specific stock sentiment may have a greater influence on returns than market specific sentiment, Aziz and Ansari (2019), Lucey (2014) used GJR-GARCH and OLS to study the asymmetric linkages among the fear index and emerging volatility indices and found a strong relationship between fear index and emerging market returns volatility in China and Brazil. Najand (2012), Ricardo (2010), Najand (2012), Egert and Koubaa (2014) that the GJR-GARCH model is preferred to the alternate standard GARCH (1,1) model in both cases. Alagidede and Panagiotidis (2016) Frimpong and Oteng-Abaiye (2016) that long memory was detected in the series and high persistence of the parameters of GARCH (1, 1) whose sum was very close to unity. This must have informed the choice of selecting the fractional integrated GARCH (FIGARCH) model as the most appropriate representation.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The Fama-French five-factor model together with an extension that includes the di↵erence between actual and expected short-term rates was analysed. The Fama-French five-factor is shown to be a good asset pricing model for the Nigerian stock market, with being able to explain circa 74 and 51percent of the variation of stock returns and having positive intercepts. The study found that debt equity ratio has negative effect on stock market return while market size, earnings yield and trading activities have positive effect on stock market return. The study further found that dividend yield and earnings volatility has negative effect on stock market return while book to equity value and earnings per share have positive effect on stock market return.

Recommendations

i. Based on the findings of the study it is recommends that government and policy makers should design and implement more stringent rule where firms will be compelled and monitored on providing high quality financial reporting, so as to be reporting earnings that reflect their actual performance.
ii. Prospective investors should not only focus on huge returns for investing in smaller capitalized or high levered firms; rather, further analysis need to be carried out to tradeoff between risk and returns.
iii. The government should fine turned the stock market policy and institute a consistent policy plan to mobilize surplus funds from abroad, which would be injected into the capital market for significant development.
iv. The government and the securities exchange commission (SEC) should create a special fund called “stabilization securities fund” to stabilize the market in the presence of external shocks. This to make the market attractive to proposed, existing and foreign investors.

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