Testing The Three Factor Model Of Fama And French: Evidence From An Emerging Market

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Abstract

This study tested the three factor model of Fama and French (1993) using the Nairobi Securities Exchange (NSE) data using excess returns of six portfolios sorted by size and Book-to-Market Equity for the three factor model and size and trade concentration ratio for the augmented model. The study used daily stock prices for the period July 2004 to June 2014. Our results show that the predictions of the three factor model hold on NSE especially when the model is adjusted for thin trading. However, the premium is not statistically significant. Further, firms with high trade concentration posted higher returns than firms with low trade concentration during the study period.

Keywords: Fama and French, asset pricing, book-to-market ratio, excess return

Introduction

The foundation of asset pricing theory can be traced back to Harry Markowitz (1952) model of portfolio choice. The model describes how a rational investor attains the best possible portfolio of assets given the risk return trade off. According to Fama and French (2004), two more assumptions were added to the Markowitz model by William Sharpe in 1964 and John Linter in 1965 to come up with the Capital Asset Pricing Model (CAPM).

The Capital Asset Pricing Model predicts that average return and risk of an asset are linearly related and that the expected return of a security can entirely be explained by beta (Fama and French, 1992). Early empirical test by Black et al, 1972 and Fama and MacBeth, 1973 supported these predictions. Fama and French (2004) posit that the popularity of CAPM among academics and practitioners stemmed from these early empirical triumphs.

There is substantial literature on asset pricing especially with the applications of the Capital Asset Pricing Model. The empirical literature on CAPM is diverse in nature. Some studies contradict the model while others confirm the predictions of the model. For example the assumption of risk free borrowing and lending is relaxed by Black (1972) and he comes up with the Black CAPM. Merton (1973) extends CAPM to cater for multi period aspect of the financial markets. Breeden (1979) comes up with a consumption based CAPM.

Fama and French are among prominent scholars who have produced studies contradicting, and even extending the CAPM. For instance, Fama and French (1992) noted that CAPM is violated for the US stock market. They further observed that the variations in expected stock returns could sufficiently be explained by a combination of size and the ratio of book equity to market equity. They extended CAPM by incorporating these two factors to come up with a model comprising of three factors. These three factors are; market, size and the ratio of book equity to market equity. This model is commonly referred to as the Fama and French (1993) three factors model.

For over half a century, financial economists have grasped with the factors that determine stock returns. This has yielded several models for pricing assets. However, these models were developed for advanced markets such as the US stock market. It is probable that these models may not hold in markets classified as emerging such as Kenya. An emerging market has unique characteristics like lower market liquidity, inexperienced market participants', shorter history, domination by institutional investors especially commercial banks and concentration of trade in a few stocks.

In particular, the concentration of trade in a few stocks and liquidity pose a lot of concern to the market regulator in Kenya. According to the Kenya Financial Sector Stability report (2014), the total volume of the top 5 traded counters at the NSE in any one month averaged 70% for the period June 2009 to June 2014. Further, eight (8) out of fifty nine (59) listed and actively trading firms accounted for 70 percent of market capitalization. The empirical studies under such market concentration can at best be described as scant. Further, the few studies on NSE such as Coffie and Chukwulobelu (2013) and Riro and Wambugu (2015) report contradicting results though they examine the same model; the three factor model.

These inconsistencies have been termed market “anomalies” since they violate CAPM’s predictions (Fama and French, 1996). There are various other unexplained patterns that have been observed in empirical studies of CAPM. For example Basu (1977, 1983) observed a positive relationship between expected returns and earnings to price ratio, Banz (1981) noted that small firms have higher returns relative to big firms, Bhandari (1988) finds the relation between debt levels and stock returns to be positive while Chan, Hamao and Lakonishok (1991) observe that the ratio of book equity to market equity can explain stock returns in Japanese market an observation that is later confirmed by Fama and French (1992) in American markets.

Fama and French (2004) contend that market proxies used in applications of CAPM are the same ones used in empirical tests. Therefore, if contradictions are observed in empirical test, it is certain they will be reflected in poor estimates of average returns in applications. They conclude that if a market proxy is unacceptable in empirical tests of CAPM, then it implies that the application of the model is invalid. This study therefore provides an empirical test of value and size effect in an emerging equity market. Consistent with the research problem, this study sought to answers the following research question: Does the three factor model of Fama and French explain the variation in average returns of stocks on the Nairobi Securities Exchange?

The aim of this paper was to investigate the validity of the three factor model of Fama and French in an emerging market for the period 2004 to 2014. Specifically, the study sought to:

✓ Investigate the presence of size and value effect on the Nairobi Securities Exchange.

✓ Evaluate the explanatory power of the market portfolio in stock returns.

✓ Investigate whether trade concentration is priced.

This study makes three main contributions to the existing literature and policy. First, evidence on stock market volatility in Kenya is scant. The models in asset pricing such as the one examined in this study, are mainly developed using data from highly efficient stock markets like NYSE, AMEX and NASDAQ. This model may not perform well in emerging markets such as Kenya with traits of illiquidity and concentration. It is therefore important that studies examining this model should contrast it to augmented models that capture these unique traits of the market. Scholars such as Bundoo (2011) and Hearn (2009) justify this approach by incorporating in their studies time varying beta and liquidity factor respectively.

Second, this study took a different approach from previous studies on NSE in two ways. First, the study contrasted the three factor model with an augmented model. Previous studies such as Riro and Wambugu, (2015), attempted to capture the unique market characteristics such as liquidity and concentration. Although Hearn (2009) captured liquidity, the skewed nature of trading in the Kenyan market may not be accurately captured by estimates of overall market liquidity employed in the study. Second, majority of asset pricing test on NSE such as Coffie and Chukwulobelu (2013), Riro and

Wambugu (2015) ignore the effect of thin trading. This study endeavoured to explain effects of thin trading on estimates of the model.

The study further constructed and tested a concentration factor to capture the effect of high volume of trade on the returns of the top counters. This inquiry was informed by the empirical evidence of the presence of return premium attributable to high volumes in markets as observed by Gervais, et al, (2001). This factor is significantly different from Hearn (2009) liquidity factor. Whereas Hearn examined aggregate market liquidity and emphasized on trading speed, this factor estimated the effect of concentration of trade in a few stocks. It was therefore expected that volume return premium was different from overall market liquidity.

Third, the study findings are important to Capital Market Authority as the regulator of the industry particularly if we establish existence of a relation between average stock returns and trade concentration. The study also provides investors with the best technique to appraise performance of fund managers in Kenya. Finally, the study reinforces the pervasiveness of size and value effect in stock returns.

Methodology

Theoretical framework

The conceptual framework for the study is based on the assumption that the relation between risk and return is linear. Further, risk is assumed to be measurable and multidimensional in nature. There are a number of enabling assumptions that hold the risk return relationship. For example, the assumption of risk aversion and utility maximization among investors. The implication is that investors will require a higher return if they perceive an investment as risky.

The risk return relation described here is expressed as follows;

$$R_i = X_i\beta_i$$

Where; $R_i$is asset *i's* return, $X_i$is a set of variables that capture risk and $\beta_i$is a measure of the sensitivity of return to risks.This study assumes that risk in a stock's return is captured by three factors, i=3. These factors are the market, size and value premiums. The general model above can be expressed in a specific form as;

$$E\left(R_i - R_{ft}\right) = \beta_{im}\left(R_{mt} - R_{ft}\right) + \beta_{is}(SMB_t) + \beta_{ic}(HML_t)$$

Where:

R_f: risk free return approximated by treasury bill rate.

(R_i–R_f)- Asset or portfolio i's return in excess of the risk free return.

(R_{Mt}- R_{ft})- Market premium; market's return in excess of risk free return.

(SMB_t): Size premium; the disparity in return between portfolios of small firms stocks and big firms stocks.(HML_t): Value premium; the difference in returns between portfolios comprising of stocks with high values of book equity to market equity ratios and portfolios of low book equity to market equity ratios.The betas (β) are factor loadings that measure the sensitivity of asset or portfolio excess returns to changes in returns factors.

The concentration of trading activities in stocks of a few companies is another factor that has been observed to proxy for risk in stock returns. Consistent with Hearn (2009), we can derive an augmented three factor model from the general form and express it as follows;

$$E(R_{it} - R_{ft}) = \beta_{im}(R_{mt} - R_{ft}) + \beta_{is}(SMB_t) + (CONC_t)$$

Where a new variable $CONC_t$ is introduced in place of value premium to capture the concentration of stock market trading in a few stocks.

Empirical model

The main objective of the study was to empirically test the validity of the three factors model of Fama and French using equity data from the Nairobi Securities Exchange. In order to carry out a comprehensive test of the model, three empirical models were examined. These were; the standard three factors model, three factors model adjusted for thin trading and an augmented three factor model.

The standard three factor model is empirically expressed as;

$$E(R_{it} - R_{ft}) = \alpha_i + \beta_{im}(R_{mt} - R_{ft}) + \beta_{is}(SMB_t) + \beta_{ic}(HML_t) + \varepsilon_t$$

Where;

R_f: risk free return approximated by treasury bill rate.

(R_i–R_f)- Asset or portfolio i's return in excess of the risk free return.

(R_{Mt}- R_{ft})-Market premium; market's return in excess of risk freereturn.

(SMB): Size premium; the disparity in return between portfolios of small firms stocks and big firms stocks.

(HML): Value premium; the difference in returns between portfolios comprising of stocks with high values of book equity to market equity ratios and portfolios of low book equity to market equity ratios.

α_i and $\varepsilon_t$are the regression intercept and residual variable respectively.

The second model is the three factor model adjusted for thin trading. The model is adjusted for thin trading following Dimson and Marsh (1981) observation that thin trading impacts coefficient estimates. The model is empirically given as below;

$$\frac{\left(R_{it} - R_f\right)}{\sqrt{D_{it}}} = \frac{\alpha_{it}}{\sqrt{D_{it}}} + \beta_{im}\left(\frac{R_{mt-R_{ft}}}{\sqrt{D_{it}}}\right) + \beta_{is}\left(\frac{SMB_t}{\sqrt{D_{it}}}\right) + \beta_{ih}\left(\frac{HML_t}{\sqrt{D_{it}}}\right) + \varepsilon_t$$

Where: D_{it} −is the average number of days a portfolio recorded zero trades in a month.

The third model is the augmented three factor model which is empirically expressed as;

$$E\left(R_{it} - R_{ft}\right) = \alpha_i + \beta_{im}\left(R_{mt} - R_{ft}\right) + \beta_{is}(SMB_t) + \beta_{ic}(CONC_t) + \varepsilon_t$$

Where the variable $CONC_t$ captures the concentration of trade in a few stocks.

Definition and measurement of variables

The determination of variables is based on asset pricing theory and literature review. The common practice in literature is to study the risk-return relation using portfolios. We adopt a similar approach by basing our portfolio composition on variables of interest like beta, firm sizes, ratios of book equity to market equity as well as trade concentration. Portfolios reduce measurement errors and reflect actual investors conduct (Gibbon, et al, 1989). Consistent with previous literature, this study used portfolios.

Dependent variables

We form six portfolios based on the size and ratios of book equity to market equity. Likewise, six portfolios are also formed on the basis of size and trade concentration. The excess returns from these portfolios are our dependent variables.

Firm size (ME) is defined as the market price of a firms stock multiplied by outstanding shares. We use the last traded price of the stock as at June of the current year say t to estimate size of the firm.

The ratio of book equity to market equity has two parts; the first part of the ratio called book equity is the sum of the value of common equity, deferred taxes and tax credit from investment less the value of preferred stocks. Book Equity (BE) is estimated as at the end of a firm's fiscal year in the preceding calendar year denoted as t-1. Market equity (ME) is approximated by the product of the stock price and shares outstanding as at the last trading day of December of the prior year denoted t-1.

Concentration factor is defined as the quotient resulting from the division of a stocks turnover in a particular month and total volume traded for the portfolio in which the stock is classified. The concentration ratio is measured as at the last trading day of the month.

We use size of the firm and the ratio of book equity to market equity to rank firms with the median firm being the breakpoint. The ranking is done in June of each year under consideration.

All firms that are less than the median firm are categorized as small firms while big firms are considered as those with a higher value than the median firm. Further, an independent ranking of firms based on their values of book to market equity ratios is done. We form three classifications with the upper cluster comprising of 30%, median cluster accounts for 40% and the lower cluster contains the last 30% of the firms.

We create six portfolios based on intersection of firm size and book to market equity. In the standard three factors model, the resulting portfolios are examined over the next 12 months when they are reconstituted. Firms are also ranked independently on trade concentration ratio and divided into three groups; the upper set consists of 30%, the median set 40% and the lower set accounts for 30% of firms. In the augmented three factor model, the size sorts are static for a year when they are reconstituted while concentration sorts are done on monthly basis.

Our portfolio formation procedure for both the standard and augmented model can be summarized as follows;

i. Portfolio S/L or $CONC_l$ is composed of small firms that are also classified as having low values of BE/ME or low trade concentration.

ii. Portfolio S/M or $CONC_m$ is comprised of small firms that are equally considered as having median values of BE/ME or median trade concentration.

iii. Portfolio S/H or $CONC_h$ is constituted of small firms that are also grouped as having high values of BE/ME or high trade concentration.

iv. Portfolio B/L or $CONC_l$ is made of big firms that equally have low values of BE/ME or low trade concentration.

v. Portfolio B/M or $CONC_m$ is incorporated of big firms that have median values of BE/ME or median trade concentration.

vi. Portfolio B/H or $CONC_h$ is comprised of big firms with high values of BE/ME or high trade concentration.

The return on a portfolio is computed as log returns as follows;

$$R_i = \ln(P_t + D_t) - \ln(P_{t-1})$$

Where; P_t is the portfolio's value weighted price on the last trading day of the month while P_{t-1} is the portfolio's value weighted price on the first day of trading in a given month.

D_t is the dividend paid between time *t-1* and *t.*

The excess portfolio return is therefore given as the return above the return of treasury bill which is commonly used to approximate the risk free return.

Excess return is given by the following expression;

$$\gamma_{it} = R_{it} - R_{ft}$$

Where;

γ_{it} is portfolio *i*'s excess return at time *t.*

$R_{it}$is portfolio i's monthly return in time *t*.
$R_{ft}$is return on risk free instrument at time *t*.

Independent variables

These are variables that proxy for stock return risks according to asset pricing theory and the literature review. The independent variables in our standard models are three. The variables are constructed using similar procedure as described under the dependent variable.

The market premium

This is taken as surplus of monthly return of NSE-all share index relative to risk free return proxied by monthly return of a one year treasury bill. The use of the NSE all share Index as opposed to NSE 20 share index is guided by the study's use of all companies listed on the stock market. The market premium is expressed as;

$$\gamma_{mt} = \left(R_{mt} - R_{ft}\right).$$

The market return is measured as: $R_{mt} = \ln(NSEA_t) - \ln(NSEA_{t-1})$

Where; γ_{mt}market premium.
$NSEA_t$ is the NSE all share Index at the last day of trade in a given month.
$NSEA_{t-1}$is the NSE all share Index at the first day of trading in a given month.
$R_{ft}$is return considered to be risk free and is approximated by monthly return of a one year treasury bill.

Size premium

It is the average return of portfolios of small firms minus the average return from the portfolios of big firms. It is obtained by the undernoted formula;

$$SMB_t = \left(\frac{(S/L) + (S/M) + \ (S/H)}{3}\right) - \left(\frac{(B/L) + (B/M) + \ (B/H)}{3}\right)$$

Portfolio returns are measured using log returns as follows;

$$R_{it} = \ln(P_t + D_t) - \ln(P_{t-1})$$

Where;
$R_{it}$is the return of portfolio i at time t. i = $(S/L), (S/M), (S/H), (B/L), (B/M) and (B/H)$.
$P_t$is the value weighted price of the portfolio at the last day of trading in a given month.
$P_{t-1}$is the portfolio's value weighted price on the first trading day in a given month.
$D_t$is the dividend paid between time t and t-1.

Value premium

This is obtained by subtracting the portfolios return of firms with low value of book equity to market equity from the return of portfolios having high values of the ratio of book equity to market equity. The variable is given by the following formula;

$$HML_t = \left(\frac{(S/H) + (B/H)}{2}\right) - \left(\frac{(S/L) + (B/L)}{2}\right)$$

The return of the portfolios is measured using log returns as follows;

$$R_{it} = \ln(P_t + D_t) - \ln(P_{t-1})$$

Where;

$R_{it}$is the return of portfolio *i* at time *t. i* = $(S/H), (B/H), (S/L), (B/L)$.
$P_t$is value weighted price of the portfolio at the last day of trading in a given month.
$P_{t-1}$is the portfolio's value weighted price on the first trading day in a given month.
$D_t$is the dividend paid between time *t* and *t-1*.

Concentration premium

It is the monthly difference in portfolio returns between firms with high trade concentration and those with low trade concentration. The variable is denoted as $CONC_t$ and expressed as follows;

$$CONC_t = \left(\frac{(S/CONC_h) + (B/CONC_h)}{2}\right) - \left(\frac{(S/CONC_l) + (B/CONC_l)}{2}\right)$$

The return of the portfolios is measured using log returns as follows;

$$R_{it} = \ln(P_t + D_t) - \ln(P_{t-1})$$

Where;

$R_{it}$is the return of portfolio *i* at time *t. i* = $(S/CONC_h), (B/CONC_h), (S/CONC_l), (B/CONC_l)$.
$P_t$is the portfolio's value weighted price on the last trading day in a given month.
$P_{t-1}$is the portfolio's value weighted price on the first trading day in a given month.
$D_t$is the dividend paid between time *t* and *t-1*.

Sources of data

The study used daily stock prices for all companies listed under the main market segment of Nairobi Securities Exchange. The data was obtained from the Nairobi Securities Exchange (NSE) daily trading reports for the period 2004 to 2014.The stock prices were used to construct market related variables such as firm size and returns. The accounting data was obtained from company financial reports through companies' websites, the capital markets authority and the NSE handbooks. The multiple sources for accounting data were based on the observation that most companies did not avail more than five years of financial statements on their websites. We also computed values for the all share index in the period 2004 to 2007 since the index was introduced in 2008. It is worth noting that the period of study coincides with the period of stock market and macroeconomic stabilization in Kenya as shown by Nyasha and Odhiambo (2014).

Econometric approach

The empirical models were estimated using the Ordinary Least Square approach for the portfolios that met the assumptions of the OLS estimation technique. Heteroscedasticity robust regression was used for portfolios that violated the homoscedasticity assumption. In addition, the Generalized Least Square (GLS) was used to estimate portfolios that exhibited autocorrelation. The excess returns were regressed on market, size and value premia and concentration premium in the case of the augmented model. The general form of the empirical model that was estimated can be given as;

$$\gamma_{it} = \alpha_i + X_{it}\beta_{it} + \varepsilon_t$$

Where γ_{it} is the excess return of the portfolios under examination, $X_{it}$is a set of independent variables in the model, α_i and β_{it} are parameters to be estimated while ε_t is the residual variable. The linear function of asset pricing models infers that the model's intercept is equal to zero, that is α_i=0. The implication is that in a properly specified model the intercept should not be significantly different from zero (Gibbons, et at, 1989).

We used the Ordinary Least Square (OLS) technique in estimation. This technique is highly dependent on the underlying assumptions. In order to carry out valid estimation, various tests were conducted to ascertain that the OLS assumptions were not violated. The tests were grouped into pre-estimation and post estimation tests.

Stationarity test

We used the Augmented Dickey Fuller commonly referred to as ADF test to examine the stationarity of our data. This was to avoid spurious regressions and to ensure that test of significance of coefficients were valid. Non-stationarity affects the distribution of test statistic consequently impacting hypothesis testing. The OLS technique is based on several assumptions. When these assumptions are violated, the validity of the coefficient estimates obtained from the technique is highly questionable. We therefore sought to test for the following assumptions that affect inference;

Heteroscedasticity test

When the variance of errors is not constant as the OLS assumes, the coefficient estimates will not be both unbiased and consistent. Heteroscedasticity affects inference through standard errors. The variance of the error is not minimum in presence of heteroscedasticity. This study used the White's general test to examine the presence of heteroscedasticity. The White's general test was preferred because it is superior to competing test since it makes few assumptions about the likely form of heteroscedasticity (Brooks, 2008).

Autocorrelation test

The OLS technique assumes that the covariance between the errors is uncorrelated with one another. When this assumption is violated, the OLS coefficient estimates are unbiased but inefficient. This affects standard error estimates and there is a tendency of rejecting the null when it is actually correct. We employed the Breusch-Godfrey test to test for autocorrelation. We adopted this test because it can test higher order autocorrelation.

The t-test and the F-test

This test was used to determine significance of the coefficient estimates. They provided a measure of the accuracy of the significance of independent variable's impact on dependent variable. Individual impact of independent variables was examined using t-tests. On the other hand, collective significance of the impact of independent variables was tested using the F-test.

Empirical findings

The standard three factor model

Univariate Analysis

Table 3.1 presents return characteristics of all the variables of the standard three factor model. This includes the mean, standard deviation, maximum and minimum returns.

Table 3. 1 Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
y (Portfolio S/L)	0.0211	0.1345	-0.2950	0.6999
y (Portfolio S/M)	-0.0129	0.1389	-0.9078	0.2132
y (Portfolio S/H)	0.0095	0.0837	-0.4250	0.1688
y (Portfolio B/L)	0.0018	0.1078	-0.6796	0.1852
y (Portfolio B/M)	0.0005	0.1213	-0.5642	0.3959
y (Portfolio B/H)	0.0033	0.1064	-0.7279	0.2695
x_1 (Market premium)	-0.0151	0.0914	-0.6009	0.2700
x_2 (SMB)	-0.0163	0.3284	-2.0776	0.8359
x_3 (HML)	-0.0024	0.2289	-0.9000	0.9506

The highest portfolio return under the standard three factor model is 2.11% per month while the lowest return is -1.2%. Average excess portfolio returns are positive with the exception of portfolio S/M. On the other hand, the average risk premiums for the three factors are all negative and lie between -0.0163 and -0.0024. The excess portfolio returns and the risk premiums are associated with high standard deviations in the range of 8.4% to 13.9% and 9.1% to 32.8% for the excess returns and risk premiums respectively.

Table 3.2 Correlation matrix

	Y	x_1(Market Premium)	X_2 (SMB)	x_3(HML)
y	1.0000			
x_1 (Market premium)	0.5553	1.0000		
x_2 (SMB)	-0.2275	0.1030	1.0000	
x_3(HML)	0.3721	0.0109	-0.5842	1.0000

Table 3.2 shows the absence of a perfect linear relationship in the variables. The correlation coefficients lie between -0.5842 and 0.5553. We can therefore conclude that there is no multicollinearity among the variables since none of the coefficients is above 0.8 (Gujarati, 2004).

The Three Factor Model Adjusted for Thin Trading

Univariate Analysis

The return characteristics after adjusting the three factors model for thin trading is presented in Table 3.3. This captures the mean, standard deviation, maximum and minimum returns.

Table 3. 3 Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
y (Portfolio S/L)	0.0080	0.1183	-0.6184	0.5233
y (Portfolio S/M)	-0.0161	0.1719	-1.6546	0.2304
y (Portfolio S/H)	0.0044	0.0919	-0.7493	0.1810
y (Portfolio B/L)	-0.0010	0.1236	-0.8678	0.4293
y (Portfolio B/M)	-0.0003	0.0846	-0.3431	0.2553
y (Portfolio B/H)	0.0036	0.0746	-0.3836	0.1794
x_1 (Market premium)	-0.0090	0.0840	-0.3208	0.5662
x_2 (SMB)	-0.0326	0.3141	-2.1570	0.5272
x_3 (HML)	0.0165	0.2403	-0.5502	2.0041

When the three factor model is adjusted for thin trading, the highest portfolio return declines from 2.11% per month to 1.65% per month. We also note a change in the lowest excess returns from -1.65% per month to -0.03% per month. Further, adjusting for thin trading results in negative return for half of the portfolios. Only one risk factors is observed to have a positive risk premium after adjusting for thin trading. The risk premiums lie between -0.0326 and 0.0165. The standard deviation of excess returns range between 7.46% and 17.19% while the standard deviation of the risk premiums lie between 8.4% and 31.41%.

Table 3. 4 Correlation matrix

	y	x1market premium	x2 (SMB)	x3(HML)
Y	1.0000			
x1market premium	-0.0315	1.0000		
x2 (SMB)	0.2635	0.2403	1.0000	
x3(HML)	-0.3980	-0.1284	-0.6346	1.0000

None of the variables after adjusting for thin trading has a perfect linear relationship with another variable as shown by Table 3.4. The correlation coefficients lie between -0.6346 and 0.2635 when the three factor model is adjusted for thin trading. Similarly, we observe that there is no multicollinearity among the variables.

Augmented three factor model

Univariate Analysis

The return characteristics of the augmented model, mainly the mean, standard deviation, minimum and maximum returns are presented in Table 3.5.

Table 3.5 Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
y (Portfolio S/ CONCL)	-0.0052	0.0925	-0.7418	0.1503
y (Portfolio S/CONCM)	0.0073	0.0906	-0.4425	0.3160
y (Portfolio S/CONCH)	-0.0124	0.1653	-1.4750	0.2397
y (Portfolio B/CONCL)	0.0071	0.0722	-0.3281	0.3717
y (Portfolio B/CONCM)	-0.0068	0.1009	-0.6104	0.2000
y (Portfolio B/CONCH)	-0.0178	0.1827	-0.9419	0.3165
x_1 (Market premium)	-0.0151	0.0914	-0.6009	0.2701
x_2 (SMB)	0.0052	0.2769	-1.3927	1.1607
x_3 (CONC)	-0.0189	0.2622	-1.4922	0.5451

The highest monthly excess return under the augmented model is 0.73% per month while the lowest excess return is -1.78% per month. Only two portfolios record a positive excess return during the study period. The risk premium for SMB factor is positive while the market and CONC premiums are negative. The risk premium lie between -0.0189 and 0.0052. Further, the standard deviations of the portfolio returns range between 7.22% and 18.27% while the standard deviations for the risk factors lie between 9.14% and 27.69%.

Table 3. 6 Correlation matrix

	y	**x1market premium**	**x2(SMB)**	**x3(CONC)**
Y	1.0000			
x1market premium	0.1604	1.0000		
x2(SMB)	0.3026	0.0279	1.0000	
x3(CONC)	-0.2038	0.4016	-0.0392	1.0000

The correlation coefficients for the augmented model show no presence of perfect linear relationships among the study variables as shown in Table 3.6. The coefficients lie between -0.2038 and 0.4016. We noted that among the models examined, the augmented three factors model has the lowest correlation among variables.

The preceding univariate analysis indicates that the risk premiums have higher volatility than the excess returns. This is evident in the values of standard deviations where the standard deviations of risk premiums are consistently higher than those of the excess returns. The volatility of excess returns is notably high. However, this is expected of an emerging market such as Kenya. The findings are consistent with Harvey (1995) who observed standard deviation in the range of 18% to 105% in the emerging markets of Jordan and Argentina respectively. The absence of multicollinearity shown in the correlation matrices imply that we can carry out a valid investigation of the influence of independent variables on dependent variables.

Unit root test

The Ordinary Least Square (OLS) estimation technique used in this study is based on the premise of stationarity over time for the time series under investigation. Stationarity of a time series implies that its mean and variance does not change over time or they are constant. Such a series is mean reverting, implying that in case of any shocks, the series is expected to return to its mean. The fluctuations occur around the mean and are expected to be constant (Gujarati, 2004). OLS cannot be applied to a non-stationary series since it will yield meaningless estimates; this is commonly called spurious regression. Another implication of non-stationary series is that the results obtained will be time specific; meaning that no inference can be made based on the estimation of the non-stationary series. Estimates that cannot be used for inference are of no economic importance.

The Augmented Dickey Fuller or ADF test was therefore employed in testing for unit root in variables under study. The test's null hypothesis of existence of unit root in the variables is run against the hypothesis of variables not having a unit root. The test was applied to level variables and results reported in Table 3.7.

Table 3. 7 Augmented Dickey Fuller tests for unit root

Unit root test results for the standard three factor model					
Variable	At Levels With Intercept and Trend		At First Difference with Intercept and Trend		Order of Integration
	ADF Test Statistic	Critical values at 5%	ADF Test Statistic	Critical values at5%	
y	-9.836	-3.447	-	-	I (0)
x1 (Market premium)	-12.300	-3.447	-	-	I (0)
x2 (SMB)	-11.680	-3.447	-	-	I (0)
x3(HML)	-9.439	-3.447	-	-	I (0)
Unit root test results for the three factor model adjusted for thin trading					
Variable	At Levels With Intercept and Trend		At First Difference with Intercept and Trend		Order of Integration
	ADF Test Statistic	Critical values at 5%	ADF Test Statistic	Critical values at5%	
y	-8.740	-3.447	-	-	I (0)
x1 (Market premium)	-15.021	-3.447	-	-	I (0)
x2 (SMB)	-10.988	-3.447	-	-	I (0)
x3(HML)	-9.782	-3.447	-	-	I (0)
Unit root test results for the augmented three factor model					
Variable	At Levels With Intercept and Trend		At First Difference with Intercept and Trend		Order of Integration
	ADF Test Statistic	Critical values at 5%	ADF Test Statistic	Critical values at5%	
y	-10.394	-3.447	-	-	I (0)
x1 (Market premium)	-12.300	-3.447	-	-	I (0)
x2 (SMB)	-12.964	-3.447	-	-	I (0)
x3(HML)	-10.545	-3.447	-	-	I (0)

The null hypothesis for all the level variables is rejected at the5% significance level. Our results suggest that all the variables are stationary at the levels. Simply put they are all mean-reverting. We can therefore carry out valid estimations using OLS.

The model of Fama and French predicts positive relation between small firms' return and SMB factor while the big firms' return is expected to be negatively related to the SMB factor. Similarly, the book to market equity and risk factor HML is postulated to be positive with the reverse also being true. The model further predicts excess return of assets and the market portfolio to be positive. We summarize the estimation results for the standard three factor model in Table 3.8

Table 3. 8 Regression with Newey-West standard errors

Portfolio S/L					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	-0.1279	-0.49	0.626	-0.6464	0.3907
x2smb	0.0160	0.57	0.570	-0.0396	0.0716
x3hml	-0.1884	-3.20	0.002	-0.3053	-0.0716
Constant	0.0105	1.05	0.298	-0.0094	0.0305
Number of observations=120			F(3,116) = 3.90		
R-squared= 0.1663			Adjusted R-squared = 0.1448		
Portfolio S/M					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.4269	3.45	0.001	0.1817	0.6721
x2smb	-0.0433	-0.56	0.575	-0.1957	0.1092
x3hml	-0.5290	-2.76	0.007	-0.9091	-0.1489
Constant	-0.0049	-0.51	0.609	-0.0238	0.0140
Number of observations=120			F(3,116) = 12.69		
R-squared= 0.5541			Adjusted R-squared = 0.5426		
Portfolio S/H					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.3516	3.15	0.002	0.1305	0.5727
x2smb	0.0450	0.93	0.356	-0.0513	0.1414
x3hml	0.0761	1.31	0.194	-0.0392	0.1913
Constant	0.0078	1.26	0.210	-0.0045	0.0201
Number of observations=120			F(3,116) = 4.72		
R-squared= 0.1350			Adjusted R-squared = 0.1127		
Portfolio B/L					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.7255	3.37	0.001	0.2990	1.1520
x2smb	-0.2216	-3.47	0.001	-0.3480	-0.0952
x3hml	-0.1897	-3.53	0.001	-0.2960	-0.0833
Constant	0.0014	0.14	0.891	-0.0193	0.0222
Number of observations=120			F(3,116) = 6.48		
R-squared= 0.3461			Adjusted R-squared = 0.3292		
Portfolio B/M					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.1779	1.23	0.222	-0.1091	0.4649
x2smb	-0.0424	-2.02	0.046	-0.0841	-0.0008
x3hml	0.0518	0.71	0.476	-0.0918	0.1955
Constant	-0.0009	-0.11	0.915	-0.0182	0.0163
Number of observations=120			F(3,116) = 2.01		
R-squared= 0.0870			Adjusted R-squared = 0.0633		
Portfolio B/H					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.4152	2.65	0.009	0.1048	0.7257
x2smb	-0.0089	-0.21	0.830	-0.0904	0.0727
x3hml	0.0868	2.60	0.011	0.0206	0.1531
Constant	0.0057	0.82	0.414	-0.0081	0.0194
Number of observations=120			F(3,116) = 5.22		
R-squared= 0.2696			Adjusted R-squared = 0.2507		

Our results in Table 3.8 show that a positive and significant relationship exists between high book to market equity firms' returns and risk factor HML. The results further confirm a negative relationship between firms with low values of book equity to market equity and HML factor at 5% level of significance. We also observe that all portfolio returns have positive significant relationship with market premium at the 10% level. However, at 5% level, the positive relationship between the returns of portfolio B/H and market premium becomes insignificant. The relationship between portfolio S/L and SMB is found to be negative and insignificant. This observation contradicts our model's prediction. Although we observe a negative relationship between portfolio B/H and SMB as predicted by the model, the relationship is statistically insignificant at 5% level.

Our estimation outcome shows that value and market premiums are important proxy for risks in expected stock returns on NSE. The finding proves the existence of value premium. The results further show that the market portfolio outperformed the risk free investments during the study period. Our results are consistent with Eraslan (2013) who observed a strong value effect on Istanbul stock market. However, the findings contradict Silvestri and Veltri(2011), who observed that size premium as proxy for risk is a major factor in Italian market while value premium needed further investigation. Their conclusion is the direct opposite of our findings.

We adjusted the three factor model for thin trading and the estimation results are presented in Table 3.9.

Table 3. 9 Regression with Newey-West standard errors

Portfolio S/L					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.3759	4.17	0.000	0.1975	0.5544
x2smb	-0.0001	-0.00	0.999	-0.1221	0.1220
x3hml	-0.2910	-2.96	0.004	-0.4855	-0.0964
Constant	0.0261	2.62	0.010	0.0064	0.0458
Number of observations=120			F(3,116) = 15.23		
R-squared=0.3077			Adjusted R-squared = 0.2898		
Portfolio S/M					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.2732	1.57	0.120	-0.0720	0.6183
x2smb	0.0721	0.72	0.473	-0.1260	0.2701
x3hml	-0.1522	-1.11	0.269	-0.4237	0.1191
Constant	-0.0077	-0.69	0.493	-0.0297	0.0144
Number of observations=120			F(3,116) = 3.12		
R-squared=0.1796			Adjusted R-squared = 0.1583		
Portfolio S/H					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.2004	2.50	0.014	0.04134	.359453
x2smb	0.0600	2.18	0.031	0.0055	.1145378
x3hml	0.1115	2.84	0.005	0.0337	.1892776
Constant	0.01379	1.88	0.063	-0.0008	.0283441
Number of observations=120			F(3,116) = 5.50		
R-squared= 0.1245			Adjusted R-squared = 0.1019		

Portfolio B/L					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.3664	1.81	0.073	-0.0342	0.7670
x2smb	-0.1562	-2.62	0.010	-0.2743	-0.0380
x3hml	-0.1857	-2.34	0.021	-0.3427	-0.0286
Constant	0.0044	0.44	0.664	-0.0154	0.0242
Number of observations=120			F(3,116) = 2.30		
R-squared= 0.2261			Adjusted R-squared = 0.2061		
Portfolio B/M					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.1309	0.56	0.578	-0.3343	0.5962
x2smb	-0.0199	-0.57	0.572	-0.0894	0.0496
x3hml	0.1978	2.26	0.026	0.0241	0.3715
Constant	.0026027	0.22	0.824	-0.0205	0.0257
Number of observations=120			F(3,116) = 2.21		
R-squared= 0.1752			Adjusted R-squared =0.1539		
Portfolio B/H					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1marketpremium	0.6558	5.84	0.000	0.4336	0.8781
x2smb	-0.0353	-0.96	0.340	-0.1082	0.0376
x3hml	0.1405	2.20	0.030	0.0139	0.2672
Constant	0.0130	1.47	0.145	-0.0045	0.0305
Number of observations=120			F(3,116) = 12.89		
R-squared= 0.4500			Adjusted R-squared = 0.4358		

The results of the adjusted model in Table 3.9 show that the relationship between small firms return and SMB factor is positive. Also, the returns of high book to market equity firms had a positive relation to risk factor HML. In addition, the relationship between returns of big firms and risk factor SMB is shown to be negative. Similarly, a negative relationship is observed in returns of low book to market equity firms and risk factors HML. Although the results for the adjusted variables confirm the predictions of the three factor model, only portfolio B/L under the size group and portfolio B/H under the value group had statistically significant relationship with the risk factors at the 5% level. Likewise, the portfolio returns and market premium had positive relationship that was significant at the 5% level with exception of one portfolio. Our results show that thin trading has a significant impact on the risk return relationship of firms listed on NSE.

The study also estimated an augmented three factor model and the results are presented in table 3.10. The augmented model predicts a positive relationship between return of small firms and the risk factor SMB while the returns of big firms are expected to be negatively related to risk factor SMB. We expect a positive relation between returns of high trade concentration firms and risk factor CONC. The relationship between low trade concentration firms and CONC is expected to be negative while returns of all portfolios are predicted to be positively related to the market premium.

Table 3.10 Regression with Newey-West standard errors

Portfolio S/CONCL					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1Marketpremium	0.2775	2.68	0.008	0.07269	0.4822
x2SMB	0.0946	1.89	0.061	-0.0045	0.1936
x3CONC	-0.1068	-2.57	0.011	-0.1890	-0.0245
Constant	-0.0035	-0.43	0.669	-0.0197	0.0127
Number of observations=120			F(3,116) = 4.42		
R-squared= 0.1913			Adjusted R-squared = 0.1704		
Portfolio S/CONCM					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1Marketpremium	0.3159	1.97	0.051	-0.0014	0.6333
x2SMB	0.0806	1.45	0.150	-0.0295	0.1908
x3CONC	-0.0085	-0.10	0.921	-0.1792	0.1622
Constant	0.0115	1.35	0.179	-0.0053	0.0284
Number of observations=120			F(3,116) = 3.80		
R-squared= 0.1613			Adjusted R-squared = 0.1396		
Portfolio S/CONCH					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1Marketpremium	0.4633	1.60	0.113	-0.1115	1.0381
x2SMB	0.3022	4.57	0.000	0.1711	0.4332
x3CONC	0.3276	3.20	0.002	0.1248	0.5304
Constant	-0.0008	-0.10	0.920	-0.0167	0.0151
Number of observations=120			F(3,116) = 13.94		
R-squared= 0.6853			Adjusted R-squared = 0.6772		
Portfolio B/CONCL					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1 Market premium	0.2906	3.90	0.000	0.1432	0.4380
x2SMB	-0.0459	-2.04	0.044	-0.0905	-0.0013
x3CONC	-0.0310	-1.20	0.234	-0.0824	0.0204
Constant	0.0111	1.77	0.079	-0.0013	0.0236
Number of observations=120			F(3,116) = 6.31		
R-squared= 0.1403			Adjusted R-squared = 0.1180		
Portfolio B/CONCM					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1Marketpremium	0.4967	1.98	0.050	-0.0010	0.9944
x2SMB	-0.0712	-1.52	0.131	-0.1638	0.0214
x3CONC	-0.1522	-2.77	0.006	-0.2608	-0.0436
Constant	-0.0018	-0.21	0.830	-0.0184	0.0148
Number of observations=120			F(3,116) = 4.46		
R-squared= 0.2430			Adjusted R-squared = 0.2235		
Portfolio B/CONCH					
Dependent variable: y	Coefficient	t	P>t	[95% Confidence Interval]	
x1Marketpremium	0.2743	2.69	0.008	0.0725	0.4760
x2SMB	-0.4053	-8.13	0.000	-0.5040	-0.3066
x3CONC	0.3913	9.48	0.000	0.3095	0.4730
Constant	-0.0041	-0.48	0.635	-0.0212	0.0130
Number of observations=120			F(3,116) = 55.01		
R-squared= 0.7951			Adjusted R-squared = 0.7898		

We found the relationship between all portfolio returns and market premium to be positive and also significant as predicted by the augmented model. The results on the other variables are diverse. For example under the size premium, we observe a negative and significant relationship between big firms and risk factor SMB as predicted by the model. Although the results of small firms confirm the predicted relationship between returns and risk factor SMB, we noted that portfolio S/L and SMB had an insignificant relationship at the 5% level. Similarly, we observe that the returns of high trade concentration firms and risk factor CONC have a positive relationship that is significant as predicted by the model. Likewise, our results confirm the expected negative relationship between low trade concentration firms and risk factor CONC. However, portfolio B/CONCL and CONC have an insignificant relationship at the 5% level.

The outcome of the augmented three factor model implies a premium on returns of small firms relative to firms considered as big in the period under review. This is consistent with the economic theory that predicts a positive relationship between risk and return. Small firms are considered riskier than big firms, meaning investors expect to be rewarded with higher returns for holding stocks of small firms. Similarly, firms with high trade concentration recorded higher returns than firms with low trade concentration during the study period. This observation suggests that high demand resulting from trade concentration lead to an increase in prices for the affected firms and consequently raises their returns. This is consistent with economic theory’s prediction of a positive relationship between demand and price of a commodity. It is therefore plausible to argue that our results conform to theoretical expectations.

On the other hand, the inconsistency in the statistical significance of the relationship between our variables makes it difficult to make a definite conclusion. We are therefore unable to make a conclusion on statistical significance of the observed relationship. The augmented three factor model’s performance conform with Claessens et al, (1995) who note that size of a firm and the volumes of trade can explain returns in emerging markets. They attributed the significance of trading volume to participation of foreign investors.

The positive relationship between returns and trade concentration premium on NSE may be an indicator of foreign investors’ preference for liquid stocks. We further noted that the augmented model had the highest explanatory power. The augmented model explains between 14.03% and 79.51% of the variations in returns. The standard three factor model was found to explain between 12.45% and 45% of the variations in returns. Moreover, adjusting the variables for thin trading improved the power of three factors model to the range of 13.5% and 55.41%. The value of variations explained by the three factors in the model is an indicator of probable existence of other factors besides those proposed by Fama and

French (1993). This argument can be qualified by the observed high values of R-squared when we introduce trade concentration premium as a proxy for risk.

Test for heteroscedasticity

The white's general test for heteroscedasticity was used to investigate whether the variance of the residual terms from the regression was constant. The results are presented in Table 3.11

Table 3.11 Whites general test for heteroscedasticity

Standard three factor model				
Portfolio	CHI2	DF	P>CHI2	Comments
S/L	36.71	9	0.0000	Reject the null hypothesis
S/M	80.92	9	0.0000	Reject the null hypothesis
S/H	13.94	9	0.1243	Do not Reject the null hypothesis
B/L	57.34	9	0.0000	Reject the null hypothesis
B/M	53.27	9	0.0000	Reject the null hypothesis
B/H	27.26	9	0.0013	Reject the null hypothesis
Three factor model adjusted for thin trading				
Portfolio	CHI2	DF	P>CHI2	Comments
S/L	80.01	9	0.0000	Reject the null hypothesis
S/M	105.23	9	0.0000	Reject the null hypothesis
S/H	24.75	9	0.0033	Reject the null hypothesis
B/L	59.70	9	0.0000	Reject the null hypothesis
B/M	17.19	9	0.0458	Reject the null hypothesis
B/H	50.11	9	0.0000	Reject the null hypothesis
Augmented three factor model				
Portfolio	CHI2	DF	P>CHI2	Comments
S/CONCL	98.91	9	0.0000	Reject the null hypothesis
S/CONCM	61.72	9	0.0000	Reject the null hypothesis
S/CONCH	91.76	9	0.0000	Reject the null hypothesis
B/CONCL	13.49	9	0.1416	Do not reject the null hypothesis
B/CONCM	35.31	9	0.0001	Reject the null hypothesis
B/CONCH	98.86	9	0.0000	Reject the null hypothesis

Table 3.11 report the results of the heteroscedasticity test for the standard three factors model, three factors model adjusted for thin trading and the augmented three factor model respectively. It is evident that the variance of the residual terms from the OLS regressions is not constant in most of the portfolios estimated. Only two portfolios across the three models had p-values greater than 5 per cent ($p>0.05$). These are portfolio S/H under the standard model whose p-value is 0.1243 and portfolio B/CONCL under the augmented model with a p-value of 0.1416. This means that only two portfolios had constant variance in their residuals. We do not reject the null

hypothesis of homoscedasticity for portfolio S/H and BCONCL at the significance level of 5%. The other portfolios had p-values less than 5 per cent. In fact the variances of the residuals of all portfolios under the thin trading adjusted model are not constant. The null hypothesis for homoscedasticity is thus rejected for the rest of portfolios at the 5 per cent level of significance.

Test for serial correlation

We used the Breusch Godfrey serial correlation test to ascertain whether residuals in the regression estimates were related to their lagged values. The test is based on a null hypothesis of no serial correlation while the alternative hypothesis assumes presence of serial correlation. The results are presented in Table 3.12.

Table 3.12 Breusch Godfrey test for serial correlation

Standard three factor model				
Portfolio	CHI2	DF	P>CHI2	Comments
S/L	0.259	1	0.6110	Do not reject the null hypothesis
S/M	0.042	1	0.8385	Do not reject the null hypothesis
S/H	0.085	1	0.7709	Do not reject the null hypothesis
B/L	0.739	1	0.3899	Do not reject the null hypothesis
B/M	6.920	1	0.0085	Reject the null hypothesis
B/H	0.046	1	0.8299	Do not reject the null hypothesis
Three factor model adjusted for thin trading				
Portfolio	CHI2	DF	P>CHI2	Comments
S/L	1.534	1	0.2155	Do not reject the null hypothesis
S/M	0.350	1	0.5540	Do not reject the null hypothesis
S/H	0.399	1	0.5275	Do not reject the null hypothesis
B/L	2.397	1	0.1216	Do not reject the null hypothesis
B/M	4.133	1	0.0421	Reject the null hypothesis
B/H	0.001	1	0.9730	Do not reject the null hypothesis
Augmented three factor model				
Portfolio	CHI2	DF	P>CHI2	Comments
S/CONCL	3.335	1	0.0678	Do not Reject the null hypothesis
S/CONCM	1.607	1	0.2050	Do not Reject the null hypothesis
S/CONCH	0.085	1	0.7711	Do not Reject the null hypothesis
B/CONCL	0.077	1	0.7817	Do not Reject the null hypothesis
B/CONCM	0.062	1	0.8036	Do not Reject the null hypothesis
B/CONCH	3.015	1	0.0825	Do not Reject the null hypothesis

Theresults of the serial correlation test for the standard model, the three factors model adjusted for thin trading and the augmented model are presented in Table 3.12. The outcome of the test shows that only portfolio B/M had p-values smaller than 5%. We reject the null hypothesis in two instances; portfolio B/M under the standard model having a p-value of

0.0085 and the sameportfolio under the thin trading adjusted model at a value of p equal to 0.0421. This suggests that only the residuals of portfolio B/M are serially correlated with their lagged values. It is observed that all other portfolios have p-values greater than 5 per cent (p=0.05). We thus do not reject the null hypothesis in the other portfolios. The residuals in the other portfolios are not serially correlated with their lagged values as required by the assumptions of OLS. It is notable that the residuals of all portfolios under the augmented model are not serially correlated with their lagged values.

Concluding remarks

The study sought to determine validity of the three factors model of Fama and French using Nairobi Securities Exchange equity data. This involved examining the model's predictions and statistical significance of the explanatory variables; market, size and value premiums. The study further adjusted the three factor model for thin trading to avoid biased beta estimates. Lastly, the study constructed an augmented three factor model to probe the existence of trade concentration premium on NSE.

The study found that the standard three factor model partially holds on the Nairobi securities exchange. There is value premium with higher returns for firms with high book equity to market equity as compared to firms with low book equity to market equity in study period. Further, when the model is adjust for thin trading; the study suggests that Small firms and firms with high values of book to market equity outperformed big firms and firms with low values of book to market equity ratios. However, the premium was statistically insignificant. Further, our results show the existence of concentration premium with high trade concentration firms earning a higher return than firms with low trade concentration. The results also suggested the presence of other factor other than the ones proposed by Fama and French. This is observable in the high value of R-squared (R^2) when we introduced concentration premium as a proxy for the risks in returns.

The study arrived at various policy implications. First, the study's findings are important for the regulator in forming policies that encourage diversification of investments. Companies use the stock market to gauge the perception of the public towards them. When the concentration of trade is rewarded with high returns, it may deter companies from listing. This may occur when the company is not certain of how its stock will perform on the market. Trade concentration may therefore prove to be a disincentive for firms considering to list on NSE. Second, it is evident from the study that various factors impact portfolio returns differently. Portfolios should therefore be valued using the method that yields the highest explanatory power. Third, an investor's valuation of the fund manager's performance should be based on the composition of his or her portfolio. For example the study shows that using the standard three factor model may give a fund manager positive review when in reality they are underperforming. Finally, the study demonstrated that size and value premia is pervasive as per the conclusion of Fama and French, (1993).

This study can be extended as follows. Future studies should explore the effect of split sample approach on the statistical significance of the risk factors. The impact of events such as post-election violence and global financial crisis on the performance of three factor model should also be examined on NSE. Lastly, trade concentration should be studied further to ascertain that the trade concentration premium is not sample specific.

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