AN EMPIRICAL TEST OF CAPITAL ASSET PRICING MODEL: EVIDENCE FROM NAIROBI SECURITIES EXCHANGE 2008-2013

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ABSTRACT

This study surveys the asset pricing characteristics at the Nairobi Securities exchange (NSE), with emphasis on the use and evidence of the Capital Asset Pricing Model (CAPM). This is in order to determine the stock returns and hence enable the estimation of beta coefficients (risk) for the securities listed in this market. The study's objective is to find out whether the CAPM is applied and functions in the Nairobi Security Exchange, which is one of the typical African emerging market. The CAPM with its assumptions offers the ability to predict securities' returns more accurately than common market analysis techniques such as technical and fundamental analysis. Perhaps the most important challenge to the CAPM is the Arbitrage Pricing Model, which is based on the idea that in competitive market financial arbitrage will ensure equilibrium pricing according to risk and return. However using a sample of equity stocks traded on the NSE, the study examined empirically the relationship between returns and beta as CAPM stipulates, over the period from January 2008 to December 2013. The evidence supports the hypothesis that, if the market price the risk variable, then there exist a systematic relationship between the risk variable and average returns. The relationship found is weak with 31.4% of market return explaining a stocks' return. This indicates that CAPM does work in the market but has a low explanatory power as regards to risk on stocks traded in the market. This outcome however, is essential in investment management that involvesmatching stock profiles to determine the most optimal set of assets to include in aportfolio. The findings are also useful in performance and project evaluation where equityis an essential part of a company's corporate financing policy.

Key Words: *Unsystematic, Systematic, Emerging market, Risky Asset, Risk free Asset, Beta*

BACKGROUND INFORMATION

A security market is market that deals with the exchange of securities, securities represent a spectrum of risky assets ranging from virtually risk-free debt instruments to highly speculative bonds, common stocks, and warrants (Sprecher 1975). According to Campbell (2000), asset pricing theory is a framework designed to identify and measure risk as well as assign rewards for risk bearing. An efficient pricing mechanism of stock market is a driving force for channelling savings into profitable investments, facilitating optimal allocation of capital (Sigman, 2005).

Asset Pricing in the Securities Exchange Market

The Capital Asset Pricing Model (CAPM) shows a linear relationship between the rate of return and risk for any given asset, given the market wide risk premium. It provides an analytical basis for explaining asset prices and the intuition that asset risk premium depend, not on total risk of the asset, but rather on the relationship of the asset to the overall market. The rate of return an investor receives from buying a common stock and holding itfor a given period is equal to the cash dividends received plus the capital gain or minus the capital loss during the holding period divided by the purchase price of the stock(Wu, 2006). However, the actual realized returns may differ from the expected returns because fluctuating stock prices result in fluctuating returns, making stocks risky (Nyambura, Elijah, & Wawira, 2005).

The key to understanding the complexities of asset pricing in an emerging market, and in application to CAPM, lies with a set of some rather strict assumptions as pointed out by Nyambura, Elijah, and Wawira, (2005) citing Sabal (2002). First, CAPM assumes that there are many small investors such that no individual investor possesses enough wealth to influence the market. Second, that there is a risk-free asset, and money can be lent and borrowed at its interest rate. This limits investments to stocks, bonds, and a risk free asset. Third, capital markets are perfect in that no transaction costs exists, securities are infinitely divisible, short sales exist, investors are price takers and the efficient portfolio is precisely the market portfolio. Fourth, it is the model's assumption that all investors are rational and mean or variance optimizers. Being risk-averse, the investors choose their investments based on expected return and risk with a bias towards those investments with a higher return and lower risk. This attribute is supported by the fifth assumption that depicts investors' rationality with

homogeneous expectations about the distribution of returns. That is, all investors have the same information at any given point in time and, hence, have the same estimates on mean, variance, and covariance in regard to the various securities available. Lastly, the model expects that all investors are myopic with very short time horizons.

Financial theory defines risk as the possibility that actual returns will deviate from expected returns, and the degree of potential fluctuation determines the degree of risk (Nyambura et al., 2005) citing Sabal (2002). CAPM deals with the risks and returns on financial securities giving the expected return for any asset or portfolio as a function of a measure of risk called beta. Asset pricing theory helps to explain why the expected return on a short-term government bond is a lot less than the expected return on a stock. Similarly, it helps to show how two different stocks have different expected returns and why expected returns change through time. The asset-pricing framework usually begins with a number of premises such as: investors like higher rather than lower expected returns, investors dislike risk and investors hold well-diversified portfolios (Souflan 2001). These insights guide in assessing the "fair" rate of return for a particular asset. Such information is critical for the investment decision facing both those corporations evaluating projects and investors forming portfolios. In the corporate setting, the theory characterizes the risk of a particular project or an acquisition and assigns a discount rate that reflects the risk. In choosing projects that have a higher promised rate of return than what the risk theory would assume, corporations create value. In the portfolio investment setting, the theory helps identify overvalued and undervalued assets. The theory is also integral to establishing a framework to help an investor understand the risks faced with a particular portfolio (Fama & French, 2004).

The Nairobi Securities exchange

The Nairobi Securities exchange (NSE), constituted in 1954 as a voluntary association of stockbrokers, and has had remarkable development to become what it is today. Its market capitalization has seen tremendous improvement to stand above Ksh.2.5 Trillion (US$ 28 Million) at the close of 2013 (NSE, 2013). Turnover for the same period stood at over Ksh. 1.3Trillion.It has also continued to play an important role in economic development, especially concerning its role in financial intermediation.

Securities traded in the NSE are bonds and shares that constitute the market's two broad segments. The shares market is referred to as the Equity Market, which is further divided into two segments, the Main Investment Market segment and the Alternative Investment Market

Segment.The Main Investment Market segment has ten sectors, namely, the Agricultural Sector, Automobile and Accessories, Banking, Commercial and Services, Construction and Allied, Energy and Petroleum, Insurance, Manufacturing and Allied, Telecommunication and Technology Segment. The NSE's liquidity, market capitalization, and turnover, makes it classified as both an emerging market and a frontier market (NSE, 2014).

NSE is a model emerging market in view of its high returns, vibrancy and a well-developed market structure (Ogum et al. 2000). Having been listed in the same market NSE is developing into a market leader in Sub-Sahara Africa (Kariuki, 2014). Most asset pricing studies have focused on developed markets. Moreover, research on emerging markets has focused on Asian and Latin American countries leaving the African markets under-researched. It is in this light that NSE is of particular interest, with a size of at least fifty-eight listed companies, and an established fixed income securities segment. It is among the most vibrant African bourse and the most developed capital market in East Africa. In light of this and with its historical development the securities exchange raises interests and sets a precedent for comparison with other emerging markets both in Africa and the world at large.

Statement of the Problem

An important aspect of efficient markets is equality in pricing of securities by the market. The prospects and value of any security should be, that perceived by the market, given the ultimate objective of investors, as being the need to derive a portfolio of the financial securities that meet preferences for risk and expected return. Such expected return is based on the stock prices where a capital gain is realized after factoring in the consequential costs and with an appreciation of the stocks' prices. Stock prices however, fluctuate due to several reasons, one being the changes in the perceived risk. If such risk can be established beforehand, then it would be easier to identify an efficient portfolio to satisfy investors. This is the principle objective of the CAPM model, and the motivating factor in testing its validity in the Nairobi Security Exchange.

Although the CAPM has undergone remarkable research over the years both in developed and emerging markets, there seem to be few studies on its application in the Kenyan stock market. An example of those studies that dwelled on the model, and the risk and Return relationship include study by Nyambura, Elijah, & Wawira, (2005)citing {Gitari, (1990), Muli, (1991), and Munywoki, (1998)}.These studies focuses on the NSE in relation to the market risk and return followed the Mean-Variance approach in estimating the unsystematic

risk and return. Moreover, companies originally listed on the exchange have changed in that some have been de-listed, others suspended, and new ones listed. The economy has also changed especially with the promulgation of the new constitution in 2010, posing different political eras and the amount of risk exposure since the study by Nyambura et al., (2005) citing Munywoki (1998). Establishing the model's workability, application and validity for the market is of much significance in rating stocks and especially so if a modified model can be established to suit the market especially emerging one. Therefore the limited studies available to the best of the researcher's knowledge is the basis of this study.

Objectives of the Study

The study involved the assessment of the application of the CAPM model in asset pricing on NSE as a typical African emerging market through the following specific objectives.

Specific Objective

These includes:

i. Identify the asset pricing mechanisms of risk exhibited in the Nairobi Security Exchange

ii. Assess the application of CAPM in asset pricing in the market, as a typical African Emerging market.

iii. Draw policy recommendations for the application of the model in the stock selection Process.

iv. Ascertain the evidence that the market (NSE) is linear.

Research Questions

As a tentative answer to the research problem on the applicability of CAPM model in NSE, the study sought to answer the following questions:

i. Is risk priced in the Nairobi Security Exchange, and if so?
ii. What asset pricing mechanisms does the market exhibit?
iii. Is CAPM useful in asset pricing of stocks for the market?
iv. Is there evidence to support the hypothesis that the market is linear?

Significance of the Study

The outcome of this study is essential in portfolio management and matching stock profilesto determine an optimal set of assets to include in a portfolio. The findings are also useful in performance and project evaluation, where equity is an essential part of a company's corporate financing policy. To the investors and public at large, the study will help ease the decision process as well as equip them with critical information in stock rating and hence

optimal decision-making. Lastly, the findings will add knowledge in the finance discipline on the application of the model in an emerging market.

LITERATURE REVIEW

Capital Asset Pricing Model is not a new concept in the field of finance. The model has undergone numerous theoretical and empirical tests since the early classical works of Sharpe and Lintner (1965), depicting an interesting historical evolution with mixed results and lots of criticism. CAPM has progressed along frenzied debate over its applicability and strength in asset pricing, and researchers' relentless undertaking on the model has developed new discoveries along the way. An underpinning of CAPM is the observation that risky stocks can be combined such that the portfolio is less risky than any of its components. It shows that if investors are rational, mean-variance optimizers and have the same view of risk and return, market equilibrium requires that the market portfolio be mean -variance efficient, (Jorion 1996).Mean-variance optimization means that the investor attempts to maximize the expected return of the portfolio and minimize the variance/risk of that return. According to CAPM, investors should not expect compensation for risk that can be eliminated by holding a portfolio, which should only contain the systematic/undiversifiable risks(Wu, 2006).

However, investors do not hold a combination of the risk-free asset, and the market portfolio and the risky portfolios of investors are different from what could be termed as market portfolio. CAPM yields unsatisfactory results for stocks of small or fast growing companies (Cochrane 1999). In addition, empirical evidence shows that the distribution may have fat tails, implying that probabilities of extreme asset returns may be larger than those implied by the normal distribution. The model, like any other, also has its strengths and weaknesses as pointed out by Sabal (2002). In its strengths, the model presents a positive relationship between risk and return, takes the benefits of diversification into account, and in relatively efficient markets, the relationship between beta and return is linear, as predicted by CAPM. The linear relationship between beta and return also simplifies its application in portfolio management.

Asset pricing has not only had a long history of theoretical but also empirical investigations. As an extension of the one period mean-variance portfolio model of Markowitz (1959), the foundational work in Capital Asset Pricing Model originated with Sharpe (1964) and Lintner (1965). In the late 1960's, Markowitz developed the basic portfolio model deriving the expected rate of return for a portfolio of assets and an expected risk measure. The Markowitz model is a single factor model, where an investors' objective is to maximize the portfolio's

expected return, subject to an acceptable level of risk. Similarly, the investors' objective is to minimize risk subject to an acceptable level of expected return.

The assumption of single period, coupled with the assumption of investors' attitude towards risk, allows risk to be measured by variance (or standard deviation) of portfolio return.

Markowitz (1959) study showed that the variance of the rate of return was a meaningful measure of portfolio risk, and an asset or a portfolio is efficient if no other asset or portfolio offers higher expected return with the same or lower risk variance (Reilly 1992).Sharpe (1964) combined a risk free asset with a risky portfolio deriving a generalized theory of capital asset pricing from the Markowitz portfolio theory. Lintner and Mossin (1965) then derived similar theories that consequently led to the capital asset pricing model being referred to as the Sharpe- Lintner model.

The Sharpe (1964) and Lintner (1965) CAPM framework is thus a crucial starting point in assessing asset pricing mechanisms in emerging markets. With liberalization in place, capital markets integration is inevitable and occurs through foreign investment in emerging markets, indispensable due to their high returns. A major hindrance towards such integration is the lack of information about price behaviour in these markets, and a study on asset pricing mechanisms of NSE as an emerging market could be a revelation(Nyambura et al., 2005).Early extensive studies of the Sharpe-Lintner model include Black and Scholes (1972), Fama and MacBeth (1973), Banz (1981), Gibbons (1982). Lintner (1965) test on CAPM found the intercept having a value much larger than R_f, the Beta coefficient being statistically significant but with a lower value, and the residual risk having effect on security returns. The methodology employed involved a first estimation of betas using time series regression. The estimated betas were then regressed as explanatory variables in testing validity of CAPM. Black and Scholes (1972) showed that the intercept term is different from zero and is time variant, concluding that when beta is greater than one, the intercept is negative and vice versa, a violation to CAPM.

Fama and MacBeth (1973) combined time series and cross sectional steps to investigate whether the risk premium of the factors in the second regression are non-zero, they used these relationship between equity returns, taken as the relative change in equity prices, and risk using CAPM to estimate betas in explaining the variation in expected returns. The regressions actually used the statistical modelling method of cross sectional regressions, consisting of two steps. First, they used ordinary least squares (OLS) to fit linear regression models for

monthly returns, and secondly, tested the hypothesis that the time series average of the monthly regression coefficients is zero(Wu, 2006). The latter was based on at statistic formed by dividing the time series average of the monthly regression coefficients by the time series standard error of this average, which properly accounted for any serial correlation among the estimated regression coefficients across months.

The beta coefficients were statistically significant and small, but the residual risk had no effect on the security returns. The study in Japan (Hawawini 1991: Chan 1991) supports the models' prediction of a positive relationship between beta and returns. This contrasts with the empirical findings inCanada (Calvet and Lefoll 1989), Belgium (Hawawini 1989), Finland and Sweden (Ostermark 1991), the United Kingdom (Chan and Chui 1996), Singapore (Wong and Tan 1991) and Korea and Taiwan (Cheung et al. 1993), which suggest either no or an in consistent relationship between return and market risk. These CAPM studies were following the unconditional, systematic, and positive trade-off between average returns and beta.

Pettengill et al. (1995) recognized a conditional relationship by following a different approach in testing the CAPM using positive and negative excess market returns period. Their argument is that since the CAPM is estimated with realized returns as proxies for expected returns, it is likely that negative realized risk premium will be observed in some periods. The model of Pettengill et al. is conditional on the realized risk premium, whether it is positive or negative. They found a positive (negative) relationship between realized returns and beta during periods of positive (negative) excess market returns. Ho et al. (2003), followed Pettengill's (1995) methodology on the Hong Kong stock market and found a conditional relationship between the risk variable and average cross-sectional realized returns, that take opposite directions during 'up' and 'down' markets.

A study on the Polish Warsaw stock market, (Zhang and Wihlborg 2003), reported empirical evidence in support of CAPM in pricing the listed firms and estimating the cost of capital. Zhang and Wihlborg (2004) also conducted a study on the pricing of equity in five other European emerging capital markets in Cyprus, Czech Republic, Greece, Hungary,Russia, and Turkey with the purpose of estimating the CAPM return and risk relationship. The study indicated a positive relationship between betas and returns. However, a conditional rather than an unconditional relationship between betas and returns was more evident. The study found beta to be a useful measure for investors and portfolio managers when making investment decisions.

Theoretical Framework

CAPM was used as a central model for data analysis, cast in terms of historic returns Copeland and Weston (1985) as follows:

Rit = Rft +βit {(Rmt)-Rft}……1.2

Where i represent individual stocks and t indexes months, andRit - stock i's expected return: estimated as:

Rit = ((Pt-J - Pt) +Dt)/P_{t-J}……2.2

Where:

R, - is the log-return in month t,

PI - is the last traded price in month t,

D, - is the dividend during month t,

P/-1 - is the last traded price in month 't-1 '

Rft - the return on the risk-free rate

Pi I -the stock's sensitivity to the market: estimated by regressing the stock i's return against the market return.Rmi- the market's return: Computed as, Rir, above using the market's monthly NSE indexin place of share prices.It is unlikely that excess market returns will perfectly explain stock i's excess stocks returns, and some residual error e_{it}.is expected (Copeland and Weston 1985)

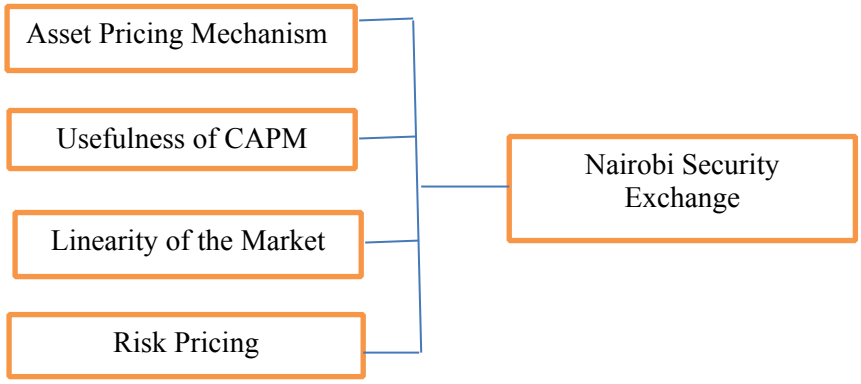
Rit = Rft + $beta_i$ {(Rmt)-Rft}+e_{it}……..3.2

The CAPM assumes that the y-intercept or alpha for the stock is zero. In other words, when the excess return on the market is zero, the excess return of the individual stock will also be zero. Equation 3.2 uses monthly returns for stock, i in estimating the relationship between an individual stock's return and its systematic risk, based on beta (Van Home 2001). For each month t, the excess return on a stock i is explained by a constant, Rf,1, the excess return forthe market during period t, (Rmi)- Rf,1, the sensitivity of stock i's excess returns to changes in the excess returns of the market proxy, b., and a random error. The y-intercept and the slope are estimated for each of the stocks and tested. The beta measures the risk associated with one particular asset in relation to the overall market (Nyambura et al., 2005).

Conceptual Framework

A conceptual framework is described as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Reichel & Ramey, 1987). When clearly articulated, a conceptual framework has potential usefulness as a tool to scaffold research and, therefore, to assist a researcher to make meaning of subsequent

findings. The framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and to communicate this. As with all investigation in the social world, the framework itself forms part of the agenda for negotiation to be scrutinised and tested, reviewed and reformed as a result of investigation (Guba & Lincoln, 1989). For this study the following conceptual framework has been established.



Methodology

Research Design

In line with the study's objective, the research design is descriptive and cross-sectional in nature and consisted of quantitative data in examining the relationship between the study's variables at a given point in time. The data are historical values obtained in the form of series from the NSE DataStream.

Study Population

The population of study included all companies listed at the Nairobi Securities exchange between January 2008 and December 2013on which a sample was selected. There are fifty five listed and active companies in the Nairobi Securities exchange, classified under equity market in the Main Investment Market and the Alternative Investment Market Segment.

Sampling Technique

The study followed a sequential sampling technique in obtaining a viable set of stocks. The technique was selected for the reason that the data needed involved prices of securities that were continuously traded in the market without any interruption during that period. For that reasons securities like Uchumi, EAPC, and CMC were excluded due to suspension faced by them at one point during the said period. The sample considered only thirty actively traded

securities, for which a price existed in every month of consideration, sorted through pre-ranking by trading frequency for all listed stocks and selected in the following sequence.

The data were first filtered according to firms that either were suspended or did not trade during the period under consideration, in which case, a share price was not available to calculate returns. All listed companies share prices were then ranked based on frequency in trading during the month under consideration, from which the first thirty highly ranked stocks were selected. All other ranked stocks not included in the sample were filtered for not having traded for at least once in a month for the period under considered.

Data Collection and Analysis

Data collected were mainly secondary in nature from the NSE share prices and market index databases. For each company, the closing share price for every month was taken for the period 2008-2013givingseventy two months' data. The data for the thirty stocks and the market index were then converted into monthly returns. Data collected on the sample firms and the market proxy was transformed into monthly returns and subjected to statistical tests, using statistical software (SPSS) for regression analysis and descriptive statistics. The returns, the share prices and the market index capital gains were computed using the equation below:

$R_{it} = (P_t - P_{t-l}) + D_t) / P_{t-1}$

Where; R_{it}- is the stocks return in month t,

P_t- is the last traded price in month t,

D_t- is the dividend during month t,

P_{t-1} - is the last traded price in montht-l

Using these returns, the excess monthly returns for the stock (R_i-R_f) and the market (R_m-R_f) were obtained, based on of the Sharpe-Lintner (1965) CAPM equation variables;

$\{R_{it} = R_{ft} + \beta_{it}(R_{mt} - R_{ft})\}$

Where: *i* represent individual stocks and *t* indexes months,

R_{it} - stock *i's* expected return

R_{ft} - the return on the risk-free rate

β_{it} -the stock's sensitivity to the market: estimated by regressing the stock i's return against the market return.

R_{mt}- the market's return

Regression analysis estimates of beta were run on these excess returns data obtained for the first twenty four months from January 2008 to December 2009. The stocks were then ranked from the smallest beta stocks to the largest, and sorted into five risky portfolios from Portfolio 1 (smallest risk) to Portfolio 5 (largest risk). The group of thirty sampled stocks thus consisted of five portfolios each with six stocks based on beta for the 24 - month period from January 2008 to December 2009.

The post-ranking portfolio Bet as for the period from January 2010 to December 2013 were estimated through regression on the monthly excess returns for each of the stocks and the market proxy. The betas obtained were assigned to each stock in each of the five portfolios and then equally weighted betas computed for all the portfolios. The regression model applied, with the portfolios betas as the independent variables, is: $R_{it} - R_{ft} = a + b\beta_{it} + e_{it}$

Where: $R_{it} - R_{ft}$- the excess return on an individual portfolio

β_{it}-the estimated betas of the portfolio.

e_{it}- the error term

*a*and *b* - the intercept and slope coefficients respectively

Using t-tests, the average values of *a*and *b* were subjected to hypothesis testing at 95% confidence limit. This use of full-period post-ranking betas help to minimize the errors in variables andat the same time enhances the precision of beta estimation. The purpose of the procedure was to test the proposition that at any point in time, there is a linear and positive relationship between CAPM's coefficients and expected returns of the stocks listed at the Nairobi Security Exchange.

FINDINGS& DISCUSSIONS

Descriptive Statistics

The descriptive statistics are for the five portfolios of dependent returns.

	Mean	Std. Dev.	Skewness	Kurtosis
Market Index	-10.1155	8.675443	0.88475	3.076677

Table 4.1: Summary Statistic for the monthly percentage market returns (2008-2013)

The table records the mean, standard deviation, Skewness, and kurtosis of thirty-one time series (thirty shares and the market index). The market has a mean return of -10.12 and a

standard deviation of 8.67 as a measure of risk. Kurtosis shows the peakedness or flatness of the distribution, while Skewness shows the side to which the distribution slants.

From a local perspective, the study agrees with Omosa (1989) that the CAPM's predictive power is low, but does exist, and Gitari (1990) findings of the relationship between unsystematic risk and return. However, the study found the average return for the market as-10.12% and the risk premium of 8%. Adding this to a 10.14% average 91-Day Treasury bill return produces a total return of 0.02%.Muli(1991) and Munywoki (1998) found a return of6% and 14.80% respectively, with a risk of 4% and 3.55% in the periods 1991, and 1998.The market characteristic in these two studies is an 'up' market as the total returns in each study were 21% and 29.8% respectively.

The study found the beta coefficient to be statistically significant but with a lower value, and the residual risk as having effect on the returns which is the same conclusion reached by Sharpe-Linter version of CAPM. The methodology followed involved a first estimation of betas using time series regression, and then using the estimated betas as explanatory variables, Nyambura et al., (2005) citing Fama and MacBeth (1973) process. These findings are in line with the empirical findings of Fama and MacBeth (1973), except that the residual risks for theFama and MacBeth (1973) study had no effect on the security returns.

The study also concurs with other studies done in other emerging markets and particularly those in the European world conducted by Zhang and Wihlborg (2004) on thepricing of equity. The six European emerging capital markets were Cyprus, Poland, Czech Republic, Greece, Hungary, Russia, and Turkey. The markets indicated a positive relationship between betas and returns and found beta to be a useful measure for investors and portfolio managers when making investment decisions. The market exhibits an asset pricing mechanism for risk in that beta, as priced under CAPM, is significant in determining the returns of assets in the market. It comes out as a significant economic tool that can be used to price risk during investment.

Portfolio and Market Return Regression Statistics

Table 3.2, below, was obtained by regressing the time series of portfolio returns against the market return for the 60-months period from January 1999 to December 2003. The t-test statistics results are attached in parentheses for each portfolio coefficients of beta and the constant.

Portfolio	Beta	Constant	Multiple R	R Squared	Adjusted R Squared
1.	1.691 (11.43)*	0.271 (l3.818)*	0.832	0.692	0.687
2.	1.77 (7.285)*	0.245 (7.528)*	0.691	0.477	0.468
3.	1.047 (6.951)*	0.118 (5.941)*	0.674	0.454	0.445
4.	1.084 (7.851)*	0.15 (8.208)*	0.717	0.515	0.507
5.	1.774 (11.206)*	0.133 (6.351)*	0.827	0.684	0.678

Table 4.2: Portfolio - Market Return Regression Statistics

Note: The figures in parentheses indicate the t- test statistics.* Indicates significance at 5% level

The purpose was to test the beta - return relationship with the overall market using the CAPM model. Beta is significant in all the portfolios at 95% confidence level, indicating that it is an important risk measure for the portfolios in the market.To further test the beta-return relationship and for the purposes of testing the models existence in the market, a cross - sectional regression was applied using the variables in Table 3.2.2, for which the results are as summarized.

Portfolio	Beta		Average Return
1.	1.33		20.86
2.	1.37		16.78
3.	0.66		11.46
4.	0.67		14.25
5.	1.37		5.56
Average Beta	1.08	Market	-10.12

Table 3.2.2: Portfolio Beta and Average Returns

The average beta is 1.08, implying an overall portfolio risk premium of 8% over and above the market, while the average market return is -10.12%. The high-risk premium and the negative average return help explain the relationship in the market, and concur with the descriptive results previously obtained. The cross-sectional regression analysis, the Fama-MacBeth (1973) process, was performed with the portfolios' average excess returns as the dependent variables and the post-ranking betas in Table 3.2.2 as the independent variables. The average returns for each of the equally-weighted portfolio were used as dependent variables and the subsequent estimated betas as independent variables. The cross-sectional regression results in Table 3.2.3 reveal support in the models' ability to describe the data.

$$R_{it} - R_{ft} = a + b\beta_{it} + e_{it}$$

P (T_c <t-statistic) two-tail: T_c= 3.1824 at 5% level

	a		*b*
Coefficients	0.9719		0.0079
t-statistic	(1.7479)		(0.2076)
R-Squared		-0.3145	
Standard Error		0.4348	

Table 4.3: Cross - Sectional Regression Output

The market exhibits a linear relationship, but in the opposite direction with an adjusted R-squared of -0.3145. The t-statistics for the intercept, *a,* of l.74 is less than t-critical of 3.18 at 95% level, indicating that the intercept is not significantly different from zero. Similarly, *b,* is also significant given that its t-statistic of 0.21 is within the range of the t-critical of the two tailed test. The relationship is however not so strong, given the adjusted R-squared of 3l.4%, suggesting that, additional variables may be needed to explain the behavior of shares prices in the NSE. To validate this, the residuals' effects were examined and the results obtained are summarized in Table 4.4 below

Observation	Portfolio Beta	Average Return	Predicted Beta	Residuals
1.	1.33	20.86	1.13553	0.194471
2.	1.34	16.78	1.10352	0.26648
3.	0.66	11.46	1.06118	-0.401783
4.	0.67	14.25	1.08367	-0.413672
5.	1.37	5.56	1.01550	0.354503
Coefficient				**-0.163**
(t-test)				**(-1.85)**
R-Squared				**-0.33**

Table 4.4: Predicted Betas and Residuals Effect on Returns

The table shows the predicted betas and the residual with their effects on returns. The residuals t-test of -l.85, fall within the t-critical value of 3.18 at 95% level, indicating that the residuals have an effect on the returns and suggesting that beta is not the only risk measured in the market. This is also supported by the R-squared value of -0.33, which being on the lower side, augments the presence of beta in the risk component of an asset's return. The

study, however, did not investigate any other variables, other than beta, that could help predict an asset's return as this was beyond its scope.

Testing the Significance of the Estimated Parameters

From Table 4.3 a significance test of intercept, *a,*was undertaken. At-statistics value of l.75 at95% confidence level was obtained with a critical value of 3.18. The value falls within the t- critical indicating that the intercept is not significantly different from zero. This means that the study accepts the proposition that beta is priced in the NSE market. The study also examined if the coefficient of beta, *b,* is equal toR_m-R_f.

The t-statistic value for the slope, *b,* is 0.2l. This is within the t - critical area of 3.18, indicating that the return premium is not different from R_m-R_r. this implies that beta is a critical factor in explaining the rate of return on a risky asset in the NSE market, and the excess market return is fundamental in the decision on stocks selection. The market return is an important element in explaining the behaviour of securities return in the NSE market, but it is not the only factor. Beta is seen as a significant measure of risk in the market making CAPM an important economic model that should be used together with other models to create practitioners' professional value in investment management.

Summary and Conclusions and Recommendations

The study assesses the asset pricing mechanisms exhibited in the Nairobi Securities Exchange as stipulated by the CAPM model. It attempts to examine the pricing of risk as measured by beta on the NSE market and the application of CAPM model in port folio management by a selected group of practitioners. The analysis of the chosen sample shows that over 74% of the shares, together with the NSE share Index, are normally distributed and the market is Gaussian. This implies that, if the sum of a large number of price changes across a long period is large, the chances are that each individual price change is negligible when compared to the total change. The price of a security does not tend to jump up or down by large amounts during short time periods.

The findings support the general hypothesis that the market prices the risk variable, as there exists a systematic relationship between the risk and returns. The relationship between beta and return in the NSE market in the period January 2008 to December 2013 is evident and the CAPM displays some explanatory power in asset pricing with the percentage of variance explained in the full period of observation standing at 31.4%.Market participants do not seem

keen in the model as only 37.5% of the total sample of institutional investors surveyed applies it during portfolio management. Of those who use the model, 50% apply it together with other models, while the rest 62.5% believe that the model is irrelevant. The overall conclusion of the study is that the market return is an important element in explaining the behaviour of securities return in the NSE market, but it is not the only factor. The risk is related to return and CAPM has passed a first test of its validity in the Nairobi securities exchange, an African emerging market. However, the power of beta as an estimate of risk is not very high (adjusted R-squared is 31.4%). This may be voiced as one of the reasons behind the models' low level .of application by the market participants in portfolio management. Beta reveals itself in the study as a significant measure of risk in the market. This makes CAPM an important economic model that can be used together with other models to create practitioners' professional value in investment management.

In view of the foregoing findings, the study recommends the model's continued and increased application, together with other models to augment it in order to achieve portfolio optimization. Practitioners within the exchange as a whole should be informed of the model's importance in the pricing of risky assets in the market to add on to their professional value in portfolio management. The study also recommends continued adoption of a CAPM approach to stock valuation despite the model's lack of compelling evidence that it is superior to a range of theoretical alternatives. This is because of the simplification inherent in the CAPM model and owing to the fact that the alternative asset pricing models criticizing CAPM do not eliminate it altogether.

The study however did not examine the range of identified assumptions within the Capital Asset Pricing Model which have been widely discussed in academic literature and policy making contexts. The continued use of the model has some practical advantages in terms of offering a level of certainty and predictability to long term investors. Rather, despite the open conclusion that participants do not stress CAPM use, the study asserts it is the most appropriate model for continued use in identifying the inherent risk premium in a stock's return. For investors, betas' significance in the market implies that the model is a critical economic tool to gauge the risk level of the stocks to include in a portfolio. Beta computations should therefore be provided, as this can be a useful analytical tool in guiding investors on the risk component expected for a given stock

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