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Effects of Estimating Systematic Risk in Equity Stocks in the Nairobi Securities Exchange (NSE) (An Empirical Review of Systematic Risks Estimation)

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Abstract *Capital Markets have become an integral part of the Kenyan economy. The manner in which securities are priced in the capital market has attracted the attention of many researchers for long. This study sought to investigate the effects of estimating of Systematic risk in equity stocks of the various sectors of the Nairobi Securities Exchange (NSE. The study will be of benefit to both policy makers and investors to identify the specific factors affecting stock prices. To the investors it will provide useful and adequate information an understanding on the relationship between risk and return as a key piece in building ones investment philosophy. To the market regulators to establish the NSE performance against investors' perception of risks and returns and hence develop ways of building investors' confidence, the policy makers to review and strengthening of the legal and regulatory framework. The paper examines the merged 12 sector equity securities of the companies listed at the market into 4sector namely Agricultural; Commercial and Services; Finance and Investment and Manufacturing and Allied sectors. This study Capital Asset Pricing Model (CAPM) of Sharpe (1964) to vis-à-vis the market returns. Monthly basis secondary data from the period January 2009 through December 2012 was used model the study from Stocks of the various sectors of the NSE. A simple regression model approach was used where stock was taken as dependent variable while systematic risk as independent variable and used. The study found out that there were effects market sector betas and returns. Second there is a relationship between systematic risk and stock market return in sectors because systematic risk and stock market return exhibits a strong negative autocorrelation, indicating that the stock market return is a function of more variable than systematic risk. The study rejects the first null hypothesis for all the four sectors and finds that beta is a statistically significant indicator of market risk for those sectors. The study also found out that agricultural sector was most risky sector with the highest volatility while the Finance and Investment sector is the least risky during the study period. Industrial and allied as well as the finance and investment sectors had less volatile returns than the overall NSE. From the findings of sectors studied it can be concluded that the various equity in NSE each of the have unique factors that influence market risk relative to the all the companies listed at the NSE.*

Key words Equity Stock, Estimation, the Nairobi Securities Exchange, Systematic risk, Effect

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1. Introduction

Financial markets play a fundamental role in the economic development of a country. They are the intermediary link in facilitating the flow of funds from savers to investors (Aduda, Masila and Onsongo, 2012). Financial theory states that a capital budgeting proposal should yield a required rate of return that

is equal to the risk and debt capacity of the proposal itself. In general, the firm's cost of capital would be an inappropriate way of categorizing all proposals arising in the firm, since a project's risk need not be the same as that of the firm. In practice, however, there is prove that few firms estimate specific required rates for individual proposals, thus the tacit assumption is made that the project's risk is not vastly dissimilar to the firm's. A firm with publicly traded securities that has risk characteristics directly similar to the project is usually impossible to find. This lack of readily available market information compels the analyst to resort to indirect methods for estimating systematic risk. Unfortunately, such methods lack strong theoretical support (King'ori, 1995).

1.1. Nairobi security exchange

The NSE, an emerging market is the self regulating organization in Kenya dealing with listed instruments and draws its membership from stock brokers, dealers and investment banks. The NSE is currently one of the most attractive and promising markets in Africa and many investors want to benefit from the high growth and promising economic outlook and therefore invest in the NSE (World Bank, 2006). In Kenya, dealing in shares and stocks started in the 1920's when the country was still a British colony. However the market was not formal as there did not exist any rules and regulations to govern stock broking activities. Trading took place on a 'gentleman's agreement.' Standard commissions were charged with clients being obligated to honor their contractual commitments of making good delivery, and settling relevant costs. At that time, stock broking was a sideline business conducted by accountants, auctioneers, estate agents and lawyers who met to exchange prices over a cup of coffee. Because these firms were engaged in other areas of specialization, the need for association did not arise. In 1951, an Estate Agent by the name of Francis Drummond established the first professional stock broking firm. He also approached the then Finance Minister of Kenya, Sir Ernest Vasey and impressed upon him the idea of setting up a stock exchange in East Africa. The two approached London Stock Exchange officials in July of 1953 and the London officials accepted to recognize the setting up of the Nairobi Stock Exchange as an overseas stock exchange. In 1954 the Nairobi Stock Exchange was then constituted as a voluntary association of stockbrokers registered under the Societies Act. Since Africans and Asians were not permitted to trade in securities, until after the attainment of independence in 1963, the business of dealing in shares was confined to the resident European community (NSE market fact sheet file 2012). Notably, on February 18, 1994 the NSE 20-Share Index recorded an all-record high of 5030 points. The NSE was rated by the International Finance Corporation (IFC) as the best performing market in the world with a return of 179% in dollar terms. The NSE also moved to more spacious premises at the Nation Centre in July 1994, setting up a computerized delivery and settlement system (DASS). For the first time since the formation of the Nairobi Stock Exchange, the number of stockbrokers increased with the licensing of 8 new brokers. The East African Securities Exchanges Association came into being in 2004, following the signing of a Memorandum of Understanding between the Dar-es-Salaam Stock Exchange, the Uganda Securities Exchange and the Nairobi Stock Exchange. In September 2006 live trading on the automated trading systems of the Nairobi Stock Exchange was implemented. The ATS was sourced from Millennium Information Technologies (MIT) of Colombo, Sri Lanka, who is also the suppliers of the Central Depository System (CDS). MIT have also supplied similar solutions to the Colombo Stock Exchange and the Stock Exchange of Mauritius. The NSE ATS solution was customized to uphold the spirit of the Open Outcry Trading Rules in an automated environment. The equity securities investment sector of the Nairobi Securities Exchange (NSE), is divided into four sectors namely the Agricultural sector; the Industrial and Allied sector; the Commercial and Services sector and the Finance and Investment sector. The group of equity securities investment sector in NSE is based on type of products and services provided by the companies whose equity securities are listed in those sectors.

1.2. Statement of the Problem

Risk appetite in Kenya has increased tremendously over the years as evidenced by the speculative excesses witnessed in the NSE. The number of investors increased in the NSE after the 2003-2007 economic growth experienced and the many IPOs that were floated in the market between 2006-2009, that unprecedented interest in the NSE therefore caused more ordinary Kenyans to be interested in the

stock market (CMA, 2009). There is literature gap in the Kenyan scenario is that the studies thus far on the Kenyan capital markets do not reflect the risk evaluation with relative to overall market volatility. In the context of the Kenyan financial markets, studies including Dickson and Muragu (1994) have largely focused on market efficiency and determination of market anomalies to the exclusion of assessment of systematic risk for the four sectors listed at the NSE (Aduda, Masila and Onsongo, 2012). The determinants of stock market development focusing the Nairobi Stock Exchange Oluoch and oyugi,2012 studied segmental market risk appraisal of equity investments at the Nairobi securities exchange, Mbugua (2007) looked at the impact of stock exchange automation, volume, volatility and liquidity on stocks, Nangayaj (2003) looked at the pricing options using Black & Scholes Model, Njoroge (2001) looked at dividend policies, growth in assets, ROTA and ROE at the NSE, Muli (1991) studied the systematic risk for the NSE and Muga (1974) looked at the history, organization and its role in the Kenyan economy. By reviewing all these and other scholars who have studies systematic risk of security investments within the various strata of the market you note that Investments are made in the stock markets in expectations of returns in excess of the risk free rate. One of the most important contributions by researchers in the securities market is the establishment of the relationship between risks and returns by way of CAPM and APT. However most of these studies have not been published and made within reach to the small and new investors in the NSE in form that is easily understandable. This is gap research study sought to fill by studying the effects of estimation of systematic risk in equity stocks trading in the NSE.

1.3. Research Objectives

The objective the study was to examine effects of estimation of Systematic risk in equity stock market for firms listed in the Nairobi stock exchange in view of the following specific factors:

i. To establish the effect of beta and volatility of on stock return for firms listed in the NSE,
ii. To find out whether systematic risks has relationship with stock market return stock prices for firms listed in the NSE;
iii. Suggestions and recommendation for investors.

1.4. Research Questions

The following were the research questions that were of relevance in fulfilling the objective of the study:

i. To what extent does the effect of beta and volatility of on stock return estimation of Systematic risk on firms listed in the NSE;
ii. Is there relationship with between systematic risks and stock prices in estimation of Systematic risk for firms listed in the NSE.

1.5. Hypothesis under investigation

The study investigated the hypothesis that:

H_{01}: There is has no the volatility of the monthly returns of the various individual sectors as indicated by their respective betas of Equity Stocks Trading in the Nairobi Security Exchange.

1.6. Justification of Study

The purpose of the study was to examine effects of estimation of Systematic risk in equity stock market from firms listed in the Nairobi stock exchange. This will be of benefit to both policy makers and investors to identify the specific factors affecting prices and can therefore be used as basis for making decision on strategies to be adopted in making investment decisions in the capital market. It will provide useful and adequate information to these investors with an aim of enabling them to develop an understanding on the relationship between risk and return as a key piece in building ones investment philosophy. The investors will also be in a position to protect themselves from selfish stockbrokers who take advantage of ignorant investors to benefits themselves at the expense of the investors. To the market regulators to establish the NSE performance against investors' perception of risks and returns and hence develop ways of building investors' confidence, the policy makers to review and strengthening of the legal

and regulatory framework to deepen the capital markets by increasing the product range, market players and protection of investors and the market intermediaries, the results of the study will attempt to provide them with adequate incites towards portfolio performance analysis by comparing actual performance to that predicted based on the portfolio's exposure to relevant factors.

1.7. Scope of Study

The study was used Monthly basis secondary data from the period January 2009 through December 2012 on all the listed companies in Kenya trading at NSE

2. Literature review

2.1. Introduction

The literature review examines the studies that have been undertaken and theoretical orientation on factors influencing stock prices. An empirical review is done discussing various studies already undertaken, identifying the research gaps and conceptualizing the current study. A summary of the variables indicating the predicted results is presented.

2.2. Theoretical review

Cooper and Schindler (2008), has defined a theory as a set of systematic interrelated concepts, definitions, and propositions that are advanced to explain and predict phenomena (facts). Several theories have been designed by different scholars to explain estimation of systematic risk in Stock exchange.

2.2.1 Systematic risk estimation theory

The Markowitz portfolio theory (portfolio selection model) was developed in the 1950s and this when the modern theory of investment commenced. Markowitz used mathematical programming and statistical analysis in order to arrange for the optimum allocation of assets within a portfolio. To reach this objective, Markowitz generated portfolios within a reward risk context. In so directing the focus, Markowitz, and others, recognized the function of portfolio management as one of composition, and not individual security selection as it more commonly practiced. The capital market theory is an extension of the portfolio theory of Markowitz (1952, 1959). Portfolio theory is a description of how the rational investors should build efficient portfolios and the capital market theory indicates how equities should be priced in the efficient capital market. Though Markowitz infused a high degree of sophistication into portfolio analysis by developing a mean variance model for the selection of portfolios, at a time when most portfolio managers used the rule of thumb and intuitive judgment, the Markowitz model was later highly criticized as being theoretically elegant and conceptually sound. Its serious limitation was that it related each security to every other security in the portfolio, demanding the sophistication and volume of work well beyond the capacity of all but a few analysts. Consequently, its application remained severely limited until Sharpe (1964) published a model simplifying the mathematical calculations required by the Markowitz model.

Sharpe assumed that, for the sake of simplicity, the return on a security could be regarded as being linearly related to a single index like the market index. Acceptance of the idea of a market index, Sharpe argued, would obviate the need for calculating thousands of covariances between individual securities, because any movements in securities could be attributed to movements in the single underlying factor being measured by the market index. The simplification of the Markowitz Model has come to be known as the Market Model or Single Index Model (SIM).

The mechanical complexity of the Markowitz's portfolio model kept both practitioners and academics away from adopting the concept for practical use. Its intuitive logic, however spurred the creativity of a number of researchers who begun examining the stock market implications that would arise if all investors used the model. As a result, Sharpe (1964), Lintner (1965) and Mossin (1968*)* independently developed a standard form of general equilibrium model for equity returns in the security market. This model has become to be known as the Sharpe-Linyetr-Mossin form of Capital Asset Pricing Model (CAPM) or standard form of CAPM. This model is based on many assumptions about capital markets; however, it

has been useful in understanding the complex relationship between securities returns and risks. Though the CAPM was regarded as a useful tool for both analysts of financial securities and financial managers, it is not without its critics since there are a number of problems that exists in adopting the theoretical model for practical use. These factors also cause some problems when empirical tests of the model are undertaken. Work on the derivation of alternatives to CAPM began and an alternative theory was developed by Ross, (1976) called Arbitrage Pricing Theory. The name Arbitrage Pricing Theory arises from the assumptions that investors will arbitrage away any differences in the expected return on the asset that have the same risks

Investors are always attracted to assess the venture risk which can be done through evaluation of systematic and unsystematic risk. Systematic risk, which is market risk relating relates to the changes in the macroeconomic environment whereas unsystematic risk is the unique risk of a given security asset which can be reduced or eliminated through diversification. Factor models focus on risk which cannot be avoided by diversification, in other words basically systematic risk. This is anchored on the arbitrage pricing model (APT) introduced by Ross (1976), which introduced several factors that were presumed to influence stock prices. The APT theory postulates that the return expected from a financial asset can be presented as a linear function of various theoretical market indices and macro-economic factors (Ross, 1976). It is considered that the factors considered are sensitive to changes represented by a factor-specific beta coefficient (β). On the other hand Fama and French (1992) analyzed firm-specific microeconomic variables such as market beta, firm size, earnings-price ratio, leverage ratio and book-to-market equity in explaining stock returns, thus representing the fundamental factor model. The APT requires that investors perceive the potential risk sources to estimate factor sensitivities, Chen et al (1986) in their notable work in United States of America analyzed macroeconomic financial variables using monthly data to investigate the systematic factor influence on US firm stock prices. The model is based on the assumption that risk adverse investors would prefer some compensation over and above the risk free level in order to invest in a market portfolio instead of the risk free assets. Investors always want to be compensated for taking systematic risk. They should not, however, expect the market to provide any extra compensation for bearing avoidable, diversifiable, unsystematic risk. It is this logic that lies behind capital asset pricing model (CAPM).

Beta

CAPM builds on the theory that the total risk of a stock, measured by the variance of stock returns, can be broken down into two categories; unsystematic risk and systematic risk. The systematic risk is the only risk that CAPM cares about and it is measured by the beta coefficient. The higher the beta the larger is the portfolio's volatility compared to the market, and vice versa (Suhar, 2003). The beta is calculated by comparing the historical return of an asset compared to the market return using statistical techniques to calculate their covariance:

Formula for the Beta Coefficient of a Stock

$$Beta\ Coefficient\ of\ Stock = \frac{Cov(rs,rm)}{\sigma 2m} \qquad \begin{array}{l} rs = Stock\ Return \\ rm = Market\ Return \\ \sigma 2m = Market\ Variance \end{array} \qquad (1)$$

Betas are mostly used to compare return/risk ratios for stocks and mutual funds, because the stock market or funds composed of stocks, have a greater diversity of volatility than other asset classes.

Formula 1 Beta equation, source (Reilly and Brown, 2002)

Beta is the appropriate risk measure according to CAPM since it is proportional to the risk a stock contributes with to the entire portfolio. The higher the beta the more volatile the stock is compared to the market index. Hence, the risk premium of a security is proportional to its beta, the larger the beta the higher the expected return (Bodie *et al.,* 2004)

The way beta is used in the CAPM formula is seen in formula 2 and it is clear that the higher the beta of the stock the higher is the expected return. The CAPM explains the risk return relationship with the assumption that investors are risk averse and they will only take risk only if they are compensated for

the risk which they bear. Since unsystematic risks can be eliminated through diversification, investors will be compensated for assuming systematic risks. The market prices securities in a manner that yield expected returns than the risk free security. Investors can thus be induced to hold risky securities when they are offered a risk premium. This relationship is defined as the Capital Market Line (CML). The equation for the CML is:

$$E(R_p) = (R_f) + \left[\frac{E(R_m) - (R_f)}{\text{¢}_m} \text{¢}_p \right] \quad (2)$$

Where:

$E(R_p)$ = Portfolio Return;
(R_f) = Risk Free Return;
$E(R_m)$ = Return on Market Portfolio;
¢_m = Standard Deviation of market portfolio;
¢_p = Standard Deviation of the portfolio.

Formula 2 CAPM equation, source (Reilly and Brown, 2002)

The CAPM provides that in well functioning capital markets, the risk premium varies in direct proportion to risk. The market (systematic) risk line is measured in terms of its sensitivity to the market movements. This sensitivity is referred to as the security's beta (ß). Beta reflects the systematic risk which cannot be reduced. Thus the expected return on a security is given by the following equation.

$$E(Rj) = (Rf) + E(Rm - Rf)ßj \quad (3)$$

Where:

$E(R_j)$ = Expected return on security j;
R_f = Risk free rate;
R_m = Market portfolio return;
$ß_j$ = Measure of the security's systematic risk (undiversifiable risk) relative to the returns of a market portfolio.

Formula 3, Expected return, Source (Reilly and Brown, 2002)

This equation gives a line called the Security Market Line (SML).When the relative risk premium, represented by beta, is plotted in a graph against the required return, it yields a straight line known as the security market line (SML). This line begins at the risk-free rate and rises with beta. The graph below assumes a market return of 12% and a risk-free rate of 4%. Note that a beta of zero is equal to the risk-free rate while a beta of 1 has a relative risk equal to the market.

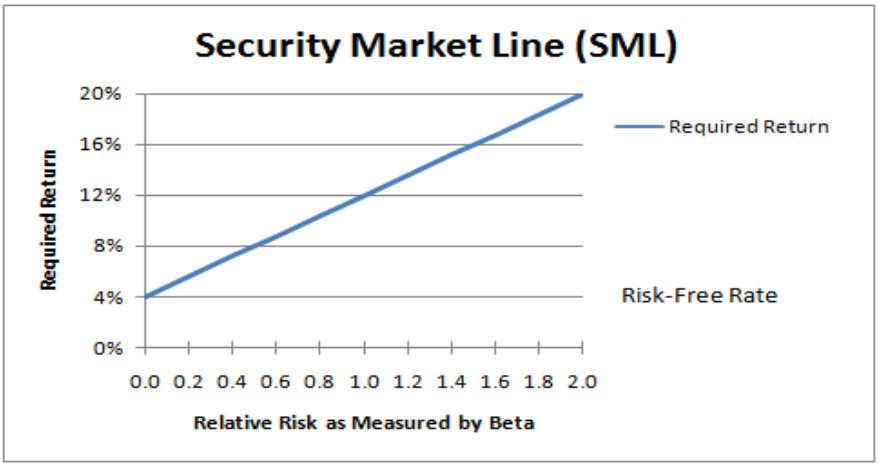

Figure 1.

Studies have shown that share prices in emerging markets are considerably more volatile than in stock markets. Despite this volatility, Firms have made considerable use of the equity market. For

example, the Indian equity market has more than 8,000 listed firms, one of the highest in the World. Financing pattern in emerging markets indicate that, contrary to expectation, emerging market corporations rely heavily on external finance and new equity issues to finance long term investment. This result indicates that equity markets have been successful in providing considerable funds to the top 100 firms in emerging markets (Singh, 1995). A study done on the Ghana Stock Exchange (GSE) finds that, institutional factors particularly the legal and regulatory framework that ensure the protection and security of investors are important in the development of the stock market. Additionally, the researcher analyzed the impact of the listing of Ashanti Goldfields Corporation (AGC) on the development of GSE. In addition capital flows by investors from Europe, America and the Far East have boosted the market capitalization. The researcher recommends that Ghana government needs to give fiscal incentives in the form of taxation in favour of listed companies, and to pursue prudent macroeconomic policies, particularly in the area of inflation management, to regularly review the legal and regulatory framework within which the investment laws operate in order to boost the confidence of investors (Osei, 1998).

Return

Since risk is something an investor has to face when investing it is impossible to talk about risk without talking about the return as well. According to standard portfolio theory, these two are connected in any decision that one make, a higher risk must mean a potential higher return. If this does not hold no one would purchase a risky security if it would not offer a higher reward. What most market participants try to do is to minimize the risk in a portfolio while increasing the expected return. (Biglova *et al.,* 2004) and (Bodie *et al*., 2004). To understand the concept of risk the expected return must be understood. The return depends on the increase/decrease in the price of the share over the investment horizon as well as dividend income the share has provided. This is called the holding period return (HPR) and can also be explained by the following formula.

$$HRP = \frac{\text{Ending Price} - \text{Beginning Price}}{\text{Beginning Price}} + \text{Dividend Yield} \quad (4)$$

Formula 4 Holding Period Return (Reilly and Brown, 2002).

Empirical results of CAPM and beta

Researchers have had long ongoing discussions of how to best define risk in the stock market. Numerous tests have been performed to show that the most popular theoretical risk measure beta is dead and not practically useful and vice versa.

Basu (1977) conducted a study between 1957 and 1971 where he determined the relationship between investment performance of US stocks and their P/E ratios. As many other researchers Basu rejected the CAPM theories since he found an inverse relationship between beta and returns, i.e. the lower the beta the higher the returns. Instead he found that “Price to earnings ratios (P/E) seem to be a proxy for some omitted risk variable“(Basu, 1977). He concluded that investors are able to profit from strategies based on buying low P/E companies since they posted the highest returns not due to levels of systematic risk.

Shukla and Trzcinka (1991) conducted a twenty year test on the US stock market and found that the residual variance, better known as the unsystematic risk, is highly significant. They conducted the tests by using regressions with different kinds of variables; using both CAPM with its beta and the Arbitrage Pricing Theory with several variables. Their conclusions were that the APT could explain 40% of the variation of the 20 year period returns and CAPM was not too far behind this number.

Fama and French (1998) also conducted an international study where they in 13 countries from 1974 to 1994 evaluated why the so called value stocks beat growth stocks. They found that value stocks, i.e. shares with low P/B, P/E and price to cash flow (P/CF) ratios, experienced higher returns than growth stocks. The result could not be explained by CAPM’s beta either.

Arguments against CAPM and beta

CAPM has been around since the early 1960s and with support from the empirical results explained above the critique against it as a good model for the risk return relationship has increased. Wagner (1994) criticized the CAPM's assumption that everybody should hold the same portfolio the market portfolio. If that is the case then a market place is unnecessary because everyone would hold the exact same shares with the exact same amount. He is also critical to the model's way of looking at companies' change in value, he says "There is no room in the theory for people to buy and sell what they value" (Wagner, 1994) because the models only take into consideration changes in risk profile which in turn lead to shift between the risk-free and risky assets.

Downe (2000) argues that the major flaw of using beta is that it is derived from a market theory where successful firms eventually face rising costs and increased competition and therefore these companies' earnings will be lowered back to a normal return. Downe himself believes that successful firms will stay successful and vice versa. So the risk analysis must take into consideration the type of firm and the industry characteristics it operates in. Therefore systematic risk becomes irrelevant because firm characteristics may be more important than global factors, hence the systematic risk becomes insignificant and thus beta as well. Dreman (1992) thinks the reason why beta is a bad risk measure is because it is based on past volatility, and he believes that the past will not be the best predictor for the future. The correlation for a stock with an index might also be coincidence and therefore beta is useless. Dreman does not come up with another risk measure but argues that one should in order to minimize risk diversify its portfolio between sectors, look for higher than average earnings and invest in companies with a reasonable debt to equity ratio.

Bhardwaj and Brooks (1992) argue that the use of a constant beta in CAPM does not capture the fluctuations of systematic risk which they found in their research on bull and bear markets. Bhardwaj and Brooks are not ready to disregard beta but suggest changes such as a risk measure that accounts for these changes (changes in systematic risk due to market changes). If the beta value was made changeable depending on market conditions it is likely it would have a higher explanatory power of actual return. Howton and Peterson (1998) use a dual beta for greater accuracy value to solve the problem with beta's variation in bull and bear markets. The dual beta model is a regression of equally weighted monthly portfolio re-turns on the market return. Treynor (1993) defends CAPM and thereby indirectly beta as a single risk variable. This model is based on Sharpe's research which suggests that systematic risk is adequately accounted for by a single risk variable. This contradicts the most common critique towards CAPM and beta which claims that systematic risk cannot be explained by a single variable (Treynor, 1993). According to Ross (1976), there are various types of risk factors associated with a security such as changes in interest rates, inflation and productivity with the expected return of that same security.

Behavioral finance researches have also criticized the basic CAPM assumptions. In behavioral finance not all investors are mean variance optimizers and securities are not all analyzed by the same opinion about the economic outlook. Chen *et al.* (1986) in their notable work in United States of America analyzed macroeconomic financial variables using monthly data to investigate the systematic factor influence on US firm stock prices. The variables used in their study were industrial production, inflation, risk premium, term structure, market index, and consumption and oil prices. The authors found that the factors had a significant influence in the stock prices with inflation showing particularly high significance particularly in periods of high volatility.

2.2.2. Alternatives to Beta

Sharpe et al. (1999) believe the reason why few other variables have got any attention in the financial world as relevant risk factors is because they become too complex. Beta is built on the variability of returns and does not take into consideration that a large beta might be good when the overall stock market is increasing in value, (this stock's return will in this case increase more than the market). Sharpe *et al.* (1999) argue that even though beta has this flaw of discriminating upside volatility it has become popular because it is computed with such ease. Below however are some alternatives to CAPM's beta presented. Specifically, whereas the CAPM designated a single risk factor to account for the volatility inherent in an individual security or portfolio of securities, the study will focus on the intuition and

application of multifactor explanations of risk and return. The chief difference between the CAPM and the multifactor models is that the latter specifies several risk factors, thereby allowing for a more expansive definition of systematic investment risk than that implied by the CAPM's single market portfolio (Ross, 1976).

Arbitrage Pricing Theory

The Arbitrage Pricing Theory was developed by Ross in 1976. In contradiction to CAPM, which has beta as solely risk variable, the APT relates the various types of risk associated with a security such as changes in interest rates, inflation and productivity with the expected return of that same security. The APT is less restrictive compared to CAPM, and has three major assumptions being; capital markets are perfectly competitive, investors always prefer more wealth to less wealth with certainty and the stochastic process generating asset returns can be expressed as a linear function of a set of *K* risk factors (or indexes). Equally important, the following major assumptions which were used in the development of the CAPM are not required: (1) Investors possess quadratic utility functions, (2) normally distributed security returns, and (3) a market portfolio that contains all risky assets and is mean-variance efficient. The model is both simpler and can explain differential security prices, and it is considered a superior theory to the CAPM.

As noted, the theory assumes that the stochastic process generating asset returns can be represented as a *K* factor model of the form:

$$Ri = E(Ri) + bi1\delta 1 + bi2\delta 2 + \ldots + bik\delta k + \varepsilon i \text{ for } i = 1 \text{ to } n \qquad (5)$$

Where:

Ri = the actual return on asset *i* during a specified time period, *i* = 1, 2, 3, . . . *n;*

E(Ri) = the expected return for asset *i* if all the risk factors have zero changes;

bij = the reaction in asset *i*'s returns to movements in a common risk factor *j;*

δ*k* = a set of common factors or indexes with a zero mean that influences the returns on all assets;

ε*i* = a unique effect on asset *i*'s return (i.e., a random error term that, by assumption, is completely diversifiable in large portfolios and has a mean of zero);

n = number of assets.

Formula 5, Expected return, Source (Reilly and Brown, 2002)

Similar to the CAPM model, the APT assumes that the unique effects (ε*i*) are independent and will be diversified away in a large portfolio. Specifically, the APT requires that in equilibrium he return on a zero-investment, zero-systematic-risk portfolio is zero when the unique effects are diversified away. This assumption (and some theoretical manipulation using linear algebra) implies that the expected return on any asset *i* (i.e., *E*(*Ri*)), can be expressed as:

$$E(Ri) = \lambda 0 + \lambda 1 bi1 + \lambda 2 bi2 + \ldots + \lambda k bik \qquad \text{(APT)} \qquad (6)$$

Where:

λ0 = the expected return on an asset with zero systematic risk;

λ *j* = the risk premium related to the *j*th common risk factor;

bij = the pricing relationship between the risk premium and the asset; that is, how responsive asset *i* is to the *j*th common factor. (These are called factor betas or factor loadings).

Formula 6, Expected return, Source (Reilly and Brown, 2002)

In contrast to the CAPM, the primary practical problem associated with implementing the APT is that neither the identity nor the exact number of the underlying risk factors are developed by theory and therefore must be specified in an ad hoc manner.

The Multiple Factor Models

A different approach to developing an empirical model that captures the essence of the APT relies on the direct specification of the form of the relationship to be estimated is, in a multifactor model, the

investor chooses the exact number and identity of risk factors. The model is a generalization of the single index market model. Due to the fact that returns of securities in such a model are influenced by factors other than just the movement in the market as a whole as in the case of the single index model, this model may yield better predictions of future performance of the securities. Returns on securities are expressed as:

$$R_{jt} = a_{jt} + (b_{jt,1} I_1 + b_{jt,2} I_2 + ...+ b_{jt,k} I_k) + C_{jt} \quad (7)$$

Where:

J - The j^{th} Security (j= 1,2,…n);

R_{jt} - Return on security *j* at time *t.*

a_{jt} & C_{jt} are the constants and random parts respectively of the components of the return unique to security *j.*

$I_{1.....}$ I_L - Are the changes in a set of L factors which explain the variation of R_{jt} about expected return $a_{jt.}$

$b_{jt,k}$ -the sensitivity of the security *I* to factor *k* at time *t.*

Formula 7, Security return, Source (Reilly and Brown, 2002)

Two general approaches have been employed in this factor identification process. First, risk factors can be macroeconomic in nature; that is, they can attempt to capture variations in the underlying reasons an asset's cash flows and investment returns might change over time (e.g., changes in inflation or real GDP growth (Chen, Roll and Ross, 1986) and (Burmeister, Roll and Ross, 1994). On the other hand, risk factors can also be identified at a microeconomic level by focusing on relevant characteristics of the securities themselves, such as the size of the firm in question or some of its financial ratios (Fama and French, 1993).

The advantage of this approach, is that the investor knows precisely how many and what things need to be estimated to fit the regression equation. On the other hand, the major disadvantage of a multifactor model is that it is developed with little theoretical guidance as to the true nature of the risk return relationship. In this sense, developing a useful factor model is as much an art form as it is a theoretical exercise.

The Single Index Market Model

When it comes to putting theory into practice, one advantage of the CAPM framework is that the identity of the single risk factor (i.e., the excess return to the market portfolio) is well specified. Thus, the empirical challenge in implementing the CAPM successfully is to accurately estimate the market portfolio, a process that first requires identifying the relevant investment universe. However this is not a trivial problem as an improperly chosen proxy for the market portfolio (e.g., using the NSE 20 Share Index and the NSE All Share Index (NASI) to represent the market) can lead to erroneous judgments. However, once the returns to an acceptable surrogate for the market portfolio are identified (i.e., *Rm*), the process for estimating the parameters of the CAPM is straight forward and can be accomplished by a security or portfolio's characteristic line that can be estimated via regression techniques using a special case of a multiple index model that expresses the return of a security as: **(**Reilly and Brown, 2002).

$$R_{jt} = \alpha_{jt} + ß_{jt} R_{mt} + \varepsilon_{jt} \quad (8)$$

Where:

J - The j^{th} Security (j= 1,2, … n)

R_{jt} - The rate of return on security *j* at time *t.*

$ß_{jt}$- Systematic risk (beta) of security *j* at time *t.*

ε_{jt} - Error term

R_{mt} - Market return at time *t.*

α_{jt}- The constant term, or intercept, of the regression, which equals $R_{jt} – ß_{jt} R_{mt}$

And produces an expected return on any security as:

$$\acute{R} = \alpha_j + \beta_j \acute{R}_m \quad (9)$$

Beta being the systematic risk of security is the ration of the covariance of the returns on security *j* and the market portfolio *m* to the covariance of the returns on the market portfolio. That is:

$$\beta_j = \frac{Cov_{jm}}{Var_m} = \frac{Cor_{jm}\ \sigma_m\ \sigma_j}{\sigma^2_m} = \frac{Cor_{jm}\ \sigma_j}{\sigma_m} \quad (10)$$

Where:
σ_j - Standard Deviation of return of security *j*
σ_m - Standard Deviation of return of the market portfolio *m*.
σ^2_m - Variance of returns of the market portfolio m
Cor_{jm} - Correlation coefficient between the returns of the security *j* and the market portfolio *m*
Formula 8, Security Return (Reilly and Brown, 2002)
Returns on the security and market index were measured on a monthly basis and computed as:

$$\text{Returns} = \frac{\text{Share price in the End} - \text{Share price at the Beginning}}{\text{Share price in the beginning}}$$

Beta is obtained by regressing the returns on the security with the returns on a market index. The characteristic line, the regression line of best fit through a scatter plot of rates of return for the individual risky asset and for the market portfolio of risky assets over some designated past period. The study used this model to estimate the risk parameters.

Value at Risk

An increasingly popular and understandable way of measuring risk is by using the Value at Risk method or VaR. It defines risk as the worst possible loss under normal market conditions for a given time horizon (Grinblatt and Titman, 2001). According to Biglova *et al.* (2004) this risk measurement technique is simple to handle since it provides a risk measure by a single variable. This variable provides the investor with the possibility of losses given a probability (1-p) in a given time horizon and offers a comprehensible understanding of the likelihood of losing money on the investment.

VaR can also measure risk to lose money within a time period and not just at the terminal date. According to Kritzman and Rich (2002) investors are generally exposed to far greater risks during the investment than on the actual end date. Investors often measure the outcome, positive or negative, on the expiring date of the investment. Continuous VaR however allows them to measure risk during the time period instead since the investment might not last the duration of the expected time. Focus should therefore shift from the end period measurement and focus on the risk during the whole holding period, so that losses during time will not affect the terminal investment.

2.3. Empirical review

Both theoretic and empirical literature indicates that whereas investors have long recognized the need for minimizing investment risk while maximizing investment returns, the mechanism of achieving this twin objective has not always been obvious (Fabozzi et al., 2002). CAPM's beta proves that the statistical variance of the investment returns that cannot be eliminated through diversification of investment as reflected in an investment portfolio of numerous risky investments due to the nature of the link between its returns and the returns of the other components of the portfolio (Tofallis, 2008). After the introduction of the preliminary portfolio model by Markowitz (1952), extensive modifications by Tobin (1958),Markowitz (1959), Sharpe (1964), Lintner (1965) and Mossin (1966) led to establishment of capital asset pricing model (CAPM) that is widely used in market asset pricing and risk evaluation. Markowitz was the first to conclude that an investor expects to be rewarded for the risk he or she takes. His theory assumes that everybody is mean variance optimizer that is seeking portfolios with the lowest amount of variance for a given level of return; hence he viewed the dispersion of returns as the appropriate risk measure, (Biglova, Ortobelli, Rachev and Stoyanov, 2004).

Aduda, Masila and Onsongo E.N. (2012), analyzed determinants of development in the Nairobi Stock Exchange. Secondary data for the period 2005-2009 was used to model the factors influencing the development of the NSE. They used secondary data to model the impact of macroeconomics and institutional factors on the development of the NSE and Period of data. This study adopted a descriptive approach.

Aduda *et al. (*2012) found out that, macro-economic factors such as stock market liquidity, institutional quality, income per capita, domestic savings and bank development are important determinants of stock market development in the Nairobi Stock Exchange. There is no relationship between stock market development and macroeconomic stability - inflation and private capital flows. The results also show that Institutional quality represented by law and order and bureaucratic quality, democratic accountability and corruption index are important determinants of stock market development because they enhance the viability of external finance. They conclude that there is a relationship between stock market developments and stock market liquidity, institutional quality, income per capita, domestic savings and bank development. However, regression analysis coefficient shows no relationship between stock market development and macroeconomic stability –inflation and private capital flows.

Empirical studies by Garcia and Liu (1996) have linked stock market development and economic growth once more underscoring the importance of having developed stock markets in an economy. Therefore it can be concluded that stock market developments is determined by stock market liquidity, institutional quality, income per capita, domestic savings and bank development. Any nation that seeks economic growth must focus on developing its stock market.

The study by Olweny 2011 on the reliability of dividend discount model in valuation of common stock at the Nairobi Stock Exchange using Data of share prices, market indices and dividend per share the eighteen companies studied, found out that the differences were then subjected to t-test. The test of significance showed that out of the eighteen companies studied; only three showed that the differences were significant. Monthly returns computed from the share prices and market indices were used to derive the market model for each company, He concluded that the dividend discount model cannot be relied on by companies in the valuation of their common stocks at the NSE.

3. Methodology of research

3.1. Research design

The study used descriptive studies design that relied on the population all the 59 companies that have been quoted in the equity securities market of the Nairobi Securities Exchange for the four year period between January 2009 and December 2012. This time period is considered because it coincides with the time the Nairobi All Share Index (NASI) has been operational at the NSE. This study adopted a descriptive approach. According to Cooper and Schindler (2003) descriptive studies are more formalized and typically structured with clearly stated hypotheses or investigative questions. It serves a variety of research objective such as descriptions of phenomenon or characteristics associated with a subject population, estimates of proportions of a population that have these characteristics and discovery of associations among different variables. Studies by Oluoch and Oyugi, Aduda, Masila and Onsongo E.N. (2012) and Yartey (2008) have used a similar research design. The coefficient of determinant, R^2 measures how well independent variable explains the dependent variable, that is, the degree of association between dependent variable and independent variables. The applied model included one dependent variable and one explanatory variable. In the current study the systematic risk was considered as explanatory variable while market return as dependent variable.

3.2. Data Sampling and sample size

The sample is the related monthly market level data covering the period January, 2009 to December 2012 for the companies listed in the Nairobi stock exchange. The period is selected so as to use the most recent data, to make the findings more current. The study used secondary data the main source of which is the NSE and the Central Bank of Kenya statistics. The following are the conceptualized variables.

3.3. Data collection procedure

Ngumi, 2013 cited Kothari (2004), who defines secondary data as data that is already available, referring to the data which have already been collected and analyzed by someone else. Ngumi (2013) observed that Secondary data analysis is efficient and economical because data collection is typically the most time-consuming and expensive part of a research project. The monthly basis secondary data from the period January 2009 through December 2012 was used model the study from stocks of the various sectors of the NSE.

3.3. Data processing and analysis

This study used both descriptive and inferential statistics to analyze data. Descriptive is usually used at the beginning of the analysis phase in order to provide preliminary analysis of the data and guide the rest of the data analysis process (Cooper and Schindler, 2008). Descriptive statistics provided information about measures of central tendency and dispersion such as mean, range, standard deviation and percentages. On the other hand, inferential statistics were used to test a number of hypothesized relationships so as to allow generalization of the findings to a larger population. The results were summarized using descriptive statistics such as mean and standard deviation. A multiple linear regression model, t-statistic and F- statistic were used to determine the relative importance of each independent variable in analysis to effects of estimate systematic risk inequity stock trading. The t-statistic was used to test the hypothesis at a maximum of 10% significance level. In the case of t-test and f-test , a statistic were considered to be statistically significant when the value of the test statistic lied in the critical region and this case the null hypothesis was rejected and alternative upheld. This was done to determine the relative contribution (sensitivity) of each independent variable. Each price obtained was compared to the actual price for that period.

4. Results

The descriptive statistics portray the central tendency and dispersion characteristics of not only the sectors portfolios and overall market returns, but also of the risk free returns as proxies by the 91-day Government Treasury Bill (TB) returns.

Table 1. Reflects the coefficient of variations of returns from the sectors and the overall market

	Sector	Mean Returns	δ Deviation Returns	Median Returns	CV
1	**Agricultural**	0.118	0.001	0.011	144.46
2	**Commercial & Allied**	0.014	0.089	0.004	6.602
3	**Finance & Investment**	0.022	0.10	0.001	4.762
4	**Industrial & Allied**	0.01	0.068	0.004	7.163
5	**Overall Market**	0.031	0. 189	0.041	0.162

According table 1 the *a* mean was about -0.001 and a median of -0.01, the average monthly returns from the agricultural sector over the study period tend to be mostly negative show that there was a general decline in prices. The statistic was obtained by computing the sectors coefficient of variation (CVAgricSeg) which is the mean variance per unit of return. This indicated that the sector was very volatile if you check it from the standard deviation of other sector portfolio returns. This situation could be attributed to the few companies in the sector. Originally there were 4 companies in 2009 but these were subsequently left to Kakuzi, Rea Vipingo Plantations Ltd and Sasini Ltd after the transfer of Unilever Tea to the alternative investments section in 2010. The few firms in the sector contributed to the effect even though huge firms in the sector resulted to larger weighting factors. The firms who dealt in related items of tea and coffee had very little room for diversification of the portfolio risks given that. commercial and services had a mean of about -0.013 and a median of -0.004, the average monthly returns from the sector showed the same characteristic shown by the agricultural sector over the study period.

The sectoral coefficient of variation of -6.601 indicates that although the sector is very volatile relative to the market, the sectors portfolio risk is significantly lower than that of the agricultural sector. This could be attributed to the higher number of companies (12) than the case of the four companies in the agricultural sector. The mean of monthly returns of the finance and investment sectors portfolio over the four year period is about -0.021while the median is an average of -0.001. The returns also tend toward the negative direction pointing towards a general tendency towards decline in prices. The sector's coefficient of variation of -4.761 indicates a lower average risk than that registered in the agricultural sector and the commercial and services sector. Again this could be as a result of the higher number of companies in the sector and the diverse nature of the equities quoted in this section ranging from the banking, insurance to investment companies. This suggests a superior ability to diversify away risks and leave an overall lower level of diversifiable risk. The mean of monthly returns of the industrial and allied sector's portfolio over the four year period is about -0.0096 while the median is an average value of about of -0.0044. The sector's coefficient of variation of -7.163 shows that is still higher than the positions observed in the commercial and allied and the finance and investment sectors although lower than that of the agricultural sector. Again this could be as a result of the large number of diverse companies in the sector which can help in reducing the diversifiable risk of a sector to the bare minimum.

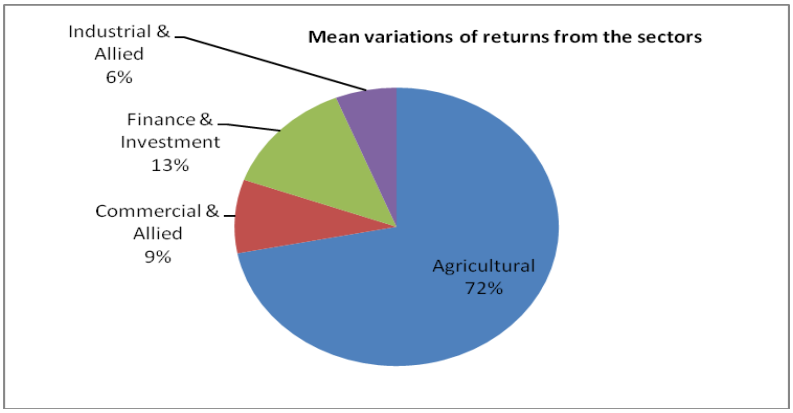

Figure 2. Mean variations of returns from the sectors

From the descriptive statistics and the measure of relative risk, the finance and investment sector is the least risky while the agricultural sector comes out as the most risky. This when looked from the fundamentals is largely because the performance of the companies in the agricultural sector is largely dependent on weather conditions. Accordingly, in additional to the other risk factors that face companies in the remaining three sectors, the agricultural stocks are also prone to weather conditions and their related unpredictability. The average return of the overall market mirrors those of the component sectors at -0.0305 and -0.040 for the mean and the median returns respectively. This translates to a CV of -0.162 the least of the five considered. This is expected because the market evaluates all the returns from all the sectors which help in risk diversification. It therefore provides all the opportunities for diversification of all the diversifiable risk to leave only the systematic risk. The first null hypothesis tests the proposition that there is no significant difference between the volatility of the monthly returns of the various individual sectors. This would be the case if sectoral beta is estimated to be 1.

Table 2. Regression output results for the agricultural sector

R		0.886		
R Square		0.785		
Adj. R Square.		0.784		
Standard Error		0.101		
Observation		59		
ANOVA	***Df***	***SS***	***MS***	***F***
Regression	*1*	*16.162*	*16.162*	*1588.961*
Residual	*57*	*0.468*	*0.010*	
Total	*58*	*16.630*		

	Coeffs	*SE*	*Stat*	*t P-value*	*Lower95%*	*Upper95%*	*Lower95%*	*Upper95%*
Intercept	*0.041*	*0.046*	*-0.888*	*0.379*	*-0.134*	*0.052*	*-0.134*	*0.0519*
Rm – Rf	*2.97314*	*0.024*	*121.800*	*0.000*	*0.924*	*1.022*	*0.924*	*1.022*

The Rsquare of this estimated regression equation is 0.7846 indicating robust results. The regression output serves two purposes. Firstly it helps estimate the agricultural sectoral volatility of returns measured by beta (βagric) as 2.97314. In this case beta is more than 1 indicating that agricultural sector is more volatile than the market returns. This confirms the results identified in the descriptive statistics. Secondly, the output is used to test if βagric is statistically significant. In this instance the significance test is taken at 95% confidence interval using the t-statistic. The regression from the equation is determined as P value is *0.379* and this means P value is greater than 0.05and therefore we reject the null hypothesis and conclude that the NSE agricultural sectoral beta. It also be concluded that it is statistically significant and therefore returns from the agricultural portfolio are more volatile than those of the overall market portfolio. For the commercial and services sector the findings are shown in table 3 the R square of this estimated regression equation is 0.9932 again points to a robust model. The sectorall volatility of returns measured by beta (βcomms) is 1.97691 pointing towards a more volatile sector than the market. This confirms the results identified in the descriptive statistics and was explained it could be attributed to the narrow range of equities with which to diversify away the sectoral risk.

Table 3. Regression Output Results for the Commercial and Services Sector

R			*0.9965*				
R Square			*0.9931*				
Adj. R Square			*0.9930*				
Standard Error			*0.0493*				
Observations			*59*				
ANOVA		***df***	***SS***		***MS***		***F***
Regression		*1*	*16.29*		*16.29*		*6682.84*
Residual		*57*	*0.11*				*0.0024*
Total		*58*	*16.4*				
	Coeffs	**SE**	**Stat**	**t P-Value**	**Lower 95%**	**Upper 95%**	**Lower 95%**	**Upper 95%**
Intercept -	*0.047*	*0.023*	*0.044*	*0.37919*	*-0.0013*	*0.092*	*0.092*	*0.0013*
Rm – Rf	*1.97*	*0.012*	*165.43*	*0.00*	*0.95*	*1.00*	*0.95*	*1.00*

For this sector, we again reject the null hypothesis and conclude that the NSE commercial and services sectoral beta is not equal to 1 and that since it is statistically significant and more than one, the returns from the commercial and services portfolio are more volatile than those of the overall market portfolio. The model is equally robust for the finance and investment sector of the NSE with a coefficient of determination of 0.9858 as indicated in table 4. The estimated beta, β*fininv,* of 0.92 corroborates the findings in the descriptive statistics that this is the least risky sector of the NSE. In this regression output, the beta is statistically significant with a t statistic of 50.8794.Since the value is less than 1, the study rejects the null hypothesis that the sector is equally as risky as the overall market and concludes that the finance and investment sector is less volatile than the general volatility of returns experienced in the NSE.

Table 4. Regression Output Results for the Finance and Investment Sector

R			*0.9929*				
R Square			*0.9858*				
Adjusted. R Square			*0.9854*				
Standard Error			*0.0743*				
Observations			*59*				
ANOVA		***df***	***SS***		***MS***		***F***
Regression		*1*	*17.594*		*17.594*		*3183.972*
Residual		*57*	*0.254*		*0.006*		
Total		*58*	*17.848*				
	Coeffs	**SE**	**Stat**	**t P-value**	**Lower 95%**	**Upper 95%**	**Lower 95%**	**Upper 95%**
Intercept -	*0.0142*	*0.0339*	*0.4195*	*0.6767*	*-0.0542*	*0.0827*	*-0.05415*	*0.0827*
Rm – Rf	*0.9153*	*0.018*	*50.8794*	*0.0000*	*0.9791*	*1.05154*	*0.9791*	*1.0515*

Finally with regard to hypothesis 1, we test the significance of the industrial and allied sector Beta in the determination of the sector's returns and its comparability with the market return volatility. Accordingly when the sector's portfolio excess returns are regressed against the NASI excess returns, the results are as indicated in table 5. The resultant estimating model has a highly significant F of 5969.79 that is confirmed by an equally high coefficient of determination of 0.99 indicating that most of the variations (about 99%) of the changes in the sectors excess returns are determined by the sectors risk premium and that only about 1% of the variations are due to other factors indicated in the random disturbance term. In that regard, the sector's beta computed from the model of 0.9843 is highly relevant in representing the average volatility of the average sector returns.

Table 5. Regression Output Results for the Industrial and Allied Sector

R			*0.9961*					
R Square			*0.99235*					
Adjusted. R Square			*0.99219*					
Standard Error			*0.05263*					
Observations			*59*					
ANOVA			**df**		**SS**		**MS**	**F**
Regression			1		16.536		16.536	5969.79
Residual			57		0.127		0.003	
Total			58		16.663			
	Coeffs	**SE**	**Stat**	**t P-value**	**Lower 95%**	**Upper 95%**	**Lower 95%**	**Upper 95%**
Intercept -	- .0296	0.0240	-1.233	0.2238	-0.0781	0.0188	01877	-0.07810
Rm – Rf	0.9843	0.0127	77.2644	0.0000	0.9587	1.01	0.9587	1.01

The fact that the corresponding t value from the regression output is highly significant with a value of 77.26442 at 95% confidence interval and 47 degrees of freedom indicates that the null hypothesis that the market volatility is equal to the sector volatility of the industrial and allied sector is rejected. Instead a conclusion that the sector is less volatile than the market is made since the computed beta for the sector is less than 1. This is most likely attributable to the large number of companies listed in this sector and the diversity of the products and services offered by these companies. To test the null hypothesis II that there is no significant difference between the volatilities in the monthly equity returns of the various individual sectors of the Nairobi Securities Exchange, the sector betas and their respective means are subjected to a single factor ANOVA test at 0.05 level of significant. The results are indicated in Table 6. The resulting F value of 12.6195 is greater than the critical F of 5.987378 hence the study rejects the null hypothesis and concludes that the variances of the sector betas are different from each other at 95% confidence interval. Combining this with the findings from the tests of hypothesis I imply that the magnitudes of the betas as indicated in Table 7 can be used to rank the relative risks of the various sectors of the NSE.

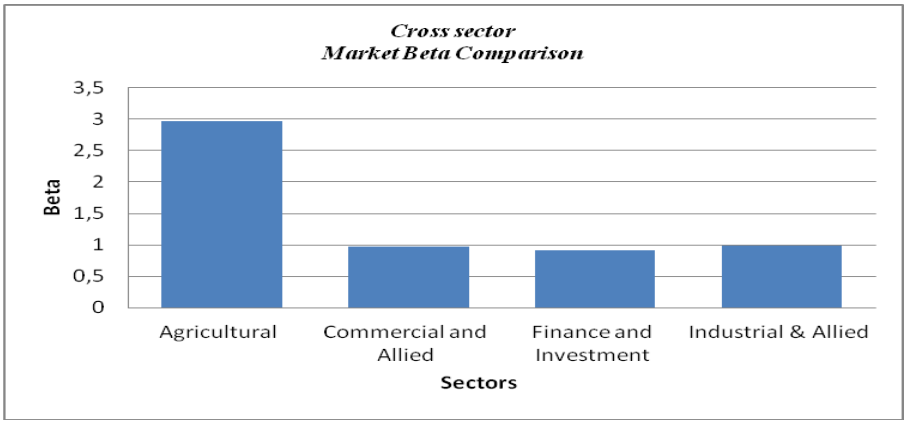

Figure 3. Cross sector Market Beta Comparison

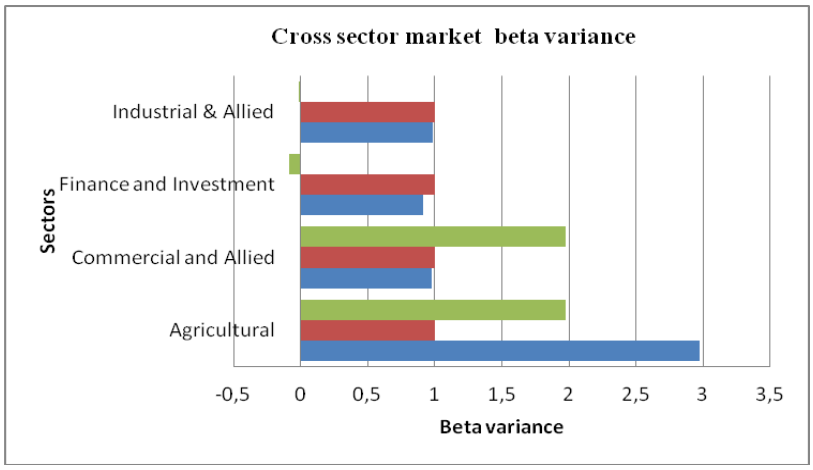

Figure 4. Cross sector market beta variance

The nature of beta as a measure of variability is such that when beta is 1, the variability of a portfolio is equal to that of the overall market. Accordingly betas of less than 1 represent less volatile returns than that of the market while those higher than 1 relate to the portfolios that have greater volatilities than that of the market. Computing the variance as the difference between the sector beta and the unitary beta gives the extent of the differences in variability between the market portfolio and the sector portfolio. Accordingly, the findings in table 7 indicate that the least volatile and hence least risky sector of the NSE for the study period was the Finance and investment followed by the industrial and allied sector. These two showed volatilities less than that of the market. The agricultural sector was the most risky as indicated by a very high beta with a variance of about 1.97 from the unitary level. Hence in that sector, for every unit change in returns of the market portfolio, the returns of the agricultural portfolio were expected to change by 2 units. The commercial and services sector though not as volatile as the agricultural sector, also registered higher volatilities than not only the finance and investment as well as the industrial and allied sectors but also of the overall market in general.

6. Discussions

The descriptive results of this study were concerned about the dispersion and central tendency of the returns of the equity securities of the various companies quoted in the four sector of the NSE. This is important because dispersion including range, variance and standard deviation are established measures of riskiness of returns of investment portfolios in finance. Four important findings emerged from the study. Firstly, over the study period, the entire four sectors at the NSE had average negative monthly returns. This implies that the monthly prices and therefore holding period returns had a general declining tendency. This could be attributed to several factors. It is during this period that the Kenyan Economy had registered sluggish economic growth.

The agriculture sector was most volatile risk of returns as shown by the variance and standard deviation in returns. This was comparison with the commercial and services sector and the industrial and allied sectors which had moderate risk and the finance and investment sector which reported the lowest relative risk among all the four sectors. The chief explanation for the high risk levels on the agricultural counters is the relative size of the sector with only three to four listed companies. The variability one company has a great weighted average influence on the sectoral returns. Besides the sector has companies that deal in weather responsive products yet the Kenyan market has very volatile weather conditions which reflects in the volatility of the returns of the companies in the sector. Looked from a different perspective, the other three sectors are of relatively larger sizes with a larger number of counters that enable equity investors to diversify their investment portfolio that could partly explain their low levels of risk. Thirdly, the coefficient of variation (CV) that relates the sector diversifiable risk to the sector average returns irrespective of size corroborates the conclusions arrived at the size unadjusted risk measures. It confirms the cultural sector as the most risk with commercial and services as well as the

industrial and allied following in that order. The finance and investment sector again emerges as the least risky after this adjustment.

Accordingly is size considerations are not made, then the agricultural sector seems to have more risk factors than the other sectors. This could be attributed to the market perception about the return prospects from the respective sectors. Market beta is used as a measure of the market risk given a diversified portfolio. The beta is such that $-\infty \leq \beta \leq +\infty$.This implies that beta can have negative, positive or unitary values. When beta is unitary, the indication is that the variability of returns of a specified investment portfolio is equal the variability of the overall market. When used in the context of this study, beta as a measure of risk shows how the securities quoted in a particular market sector vary relative to the variations in the market portfolio. If β of a sector is less than 1, the indication is that the sector has returns that are less volatile than that of the market. The opposite applies to betas that are higher than 1.

From this perspective the agricultural and the commercial and services sectors record betas higher than 1 of 2.97 and 1.97 respectively. This indicates that besides the fact that these two sectors have the widest dispersion in returns, they also present the highest market risk. The finance and investment as well as the industrial and allied sectors seem to have risk levels perceived lower than those of the market since their betas fall slightly below 1. In fact their betas could easily be approximated to1 indicating an equal level of risk in these sectors to that observed in the entire market. Perhaps this is not surprising because most of the companies at the NSE fall under these sectors and their sheer sizes have a heavy influence on the market returns. This explains why they approximate market conditions in terms of risk levels. The implication of this is that a Kenyan investor can diversity away most of the risk at the NSE market by constructing a portfolio that mimic the finance and investment and the industrial and allied sectors. This is particularly true because some of the most profitable and stable companies like Barclays Bank of Kenya, Standard chartered bank, East African Breweries Ltd, British American Tobacco Ltd and Bamburi Ltd fall in this category of companies. On average, the findings imply that the systematic risk in each of the market sectors is unique and distinct from each of other remaining sectors. This conforms to theoretical expectations given the idiosyncrasies in operations of each of the companies in the respective sectors. Accordingly some unique factors affect each of the sectors differently from the way it affects any other. This implies that an investor can optimize on his/her investment risk return matrices by judiciously identifying the counters to invest it from each of the sectors.

7. Conclusions

This paper applied multiple regression analysis to effects of estimate systematic risk inequity stock trading. The analysis covered firms listed in the NSE, and sampled monthly market level data for 36 months covering the period 2009 to 2012. By means of multiple regressions analysis of stock returns to sensitivity of the price changes was estimated. Investors differ in their willingness to receive risk for a greater return. But if investors are willing to invest in the stock market, then they are prepared to assume some risk. What the capital asset pricing model offers is a consistency to the risk premiums. If you are prepared to accept higher risks to get higher returns, then it makes sense to demand a higher return for a higher risk; otherwise, why take the higher risk. By comparing the beta of a stock and its historical return with that of the general market, you can determine whether the return of a stock is worth its risk.

Correlation coefficient is a standardized statistical measure of linear relationship between two variables. A positive correlation coefficient indicates that the returns from two securities generally move in the same direction, while a negative correlation coefficient implies that they generally move in opposite direction. A zero correlation coefficient implies that implies that the returns from two securities are uncorrelated; they show no tendency to vary together in either positive or negative linear fashion. The current study had the prime objective to identify the some relationship between systematic risk and stock market return. It was concluded that the systematic risks had no effect upon stock market return. These variables move independently ineffective from each other as there was very poor correlation and weak association between the two variables. These results also consistent with the study of Oluoch and Oyugi (2012) who conducted the study Segmental market risk appraisal of equity investments at the Nairobi Securities Exchange.

The study rejects both hull hypotheses that firstly **t**here is no significant difference between the volatility of the monthly returns of the various individual sectors and the overall monthly returns of the NSE market and secondly that there is a significant difference between the volatility of the monthly returns of the various individual sectors and the overall monthly returns of the NSE market. The study shows that the various markets have their own unique betas pointing towards the fact that the NSE tends towards an informally efficient market such that prices of the various companies reflect the risk levels of each of the companies and sectors. This also shows that each of the market sectors has their own unique risk factors such that they exhibit unique levels of systematic risk. However it can also be concluded that that large size sectors are less risky than the small size sectors of the NSE. Investors are likely to experience reduced uncertainties in their returns if their portfolio has higher weightings of companies in two sectors namely the finance and investment and industrial and allied sectors. It is also instructive that the agricultural sector is very risky. This is attributed to the high return volatilities as a consequent of weather patterns. Indicatively, stocks in the agricultural sector are more weather elastic than those of the other sectors. The study however faced some limitations that may require further studies to bridge the gap in the current knowledge about risks and returns in financial markets. The first limitation relates to the differences in the sizes of the various sector of the market as reflected by the differences in the number of companies quoted at each sector as well as the values of sectoral capitalization. This could easily make inter-sector comparison of return deviation based risk very difficult. However, the study overcomes this problem by employing the use of the coefficient of variation statistic (CV) which relates risk measures to average returns. This facilitates the cross-sector comparison. The second limitation is mainly structural emanating from the fact that the NASI index which is used to determine overall NSE market returns is a relatively new innovation that came into practice in January 2009. This meant that the study could not be carried out for a longer period than the 55 months between January 2009 and December 2012. Despite this, it is taken that a study for four years is long enough to generate acceptable market beta. Significantly, similar studies on market trends have taken comparable time into consideration (Koustubh, 2010; Koo and Olson, 2008; Jecheche, 2009). Another structural problem that presented a limitation to the study is the relatively small size of the market with a market capitalization that has fluctuated between KSh.700 billion (US$8.3 billion) and one trillion Kenya shillings (US$12 billion) over the study period. Accordingly, the study is limited to only an average of 54 companies quoted at the bourse. With the sub-division into five sectors including the alternative investments market sector (AIMS), the equity securities that fall into each sector are understandably small in number. This is however not a particularly limiting problem because the study uses all the relevant companies as opposed to reliance on a sampling mechanism.

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