THE ASSESSMENT OF RISK IN THE FOUR SEGMENTS OF THE NSE

BY

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DECLARATION

I hereby declare that this project is my own work and effort and that it has not been submitted anywhere for any award. Where other sources of information have been used, they have been acknowledged.

Signature: .....

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Date: 11/11/2011

This declaration has been presented with my approval as the university supervisor.

Signed .....

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Date 11/11/11

DEDICATION

For my wife Kasiku and my two sons Ken and Oliver

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For the success of this research I owe it to various people and organizations without whose material and non material support this research would have come to naught. I take this opportunity to express my sincere thanks to each of these people and organizations.

The staff of Jomo Kenyatta Library of the University of Nairobi who provided to me the opportunity of using their facilities especially the MBA and the Electronic Library section. From these able staff I was able to access not only research reports from earlier MBA research findings but I was able to access scholarly publication from the wider academic sphere.

Much of the direction on what to do at each stage of this research from the generation of the research idea, to its conceptualization, to the drafting of the research proposal, to the analysis of samples and preparation of the report was provided by my supervisor Mr. Barasa J. L.

The data of analysis was got from the Nairobi Stock Exchange. It would not have been possible to conduct an analysis and extract out the relevant finding if the data was not available in the first place. This data was well kept by the staff of the NSE who then availed it to me when I needed it to conduct this research.

In my literature review I have cited quite a lot of scholarly publications; some from earlier MBA students' research findings and others from the wider academia. These are works without which I could not have had a scholarly insight into this research

Finally I would wish to thank my family that provided me with constant encouragement throughout.

ABSTRACT

This research provides evidence that there is improvement of market efficiency on the NSE and that the risk on the four segments of the NSE are not necessarily the same. They could be significantly different at times despite being in the same market. The findings are based on Wednesday stock volumes and prices of forty-eight listed companies. Risk was calculated using two different approaches. The first one focused on the variance of returns from CAPM predictions while the other focused on variance from the mean of the returns of a segment. This approach was used to conduct the first test that drew the conclusion that the NSE is improving in efficiency according to CAPM and that the variance reduced with time. In this test mean absolute deviations were found by getting the difference between company returns as calculated by the Modigliani-Miller (1961) model and the returns calculated by the CAPM. The inter-weekly comparison of the changes in the mean absolute deviations was done using Z scores

The second approach of risk was used to test whether the level of risk in the four segments of the NSE. This was done by finding the average segment return and using it to find segment-based absolute deviations. These were then tested using the Z scores to test whether there were significant differences among the four segments.

Analysis results showed that though there was a wider variance between CAPM returns and the returns calculated from market prices, this variance tended to narrow towards the end of 2010. The inter-week Z-tests showed that prices were random for the variations in the mean absolute deviations were mostly not different from those of the preceding week. This indicated market efficiency. The findings of the second tests showed that in 2006 the markets did not have significantly different levels of risk but divergence increased in the later years with the A&AMS showing the highest risk. The FIMS and the MAIMS showed almost same levels of risk that were both low and reducing. The risk level in the AIMS was not did not show a clear trend only that it kept oscillating.

LIST OF ABBREVIATIONS

AIMS	Alternative Investments Market Segment
APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
CDS	Central Depository System
CMA	Capital Market Authority
DASS	Delivery And Settlement System
EMH	Efficient Market Hypothesis
HML	High Minus Low
ICAPM	Intertemporal Capital Asset Pricing Model
IT	Information Technology
MBA	Master of Business Administration
MIMS	Main Investment Market Segment
NSE	Nairobi Stock Exchange
SMB	Small Minus Big
T-Bill	Treasury Bill

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CHAPTER 1

INTRODUCTION

1.1 Background

The NSE is divided into four segments the MIMS, the FISM, Agricultural & Allied Market Segment and the AIMS (NSE 2011). These submarkets facilitate the sell and purchase of stocks. The NSE provides daily data on their website focusing on a lot of financial information like current stock prices with corresponding changes, capitalization, NSE 20 Share Index, All Share Index, Equity Turnover, Market Capitalization, Total Deals, Total Share Traded etc (NSE 2011). No information is provided on how risky each of the market segments is. It is important to establish the level of risk in the four submarkets and provide a ranking to help investors know which market segment is the safest and which one is generally most risky according to some standard measure like CAPM. This type of information will hopefully help investors get a quick glimpse of the riskiness in a market segment to aid investment decision.

Market Efficiency as expressed in the efficient market hypothesis (EMH) formulated by Fama (1970), posits that at any given time, prices fully reflect all available information on a particular stock and/or market. Thus, according to the EMH, no investor has an advantage in predicting the return on a stock price because no one has access to information not already available to everyone else (Fama, 1965). It is possible, therefore, to use the CAPM as a measure upon which risk in a market can be analyzed.

The key terms to this study are as follows risk, return, dividend, EMH, CAPM and stock price. Risk is a quantifiable variation in return on an asset measured by the standard deviation of returns (Markowitz, 1952). A return on an asset is the gain or loss on a security in a given period (Investopedia, 2011) expressed as a percentage.

Return consists of the income and the capital gains relative on an investment, usually quoted as a percentage (Modigliani & Miller, 1961).

A dividend is a distribution of a portion of a company's earnings, decided upon by the board of directors, to a class of its shareholders (Investopedia, 2011). The dividend is most often quoted in terms of units of currency per share received (dividends per share) or as a percentage of the current market price (NSE, 2011). The EMH is a theory developed by Fama (1965) which states that it is impossible to beat the market because prices already incorporate and reflect all relevant information i.e. past, public and private (Fama, 1965).

The CAPM is a model that relates risk and return in a linear form. It argues that the total expected return from an asset is partly constant (risk free rate) and partly directly varies as the level of stock risk (market premium) (Sharpe, 1964). Price of an asset is a mere allocation that has little to do with value (Bajaj, Bukesh, & Vijh 1990) but decided upon through interaction between demand and supply. If CAPM is taken as the true return predication, then it's the returns by the market that vary away. The further away the variance, the highly inaccurate the market and therefore high risk rates (Bajaj, & Vijh 1990).

1.2 Statement Of The Problem

Despite the proven potential for growth, and its attraction to a lot of investors, both local and foreign (NSE, 2011), the NSE has left many investors disappointed by the deals they get from the market players (Mwanza, 2007). The entry of several small, short term investors with little knowledge about the market has created a near perfect market with competition, supply and demand factors that drive the market (Mwanza, 2007). This near perfect market s expected therefore to transfer value as accurately and as efficiently as possible to the investor (Fama, 1965). Studies by Jahan-Parvar & Mohammadi (2010) and Raputsoane (2009) found that markets with naive traders can be efficient and that the CAPM can appropriately be applied in such a market.

Jahan-Parvar et al (2010), analyzed market index returns in the Tehran stock exchange (TSE) within the context of three variants of the Capital Asset Pricing Model: the static international; the constant-parameter Intertemporal; and a Markov-switching Intertemporal CAPM, which allows for the degree of integration with regional and international equity markets to be time-varying. They used daily and monthly returns data from the TSE, Dow Jones, and MSCI (formerly, Morgan Stanley Capital International) in this research.

Jahan-Parvar et al (2010) found supporting evidence in favor of Intertemporal CAPM efficiency at the monthly frequency. This characteristic was lost on changing sampling frequency to daily. They could not improve the performance of the ICAPM model through inclusion of factors such as exchange rates and oil price fluctuations or inter-national macroeconomic factors, such as increased risk of an economic downturn reflected in term spreads. The study shows that a market dominated by naive traders can still be efficient. They found the TSE to be an efficient market, even in the presence of insider trading, collusion, price fixing, and considerable informational asymmetry.

Raputsoane (2009) found that relation between risk and return to be linear, while Jahan- Jahan-Parvar et al (2010) found that markets with naive investors can be efficient even with information asymmetry. Further the CAPM operates within an efficient market. The question that arises is, is it possible to apply CAPM to ascertain whether the NSE is efficient by measuring how returns are at variance with CAPM predictions? Do the submarkets of the NSE necessarily have same risk?

1.3 Research Questions

This research seeks to answer two questions:

1. Is the Nairobi Stock Exchange efficient in the pricing of stocks?
2. Do the four market segments MAIMS, FIMS, A&AMS and AIMS have different risk levels?

1.4 Research Objectives

1.4.1. General Objectives

By the end of this research it will be possible to:

2. Tell whether stock pricing is improving efficiency and in accordance with CAPM predicted values.
3. Determine whether or not the four market segments have significantly different annual risk levels within the stipulated period of study.

1.4.2 Specific Objectives

By the end of this research it will be possible to:

1. Establish whether the variance between stock returns from market price and those predicted by the CAPM is reducing.
2. Determine whether or not risk levels in the four market segments are different or same

1.5 Value (Significance) Of the Study

Establish basis for establishing a scale for ranking security markets basing on risk. If established it will make possible to classify security markets in the world for diversification and investment purposes. The investors and quoted firms will have confidence in the prices of the asset in case there is establishment that improvements on the NSE cause efficient pricing. This can be used as rationale to demand improvements on the stock exchange management in future.

The result will provide basis for further argument in the scholarly field of finance as this study is yet another test on the CAPM and the EMH. The study is to establish complementationary rather than the competitionary relationship between EMH/CAPM and behavioral finance. If the market segments risk ranking is established it will be possible imput for diversification and investment purposes.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

This section is divided into three parts. The theoretical literature review part discusses the EMH, the Behavioural finance theory, and the APT. The empirical literature review traces the origins of the CAPM and how, due to criticisms, changes have been made on CAPM and other rival models like the three factor model came up. It also looks at the criticism against the statistical methods used by the CAPM. The CAPM has survived all this and is still dominant. The section also discusses how efficiency is achieved through organizational changes and technological improvement, similar o changes that have been taking place at the NSE since it began to date. Finally the section ends with a historical look at the NSE, the context of the study.

2.2 Theoretical Literature Review

2.2.1 The Efficient Market Hypothesis (Fama, 1965)

The Efficient Market Hypothesis arose in response to allegations from the professional investment community and critics of financial accounting before it was developed into the concept market efficiency. A securities market is efficient with respect to an information system if and only if security prices act as if everyone knows and responds according to that information system and under these conditions prices are said to "fully reflect" the information system (Fama, 1965). CAPM should therefore be an appropriate standard measure of return on the NSE upon which returns can be compared (Fama, 1965).

2.2.2 Behavioural Finance (Kahneman & Tversky, 1979)

The Behavioral Finance theory, offers an alternative paradigm (to EMH) in the explanation of how individuals make investment decisions based on their behavioural dispositions it is concerned with the bounds of rationality of economic agents (Daniel & Titman, 2000). Behavioral models typically integrate insights from psychology with neo-classical economic theory. This theory posits that individuals make systematic mistakes in the way that they process information (Daniel & Titman, 2000). The delving into the behavioral theory in finance was initialized by the works of Kahneman and Tversky (1979) when they published *Prospect Theory: An Analysis of Decision under Risk*. Behavioural finance discusses issues like behavioral biases (like excessive optimism, overconfidence, confirmation bias, illusion of control), heuristics (like representativeness, availability, anchoring) and framing effects. This theory recognizes that there are irrationalities that will make prices deviate from the actual and the presence of these deviations show inefficiency in the market (Kahneman and Tversky, 1979)

2.2.3 Adaptive Market Hypothesis (Lo, 2004)

The Adaptive Market Hypothesis, as proposed by Lo (2004), attempts to reconcile economic theories based on the EMH with behavioral economics, by applying the principles of evolution (competition, adaptation and natural selection) to financial interactions: Under this approach, the EMH can coexist with Behavioral models. Lo asserts that much of what behaviorists cite as counterexamples to economic rationality are, in fact, consistent with an evolutionary model of individuals adapting to a changing environment using simple heuristics (Lo, 2004). This hypothesis unites the EMH and the Behavioural finance hypothesis into one market environment with the irrationalities contributing significantly to risk (Lo, 2004). Higher risk is a measure of the market being informationally inefficient (Lo, 2004).

2.3 Empirical Literature Review

Raputsoane (2009) conducted a study on the South African stock market using Merton's (1973) single factor ICAPM. The GARCH-M model was used to analyze

the daily residual returns of market and industry stock price indexes of the Johannesburg stock exchange listed companies. The risk-return trade-off was estimated using daily returns on 50 market and industry stock price indexes. The risk-free rate of interest was estimated by bond yields on R153 (short term government bond) and R186 (long term government bond). Risk was estimated by the stocks betas. All data was sourced from the South African Reserve and covered January 04, 1995 to February 06, 2009.

According to the empirical results, out of the 50 stock price indexes, 45 (95 percent) showed a positive and a highly statistically significant coefficient of risk aversion. Only 5 (5 percent) of the 50 stock price indexes showed no statistically significant coefficient of risk aversion. The estimated results generally lent support to the robust positive risk-return relationship between expected returns and the market risk premium in the South African stock market in line with CAPM, notwithstanding the few exceptions (Raputsoane, 2009).

In another study Jahan-Parvar & Mohammadi (2010), analyzed market index returns on the Tehran Stock Exchange (TSE) within the context of three variants of the Capital Asset Pricing Model: the static international; the constant-parameter Intertemporal; and a Markov-switching Intertemporal CAPM, which allows for the degree of integration with regional and international equity markets to be time-varying. They used daily and monthly returns data from the TSE, Dow Jones, and MSCI (formerly, Morgan Stanley Capital International) in this research.

Jahan-Parvar & Mohammadi (2010) found supporting evidence favoring Intertemporal CAPM efficiency at the monthly frequency. This characteristic was lost on changing sampling frequency to daily. They could not improve the performance of the ICAPM model through inclusion of factors such as exchange rates and oil price fluctuations or inter-national macroeconomic factors, such as increased risk of an economic downturn reflected in term spreads. The study shows that a market dominated by naive traders can still be efficient. They found the TSE to be an

efficient market, even in the presence of insider trading, collusion, price fixing, and considerable informational asymmetry.

The NSE, since its inception, has undergone growth in terms of number of listed companies, member broker firms, volume of shares, traders, and technological and organizational improvements. A research done by Otuke (2006) is evidence that there have been improvements on the NSE. This study sought to determine whether the implementation of the Central Depository System had impact on the NSE

This study by Otuke analyzed monthly price averages for both before and after the implementation of the CDS. The mean prices per firm for both periods were computed and tested for significance of difference. Also significance of difference in market size (using market capitalization), market activity (using market turnover and number of shares traded) and market liquidity (using value of shares traded) was done using trend analysis.

The findings were that clearance and settlement procedures were simplified and quickened, processing of orders was faster, the speeds just mentioned reduced managed risk, accuracy levels were raised, trading costs reduced, the market deepened and widened, access to the market was made easier for it became electronic rather than physical. The report is, however, quiet on the effect of the CDS on asset pricing. But based on the EMH, it is expected that the level of accuracy in asset pricing should be enhanced (Otuke, 2006)

These researches confirmed that there is a linear relationship between risk and return and that even emerging markets with naïve investors coupled with information asymmetry show traits of market efficiency. Market efficiency is a strong assumption of the CAPM, indicating CAPM can be used as a measure of market efficiency. None of this research attempts to establish a risk ranking of the four market segments of the NSE based on the CAPM

2.4 General Literature Review

Market efficiency is directly or indirectly tested every time a study is performed to identify stock price reactions to certain events such as dividend announcements (Bajaj and Vijh 1995, 1990), earnings announcements (Bamber, 1987), stock splits (Copeland 1979), large block transactions (Holthausen, Leftwich, and Mayers 1987; Kraus and Stoll 1972), repurchase tender offers (Lakonishok and Vermaelen 1990) and other public announcements (Kim, and Verrecchia 1991). It is traditional that event-study methodology is used to evaluate the reaction of the market to certain corporate events (Kim, and Verrecchia 1991). These studies which are specific in nature are designed to measure market efficiency at certain points in time and only with reference to the specific events (Kim, and Verrecchia 1991).

A more encompassing evaluation of market efficiency can be made by testing whether or not the returns in a market follow a random walk process over a longer period of time in line with the prediction of EMH that stock prices should fluctuate randomly in the short run if the stock market is efficient (Fama, 1965). The semi-strong form of the Efficient Market Hypothesis (EMH) holds that the market almost instantaneously absorbs all relevant information as it becomes publicly available as presented by the published financial records (Fama, 1965). Fundamental analysis can reliably predict future changes in such markets but may not generate consistent arbitrage benefit as all investors have such information. Hence, daily returns should fluctuate at random in a manner similar to the Brownian motion, traced at least as far back as the work of Bachelier (1900) in line with the random nature of new information coming up (Andrikopoulos, 2011).

The weak form and the strong form are the other forms of efficiency (Fama, 1965). In the weak form, asserts Fama, prices are supposed to reflect all relevant past information. And, as a consequence, the study of past information can produce a reliable prediction of future prices but cannot lead to arbitrage benefit as all investors have such information. This, according to Fama, enforces the practice of chart

analysis of price trends and using the findings to foretell what the future prices and therefore return will be.

The strong form theorizes that if the market is efficient then the prices of assets should be an embodiment of all the relevant information, past, public and private about an asset (Fama, 1965). This means the information got is accurate, accessed quickly and is almost immediately (and without bias) embodied in market prices of assets (It is appropriate to include the speed with which such markets recover from uncertain events). There is totally no chance of arbitrage (even by experts) based on any form of information. Further all the players are assumed to be in a state of "wisdom". The axiom of wisdom ascertains that the subject is not unaware of anything - neither any piece of information nor to what use the pieces of information is to be put within the market context (Landstrom, 2007).

This leads to what Burton G. Malkiel humorously put it in his book, *A Random Walk Down Wall Street*, first published in 1973 as, a blindfolded chimpanzee throwing darts at the Wall Street Journal could select a portfolio that would do as well as the experts within an efficient market, asserting that in a strongly efficient market it is advisable to buy a broad-based portfolio of assets randomly selected. Such an investor will still be able to get a fair return according to the market because even the experts do not have any advantage above the other investors (Malkiel, 1973).

In the efficient market it is assumed that first, all investors are independent, rational, well informed and hope for the highest profit; second, all information is free and randomly available in the market, meaning that no one can predict any new information; once the information is released in the market, third, the price will be in response as soon as possible; and finally, there are no taxes or transaction fees in the market (Samuelson, 1965, Fama, 1965 and Mandelbrot, 1966).

Set within the EMH is the Capital Asset Pricing Model (CAPM). This model assumes that all investors aim to maximize economic utilities, are rational and risk-averse, are

broadly diversified across a range of investments, are price takers, (they cannot influence prices), can lend and borrow unlimited amounts under the risk free rate of interest, trade without transaction or taxation costs, deal with securities that are all highly divisible into small parcels, and assume all information is available at the same time to all investors (Sharpe, 1964). It is also assumed that returns are normally distributed about the mean return. The model is presented as

$$R_A = R_F + \beta_A (R_M - R_F) + \epsilon_A$$

In an ideally perfect market (what a perfect stock market should be) the intrinsic value of an asset should be equal to the market price (Sharpe, 1964). The term ϵ_A in the model above is a random error that arises as a result of a random misprice and it is a zero mean term (Ross, 1976). The argument is that given a set of information about an asset j at time t then,

$$E(X_{j,t+1} | \Phi_t) = 0$$

where $X_{j,t+1}$ represents the difference between the actual price of security j at time $t+1$ and its expected price based on the given set of information Φ_t. In case the expectation given by the above equation is equal to zero it is concluded that there are no available opportunities for investors to beat the market, as no overpriced or underpriced stocks exist at time t. The stochastic process X_j is then considered to be a fair game (Le Roy, 1989). An inefficient market would not produce such result, as $E(X_{j,t+1} \mid \Phi_t) \neq 0$. Farther it can be argued that $E(P_{j,t} \mid \Phi_t) = 0$ where $P_{j,t}$ is the difference between the price of stock j and its intrinsic price at time t given the information set Φ_t.

The EMH and the CAPM brought about a lot of discussion within the finance academia. The discussions dealt with nearly every aspect of the EMH and the CAPM; the assumptions, the accuracy and even the fact that the model is statistics-based. The nature of the criticism determined the nature of the other rival models that arose later. Merton (1973) criticized the CAPM as a model that provided a static measure to return. In the same paper, "An Intertemporal Capital Asset Pricing Model," published

in September 1973, Merton further argues that since the model assumes that investors choose their portfolios according Markowitz (1952) mean-variance criterion, it is also subject to the objections laid against the mean-variance model. The CAPM, more still, is subject to objections against its assumptions like homogeneous investor expectations and objections against its single period nature. The Intertemporal Capital Asset Model (ICAPM) is based on the major assumption that "Trading in assets takes place continually in time."(Merton, 1973, pp. 869). Unlike the CAPM which considers a single-time maximizer, the ICAPM maximizer selects portfolios by considering the relationship between current period returns and the returns that will be available in future (Merton, 1973).

In Ross (1976) sought to provide an alternative to the CAPM. The Ross model is called the Arbitrage Pricing Theory (APT). The APT, as given by Ross in the same publication, holds that the expected return of a financial asset can be modeled as a linear combination of various macro-economic factors or theoretical market indices, where sensitivity to changes in each factor is represented by a factor-specific beta coefficient. If assets returns follow a factor structure then the following relation exists between expected returns and the factor sensitivities:

$$E(r_j) = r_f + b_{j1}RP_1 + b_{j2}RP_2 + \ldots + b_{jn}RP_n$$

where $\mathbf{RP_k}$ is the risk premium of the factor, b_{jk} are the corresponding betas, and r_f is the risk-free rate (that has nothing to do with the T-Bill rates). This means that, the expected return of an asset j is a linear function of the asset's sensitivities to the n factors in the market (Ross, 1976).

The APT differs from the CAPM in that it is less restrictive in its assumptions (Ross, 1976). It allows for an explanatory (as opposed to statistical) model of asset returns. It assumes that each investor will hold a unique portfolio with its own particular array of betas, as opposed to the identical "market portfolio". In some ways, the CAPM can be considered a "special case" of the APT (Shanken, 1986) in that the securities

market line represents a single-factor model of the asset price, where beta is exposed to changes in value of the market. There must be perfect competition in the market. The risk-free rate is not necessarily equal to the 91-day T-bill rate, but it is the return of a zero-beta portfolio (Shanken, 1986).

The three-factor model of Fama and French (1993) posits that expected returns can be explained by three proxy variables namely the excess market return, a size factor (SMB), and a book-to-market equity factor (HML). The three factor model adds the two factors (size factor and book-to-market equity factor) to CAPM to reflect a portfolio's exposure to these two classes of factors. The model is stated as

$$r_A = r_f + b_{im}(r_M - r_f) + b_s(SMB) + b_v(HML) + \alpha$$

Here r_A is the portfolio's rate of return, r_f is the risk-free return rate, and r_M is the return of the whole stock market. The "three factor" β is analogous to the classical β but not equal to it, since there are now two additional factors to do some of the work. SMB stands for "small (market capitalization) minus big" and HML for "high (book-to-price ratio) minus low." They measure the historic excess returns of small caps over big caps and of value stocks over growth stocks. These factors are calculated with combinations of portfolios composed by ranked stocks and available historical market data (Fama & French, 1993)

The consumption-CAPM is an Intertemporal model within which investors maximize their expected lifetime utility. In this model, financial assets are used to smooth the path of consumption over time, selling assets when times are bad and investing in assets when times are good. It assumes that investors are not interested in maximizing their portfolio, but rather in maximizing the consumption they get from their portfolio. This model argues that excess equilibrium returns are proportional to their consumption betas according to Rubinstein (1976), Breeden and Litzenberger (1978) and Breeden (1979).

In the advent of Behavioural Finance (Tversky and Kahneman, 1973), a field of finance that proposes psychology-based theories to explain stock market anomalies

that occur within the EMH, for instance representativeness, anchoring and weekend effect, the Behavioural CAPM (Shefrin and Statman, 1994) was derived. The Behavioural CAPM centers on a market where both information traders and noise traders participate (Shefrin and Statman, 1994).

Estrada (2002) took issue with the normal distribution of returns around the mean return and differed with the use of variance and standard deviation as measures of risk. He argues that the variance of returns is a questionable measure of risk for at least two reasons: First, it is an appropriate measure of risk only when the underlying distribution of returns is symmetric. And second, it can be applied straightforwardly as a risk measure only when the underlying distribution of returns is normal. However, continues Estrada (2002), both the symmetry and the normality of stock returns are seriously questioned by the empirical evidence on the subject.

Estrada (2002) therefore uses the semivariance of returns, which he argues is a more plausible measure of risk for consonant with investors' dislike of downside volatility only He further states the semivariance is more useful than the variance when the underlying distribution of returns is asymmetric and yet as useful when the underlying distribution is symmetric. Finally, he argues, the semivariance combines into one measure the information provided by two statistics, variance and skewness, thus making it possible to use a one-factor model to estimate required returns. This model can be defined as the CAPM without considering the upside risk (Estrada, 2002).

Lo (2004) sought to reconcile the EMH and the rival Behavioural finance postulates. In this 2004 article, Lo reviewed the then state of controversy surrounding the EMH and proposed a new perspective that was to reconcile the two opposing schools of thought. This proposition which he called *The Adaptive Markets Hypothesis* (AMH) is based on an evolutionary approach to economic interactions, as well as some recent research in the cognitive neurosciences that has been transforming and revitalizing the intersection of psychology and economics (Lo, 2004). Specifically, the AMH

could be viewed as a new version of the EMH, derived from evolutionary principles (Lo, 2004).

According to Lo (2004) prices reflect as much information as dictated by the combination of environmental conditions and the number and nature of "species" in the economy or, to use a more appropriate biological term, the *ecology*. "Species" refers to sets of investors that have similar characteristic. For instance some investors are basically pensioners, others are retail investors, hedge fund managers etc If there are many different subsets of a species fighting for the scarce resources within that market, then that market is efficient. Otherwise it is not. Lo (2004) argues that market efficiency cannot be analyzed in a vacuum but is highly context-dependent and dynamic, just as insect populations advance and decline as a function of the seasons, the number of predators and prey they face, and their abilities to adapt to an ever-changing environment.

The AMH therefore advances the Darwinian survival-for-the-fittest maxim within the financial market (Lo, 2004) and as the nature of "species" and environmental conditions change, so do the attitudes toward risk and return. The nature of, response and the adaptation of the current species to the financial forces will have an impact on future players. In fact the arbitrage opportunities (among other opportunities) that arise provide the drive for more accurate information and to what use such information is to be put for the investors benefit. In short such trends keep pushing the market towards efficiency, supposedly from inefficiency (Lo, 2004)

Other onslaughts have been launched against social sciences for their use of statistical methodology and historical data to lay future predictions. In "Poverty of Historicism," Popper (1944) posits that he is convinced that this historicist methodology is, at bottom, responsible for the "back-wardness of the social sciences." (Popper, 1944, pp. 86). He further asserts that "Historicism claims that the historical character of social laws makes it impossible for us to apply the majority of the methods of physics to sociology."(Popper, 1944, pp. 87). Historicism is a mode of thinking in which the basic significance of specific social context—e.g., time, place,

local conditions—is central; whereas the notion of fundamental generalizable immutable laws in the realm of sociology or social behavior tends to be rejected. It is the theory that the only true understanding of a person, society, historical period, etc. comes about through knowledge of its history (Popper, 1944). This is what Popper argues has led to the "backwardness" of social sciences. This has been a general criticism against the use of statistics in finance. Some critics (Taleb, 2007, Lo and Mueller, 2010) call it the "physics envy."

Andrikopoulos (2011) refers to the EMH as an oversimplification of human behavior to suit modernistic approach to finance where man is seen as perfectly self-interested, perfectly rational and having free access to perfect information regarding a specific condition. The result being the treatment of man as if he exists in the 'hard sciences' realm, simply for accurate mathematical predictability purposes, while ignoring the antipositivist-interpretivist nature of human behaviour (Andrikopoulos, 2011).

The paper by Lo and Mueller (2010) brings in a new angle to what rationality and therefore market efficiency is all about. The paper recognizes that "recent research in the cognitive neurosciences has identified an important link between rationality in decision-making and emotion, implying that the two are not antithetical, but in fact complementary."(Lo and Mueller, 2010, pp. 8) In particular, emotions are the basis for a reward-and-punishment system that facilitates the selection of advantageous behavior. Even fear and greed (originating internally or externally)—the two most common culprits in the downfall of rational thinking, according to most behavioralists—are the product of evolutionary forces, and adaptive traits that increase the probability of survival (Lo and Mueller, 2010).

The paper by Lo and Mueller, (2010) goes on to assert that this leads to the conclusion that rationality is not about absence of emotion in decision-making, but rather manipulating emotion to match (or enhance) the decision to be made. Information, analytical methods, and decision criteria are simply aimed to help the decision-maker to manipulate emotion and match it with decision. Irrationality therefore arises when emotional level is higher or lower than necessary. In an

efficient market, rationality as implied here is prevalent, while in an inefficient market mismatching emotion with decision is rampant. Markets are not simply either efficient or inefficient (Bowman & Buchanan, 1995). Market efficiency can be viewed as a continuum running from the perfect market (i.e., precisely strong form efficient) to the grossly inefficient market where excess earning opportunities abound. The efficiency level of the market is at a point on the continuum between gross inefficiency and perfect efficiency (as defined by EMH).

Despite these criticisms the model is robust and it may be argued that the fact that CAPM has failed statistical tests may be an indication of the problems faced by the finance academia of whether the data used to test CAPM and EMH is accurately processed given that there are many problems ailing the financial accounting field that generates the financial data (Fama & French, 2004)

A stock exchange provides "trading" facilities for stock brokers and traders to trade stocks, bonds, and other securities. The stock exchange also provides facilities for issue and redemption of securities and other financial instruments, and capital events including the payment of income and dividends. Securities traded on a stock exchange include shares issued by companies, unit trusts, derivatives, pooled investment products and bonds. Trade on an exchange is by listed members only (NSE, 2006).

There is usually no compulsion to issue stock via the stock exchange itself, nor must stock be subsequently traded on the exchange. Such trading is said to be *off exchange* or over-the-counter. This is the usual way that derivatives and bonds are traded. Increasingly, stock exchanges are part of a global market for securities (NSE, 2006).

Other than trading, the NSE (2011) identifies many other less general benefits which the stock exchange affords individuals, corporations and Governments. It helps in the mobilization of savings for investment in productive enterprises as an alternative to putting savings in bank deposits, purchase of real estate and outright consumption. It facilitates the growth of related financial services sector like insurance, pension and

provident fund schemes which nurture the spirit of savings. It provides check against flight of capital which takes place because of local inflation and currency depreciation. It also provides encouragement to the divorcement of the owners of capital from the managers of capital and therefore encouraging expertise in management. Furthermore, the stock exchange facilitates the encouragement higher accounting standards, management of resources and public disclosures which in turn spur greater efficiency in the process of capital growth. Facilitation of equity financing as opposed to debt financing is enabled and so is improvement in access to finance for new and smaller companies through the Alternative Investments Market Segment (NSE, 2011).

The functions above need to be handled enhanced effectively and efficiently. For this to be achieved the stock exchange in itself as an organization needs to put in place measures to render it both effective and efficient (Vandenberg, 2011). Vandenberg identifies the key areas to be emphasized in the quest for efficiency and effectiveness as ethical and value framework, clear and concise description of the business to create a clear picture in every employee's mind of what the organization will become, explaining the value the business delivers to its clients in the simplest most basic form, being crystal clear about what each person is responsible for, designing how work flows through the organization to allow everyone to understand processes, and creation of a communications plan that ensures information is shared with the appropriate people at the appropriate time and ease among others These have to be coupled with information hardware and software and continuous assessment and review of the systems to upgrade them (Vandenberg, 2011).

Science Dictionary (2009) defines information technology (IT) as, "the technology involved with the transmission and storage of information, especially the development, installation, implementation, and management of computer systems within companies, universities, and other organizations." It encompasses the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a microelectronics-based combination of computing and telecommunications. IT is a wide area of managing technology and areas that include

(but not limited to) things such as processes, computer software, information systems, computer hardware, programming languages, and data constructs. Anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of Information Technology (Science Dictionary, 2009).

Wurgler, (1999) posits that IT professionals perform a variety of functions which include data management, networking, engineering computer hardware, database and software design, as well as management and administration of entire systems. An entire IT system is made up of hardware, software, procedure, data, and people. An improvement is said to have occurred in IT if there is an observable improvement in at least one of the components without compromising on any of the remainders (Wurgler, 1999). These improvements coupled with organizational improvements within NSE should in effect enhance market efficiency and performance of the CAPM (Wurgler, 1999).

In an efficient, argue Bajaj & Vijh (1990 market there are many buyers and sellers, many substitute products (in this case assets), few barriers, if any, to entry of new investors, and prices are determined by supply and demand. Thus, participants in a perfectly competitive market are subject to the prices determined by the market and do not have any information advantage over others. Prices are as close as possible to the intrinsic values of assets and as argued earlier, tomorrow's prices randomly vary from the prices of today (Bajaj & Vijh 1990).

2.5 The Nairobi Stock Exchange (NSE)

According to The Nairobi Stock Exchange (2011), the NSE in Kenya was formed in 1954 as a voluntary organization of stockbrokers. Located on the 1st Floor, Nation Centre on Kimathi Street in Nairobi the Nairobi Stock Exchange is now one of the most active securities markets in Africa. The cite goes on to acknowledge that NSE developed from the efforts of Francis Drummond in 1951, an Estate Agent, who had approached Sir Ernest Vasey (Finance Minister of Kenya then), and impressed upon

him the idea of setting up a stock exchange in East Africa. The two then approached London Stock Exchange officials in July of 1953 and as a result the Nairobi Stock Exchange was set up as an overseas stock exchange attached to the London Stock Exchange (NSE, 2011)

In 1954, formed as a voluntary association of stockbrokers, the NSE registered under the Societies Act with Africans and Asians not permitted to trade, until after the attainment of independence in 1963 1988 saw the first privatization through the NSE, and the successful sale of a 20% government stake in Kenya Commercial Bank (NSE, 2011). The highest 20-Share Index was recorded on February 18, 1994. More improvements took place on the NSE which had moved to more spacious premises at the Nation Centre in July 1994, set up a computerized delivery and settlement system (DASS), the number of stockbrokers increased with the licensing of 8 new brokers (NSE, 2011).

The number of registered firms now stands at over fifty. On Monday 11 September 2006 live trading on the automated trading systems of the Nairobi Stock Exchange was implemented (NSE, 2011).

The NSE is subordinate to the Capital Market Authority (CMA). The CMA was created as a regulator of the securities market in Kenya. Among other things the Authority is charged with the role of protecting investor interests (NSE, 2011). There is need to have a simple summary of information to help investors know the risk levels of the markets in order to aid fast and informed decision making among investors.

2.5 Conclusion

This chapter has in detail discussed the EMH, the Behavioral Finance theory, and the AMH. It has further traced the asset pricing models based on risk and return since 1952 when Harry Markowitz published his works on portfolio theory, to the CAPM

with its derivative and rival models as the research environment changed till the recent works of Javier Estrada in 2002. The chapter has also discussed local researches done on the NSE that may be related or not directly related to this research Given that care should be taken when making investments on the NSE, there is need to provide investors with as much information as possibly available to provide data to help in investment decision making.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the method to be used to conduct data collection and analysis. It provides the definition of the population of study the period of study, how sampling was done, how data was captured and analyzed in line with research objectives.

3.2 Research Design

This research was a case study of the Nairobi Stock Exchange based on Wednesday average stock prices from January 1 2006 to December 31, 2010. The study was on the impact of the technological and organizational changes that have been taking place (on the NSE) on market efficiency and classification of the four market segments according to riskiness.

3.3 Population

The firms listed on The NSE between 2006 and 2010 made up the population of this study. These are those in the Main Investment Market Segment (MAIMS); those in the Financial Investment Market Segment (FIMS); those in the Agriculture and Allied Market Segment (A&AMS) and those in the Alternative Investment Market Segment (AIMS).

3.4 Sampling

All the firms listed on the NSE between 2006 and 2010 were considered. The analysis was based on the Wednesday average prices of stocks. Wednesday was selected because it has a smaller degree of irrationalities like the Monday effect (Fama, 1965), weekend effect (French, 1980). Fama (1965) found a higher variation in returns on Mondays while French (1980) found same significantly different variation in return on Fridays. Wednesday then should represent normal behaviour of the stock

exchange The data was separated according to the four segments on the market dealing in stocks.

3.5 Data Collection

This research needed Wednesday stocks volumes per company, their corresponding prices, the dividends of companies and the T-Bill rates. Wednesday average prices from 2006 to 2010 making a total of 260 weeks were collected. All the fifty-one companies were considered leading to 13260 data points (that is 5 years * 52 weeks * 51 companies). The Wednesday stocks volumes per company were also collected making 13260 data points. T-Bill rates were collected from the Central Bank of Kenya while the rest of the data was collected from NSE databank electronically. The data was captured, organized and analyzed in MS EXCEL version 07.

3.6 Data Analysis

This analysis was based on weekly returns calculated by the Modigliani-Miller (1961) model indicated (i). The dividend values were reduced to weekly values by multiplying each firm's dividend by the factor $(\frac{1}{52})$ to get a value $D_{i,w}$. The weekly return is then calculated by the model

(i)

$$R_{i,w} = \frac{D_{i,w}}{P_0} + \frac{P_1 - P_0}{P_0}$$

Where $R_{i,w}$ is the return of company i in week w, $D_{i,w}$ is the dividend of company i in week w, P_0 is the Wednesday price of shares in the week in reference, P_1 is the price of the same stocks one week later. This will be done for the 256 weeks and for each firm. The market return will be found by calculating the weighted average return for all the trading firms on every one of the 260 Wednesdays. The model used was:

(ii)

$$R_M = \sum_{i=1}^{i=48} w_i . R_i$$

Where R_M is the market return on every Wednesday, w_i is the weight of company i based on the stocks of that company sold so that:

(iii)

$$w_i = \frac{S_i}{\sum_{i=1}^{i=48} S_i}$$

and

(iv)

$$\sum_{i=1}^{i=48} w_i = 1$$

The results of the market returns enabled the calculation of the annual betas β of the companies using the Sharpe (1964) model:

(v)

$$\beta_{i,n} = \frac{Cov\,(R_{i,n}, R_{M,n})}{Var(R_M)}$$

where $\beta_{i,n}$ is the beta of company i in year n, $Cov\,(R_{i,n}, R_{M,n})$ is the covariance between weekly returns of company i in year n, and $R_{M,n}$ are the returns of the market in the same year, $Var(R_M)$ is the variance of the market returns in the year of reference. The 91 day T-Bill rates were turned to weekly risk-free rates using the model:

(vi)

$$r_{f,w} = (\sqrt[52]{[1 + r_T]^4}) - 1$$

where r_{fw} is the risk-free rate of week w, r_T is the 91-day T-Bill rate during the week in question. The value 4 is found by $365 \div 91$. The returns estimated by CAPM will be estimated by the model:

(vii)

$$r_{i,w} = r_{f,w} + \beta_{i,n}(R_{M,w} - R_{f,w})$$

Where $R_{i,w}$ is the return of company i in week w, $R_{M,w}$ is the market return for the week w. The analysis was carried out in two tests.

TEST ONE:

The weekly variation of returns were analyzed for risk by taking by taking

(viii)

$$E(|R_{i,w} - r_{i,w}|)$$

The means were weighted using the number of stocks of the companies to get the mean absolute deviation of the week. The standard deviations of the weeks were also calculated. The mean absolute deviation of one week was tested for significance of difference from the mean of the previous week using Z_c value at 95% confidence interval. This was done by the model:

(ix)

$$Z_{Cal} = \frac{E(|R_{i,w} - r_{i,w}|) - E(|R_{i,w-1} - r_{i,w-1}|)}{S_{w-1}}$$

Where $Z_{cal} < 0$ and $|Z_{Cal}| > Z_c$ the conclusion was that there was an improvement in market efficiency and the improvement was significant (SI). If $Z_{cal} > 0$ and $|Z_{Cal}| > Z_c$ the conclusion was that there was a drop in market efficiency and the drop was significant (SD). If $|Z_{Cal}| < Z_c$ it was concluded that there was no significant change in market efficiency (N). The 260 weeks were separated into two periods each with 130 weeks and the distribution of the comments "SI," "N" and "SD" compared.

TEST TWO:

The second test was to investigate whether the risk levels of the four segments are indeed different from each other. For each market segment, the Wednesday weighted weekly returns were calculated for the five years. The standard deviation, and mean absolute deviations calculated for each market segment. The mean absolute deviations and standard deviations were used to test for significance of difference using Z-scores at 95% confidence level. The calculated values of Z for each year were put in the following matrix.

SEGMENT	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0	$Z_{M,F}$	$Z_{M,A}$	$Z_{M,I}$
FIMS		0	$Z_{F,A}$	$Z_{F,I}$
A&AMS			0	$Z_{A,I}$
AIMS				0

Figure 1 Z-Scores Matrix

At 95% confidence interval, it will be possible to tell significance of difference. If the conclusions of "significant difference" were more than no difference, then it was concluded that the risks in the market segments are different.

With the segment average return, annual was calculated for each segment and each of the five years. An annual rank based on risk will be made. The analysis was done using MS EXCEL version 07.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

This chapter discusses issues to do with sampling how the data was analysed and a presentation of the findings. Though the research aimed at covering all the listed firms on the NSE only forty-eight qualified for analysis as a result of data issues. The data captured was processed to generate the returns for the companies and the market, the company betas, segment risk and returns and carry out the tests. The findings showed that the variance between returns generated from the market prices and the ones predicted by the Capital Asset Pricing Model were tending towards convergence and that there was tendency of the four market segments having different risk levels.

4.2 Analysis of Data and Presentation of Findings.

4.2.1 Sampling

This research conducted an analysis based on 48 companies listed on the NSE during the period 2006 January to 2010 December. This was due to data reasons as some companies did not have data to enable the kind of analysis for this data reason notwithstanding The data collected from the NSE included Wednesday stocks exchanged per company, their corresponding average prices, and dividends. Data on 91-Day T-Bill rates were collected from the Central Bank of Kenya. The list companies analysed classified according to segments is presented in Table 6 in the appendix.

4.2.2 Returns

The returns for each company were established after extracting data on Wednesday Prices and stocks from the daily trading records and records of corporate activities which hold dividend values of firms. The dividend values were divided by 52 for each company and these together with stock prices were used to calculate the weekly returns. This was done using the model

$$R_{i,w} = \frac{D_{i,w}}{P_0} + \frac{P_1 - P_0}{P_0}$$

The weekly market return was simply the weighted average return of the stock returns on the market. The volumes of stock of companies provided the weighting mechanism. The values of these market returns for the study period are presented Table 4a to Table 4e in the appendix.

4.2.3 Company Betas

Company betas were calculated according to the Sharpe (1964) model. This was done by finding the quotient between the covariance between market returns in a year with the corresponding company returns in the numerator and the market return variance in the denominator. The resultant values of beta for each company for the five years of study are presented in Table 3 of the appendix

4.2.4 Segment Risk and Return

The companies were classified into segments in accordance with the current segmentation of the companies on the NSE and such a classification assumed throughout the five years of study. The weighted average of return and the risk on annual basis were calculated and the results are presented in the Tables 5a and Table 5b.

4.2.5 The Tests

The research was conducted in two tests called Test One and Test Two. Test One is CAPM and EMH based. The differences between the returns of the stocks calculated by Modigliani-Miller model and those predicted by CAPM were calculated for each company. These differences were made absolute and their weighted average on every Wednesday for the five years done. In addition their standard deviations were calculated. The values got are presented in Tables 2 series in the appendix. The Z values of the tests were compared with the Z value 1.96 which corresponds to 95% confidence level. The Z values from the data are presented as the column titled Z in the Table 2 series. And the conclusions presented in the column for RMK which means "Remark." Table 2f summarizes the remarks after dividing them into two

periods. The chart below indicates the points where there were significant changes using the black vertical lines.

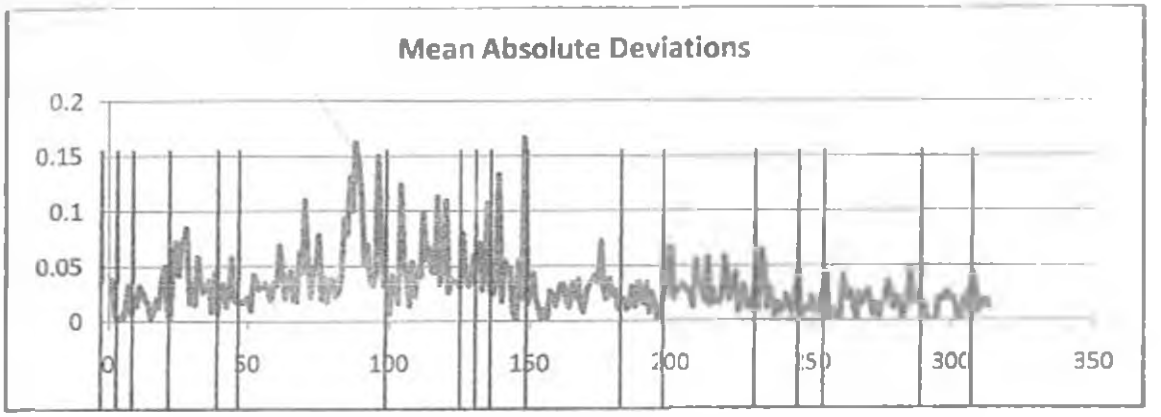

Figure 2 (Prepared by author. The period of study starts at week 53).

The second test, Test Two was focusing on whether the levels of risk within the segments was the same or different. The tests were done by using the Z-test between all the possible pairing of the market segments and presenting the results on annual basis in the Table 1 series. Figure 3 is a chart prepared to show the divergence in the segmental risk.

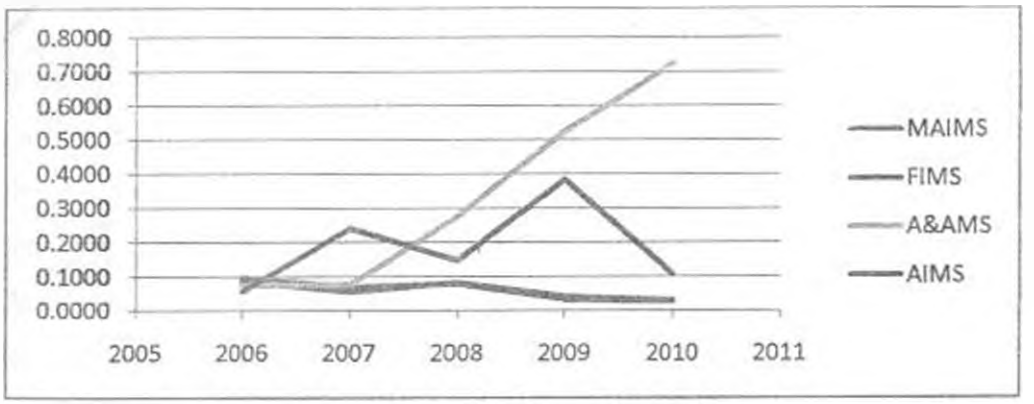

Figure 3 (Prepared by author)

4.3 Summary and Interpretation of Findings

The results for test one are as presented in Tables 2a, 2b, 2c, 2d and 2e, each for the indicated year. In the test for efficiency the test recorded per row shows whether the returns of week n are different from the return of week $n + 1$ with Z score of 1.96 as the deciding variable. A Z score of less than 1.96 is an indication that there was no change in the variance between returns provided by the market and those required by

the CAPM. But some weeks showed significant changes. A remarkable improvement was shown by a drop in MAD with a significant but negative Z score. In the chart in Figure 2 this is shown by a drop in the graph while a remarkable drop is indicated by positive significant *Z* values and shown by a sharp rise in the graph. The black vertical lines show some week where there was a remarkable improvement or drop. For example the line at week 200 estimates the location of week 208 when there was a drop in the efficiency as the MAD rose. The line just before 200 estimates the location of week 139 when there was significant improvement.

Note that when the graph comes down the returns from the market are closer to the CAPM prediction otherwise they are far apart. Generally the CAPM values are getting closer to market predictions indicating the improvement of market pricing within CAPM context.

The second test was carried to test whether the four segments were having the same or significantly different level of risk. Generally the A&AMS recorded increasing level of risk while the FIMS and the MAIMS had almost similar and dropping risk levels as shown in Figure 2.Much as the graphs show different levels of risk, the tests indicated otherwise. In 2006 there was no significant difference in the levels of risk as the *Z*-value matrix had no value greater than 1.96. In 2007 the scenario was almost the same except for the risk in the A&AMS showing a marginal rise in risk. The AIMS was the most risky segment that year. By 2010 the A&AMS was having risk levels significant from the rest of the market segments.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Project

This project was set up to assess the level of risk on the NSE as a whole and within the four segments of the market. Risk was looked at from two points of view. The first view was how the returns on stocks varied from the CAPM while the other was how the same returns varied from their own market mean return.

With these intentions in focus data on all the companies listed on the NSE were collected. The specific data collected included Wednesday stock prices, corresponding number of stocks sold of companies, the risk-free rates proxied by the 91-Day T-Bill rates, and dividends. These data enabled the calculation of the key variables to be use in the model, namely the company returns, market returns, betas, absolute deviations and eventually carry out the tests

The analysis and tests were carried out and the results showed that though there was a wider variance between CAPM returns and the returns calculated from market prices, this variance tended to narrow at the end of 2010 as shown by the reduction in the values of the mean absolute deviations. Further the inter-week Z-tests showed that prices were random. The variations in the mean absolute deviations were mostly not different from those of the preceding week. This indicated market efficiency. On whether the segments of the NSE have different levels of risk the findings show that in 2006 the markets did not have significantly different levels of risk but divergence increased in the later years with the A&AMS showing the highest risk. The FIMS and the MAIMS showed almost same levels of risk that were both low and reducing. The risk level in the AIMS was not did not show a clear trend only that it kept oscillating. It is therefore possible to provide information to the investors on the risk of the market.

5.2 Conclusions Based on Findings

Test One was designed to assess risk defined as the difference between return measured by CAPM and those measured by stock prices and dividends. Most of the weeks showed no significance difference between the deviations of two consecutive weeks. This was an indication the randomness of the returns and therefore no chance of consistent arbitration benefits. Further the downward trend of the absolute deviations indicated the tendency of both measures of return to converge meaning that the performance of the CAPM on the NSE is improving.

The assessment of risk in the four segments showed that in 2006 the four segments generally had same levels of risk. This was demonstrated by the insignificant values of the Z scores. In the succeeding years, though, divergence manifested and the markets started showing different levels of risk that was significant.

5.3 Policy Recommendations

Despite the study showing a reducing variance between the returns on assets according to the market and according to the CAPM, the deviation is still not diminished. This means there is still overpricing and under-pricing of assets on the NSE. The value that investors get may therefore not represent the true value deserved. Steps should be taken to improve on the nature, availability and the speed at which the information is available to the investor.

The provision of information on market risk is a delicate issue as due to behavioural issues this may spark a crisis. But if well done an indication of which segment is riskier, will be a check on the performance of the firms in such a segment therefore safely guarding the interests of the investors.

5.4 Limitations of the Study

This study limited the sampling to the period between 2006 and 2010. It further focused on Wednesday market data. Analysis was therefore not done on the periods

outside the duration and outside the Wednesdays. There is a possibility of the findings for the excluded periods being different.

The analysis used the CAPM in analysis especially for Test One. The CAPM is not the only asset pricing model for there are other alternatives like the APT, and the ICAPM just to mention but two. This research has not attempted to investigate the suggestions put forth by these other models to make the findings more solid.

The companies studied are only those on the NSE. The findings are therefore relevant to the NSE. The question that arises is whether the same results are replicable on other stock exchanges.

5.5 Suggestions for Further Research

This research can be improved if a research is conducted for a longer period of time to include the years before and after the study period. Further studies can be conducted to capture all the trading days of the week in order to get more generalizable results. Such a research would capture all the market information and for a longer period of time.

The same analysis can be done using the other models. This would provide more plausible results. This is because not only does CAPM itself have its own weaknesses but it s not known which model among the many alternatives would provide better result.

The study can be carried out on a larger scale than the NSE alone. The suggestion is that the study be expanded to other stock exchanges to enable universalization of findings. This is because the findings of this study are NSE-specific and therefore raising the issues of what the other stock markets elsewhere would reveal

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APPENDIX

Table 1

MEAN AND STANDARD DEVIATIONS OF THE ABSOLUTE DEVIATIONS FOR TEST TWO

(Key: MADS=Mean Absolute Deviations, SD = Standard Deviation)

Table 1a

YEAR		MAIMS	FIMS	A&AMS	AIMS
2006	MAD	**0.0552**	0.0607	0.0517	0.0430
	SD	0.0690	0.0747	0.0587	0.0553
2007	MAD	0.0318	0.0497	0.0457	0.1082
	SD	0.0462	0.0466	0.0613	0.3728
2008	MAD	0.0665	0.0458	0.0409	0.2099
	SD	0.0665	0.0651	0.0645	0.3349
2009	MAD	0.0294	0.0231	0.0308	0.0093
	SD	0.0294	0.0242	0.0324	0.0244
2010	MAD	0.0240	0.0183	0.0211	0.0770
	SD	0.0192	0.0207	0.0215	0.1048

Table 1b

2006 Z-TEST VALUES				
	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0.0000	0.0807	-0.0501	0.1755
FIMS		0.0000	-0.1208	0.2367
A&AMS			0.0000	-0.1474
AIMS				0.0000

Table 1c

2007 Z-TEST VALUES				
	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0.0000	0.3877	0.2997	1.6527
FIMS		0.0000	-0.0873	1.2534
A&AMS			0.0000	1.0206
AIMS				0.0000

Table 1d

2008 Z-TEST VALUES				
	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0.0000	-0.3118	-0.3847	2.1567
FIMS		0.0000	-0.0745	2.5216
A&AMS			0.0000	2.6177
AIMS				0.0000

Table 1e

2009 Z-TEST VALUES				
	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0.0000	-0.2128	0.0463	-0.6829
FIMS		0.0000	0.3151	-0.5716
A&AMS			0.0000	-0.6605
AIMS				0.0000

Table 1f

2010 Z-TEST VALUES				
	MAIMS	FIMS	AIMS	A&AMS
MAIMS	0.0000	0.2944	-0.1521	2.7633
FIMS		0.0000	0.1321	2.8390
A&AMS			0.0000	2.6067
AIMS				0.0000

Table 2

TABLES FOR TEST ONE RESULTS (2006-2010)

Table 2a (2006)

DATE(WEDNESDAYS)		MADS	SD	Z	RMK
2006/01/04	1308	0.0379	0.0332	-0.2483	N
2006/01/11	1313	0.0296	0.0347	0.0540	N
2006/01/18	1318	0.0315	0.0319	0.1304	N
2006/01/25	1323	0.0357	0.0220	-0.2298	N
2006/02/01	1328	0.0306	0.0169	-0.6499	N
2006/02/08	1333	0.0197	0.0181	0.9032	N
2006/02/15	1338	0.0360	0.0219	-0.1457	N
2006/02/22	1343	0.0329	0.0235	1.5569	N
2006/03/01	1348	0.0695	0.0479	-0.5898	N
2006/03/08	1353	0.0442	0.0337	-0.6994	N
2006/03/15	1358	0.0206	0.0190	0.9946	N
2006/03/22	1363	0.0195	0.0275	0.2305	N
2006/03/29	1368	0.0459	0.0203	-1.2873	N
2006/04/05	1373	0.0198	0.0156	-0.0977	N
2006/04/12	1378	0.0182	0.0319	1.4058	N
2006/04/19	1383	0.0631	0.0437	-0.4095	N
2006/04/26	1388	0.0452	0.0509	1.2855	N
2006/05/03	1393	0.1106	0.0579	-0.8074	N
2006/05/10	1398	0.0638	0.0677	-0.6152	N
2006/05/17	1403	0.0222	0.0328	0.7473	N
2006/05/24	1408	0.0465	0.0548	0.1023	N
2006/05/31	1413	0.0521	0.0507	0.5287	N
2006/06/07	1418	0.0789	0.0639	-0.9192	N
2006/06/14	1423	0.0201	0.0327	0.5967	N
2006/06/21	1428	0.0396	0.0737	-0.9353	N
2006/06/28	1433	0.0175	0.0132	1.5554	N
2006/07/05	1438	0.0380	0.0208	0.0187	N
2006/07/12	1443	0.0384	0.0201	-0.7917	N
2006/07/19	1448	0.0225	0.0121	0.3349	N
2006/07/26	1453	0.0766	0.1113	0.1639	N
2006/08/02	1458	0.0448	0.0804	1.2062	N
2006/08/09	1463	0.0993	0.0646	-0.2154	N
2006/08/16	1468	0.0796	0.0735	0.7047	N
2006/08/23	1473	0.1314	0.4498	-0.0673	N
2006/08/30	1478	0.1011	0.1963	0.3157	N
2006/09/06	1483	0.1631	0.1068	-0.1843	N
2006/09/13	1488	0.1434	0.1127	-0.2587	N
2006/09/20	1493	0.1143	0.0833	-0.7329	N
2006/09/27	1498	0.0532	0.0226	0.5155	N
2006/10/04	1503	0.0700	0.0359	-0.9443	N
2006/10/11	1508	0.0361	0.0305	-0.1016	N
2006/10/18	1513	0.0130	0.0305	0.3056	N
2006/10/25	1518	0.0424	0.0687	1.5662	N
2006/11/01	1523	0.1498	0.0964	-0.7908	N
2006/11/08	1528	0.0737	0.0516	-0.8108	N
2006/11/15	1533	0.0319	0.0315	0.1795	N
2006/11/22	1538	0.0373	0.0262	1.1669	N
2006/11/29	1543	0.0067	0.1745	0.2013	N
2006/12/06	1548	0.0419	0.0279	-0.2295	N
2006/12/13	1553	0.0355	0.0720	-0.2570	N
2006/12/20	1558	0.0170	0.0164	6.5829	N
2006/12/27	1563	0.1247	0.1405	-0.4940	N

Table 2b (2007)

DATE[WEDNESDAYS]		MADS	SD	Z	RMK
2007/01/03	1568	0.0553	0.0793	-0.1794	N
2007/01/10	1573	0.0411	0.0568	-0.4735	N
2007/01/17	1578	0.0140	0.0383	1.1018	N
2007/01/24	1583	0.0541	0.0362	-0.8622	N
2007/01/31	1588	0.0229	0.0255	0.9133	N
2007/02/07	1593	0.0462	0.0290	-0.1761	N
2007/02/14	1598	0.0411	0.0578	1.0000	N
2007/02/21	1603	0.0989	0.1759	-0.2409	N
2007/02/28	1608	0.0565	0.0407	0.2550	N
2007/03/07	1613	0.0669	0.0490	-0.4273	N
2007/03/14	1618	0.0460	0.0514	-0.0258	N
2007/03/21	1623	0.0446	0.0862	0.7990	N
2007/03/28	1628	0.1135	0.2470	-0.3248	N
2007/04/04	1633	0.0333	0.0975	0.1714	N
2007/04/11	1638	0.0500	0.0286	2.0906	SI
2007/04/18	1643	0.1088	0.1179	-0.7115	N
2007/04/25	1648	0.0268	0.0210	0.6090	N
2007/05/02	1653	0.0388	0.0436	-0.0638	N
2007/05/09	1658	0.0360	0.0413	0.0046	N
2007/05/16	1663	0.0342	0.0372	-0.1360	N
2007/05/23	1668	0.0911	0.0259	1.9050	N
2007/05/30	1673	0.0805	0.0729	-0.4885	N
2007/06/06	1678	0.0449	0.0401	-0.3058	N
2007/06/13	1683	0.0326	0.0241	0.1253	N
2007/06/20	1688	0.0356	0.0409	0.6046	N
2007/06/27	1693	0.0603	0.0404	-0.1982	N
2007/07/04	1698	0.0523	0.0381	0.4929	N
2007/07/11	1703	0.0711	0.0392	-1.0993	N
2007/07/18	1708	0.0280	0.0155	1.0602	N
2007/07/25	1713	0.0444	0.0313	2.0277	SI
2007/08/01	1718	0.1078	0.0626	-1.2928	N
2007/08/08	1723	0.0269	0.0204	-0.0896	N
2007/08/15	1728	0.0251	0.0143	0.8972	N
2007/08/22	1733	0.0379	0.0663	1.4454	N
2007/08/29	1738	0.1337	0.0417	-2.7831	SI
2007/09/05	1743	0.0177	0.0291	1.2676	N
2007/09/12	1748	0.0545	0.0248	-0.2813	N
2007/09/19	1753	0.0476	0.0333	0.0070	N
2007/09/26	1758	0.0478	0.0746	-0.4875	N
2007/10/03	1763	0.0114	0.0056	-2.0433	SI
2007/10/10	1768	0.0000	0.0000	0.0000	N
2007/10/17	1773	0.0558	0.0179	-1.9941	SI
2007/10/24	1778	0.0282	0.0221	6.6320	SD
2007/10/31	1783	0.1668	0.1501	-1.0033	N
2007/11/07	1788	0.0162	0.0266	0.3971	N
2007/11/14	1793	0.0268	0.0368	0.4630	N
2007/11/21	1798	0.0438	0.0345	-0.6085	N
2007/11/28	1803	0.0228	0.0234	-0.5408	N
2007/12/05	1808	0.0102	0.0050	-2.0470	SI
2007/12/12	1813	0.0000	0.0000	0.0000	N
2007/12/19	1818	0.0109	0.0053	-2.0615	SI
2007/12/26	1823	0.0000	0.0000	0.0000	N

Table 2c (2008)

DATE(WEDNESDAYS)		MADS	SD	Z	RMK
2008/01/02	1828	0.0273	0.0164	-0.1500	N
2008/01/09	1833	0.0249	0.0201	-0.5254	N
2008/01/16	1838	0.0143	0.0288	0.2313	N
2008/01/23	1843	0.0210	0.0263	0.4976	N
2008/01/30	1848	0.0341	0.0416	-0.0167	N
2008/02/06	1853	0.0134	0.0179	-0.8464	N
2008/02/13	1858	0.0182	0.0154	-0.3645	N
2008/02/20	1863	0.0126	0.0212	1.0533	N
2008/02/27	1868	0.0350	0.0457	-0.3015	N
2008/03/05	1873	0.0212	0.0252	0.6884	N
2008/03/12	1878	0.0385	0.0347	-0.6807	N
2008/03/19	1883	0.0149	0.0142	-0.4620	N
2008/03/26	1888	0.0084	0.0083	2.2125	SI
2008/04/02	1893	0.0267	0.0122	0.6918	N
2008/04/09	1898	0.0351	0.0207	0.1763	N
2008/04/16	1903	0.0388	0.0194	0.1738	N
2008/04/23	1908	0.0421	0.0279	-0.2354	N
2008/04/30	1913	0.0356	0.0274	1.3621	N
2008/05/07	1918	0.0729	0.0728	0.6053	N
2008/05/14	1923	0.0289	0.0345	0.2451	N
2008/05/21	1928	0.0204	0.0163	1.1684	N
2008/05/28	1933	0.0194	0.0602	0.2671	N
2008/06/04	1938	0.0233	0.0181	0.2915	N
2008/06/11	1943	0.0286	0.0174	0.9846	N
2008/06/18	1948	0.0115	0.0064	0.7350	N
2008/06/25	1953	0.0162	0.0097	0.4342	N
2008/07/02	1958	0.0204	0.0072	-1.3071	N
2008/07/09	1963	0.0109	0.0067	0.4536	N
2008/07/16	1968	0.0140	0.0064	2.8383	SI
2008/07/23	1973	0.0321	0.0184	-1.0309	N
2008/07/30	1978	0.0131	0.0072	3.1419	SI
2008/08/06	1983	0.0358	0.0120	-0.6101	N
2008/08/13	1988	0.0285	0.0145	-0.8400	N
2008/08/20	1993	0.0163	0.0235	0.8070	N
2008/08/27	1998	0.0353	0.0152	-1.8172	N
2008/09/03	2003	0.0077	0.0163	1.1718	N
2008/09/10	2008	0.0268	0.0161	-0.4648	N
2008/09/17	2013	0.0193	0.0432	-0.3704	N
2008/09/24	2018	0.0013	0.0021	-1.5229	N
2008/10/01	2023	0.0000	0.0000	0.0000	N
2008/10/08	2028	0.0205	0.0303	0.3310	N
2008/10/15	2033	0.0305	0.0264	0.2055	N
2008/10/22	2038	0.0359	0.0214	1.4512	N
2008/10/29	2043	0.0670	0.0332	-1.3810	N
2008/11/05	2048	0.0211	0.0323	0.2808	N
2008/11/12	2053	0.0302	0.0195	-0.1182	N
2008/11/19	2058	0.0279	0.0210	0.2574	N
2008/11/26	2063	0.0333	0.0153	-0.1523	N
2008/12/03	2068	0.0310	0.0269	-0.1327	N
2008/12/10	2073	0.0274	0.0283	-0.1625	N
2008/12/17	2078	0.0228	0.0164	-0.6094	N
2008/12/24	2083	0.0128	0.0133	3.2603	SD
2008/12/31	2088	0.0562	0.0284	-0.8701	N

Table 2d (2009)

DATE (WEDNESDAYS)		MADS	SD	Z	RMSE
2009/01/07	2093	0.0015	0.0564	0.0305	N
2009/01/14	2098	0.0371	0.0155	-1.2665	N
2009/01/21	2103	0.0175	0.0130	1.1608	SI
2009/01/28	2108	0.0587	0.0635	0.6995	N
2009/02/04	2113	0.0142	0.0228	0.6442	N
2009/02/11	2118	0.0289	0.0324	-0.3115	N
2009/02/18	2123	0.0188	0.0337	-0.0751	N
2009/02/25	2128	0.0163	0.0256	0.1480	N
2009/03/04	2133	0.0201	0.0149	2.6006	SI
2009/03/11	2138	0.0588	0.0525	-0.3337	N
2009/03/18	2143	0.0413	0.0509	-0.4799	N
2009/03/25	2148	0.0294	0.0693	0.2585	N
2009/04/01	2153	0.0273	0.0253	0.2709	N
2009/04/08	2158	0.0441	0.0517	0.6828	N
2009/04/15	2163	0.0083	0.0171	0.7928	N
2009/04/22	2168	0.0224	0.0235	0.4610	N
2009/04/29	2173	0.0332	0.0280	-0.7539	N
2009/05/06	2178	0.0121	0.0166	0.3945	N
2009/05/13	2183	0.0186	0.0161	0.5491	N
2009/05/20	2188	0.0098	0.0189	1.9802	SD
2009/05/27	2193	0.0473	0.0403	1.2354	N
2009/06/03	2198	0.0098	0.0281	1.9630	SD
2009/06/10	2203	0.0650	0.0238	-0.3886	N
2009/06/17	2208	0.0558	0.0536	-0.8178	N
2009/06/24	2213	0.0119	0.0161	1.1633	N
2009/07/01	2218	0.0306	0.0229	-0.5413	N
2009/07/08	2223	0.0182	0.0174	-0.7415	N
2009/07/15	2228	0.0053	0.0096	1.1912	N
2009/07/22	2233	0.0168	0.0157	-0.4608	N
2009/07/29	2238	0.0096	0.0154	0.0995	N
2009/08/05	2243	0.0111	0.0212	0.6022	N
2009/08/12	2248	0.0239	0.0246	-0.3520	N
2009/08/19	2253	0.0152	0.0155	-0.5198	N
2009/08/26	2258	0.0072	0.0131	1.3201	N
2009/09/02	2263	0.0245	0.0179	1.2062	N
2009/09/09	2268	0.0461	0.0141	-2.9192	SI
2009/09/16	2273	0.0049	0.0043	0.9653	N
2009/09/23	2278	0.0091	0.0132	0.2245	N
2009/09/30	2283	0.0120	0.0114	-0.1128	N
2009/10/07	2288	0.0107	0.0152	0.7391	N
2009/10/14	2293	0.0220	0.0145	-0.9548	N
2009/10/21	2298	0.0081	0.0089	0.0587	N
2009/10/28	2303	0.0086	0.0067	0.9757	N
2009/11/04	2308	0.0151	0.0288	0.3960	N
2009/11/11	2313	0.0266	0.0130	1.3738	N
2009/11/18	2318	0.0445	0.0413	-1.0129	N
2009/11/25	2323	0.0027	0.0011	-2.4815	SI
2009/12/02	2328	0.0000	0.0000	0.0000	N
2009/12/09	2333	0.0104	0.0226	-0.3101	N
2009/12/16	2338	0.0034	0.0022	-1.5395	N
2009/12/23	2343	0.0000	0.0000	0.0000	N
2009/12/30	2348	0.0420	0.0645	-0.1918	N

Table 2e (2010)

DATE(WEDNESDAYS)		MADS	SD	Z	SIMK
2010/01/06	2353	0.0256	0.0131	0.7243	N
2010/01/13	2358	0.0283	0.0333	0.2200	N
2010/01/20	2363	0.0234	0.0140	-1.2940	N
2010/01/27	2368	0.0094	0.0077	-0.1858	N
2010/02/03	2373	0.0023	0.0084	2.7136	SD
2010/02/10	2378	0.0252	0.0267	-0.3878	N
2010/02/17	2383	0.0148	0.0193	0.4079	N
2010/02/24	2388	0.0227	0.0239	0.2301	N
2010/03/03	2393	0.0282	0.0460	-0.2261	N
2010/03/10	2398	0.0178	0.0330	-0.3702	N
2010/03/17	2403	0.0056	0.0107	0.9832	N
2010/03/24	2408	0.0161	0.0425	-0.3034	N
2010/03/31	2413	0.0032	0.0118	0.8908	N
2010/04/07	2418	0.0137	0.0228	0.1013	N
2010/04/14	2423	0.0160	0.0302	0.7056	N
2010/04/21	2428	0.0173	0.0233	0.5770	N
2010/04/28	2433	0.0251	0.0206	-0.6711	N
2010/05/05	2438	0.0112	0.0149	0.7562	N
2010/05/12	2443	0.0225	0.0270	-0.0531	N
2010/05/19	2448	0.0211	0.0225	-0.8583	N
2010/05/26	2453	0.0018	0.0103	0.6335	N
2010/06/02	2458	0.0083	0.0112	0.9024	N
2010/06/09	2463	0.0183	0.0133	2.2678	SI
2010/06/16	2468	0.0486	0.0568	-0.5589	N
2010/06/23	2473	0.0169	0.0124	0.3046	N
2010/06/30	2478	0.0206	0.0207	0.1451	N
2010/07/07	2483	0.0236	0.0220	0.5616	N
2010/07/14	2488	0.0113	0.0180	0.2476	N
2010/07/21	2493	0.0158	0.0140	-1.0032	N
2010/07/28	2498	0.0017	0.0011	-1.5106	N
2010/08/04	2503	0.0000	0.0000	0.0000	N
2010/08/11	2508	0.0013	0.0012	-1.1027	N
2010/08/18	2513	0.0000	0.0000	0.0000	N
2010/08/25	2518	0.0205	0.0283	-0.0104	N
2010/09/01	2523	0.0202	0.0118	-0.0647	N
2010/09/08	2528	0.0194	0.0174	0.4059	N
2010/09/15	2533	0.0265	0.0117	-0.5728	N
2010/09/22	2538	0.0198	0.0147	0.1718	N
2010/09/29	2543	0.0223	0.0175	-0.2594	N
2010/10/06	2548	0.0178	0.0143	-1.0901	N
2010/10/13	2553	0.0021	0.0019	-1.1424	N
2010/10/20	2558	0.0000	0.0000	0.0000	N
2010/10/27	2563	0.0185	0.0320	0.1394	N
2010/11/03	2568	0.0230	0.0210	-0.6219	N
2010/11/10	2573	0.0099	0.0135	2.5031	SD
2010/11/17	2578	0.0436	0.0377	-0.1800	N
2010/11/24	2583	0.0368	0.0494	-0.5927	N
2010/12/01	2588	0.0075	0.0134	0.8242	N
2010/12/08	2593	0.0185	0.0176	-0.3082	N
2010/12/15	2598	0.0131	0.0171	0.3494	N
2010/12/22	2603	0.0191	0.0197	-0.3109	N
2010/12/29	2608	0.0130	0.1039	-	-

Table 2f Summarized Results

DATES	NO CHANGE	SIGNIFICANT INCREMENT	SIGNIFICANT DROP	TOTAL
P1(04/01/2006 to 24/12/2008)	120	6	4	130
P2(31/12/2008 to 29/12/2010)	118	5	7	130

Table 3
ANNUAL BETAS OF COMPANIES

COMPANY	2006	2007	2008	2009	2010
Athi River Mining	0.4517	0.2699	0.5294	0.5171	-0.0463
B.O.C Kenya Ltd	0.0000	0.4513	0.0000	-0.0389	0.1156
Bamburi Cement Ltd	0.0802	0.3568	0.1511	0.4052	-0.1349
Barclays Bank Ltd	0.6512	0.2075	0.6250	0.6505	0.3841
British American Tobacco Kenya Ltd	-0.0381	-0.2604	0.0895	0.1018	0.2159
Car and General (K) Ltd	0.2704	0.4851	0.0353	0.0392	-0.3280
Carbacid Investments Ltd	0.0000	0.0226	0.0000	-0.4068	-0.0199
CFC Stanbic Holdings Ltd	0.1648	0.6878	0.4347	0.0605	-0.3110
city trust	0.1215	2.5071	0.0321	0.0024	-0.7975
CMC Holdings Ltd	0.1318	1.2845	1.0441	1.1263	0.0298
Crown Berger Ltd	-0.0035	0.6466	0.2575	0.5584	1.1584
Diamond Trust Bank Kenya Ltd	2.7633	0.2469	0.9940	0.6010	0.4237
E.A.Cables Ltd	0.5857	0.5284	0.7312	0.6257	0.6406
E.A.Portland Cement Ltd	-0.0080	0.2636	0.0183	-0.1433	0.0500
EAAGARD	-0.2385	-0.2175	0.0180	-0.1403	0.4770
East African Breweries Ltd	0.1429	0.0852	0.9267	0.6105	-0.0176
Equity Bank Ltd	0.2040	0.7762	1.5805	1.2742	0.4482
Eveready East Africa Ltd	-	0.3410	0.5066	0.4608	0.8285
EXPRESS	0.0341	-0.3155	0.3717	-0.0981	0.0591
Housing Finance Co Ltd	0.3012	0.7003	1.7191	0.3692	0.3503
Jubilee Holdings Ltd	0.3119	0.3432	0.1400	0.4388	0.1529
KAPCHORWA	0.0572	0.0235	-0.0040	-0.0422	0.3352
KenGen Ltd	0.3197	1.0994	0.9633	0.8624	0.5628
Kenya Airways Ltd	0.3393	0.4481	0.4871	0.8885	1.1768
Kenya Commercial Bank Ltd	0.3559	-0.4583	1.0923	0.6791	0.9303
Kenya Power	0.1722	0.5590	0.9505	0.9493	-0.4397
LIMURU TEA	0.0003	-0.0672	0.0059	0.0111	-0.0606
Marshalls (E.A.) Ltd	0.1483	-0.0087	-0.2064	0.0000	-0.0874
Mumias Sugar Co. Ltd	0.2147	1.7554	0.9106	0.8182	0.1289
Nation Media Group	0.1551	0.3137	0.9306	0.3994	0.2077
National Bank of Kenya Ltd	3.0311	0.9759	0.9099	0.7617	0.3402
NIC Bank Ltd	-0.3585	0.5174	0.7841	0.4867	0.5798

Table 3 cont…

COMPANY	2006	2007	2008	2009	2010
Olympia Capital Holdings ltd	-0.1063	-0.0781	0.2568	0.0183	0.2272
Pan Africa Insurance Holdings Ltd	-0.3307	0.1255	0.2661	0.2145	0.1477
Rea Vipingo Plantations Ltd	0.3631	0.2971	0.3688	0.0922	0.6524
Sameer Africa Ltd	1.4289	0.5014	0.8600	-0.0602	0.7026
Sasini Ltd	0.6316	0.4136	0.6775	0.4357	0.7889
Scangroup Ltd	0.4697	0.3571	0.6529	0.6517	0.3908
Standard Chartered Bank Ltd	-0.0404	0.2719	0.2915	0.2089	-0.1859
The Co-operative Bank of Kenya Ltd	0.0000	0.0000	0.0079	0.3616	0.4863
Total Kenya Ltd	0.0513	-0.3150	2.5023	0.3045	0.0282
TPS Eastern Africa (Serena) Ltd	0.0000	0.0000	0.0000	-0.0228	0.0000
UNGA GROUP	0.9225	0.2725	0.2104	0.4781	-0.4169

Table 4
MARKET RETURNS

Table 4a (2009)

DATES		RETURN	DATES		RETURN
2006/01/04	1308	0.03791	2006/07/05	1438	0.03803
2006/01/11	1313	0.02964	2006/07/12	1443	0.03842
2006/01/18	1318	0.03152	2006/07/19	1448	0.02250
2006/01/25	1323	0.03568	2006/07/26	1453	0.02656
2006/02/01	1328	0.03063	2006/08/02	1458	0.04480
2006/02/08	1333	0.01968	2006/08/09	1463	0.09352
2006/02/15	1338	0.03605	2006/08/16	1468	0.07961
2006/02/22	1343	0.03286	2006/08/23	1473	0.13142
2006/03/01	1348	0.06952	2006/08/30	1478	0.10113
2006/03/08	1353	0.04422	2006/09/06	1483	0.16309
2006/03/15	1358	0.02064	2006/09/13	1488	0.14341
2006/03/22	1363	0.03955	2006/09/20	1493	0.11425
2006/03/29	1368	0.04588	2006/09/27	1498	0.05318
2006/04/05	1373	0.01977	2006/10/04	1503	0.06998
2006/04/12	1378	0.01825	2006/10/11	1508	0.03610
2006/04/19	1383	0.06306	2006/10/18	1513	0.03300
2006/04/26	1388	0.04516	2006/10/25	1518	0.04236
2006/05/03	1393	0.11058	2006/11/01	1523	0.14991
2006/05/10	1398	0.06383	2006/11/08	1528	0.07371
2006/05/17	1403	0.02216	2006/11/15	1533	0.03187
2006/05/24	1408	0.04650	2006/11/22	1538	0.03734
2006/05/31	1413	0.05210	2006/11/29	1543	0.00673
2006/06/07	1418	0.07889	2006/12/06	1548	0.04185
2006/06/14	1423	0.02014	2006/12/13	1553	0.03545
2006/06/21	1428	0.03965	2006/12/20	1558	0.01695
2006/06/28	1433	0.01752	2006/12/27	1563	0.12468

Table 4b (2007)

DATES		RETURN	DATES		RETURN
2007/01/03	1568	0.05528	2007/07/04	1698	0.05234
2007/01/10	1573	0.04105	2007/07/11	1703	0.07111
2007/01/17	1578	0.01416	2007/07/18	1708	0.02801
2007/01/24	1583	0.05410	2007/07/25	1713	0.04442
2007/01/31	1588	0.02290	2007/08/01	1718	0.10781
2007/02/07	1593	0.04618	2007/08/08	1723	0.02688
2007/02/14	1598	0.04106	2007/08/15	1728	0.02505
2007/02/21	1603	0.09891	2007/08/22	1733	0.03786
2007/02/28	1608	0.05654	2007/08/29	1738	0.13371
2007/03/07	1613	0.06692	2007/09/05	1743	0.01769
2007/03/14	1618	0.04597	2007/09/12	1748	0.05453
2007/03/21	1623	0.04460	2007/09/19	1753	0.04755
2007/03/28	1628	0.11350	2007/09/26	1758	0.04779
2007/04/04	1633	0.03325	2007/10/03	1763	0.01143
2007/04/11	1638	0.04997	2007/10/10	1768	0.00000
2007/04/18	1643	0.10982	2007/10/17	1773	0.05584
2007/04/25	1648	0.02596	2007/10/24	1778	0.02020
2007/05/02	1653	0.03876	2007/10/31	1783	0.16682
2007/05/09	1658	0.03598	2007/11/07	1788	0.01622
2007/05/16	1663	0.03617	2007/11/14	1793	0.02680
2007/05/23	1668	0.03111	2007/11/21	1798	0.04382
2007/05/30	1673	0.08050	2007/11/28	1803	0.02284
2007/06/06	1678	0.04487	2007/12/05	1808	0.01020
2007/06/13	1683	0.03262	2007/12/12	1813	0.00000
2007/06/20	1688	0.03565	2007/12/19	1818	0.01087
2007/06/27	1693	0.06034	2007/12/26	1823	0.00000

Table 4c (2008)

DATES		RETURN
2008/01/02	1828	0.02731
2008/01/09	1833	0.02485
2008/01/16	1838	0.01429
2008/01/23	1843	0.02095
2008/01/30	1848	0.03406
2008/02/06	1853	0.03337
2008/02/13	1858	0.01820
2008/02/20	1863	0.01258
2008/02/27	1868	0.03496
2008/03/05	1873	0.02119
2008/03/12	1878	0.03854
2008/03/19	1883	0.01490
2008/03/26	1888	0.00835
2008/04/02	1893	0.02667
2008/04/09	1898	0.03511
2008/04/16	1903	0.03875
2008/04/23	1908	0.04212
2008/04/30	1913	0.03555
2008/05/07	1918	0.07289
2008/05/14	1923	0.02886
2008/05/21	1928	0.02040
2008/05/28	1933	0.03939
2008/06/04	1938	0.02332
2008/06/11	1943	0.02861
2008/06/18	1948	0.01147
2008/06/25	1953	0.01619

DATES		RETURS
2008/07/02	1958	0.02040
2008/07/09	1963	0.01094
2008/07/16	1968	0.01397
2008/07/23	1973	0.03207
2008/07/30	1978	0.01312
2008/08/06	1983	0.03584
2008/08/13	1988	0.02852
2008/08/20	1993	0.01632
2008/08/27	1998	0.03526
2008/09/03	2003	0.00771
2008/09/10	2008	0.02677
2008/09/17	2013	0.01928
2008/09/24	2018	0.00326
2008/10/01	2023	0.00000
2008/10/08	2028	0.02048
2008/10/15	2033	0.03051
2008/10/22	2038	0.03594
2008/10/29	2043	0.06701
2008/11/05	2048	0.02110
2008/11/12	2053	0.03017
2008/11/19	2058	0.02787
2008/11/26	2063	0.03329
2008/12/03	2068	0.03096
2008/12/10	2073	0.02739
2008/12/17	2078	0.02279
2008/12/24	2083	0.01280
2008/12/31	2088	0.05622

Table 4d (2009)

DATES		RETURN	DATES		RETURN
2009/01/07	2093	0.03151	2009/07/08	2223	0.01822
2009/01/14	2098	0.03711	2009/07/15	2228	0.00533
2009/01/21	2103	0.01749	2009/07/22	2233	0.01682
2009/01/28	2108	0.05868	2009/07/29	2238	0.00959
2009/02/04	2113	0.01423	2009/08/05	2243	0.01112
2009/02/11	2118	0.02892	2009/08/12	2248	0.02391
2009/02/18	2123	0.01883	2009/08/19	2253	0.01524
2009/02/25	2128	0.01630	2009/08/26	2258	0.00716
2009/03/04	2133	0.02008	2009/09/02	2263	0.02445
2009/03/11	2138	0.05877	2009/09/09	2268	0.04606
2009/03/18	2143	0.04125	2009/09/16	2273	0.00494
2009/03/25	2148	0.01937	2009/09/23	2278	0.00905
2009/04/01	2153	0.03729	2009/09/30	2283	0.01202
2009/04/08	2158	0.04414	2009/10/07	2288	0.01074
2009/04/15	2163	0.00880	2009/10/14	2293	0.02196
2009/04/22	2168	0.02240	2009/10/21	2298	0.00812
2009/04/29	2173	0.03323	2009/10/28	2303	0.00864
2009/05/06	2178	0.01210	2009/11/04	2308	0.01514
2009/05/13	2183	0.01864	2009/11/11	2313	0.02656
2009/05/20	2188	0.00982	2009/11/18	2318	0.04449
2009/05/27	2193	0.04728	2009/11/25	2323	0.00271
2009/06/03	2198	0.00980	2009/12/02	2328	0.00000
2009/06/10	2203	0.06503	2009/12/09	2333	0.01043
2009/06/17	2208	0.05577	2009/12/16	2338	0.00344
2009/06/24	2213	0.01190	2009/12/23	2343	0.00000
2009/07/01	2218	0.03063	2009/12/30	2348	0.04199

Table 4e (2010)

DATES		RETURN	DATES		RETURN
2010/01/06	2353	0.02961	2010/07/07	2483	0.02364
2010/01/13	2358	0.02010	2010/07/14	2488	0.01130
2010/01/20	2363	0.02742	2010/07/21	2493	0.01575
2010/01/27	2368	0.00935	2010/07/28	2498	0.00170
2010/02/03	2373	0.00234	2010/08/04	2503	0.00000
2010/02/10	2378	0.02518	2010/08/11	2508	0.00129
2010/02/17	2383	0.01482	2010/08/18	2513	0.00000
2010/02/24	2388	0.02270	2010/08/25	2518	0.02047
2010/03/03	2393	0.02820	2010/09/01	2523	0.02017
2010/03/10	2398	0.01781	2010/09/08	2528	0.01941
2010/03/17	2403	0.00560	2010/09/15	2533	0.02645
2010/03/24	2408	0.01615	2010/09/22	2538	0.01978
2010/03/31	2413	0.00324	2010/09/29	2543	0.02230
2010/04/07	2418	0.01373	2010/10/06	2548	0.01775
2010/04/14	2423	0.01604	2010/10/13	2553	0.00212
2010/04/21	2428	0.03735	2010/10/20	2558	0.00000
2010/04/28	2433	0.02507	2010/10/27	2563	0.01850
2010/05/05	2438	0.01125	2010/11/03	2568	0.02296
2010/05/12	2443	0.02253	2010/11/10	2573	0.00988
2010/05/19	2448	0.02110	2010/11/17	2578	0.04357
2010/05/26	2453	0.00175	2010/11/24	2583	0.03678
2010/06/02	2458	0.00826	2010/12/01	2588	0.00751
2010/06/09	2463	0.01835	2010/12/08	2593	0.01853
2010/06/16	2468	0.04858	2010/12/15	2598	0.01312
2010/06/23	2473	0.01686	2010/12/22	2603	0.01909
2010/06/30	2478	0.02064	2010/12/29	2608	0.01296

Table 5a
Segment-Based Risk Values

	2006	2007	2008	2009	2010
MAIMS	0.0884	0.0561	0.0815	0.0416	0.0307
FIMS	0.0963	0.0682	0.0796	0.0335	0.0276
A&AMS	0.0782	0.0765	0.2765	0.5258	0.7252
AIMS	0.0581	0.2411	0.1470	0.3834	0.1068

Table 5b
Segment-Based Return Values

	2006	2007	2008	2009	2010
MAIMS	0.0263	-0.0055	0.0039	0.0061	0.0037
FIMS	0.0241	0.0149	-0.0073	-0.0007	-0.0002
A&AMS	0.0218	-0.0148	-0.0125	0.8444	-67.6934
AIMS	0.0276	0.0645	-0.0114	0.1766	0.0351

Table 6

LIST OF THE 48 ANALYSED COMPANIES

MAIN INVESTMENTS MARKET SEGMENT

1. Car and General (K) Ltd
2. CMC Holdings Ltd
3. Kakuzi
4. Kenya Airways Ltd
5. Marshalls (E.A.) Ltd
6. Nation Media Group
7. Olympia Capital Holdings ltd
8. Rea Vipingo Plantations Ltd
9. Safaricom Ltd
10. Sasini Ltd
11. Scangroup Ltd
12. TPS Eastern Africa (Serena) Ltd

FINANCE AND INVESTMENT MARKET SEGMENT

1. Barclays Bank Ltd
2. CFC Stanbic Holdings Ltd
3. Diamond Trust Bank Kenya Ltd
4. Equity Bank Ltd
5. Housing Finance Co Ltd
6. Jubilee Holdings Ltd
7. Kenya Commercial Bank Ltd
8. Kenya Re-Insurance Corporation Ltd
9. National Bank of Kenya Ltd
10. NIC Bank Ltd
11. Pan Africa Insurance Holdings Ltd
12. Standard Chartered Bank Ltd
13. The Co-operative Bank of Kenya Ltd

INDUSTRIAL AND ALLIED MARKET SEGMENT

1. Athi River Mining
2. B.O.C Kenya Ltd
3. Bamburi Cement Ltd
4. British American Tobacco Kenya Ltd
5. Carbacid Investments Ltd
6. Crown Berger Ltd
7. E.A.Cables Ltd
8. E.A.Portland Cement Ltd
9. East African Breweries Ltd
10. Eveready East Africa Ltd
11. KenGen Ltd
12. KenolKobil Ltd
13. Mumias Sugar Co. Ltd
14. Sameer Africa Ltd
15. Total Kenya Ltd
16. Unga Group Ltd
17. Kenya Power

ALTERNATIVE INVESTMENTS MARKET SEGMENT

1. A.Baumann CO Ltd
2. City Trust Ltd
3. Eaagads Ltd
4. Express Ltd
5. Kapchorua Tea Co. Ltd
6. Limuru Tea Co. Ltd