

**Beta, firm size, book-to-market equity and stock returns:
Evidence from the Nairobi Stock Exchange**

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**By
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D61/P/8537/2001**

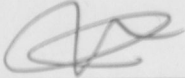
**A management research paper submitted in partial
fulfillment of the requirements for the degree of Master
of Business Administration (MBA)**

**School of Business
University of Nairobi**

December, 2006

Declaration

This research project is my original work and has not been submitted for a degree in any other university.

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This research project has been submitted for examination with my approval as the university supervisor.

Sign  _____ LISHENGA J.L.

Date 29-11-06

Dedication

This project is dedicated to my dear parents for taking the risk to educate me and their advice without an obvious return for it.

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Acknowledgement

I thank my parents, siblings, friends and colleagues for their support and encouragement during my studies this far.

Fama and French (FF) (1996) for companies listed in the main investment market segment at the Nairobi Stock

My sincere thanks go to Mr. Lishenga for his intellectually stimulating comments, guidance and corrections through out the entire project. Thank you very much.

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To all lecturers and fellow MBA students, thank you for your invaluable guidance and support through out the entire program.

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I wish to thank the information desk fraternity ant the Nairobi Stock Exchange for the invaluable support they accorded me in obtaining data

reasonable manner.

Abstract

This paper sought to compare the explanatory power of a single index model with the multifactor asset pricing model of Fama and French (FF) (1996) for companies listed in the main investment market segment at the Nairobi Stock Exchange over the years 1999 to 2005. According to the CAPM, the market beta alone is sufficient to explain security returns and that there is a positive expected premium for investing in beta risks. The current consensus is that firm size and book-to-market equity factors are pervasive risk factors besides the overall market factor.

The results of the study suggest that the CAPM beta alone is not sufficient to describe the cross section of expected returns. The study finds that the size and book-to-market equity help explain the variations in average stock returns in a reasonable manner.

Subrahmanyam (JFE, 1998) analyses the relation between stock returns and measures of risk (book-to-market, firm size, dividend yield) and several non-risk characteristics (lagged returns). They show that return momentum, size, book to market effects and liquidity explain the cross-section of US monthly returns for the period from January 1966 to December 1985. (average of 2457 CRSP/COMPUSTAT stocks) even after controlling for the Connor and Korajczyk (1986) statistical factors.

Recent research has looked at the relative importance of country versus industry factors. For example, Heston and Rouwenhorst (1994), Griffin and Karolyi (1998) or Serra (2000). The evidence seems to support that country affiliation dominates (global) industry affiliation but it is unclear to what extent the debate is on the importance of country versus industry factors per se or, more broadly, on the

CHAPTER ONE: INTRODUCTION

1.2 Background

Understanding the factors that drive stock returns has long challenged both academics and professional portfolio managers. For example, Chen, Roll and Ross (1986) investigated the systematic variables that influence asset pricing in the US. There is still a lot of debate of what are the factors that influence the movement of a company's share price. There is ongoing research assessing whether stock returns are generated by risk (e.g. market betas, APT factors, liquidity factors) and/or non-risk characteristics (e.g. reversal or momentum) and whether the pricing factors are global or local. Brennan, Chordia and Subrahmanyam (JFE, 1998) analyse the relation between stock returns and measures of risk (book-to-market, firm size, dividend yield) and several non-risk characteristics (lagged returns). They show that return momentum, size, book to market effects and liquidity explain the cross-section of US monthly returns for the period from January 1966 to December 1995. (average of 2457 CRSP/COMPUSTAT stocks) even after controlling for the Connor and Korajczyk (1988) statistical factors.

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importance of local (country specific) factors relative to global factors. Another related issue is to understand what these country specific influences stand for, if they proxy local characteristic factors, local industry factors or local macroeconomic factors.

Risk factors

Risk factors are dictated by theoretical models of asset pricing (Capital Asset Pricing Model, Arbitrage Pricing Model in their local or international versions). If markets are liquid and efficient, differences in expected returns should result from differences in risk. Further, there is substantial evidence on the power of risk measures in explaining the cross-section of returns, not only in the US but also in other developed and emerging markets. Serra (2002) examined the following risk factors: local and world market betas; currency betas; macroeconomic betas; and volatility (total risk and idiosyncratic risk), with the expected payoffs to these factors being positive: higher risk stocks require higher returns. Serra (2002) investigated the role of univariate and multivariate betas. Jagannathan and Wang (1998) motivate this procedure showing that when the true beta specification is unknown, investigating only the role of multivariate betas can be misleading.

Firm characteristics or factors indicating over-reaction

Several recent studies have shown that fundamental valuation ratios have a very important role in explaining returns. Daniel, Titman and Wei (2001) provide

evidence that security characteristics may have a different influence on returns than Fama and French book to market and size factors. This "characteristic model" (Daniel and Titman, 1997), where returns are related directly to book to market ratios instead of the Fama and French loadings, seems to produce better results than the risk factors model for Japan stocks. Yet there is much controversy on what they account for: some authors claim these ratios are a proxy for distress, some say that they indicate whether a stock is selling cheap or dear. Serra (2002) examined the following ratios: earnings to price; book value to price and dividend yield and showed the time-series averages of these attributes and size for the median stock in each emerging market. Regardless of whether the payoffs to these attributes compensate risk or overreaction, the coefficients on these attributes should be positive. High yield, value companies should observe higher returns.

Liquidity factors

Differences in liquidity can also drive the cross-sectional differences in returns. Investors require a super risk premium to hold illiquid securities, to compensate for higher bid-ask spreads. Serra (2002) uses two measures for liquidity: market capitalisation and price per share. The size effect is widely regarded as a proxy for trading liquidity but it captures many other effects. For example, smaller stocks are regarded as low quality stocks due to a greater variability in earnings and greater exposure to local factors. Again it is controversial to say that market capitalisation is only picking up liquidity. Size could be a proxy for risk. Liquid

stocks should have lower expected returns. Therefore, it is expected the coefficients on these factors to be negative.

Technical factors

Efficient markets preclude any significant relation between the price history of a stock and its future expected return. Yet several papers have found significant relations between past and future returns. There is mixed evidence on the profitability of strategies that bet on short term reversals and only a few studies have looked at long term reversals, but there is growing evidence on the importance of momentum in predicting returns in the US and in other developed and emerging markets. Serra (2002) examined lagged (raw and excess) weekly returns for several lags (1 to 12, 26 weeks) and also lagged buy and hold returns of 8, 12, 26 and 52 weeks. All lagged return variables excluded the return of the prior week in order to account for the bid-ask bounce and to avoid spurious association between the prior week return and the current week return caused by thin trading. It is expected that the payoffs for the lagged returns up to 12 weeks to be negative; for lagged returns of 26 weeks, positive; and negative again for the 52 weeks.

Sharpe (1964), Lintner (1965) and Mossin (1966) independently developed the capital asset pricing model (CAPM). This model uses the logic of Markowitz in forming portfolios and that there is an asset (the risk free asset) that has a certain return.

Early cross-sectional studies of stock returns (e.g. Nicholson, 1960) did not receive a great deal of attention due to the small sample used to conduct the empirical tests. It was not until CSRP and Compustat databases became available that researchers could construct samples large enough (and of sufficient quality) to produce reliable results. Consequently, for a few years after the development of CAPM, there was no reliable way to test the model's predictions against variables like book-to-market equity or earnings/price

average returns on U.S. stock portfolios constructed on firm size and book-to-

One of the early studies to contradict the predictions of CAPM was Basu (1977).

Using a sample period that stretched from 1957 to 1971, he showed that stocks with high earnings/price ratios (or low P/E ratios) earned significantly higher returns than stocks with low earnings/price ratios. His results showed that differences in beta could not explain these return differences

investors should pay attention to PE ratios when forming or revising

Banz (1981) showed that the stocks of a firm with low market capitalization have higher average returns than large capitalization stocks. Basu (1983) showed that the size effect is distinct from the Earnings/Price (E/P) effect using a period that stretched from 1957 to March 1971- small firms tend to have higher returns even after controlling for firm size.

relationship between unsystematic risk and return was found to be

DeBondt and Thaler (1985) identify "losers" as stocks that have had a poor return over the past three to five years. Winners are those stocks that had high returns over a similar period. The main result of DeBondt and Thaler is that losers have much higher average returns than winners over the next three to five year.

Chopra, Lakonishok and Ritter (1991) show that beta cannot account for this differences in average returns.

of Fama and French (1996) for companies listed on the Nairobi Stock Exchange (NSE).

Fama and French (FF) (1992) report that the market beta has little or no ability in explaining the variation in stock returns and that the firm size and book-to-market equity effect seem to describe the variation in average returns in a meaningful manner. FF (1993, 1996) posit that a three factor model largely captures the average returns on U.S stock portfolios constructed on firm size and book-to-market equity.

In a test of the market efficiency at the Nairobi Stock Exchange, Makara (2004) using the price/earning (PE) ratio, low price earning portfolios outperformed high PE portfolios and the market from 1994 to 2004. PE ratios bear information content. Investors should pay attention to PE ratios when forming or revising portfolios.

book to market value would be a good measure of expected returns of investment. Asset risk is important since it is an indication of the premium over Using market data from forty five quoted companies, Gitari (1990) found a positive (albeit statistically insignificant) relationship between systematic risk and returns, consistent with the theory that investors are rewarded for taking on high risks. The relationship between unsystematic risk and return was found to be negative and statistically insignificant

single-period model, where an investor forms a portfolio at the beginning of the period. The investor's objective is maximizing the portfolio's expected returns, subject to an acceptable level of risk (or minimizing risk, subject to an acceptable level of return). The assumption of a single time

This study will compare the explanatory power of a single index model with the multifactor asset pricing model of Fama and French (1996) for companies listed on the Nairobi Stock Exchange (NSE).

1.3 Statement of the problem

While an investor is making a decision as to basis to use, he is confronted by certain factors to rely upon in evaluating such an undertaking. He must be able to examine the investment risk, the firm size as well as the ratio of its book to market equity.

Size is important since smaller companies are often perceived as being more risky as to their likelihood of surviving a recession or a competitive challenge. Book value represents the net book value of the firm's assets. A higher investment in assets would translate into increased cash flows. Therefore, the ratio of book to market value would be a good measure of expected returns of investment. Asset risk is important since it is an indication of the premium over the market that the particular investment bears. A riskier asset is expected to bear higher returns for the investor as a compensation for bearing that extra risk.

Any discussion of the theory of stock behavior has to start with Markowitz (1952, 1959). The Markowitz model is a single-period model, where an investor forms a portfolio at the beginning of the period. The investor's objective is maximizing the portfolio's expected returns, subject to an acceptable level of risk (or minimizing risk, subject to an acceptable level of return). The assumption of a single time

period, coupled with assumptions about the investor's attitude towards risk, allows risk to be measured by the variance (or standard deviation) of the portfolio's return. Capital asset pricing theory is concerned with the equilibrium relationship between risk and expected return on risky assets. As securities are added to the portfolio, the expected return and standard deviation change in very specific ways, based on the way in which the added securities co-vary with the other securities in the portfolio.

In emerging markets, test conducted on the Fama and French three factor model show mixed results. For instance, Bundoo (2004) shows that for companies listed on the Stock Exchange of Mauritius, beta is significant but less than one. In New Zealand, Bryant and Eleswarapu (1997) investigated the role of beta, firm size and book to market ratio in explaining security returns over the 1971 to 1993 using methods adapted from Fama and French (1992). They found beta of little use in explaining cross sectional returns. Australian studies generally find support for the three factor model to varying degree. Among these studies are Halliwell and Sawicki (1999) Faff (2001) and Gaunt (2004) In their study using data from the Australian Stock Exchange, which spans a period from January, 1981 to June 1991, Halliwell, Heaney and Sawicki (1999) conclude that the parameter magnitudes and statistical significance of their findings are in general comparable to Fama and French (1993) They report a statistically significant size effect but find little evidence of a statistically BM effect and conclude that the role of this factor may not be strong as suggested in the literature.

Mwangi (1999) while testing whether the price /earning (PE) ratio is an indicator of investment performance of ordinary shares on the NSE, found a strong association between firms with high PE ratio and high earnings growth rate.

The result of Oliech J.O (2004) on the relationship between the size, book-to-market value and returns at the Nairobi Stock Exchange of common stocks for all companies listed on the Nairobi Stock Exchange from 1996 to 2000 could not confirm the result achieved by Fama and French (1993) i.e. the size of the companies quoted on the NSE have no relationship with the return of those companies and the ratio of book-to-market value has no relationship to returns of the company.

Given the inconsistency cited in the above studies and given the need to understand security pricing so as to exploit them, this study aimed at establishing the adequacy of market risk in explaining the variation in average stock returns and if the multifactor model of Fama and French explains the variation in average stock returns more adequately within the context of the Nairobi Stock Exchange.

1.4 Objectives of the study

The endeavour to compare the explanatory power of a single index model with the multifactor model of Fama and French (1996) for Kenya. Specifically, the study was conducted:

1. To establish the adequacy of beta risk in explaining the variation in average stock returns. The basic time series model is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_i (R_{mt} - R_{ft}) + \epsilon_{it}$$

2. To establish if the multifactor model of Fama and French (FF) (1996) explains the variation in average stock returns more adequately than the one factor model.

1.5 Importance of the study

The results of the study are bound to be of insightful benefit to its users in various ways. In particular, it will be of benefit to the following groups of users:

Academicians.

The study will offer an extension of knowledge of assets and securities in Kenya as to the factors that ought to be considered in pricing dynamics.

Individual and corporate investors.

The study is bound to provide details as to what factors the investing public should consider in evaluating and valuing securities offered to them by companies and other entities that are raising funds. The size effect and the value premium may be used as investment strategies by the portfolio managers and equity investors.

Governments and policy developers.

CHAPTER TWO: LITERATURE REVIEW

In the administration of the financial system, the government as a policy developer will acquire insights as to parameters affecting investment decisions and therefore, accommodate such in the policies.

Consultants.

Empirical test of CAPM focused on these hypotheses to determine if the model

The study will provide knowledge among consultants who are required often to provide their investing clients with vital knowledge on investing decisions.

2.1 Size effect

Issuers of securities.

The study will provide insights to companies and governments (including local authorities) that intend to raise funds from the public as to the appropriate factors to put into consideration in pricing their securities.

Chen (1998) propose that the size effect is an artifact of large measurement errors in betas that allow firm size as a proxy for true beta. However, Fama and French (1992) used test portfolios sorted based on both size and beta and find that the size effect is not explained by beta.

Al-Saad, (2005) paper investigated the existence of the holiday effect on stock returns in the Kuwait Stock Exchange (KSE), using the market index for two periods- pre-invasion (1984-1990) and post-liberation (1993-2000). The results obtained indicate the non-existence of the holiday effect in the KSE. This result is not consistent with the results obtained in the developed and some emerging

CHAPTER TWO: LITERATURE REVIEW

A number of studies have attempted to test CAPM empirically. CAPM hypothesis that higher risk should be associated with higher return, return is linearly related to beta, and there is no reward for bearing non-market risk

Empirical test of CAPM focused on these hypotheses to determine if the model describes returns. In essence, tests of CAPM examined whether the betas were the sole measures of risk.

2.1 Size effect

The evidence that small firms, on average, earn higher returns than large firms, documented by Banz (1981) and Reinganum (1981) has attracted much attention from both academics and practitioners. Chan and Chen (1998) propose that the size effect is an artifact of large measurement errors in betas that allow firm size as a proxy for true beta. However, Fama and French (1992) used test portfolios sorted based on both size and beta and find that the size effect is not explained by beta.

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markets. Testing for differences between the two periods indicates the existence of significant higher stock returns in the post-liberation period. Tests also indicate the existence of significant higher returns for the post-holidays in the post-liberation period.

2.2 Book to market equity

Recently there has been much discussion in the financial press regarding whether current accounting procedures accurately reflect the investment in assets by business enterprises. Commentators such as Baruch Lev (*Barron's*, November 20, 2000) argue that book value of common equity is a poor measure of a firm's net assets. Others have extended this argument to conclude that the book-to-market ratio no longer has a place in investment analysis. In particular, strategies that use the book-to-market ratio to identify value stocks have come under attack. However, there is no evidence of BM becoming irrelevant for identifying value stocks. Compared to popular alternatives, BM is at least as good at producing dispersion in average returns. This ability has not declined in recent years. The changes in the composition of the US economy during the past several years have not eliminated the strong cross-sectional relation between BM and realized returns.

2.3 Capital Asset Pricing Model

Penman *et al* (2006) lays out a decomposition of book-to-price (B/P) that articulates precisely how B/P "absorbs" leverage. The B/P ratio can be decomposed into an enterprise book-to-price (that pertains to operations and potentially reflects operating risk) and a leverage component (that reflects

financing risk). The empirical analysis shows that the enterprise book-to-price ratio is positively related to subsequent stock returns but, conditional upon the enterprise book-to price, the leverage component of B/P is negatively associated with future stock returns. Further, both enterprise book-to-price and leverage explain returns over those associated with Fama and French nominated factors – including the book-to-price factor – albeit negatively so for leverage.

The seemingly perverse finding with respect to the leverage component of B/P survives under controls for size, estimated beta, return volatility, momentum, and default risk.

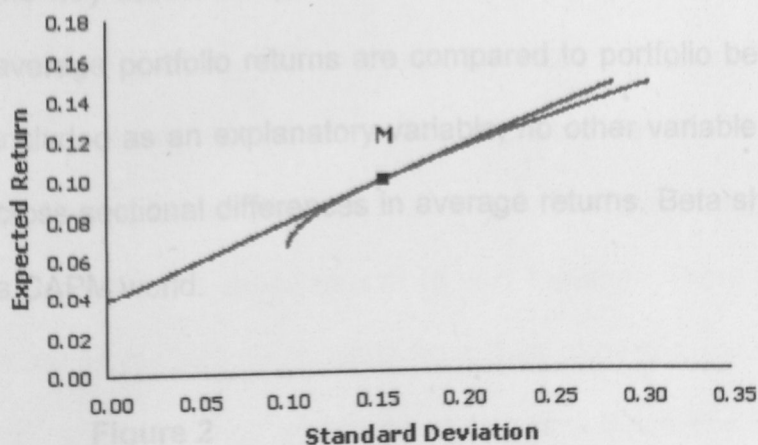
Fama and French (Journal of Finance, 1992) report that size and the book-to-market ratio (BE/ME) “provide a simple and powerful characterization of the cross-section of average returns for the 1963-1990 period. To quickly summarize their findings: Value firms (high book-to-market ratio) reliably have higher returns than growth firms (low book-to-market ratio). Small firms have higher returns than large firms. Fama and French results are driven by low returns by small, young, growth stocks, and a strong January seasonal in the book-to-market (BE/ME) effect.

2.3 Capital Asset Pricing Model

This model assumes that investors use the logic of Markowitz in forming portfolios. It further assumes that there is an asset (the risk-free asset) that has a certain return. The assumption of a single time period, coupled with assumptions about the investor's attitude toward risk, allows risk to be measured by the

variance (or standard deviation) of the portfolio's return. Thus, as indicated by the arrow in Figure 1, the investor is trying to go as far northwest as possible.

Figure 1
Markowitz Portfolio Selection



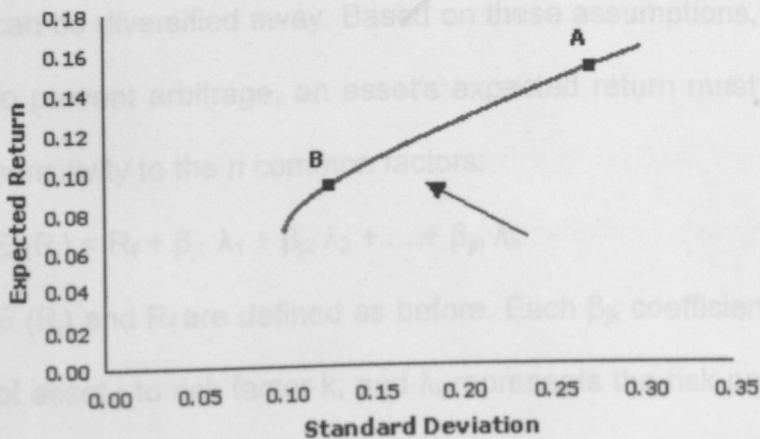
The straight line in Figure 2, which has the risk-free rate as its intercept and is tangent to the efficient frontier, is now the northwest boundary of the investment opportunity set. Investors choose portfolios along this line (the capital market line), which shows combinations of the risk-free asset and the risky portfolio M. In order for markets to be in equilibrium (quantity supplied = quantity demanded), the portfolio M must be the market portfolio of all risky assets. So, all investors combine the market portfolio and the risk-free asset, and the only risk that investors are paid for bearing is the risk associated with the market portfolio. This leads to the CAPM equation:

$$E(R_j) = R_f + \beta_j [E(R_m) - R_f]$$

$E(R_j)$ and $E(R_m)$ are the expected returns to asset j and the market portfolio, respectively, R_f is the risk free rate, and β_j is the beta coefficient for asset j . β_j measures the tendency of asset j to co-vary with the market portfolio. It

represents the part of the asset's risk that cannot be diversified away, and this is the risk that investors are compensated for bearing. The CAPM equation says that the expected return of any risky asset is a linear function of its tendency to co-vary with the market portfolio. So, if the CAPM is an accurate description of the way assets are priced, this positive linear relation should be observed when average portfolio returns are compared to portfolio betas. Further, when beta is included as an explanatory variable, no other variable should be able to explain cross-sectional differences in average returns. Beta should be all that matters in a CAPM world.

Figure 2
Capital Market Line



2.4 Arbitrage Pricing Theory

While the CAPM is a simple model that is based on sound reasoning, some of the assumptions that underlie the model are unrealistic. Some extensions of the basic CAPM were proposed that relaxed one or more of these assumptions (e.g., Black, 1972). Instead of simply extending an existing theory, Ross (1976a,

1976b) addresses this concern by developing a completely different model: the Arbitrage Pricing Theory (APT). Unlike the CAPM, which is a model of financial market equilibrium, the APT starts with the premise that arbitrage opportunities should not be present in efficient financial markets. This assumption is much less restrictive than those required to derive the CAPM.

The APT starts by assuming that there are n factors which cause asset returns to systematically deviate from their expected values. The theory does not specify how large the number n is, nor does it identify the factors. It simply assumes that these n factors cause returns to vary together. There may be other, firm-specific reasons for returns to differ from their expected values, but these firm-specific deviations are not related across stocks. Since the firm specific deviations are not related to one another, all return variation not related to the n common factors can be diversified away. Based on these assumptions, Ross shows that, in order to prevent arbitrage, an asset's expected return must be a linear function of its sensitivity to the n common factors:

$$E(R_j) = R_f + \beta_{j1} \lambda_1 + \beta_{j2} \lambda_2 + \dots + \beta_{jn} \lambda_n$$

$E(R_j)$ and R_f are defined as before. Each β_{jk} coefficient represents the sensitivity of asset j to risk factor k , and λ_k represents the risk premium for factor k . As with the CAPM, we have an expression for expected return that is a linear function of the asset's sensitivity to systematic risk. Under the assumptions of APT, there are n sources of systematic risk, where there is only one in a CAPM world.

2.5 Intertemporal Capital Asset Pricing Model

Both the CAPM and the APT are static, or single-period models. As such, they ignore the multi-period nature of participation in the capital markets. Merton's

(1973) intertemporal capital asset pricing model (ICAPM) was developed to capture this multi-period aspect of financial market equilibrium. The ICAPM framework recognizes that the investment opportunity set (see Figures 1 and 2) might shift over time, and investors would like to hedge themselves against unfavorable shifts in the set of available investments. If a particular security tends to have high returns when bad things happen to the investment opportunity set, investors would want to hold this security as a hedge. This increased demand would result in a higher equilibrium price for the security (all else constant). One of the main insights of the ICAPM is the need to reflect this hedging demand in the asset pricing equation. The resulting model is:

$$E(R_j) = R_f + \beta_{jM} \lambda_M + \beta_{j2} \lambda_2 + \dots + \beta_{jn} \lambda_n$$

Note that the form of the ICAPM is very similar to that of the APT. There are subtle differences, however. The first factor of the ICAPM is explicitly identified as being related to the market portfolio. Further, while the APT gives little guidance as to the number and nature of factors, the factors that appear in the ICAPM are those that satisfy the following conditions: They describe the evolution of the investment opportunity set over time and investors care enough about them to hedge their effects.

For example, there might be a priced factor for unexpected changes in the real interest rate. Such a change would certainly shift the investment opportunity set (for example, the intercept of the line in Figure 2 would move), and the effect would be pervasive enough that investors would want to protect themselves from the negative consequences. We still don't know exactly how many factors there are, but the ICAPM at least gives us some guidance.

2.6 Consumption-oriented Capital Asset Pricing Model

The consumption-based model of Breeden (1979) provides a logical extension of the previous work in asset pricing. Breeden's model is based on the intuition that an extra dollar of consumption is worth more to a consumer when the level of aggregate consumption is low. When things are going really well and many people can afford a comfortable standard of living, another dollar of consumption doesn't make us feel very much better off. But when times are hard, a few extra dollars to spend on consumption goods is very welcome. Based on this "diminishing marginal utility of consumption," securities that have high returns when aggregate consumption is low will be demanded by investors, bidding up their prices (and lowering their expected returns). In contrast, stocks that co-vary positively with aggregate consumption will require higher expected returns, since they provide high returns during states of the economy where the high returns do the least good. Based on this line of reasoning, Breeden derives a consumption-based capital asset pricing model (CCAPM) of the form:

$$E(R_j) = R_f + \beta_{jC} [E(R_m) - R_f]$$

In this model, β_{jC} measures the sensitivity of the return of asset j to changes in aggregate consumption. β_{jC} is referred to as the consumption beta of asset j , and the CCAPM's main result is that expected returns should be a linear function of consumption betas. Despite the intuitive appeal of the consumption-based model, empirical tests have not supported its predictions (Breeden, Gibbons and Litzenberger, 1989). Accordingly, consumption-based asset pricing has not received as much attention in practice as the other models discussed here. In

spite of the unrealistic assumptions underlying the single-period CAPM, it still became the most widely used asset pricing model within a few years after its development. Its simplicity, coupled with empirical tests that supported most of its predictions (for example, see Fama and MacBeth, 1973), made it the most widely taught asset pricing model in schools of business. The APT was tested in a number of empirical studies, but the CAPM received most of the financial world's attention.

2.7 Fama and French three factor model

The three factor model suggested by Fama and French [1992, for example] provides an alternative to CAPM for estimation of expected return. In this model two additional factors are included to explain excess return; size and the book to market ratio. Thus for each stock, i , to estimate excess return, first beta estimates for each of the factors are obtained

In 1992, an influential paper was published that pulled together much of the earlier empirical work. Fama and French (1992) brought together size, leverage, E/P, BM, and beta in a single cross-sectional study. Their results were controversial. First, they showed that the previously documented positive relation between beta and average return was an artifact of the negative correlation between firm size and beta. When this correlation is accounted for, the relation between beta and return disappears. Figures 3 and 4 show this result. Figure 3 plots beta and average return for twelve portfolios formed by ranking stocks on firm size. The positive relation between return and beta is highly linear, as

predicted by the CAPM. Based on this evidence, it appears that the CAPM nicely explains the higher returns that small firms have earned. Figure 4 plots average return and beta for portfolios formed by ranking on both firm size and beta, so that each portfolio contains stocks that are similar in both their betas and their market values. This chart shows that when beta is allowed to vary in a manner unrelated to size, the positive, linear beta return relation disappears. This result contradicts the central prediction of the single-period CAPM. Given that beta does a poor job of explaining average returns, what variables can do a better job? This is the second main point of the Fama/French study. They compared the explanatory power of size, leverage, E/P, BM, and beta in cross-sectional regressions that spanned the 1963-1990 period. Their results indicate that BM and size are the variables that have the strongest relation to returns. The explanatory power of the other variables vanishes when these two variables are included in the regressions. The cross-section of average stock returns can be nicely described by two variables.

The Fama/French (1992) results dealt a severe blow to the view that the single-period CAPM is the way securities are actually priced.

2.8 Early Empirical Tests

Tests of CAPM are based on three implications of the relation between expected return and market beta implied by the model. First, expected returns on all assets are linearly related to their betas, and no other variable has marginal explanatory power. Second, the beta premium is positive, meaning that the expected return on the market portfolio exceeds the expected return on assets are uncorrelated

Figure 3
Beta and Average Return for Portfolios formed on
Size

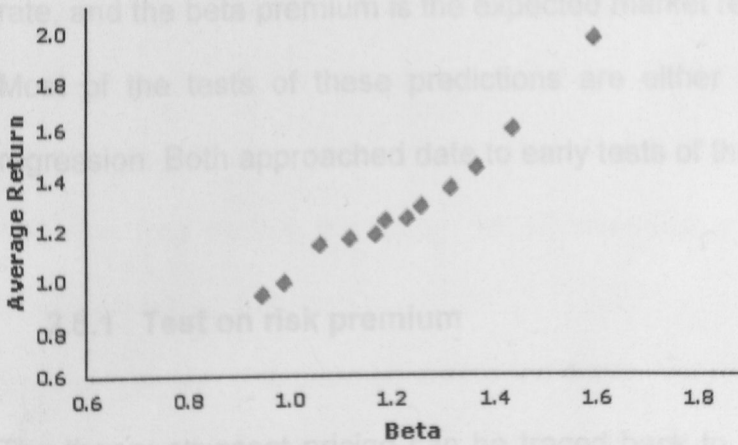
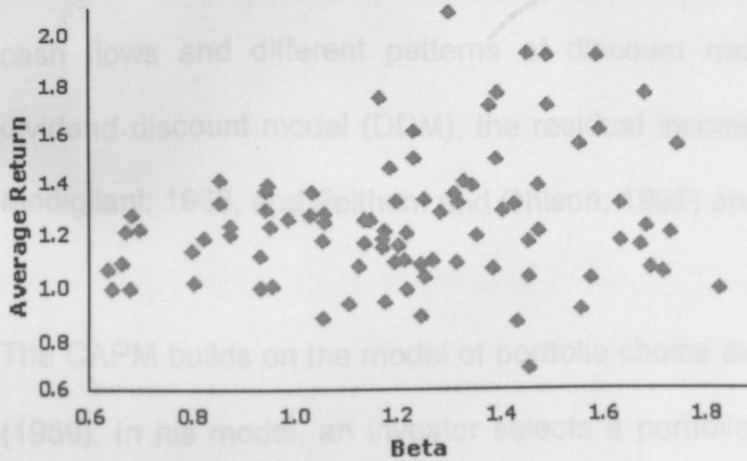


Figure 4
Beta and Average Return for Portfolios formed on
Size and Beta



2.8 Early Empirical Tests

Tests of CAPM are based on three implications of the relation between expected return and market beta implied by the model. First, expected returns on all assets are linearly related to their betas, and no other variable has marginal explanatory power. Second, the beta premium is positive, meaning that the expected return on the market portfolio exceeds the expected return on assets are uncorrelated

with the market return. Third, in the Sharpe-Lintner version of the model, assets uncorrelated with the market have expected return equal to the risk free interest rate, and the beta premium is the expected market return minus the risk free rate. Most of the tests of these predictions are either cross-section or time-series regression. Both approached date to early tests of the model.

2.8.1 Test on risk premium

The theory on asset pricing can be traced back to Fischer's Net Present Value (NPV) of 1896. Since then, researchers have developed many asset pricing models. The discounted model thinks that the value of equity is the present value of expected cash flows. According to the different understanding of expected cash flows and different patterns of discount model mainly consists of the dividend discount model (DDM), the residual income valuation (RIV) (Miller and Modigliani, 1966, and Feltham and Ohlson, 1995) and stochastic discount model.

The CAPM builds on the model of portfolio choice developed by Harry Markowitz (1959). In his model, an investor selects a portfolio at time $t-1$ that produces a stochastic return at time t . the model assumes that investors are risk averse and when choosing among portfolios, they care only about the mean and variance of their one-period investment return. As a result, investors choose mean-variance efficient portfolios in the sense that the portfolios minimize the variance of portfolio returns given expected returns and maximize expected return given variance.

Sharpe (1964) and Lintner (1965) add two assumptions to the Markowitz model to identify a portfolio that must be mean-variance efficient. The first assumption is complete agreement. Given market clearing asset prices at $t-1$, investors agree on the joint distribution of assets returns from that $t-1$ to t , and this distribution is the true one. The second assumption is that there is borrowing and lending at a risk free rate that is the same for all investors and does not depend on the amount borrowed or lent.

To improve the precision of estimated betas, Blume (1970), Friend and Blume (1970) and Black, Jensen, and Scholes (1972) work with portfolios rather than individual assets.

2.8.2 Testing whether market based betas explain expected returns

Fama and MacBeth (1973) propose a method of dealing with the inference problem caused by correlation of the residuals in cross-section regressions. Instead of estimating a single cross-section regression of average monthly returns on betas, they estimate month-by-month cross section regressions of average monthly returns on betas.

2.9 Recent tests

Basu (1977) observes that when common stocks are sorted on an earning-price (E/P) ratio, future returns on high E/P stocks are higher than predicted by the CAPM. Banz (1981) document a size effect; when stocks are sorted on market capitalization, (price time shares outstanding) average returns on small stocks

are higher than predicted by CAPM. Bhandari (1988) finds that high debt-equity ratio (book value of debt over the market value of equity, a measure of leverage) are associated with returns that are too high relative to their market betas. Statman (1980) and Rosenberg, Reid, and Lanstein (1985) document that stocks with high book-to-market equity ratios (B/M, the ratio of book value of a common stock to its market value) have high average returns that are not captured by their betas.

Ratios involving stock prices have information about expected returns missed by market betas. A stock's price depends not only on the expected cash flows it will provide, but also on the expected returns that discount expected cash flow back to the present. Such ratios are prime candidates to expose shortcomings of asset pricing models – in the case of the CAPM, shortcomings of the prediction that market betas suffice to explain expected returns (Ball, 1978). The contradictions of CAPM summarised above suggest that earnings-price, debt-equity, and book-to-market ratios indeed play this role.

2.10 Explanations: Irrational Pricing or Risk

Fama and French (1992) update and synthesise evidence on the empirical failure of the CAPM. Using cross section regression approach, they confirm that size, earnings-price, debt-equity and book-to-market ratios add to the explanation of expected stock returns provided by market beta. Fama and French (1996) reach the same conclusion using the time series regression approach applied to portfolios of stocks sorted price ratios. They also find that different price ratios have much the same information about expected returns.

Behaviouralists argue that sorting firms on book-to-market ratios expose Fama and French (1992) also confirm the evidence (Reinganum, 1981, Stambaugh, 1982, Lakonishok and Shapiro, 1986) that the relation between average returns return and beta for common stocks is even flatter after the sample periods used in the early empirical on the CAPM. Kothari, Shanken, and Sloan (1995) try to resuscitate the Sharpe – Lintner CAPM by arguing that the weak relation between average return and beta is just a chance result.

Chan, Hamao, and Lakonishok (1991) find a strong relation between book-to-market equity (B/M) and average return for Japanese stocks. Capaul, Rowly and Sharpe (1993) observe a similar B/M effect in four European markets and in Japan. Fama and French (1998) find that the price ratios that produce problems for the CAPM in USA data show up in the same way in the stock returns of twelve non-US major markets, and they are present in emerging market returns. This evidence suggests that the contradictions of the CAPM associated with price ratios are not sample specific.

2.10 Explanations: Irrational Pricing or Risk

Amongst those who conclude that the empirical failures of the CAPM are fatal, two stories emerge. On one side are behaviouralists. Their view is based on evidence that stocks with high ratios of book value to price are typically firms that have fallen on bad times, while low B/M is associated with growth firms (Lakonishok, Shleifer, Vishny, 1994; Fama and French, 1995).

Behaviouralists argue that sorting firms on book-to-market ratios expose investors' overreaction to good and bad times. Investors over-extrapolate past performance, resulting in stock prices that are too high for growth (low B/M) firms and too low for distressed (high B/M, so called value) firms. When the overreaction is eventually corrected, the result is high return for value stocks and low return for growth stocks. Proponents of this view include DeBondt and Thaler (1987), Lakonishok, Shleifer and Vishny (1994), and Haugen (1995).

The second story for the empirical contradictions of the CAPM is they point to the need for more complicated asset pricing model. The CAPM is based on the many unrealistic assumptions. For instance, the assumption that investors care only about mean and variance of distribution of one-period portfolio return is extreme. It is reasonable that investors also care about how their portfolio returns covaries with labour income and future investment opportunities, so a portfolio's return variances missed important dimensions of risk.

Merton's (1973) intertemporal capital asset pricing model (ICAPM) is an extension of the CAPM. The ICAPM begins with a different assumption about investor objectives. In the ICAPM, investors are concerned not only with their end of period payoffs, but also with the opportunities they will have to consume or invest the payoff. Thus, when choosing a portfolio at time $t-1$, ICAPM investors consider how their wealth at t might vary with future state variables, including labour income, the prices of consumption of goods and the nature of portfolio

opportunities at t , and expectations about the labour income, consumption, and investment opportunities to be available after time t .

Like CAPM investors, ICAPM investors prefer high expected returns and low return variances. However, ICAPM investors are also concerned with covariances of portfolio returns with state variables. As a result, optimal portfolios are "multifactor efficient," which means they have the largest possible expected returns, given their return variances and the covariance of their returns with the relevant state variables.

returns on diversified portfolios of high and low B/M

Fama (1996) shows that the ICAPM generalizes the logic of the CAPM i.e. if there is risk free borrowing and lending or if short-sales of risky assets are allowed, market clearing prices imply that the market portfolio is multifactor efficient.

$$R_t - R_{ft} = \alpha_i + \beta_{iM}(R_{Mt} - R_{ft}) + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + \epsilon_{it}$$

Fama and French (1993) take a more indirect approach perhaps in the spirit of Ross's (1976) arbitrage pricing theory (APT). They argue that though size and book-to-market equity are not themselves state variables, the higher average returns on small stocks and high book-to-market stocks reflect unidentified state variables that produce undiversifiable risks (covariances) in returns that are not captured by the market return and are priced separately from market betas. In support, they show that the returns on the stocks of large firms, and returns on high book-to-market (value) stocks covary more with one another than with returns on low book-to-market (growth) stocks. Fama and French (1995) show

that there are similar size and book-to-market patterns in the covariance of fundamentals like earnings and sales.

Based on this evidence, Fama and French (1993, 1996) propose a three factor model for expected returns,

(Three factor model) $E(R_{it}) - R_{ft} = \beta_{im}[E(R_{mt}) - R_{ft}] + \beta_{is}E(SMB_t) - \beta_{ih}E(HML_t)$

in the expression, SMB_t (small minus big) is the difference between the returns on diversified portfolios of small and big stocks, HML_t (high minus low) is the difference between the returns on diversified portfolios of high and low B/M stocks, and the betas are slopes in the multiple regression of $R_{it} - R_{ft}$ on $R_{mt} - R_{ft}$, SMB_t and HML_t .

One implication of the expected return equation of the three factor model is the intercept α_i in the time series regression,

$$R_{it} - R_{ft} = \alpha_i + \beta_{im}(R_{mt} - R_{ft}) + \beta_{is}SMB_t - \beta_{ih}HML_t + \varepsilon_i$$

is zero for all assets i . Using this criterion, Fama and French (1993, 1996) find that the model captures much of the variable in average returns for the portfolios formed on size, book-to-market equity, and other price ratios that cause problems for the CAPM. Fama and French (1998) show that an international version of the model performs better than an international CAPM in describing average returns on portfolios formed on scaled price variable for stocks in thirteen major markets.

Estimation of α_i from the time series regression above are used to calibrate how rapidly stock prices respond to new information; for instance Loughran and Ritter (1995), Mitchell and Stafford (2000). They are also used to measure the special information of portfolio managers, for example, in Carhart's (1977) study of mutual fund performance. Among practitioners, the model is offered as an alternative to the CAPM for estimating the cost of equity capital (for instance, Ibbotson Associates).

From a theoretical perspective, the main shortcoming of the three factor model is its empirical motivation. The small-minus-big (SMB) and high-minus-low (HML) explanatory returns are motivated by predictions about state variables concern to investors.

The three factor model's most serious problem is the momentum effect of Jegadeesh and Titman (1993). Stocks that do well relative to the market over the last three to twelve months tend to continue to do well for the next few months, and stocks that do poorly continue to do so. Moreover, the momentum effect is left unexplained by the three factor model, as well as by the CAPM. Following Carhart (1997), one response is to add a momentum factor (the difference between the returns on diversified portfolios of short-term winners and losers) to the three factor model.

A major problem for the CAPM is that portfolios formed by sorting stock price ratios produce a wide range of average returns, but the average returns are not

positively related to market betas (Lakonishok, Shleifer and Vishny, 1994, Fama and French, 1996, 1998).

2.11 The market proxy problem

Roll (1977) argues that the CAPM has never been tested and probably will never be. The problem is that the market portfolio at the heart of the model is theoretically and empirically elusive. It is not theoretically clear which assets (for example, human capital) can legitimately be excluded from the market portfolio, and data availability substantially limits the assets that are included. As a result, tests of the CAPM are forced to use proxies for the market portfolio, in effect testing whether the proxies are on the minimum variance frontier. Roll argues that because the tests use proxies, not the true market portfolio, we learn nothing about the CAPM.

2.12 Studies outside the U.S.A

The Fama and French three factor model was developed mainly on US data, hence the findings may arguably be relevant only in the US settings. Fama and French (1998) confirm their model using data from several international markets. Griffin (2002) on the other hand, using monthly data for 1,521 companies in Japan, 1,234 in the United Kingdom, and 631 in Canada from 1981 to December 1995, suggest that practical applications of the Fama-French three factor model are best performed on a country-specific basis.

In the Asia-Pacific region, Chui and Wei (1998) report a weak relationship between market beta and average stock returns in five Pacific-Basin emerging markets – Hong Kong, Korea, Malaysia, Taiwan and Thailand. A book to market effect was evident from Hong Kong, Korea, and Malaysia with a size effect evident in all markets except for Taiwan. Drew and Veeraraghavan (2002) also report evidence of a firm size, book to market effect in Malaysian stock market and found the FF model to be a parsimonious representation of the risk factors for Malaysia. Likewise, Drew and Veeraraghavan (2003) report a firm size and book to market effect in Hong Kong, Korea, Malaysia and the Philippines. They also report large absolute pricing errors produced by the single-factor CAPM compared with the FF three factor model. Lam (2002) using data for 100 firms listed in the Stock Exchange of Hong Kong (SEHK) from July 1980 to June 1997 also find that beta is unable to explain the average monthly returns on stocks, but size, book-to-market effect was not as pervasive in the Shanghai market as was found in the US and other international markets. Nevertheless, they report that the overall market factor and the firm size effect are priced in the Shanghai market.

Zealand, Bryant and Eleswarapu (1997) investigated the role of beta, firm size and book to market ratio in explaining security returns over the 1971 to 1993

Australian studies generally find support for the three factor model to varying degree. Among these studies are Halliwell and Sawicki (1999) Faff (2001) and Gaunt (2004) In their study using data from the Australian Stock Exchange, which spans a period from January, 1981 to June 1991, Halliwell, Heaney and Sawicki (1999) conclude that the parameter magnitudes and statistical significance of their findings are in general comparable to Fama and French

(1993) They report a statistically significant size effect but find little evidence of a statistically BM effect and conclude that the role of this factor may not be strong as suggested in the literature. Faff (2001) uses 24 Australian industry portfolio data from Datastream International covering a period from January 1991 to April 1999, and find strong support for the Fama- French model. However, he also states that the conclusion favouring the model has to be down weighted somewhat by the fact that though he reports a statistically significant size beta, it is of the "wrong" sign. He explains this negative size premium as being consistent with recent findings of reversal of the size effect with large firms earning a risk premium (Gustafson and Miller, 1999). Finally, Gaunt (2004) extends the Halliwell, *et al.* (1999) data set and covers a period from 1993 to 2001. Gaunt (2004) reports a statistically significant size effect, consistent with Halliwell, *et al.* (1999). However, contrary to Halliwell, *et al.* (1999), Gaunt (2004) find some evidence of a BM effect and a significant improvement in the explanatory power if the three factor model over the conventional CAPM.

techniques to test the robustness of their findings.

In New Zealand, Bryant and Eleswarapu (1997) investigated the role of beta, firm size and book to market ratio in explaining security returns over the 1971 to 1993 using methods adapted from Fama and French (1992). They found beta of little use in explaining cross sectional returns. They find a significant positive relation between book to market and average returns, but not a strong firm size effect. On the other hand, Vos and Pepper, also using an adaptation from Fama and French (1992) methodology found over the period 1991-1995 that stock returns are negatively related to size and positively related to book-to-market ratio. And

contrary to Bryant and Eleswarapu (1997), they found the size effect to be stronger than the book to market effect. However, Vos and Pepper (1997) also acknowledge that their results could be subject to survivorship bias since they only consider firms that were listed in the stock exchange over the entire sample period. Li and Pinfeld (2000) replicated Vos and Pepper (1997) for the period starting at the end of 1995 to June 1999 but did not find a book to market effect. Pinfeld, Wilson and Li (2001) used a longer period starting from mid 1993 to March 2001 and addressed the survivorship bias in Vos and Pepper (1997) and found book to market effect similar in magnitude to those found in US stocks and a week size effect. However, they also found beta has more predictive power than a combination of book to market size variables, contrary to the findings of Bryant and Eleswarapu (1997). Pinfeld *et al* (2001) stress however, that any study of either the size effect or the book to market effect will be highly dependent on the time frame selected. Vos and Pepper (2000) suggest that more research needs to be done using different periods and different portfolio selection techniques to test the robustness of their findings.

Closer home, Bundoo (2004) in his paper, "An Augmented Fama and French Three Factor Model: New Evidence from An Emerging Stock Market" found that the Fama and French model holds for the Stock Exchange of Mauritius and that the augmented Fama and French model shows that the time variation in betas is priced, but the size and book to market equity effects are still statistically significant. The FF model is therefore robust after taking into account the time variation in beta.

While examining the role of the firm size in explaining the cross section of Oliech (2004) studied the relationship between the size, book-to-market value and returns of Nairobi Stock Exchange of common stocks for all companies listed on the Nairobi Stock Exchange from 1996 to 2000. Data was collected from financial statements of the companies and the NSE. Size was determined by market capitalization, the average return included both capital gains and dividend gains and book value was the amount of stockholder's equity less any preference equity. The F and T ratios were used to test the significance of the model with a confidence level of 95%. The result could not confirm the result achieved by Fama and French (1993) i.e. the size of the companies quoted on the NSE have no relationship with the return of those companies and the ratio of book-to-market value has no relationship to returns of the company

The low levels of significance achieved in his study could be attributed to the small number of shares quoted at the exchange. It shows that the returns of companies quoted on the exchange are determined by other factors than size and ratio of book-to-market value.

Mwangi (1999) while testing whether the price /earning (PE) ratio is an indicator of investment performance of ordinary shares on the NSE found a strong association between firms with high PE ratio and high earnings growth rate although his study had several limitations including six years of study only, lack of financial data and non adjustment of inflation effect on earnings.

While examining the role of the firm size in explaining the cross section of average stock returns in Kenya over the 1991 to 2002, the size effect was found to be weakly exhibited at the Nairobi Stock Exchange by Ndung'u in 2003.

The type of research design that was used in the study was an empirical analysis. Numerical data was collected and analysed using statistical methods in order to answer the research questions. The data used was secondary in nature.

3.2 Population and Sample

The population of the study was made up of companies listed on the Nairobi Stock Exchange (NSE). Of interest was all companies listed on the NSE under the Main Investment Market Segment (MIMS) for the period between 1999 and 2005, both of the years included. This resulted in 41 companies being included in the study. The choice of these companies (MIMS) was motivated by the fact that this segment of the market is the most active at any given time. Interest rates were obtained from the Central Bank of Kenya's reports.

Companies whose data was not available in the entire study period were dropped from the study. As a result, Hutching Belmer Kenya Limited (whose data was not available for a significant duration of the study period) and Mumias Sugar Company (listed in November, 2001) were excluded from the study.

3.3 Data collection

Monthly stock returns and accounting data were obtained from the Nairobi Stock Exchange (NSE). The study made use of secondary data. The secondary data was made available by the NSE. Monthly closing stocks prices, monthly NSE

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

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index closing positions and monthly 91 day interest rates for the period 1999 to 2005 were adopted from the NSE and CBK respectively.

3.4 Data presentation techniques

The study made use of tables and graphs as appropriate to present the data. Tables were used to illustrate comparative results of the explanatory power of the market coefficient (beta) and the explanatory power of firm size and book-to-market equity.

3.5 Data analysis techniques

Monthly stock returns and accounting data of companies listed under the main investment market segment of the Nairobi Stock Exchange (NSE) for the period 1999 to 2005 were obtained. In order to obtain portfolio returns, the returns on individual stocks making up the portfolio were obtained using the following model;

$$R_{it} = [P_{it} - P_{i(t-1)} + D_{it}] / P_{i(t-1)}$$

R_{it} Return of stock i at time t

P_{it} Price of stock i at time t

$P_{i(t-1)}$ Price of stock i at time t-1

D_{it} Dividend of stock i at time t

In order to obtain the risk free rate, the 91 day treasury bill (TB) rate as obtained from the Central Bank of Kenya (CBK) was used.

The market return was obtained by computing the relative change in the NSE 20 share index over the period under review i.e.

$$R_{mt} = [P_{mt} - P_{m(t-1)}] / P_{m(t-1)}$$

R_{mt} Return of market at time t

P_{mt} NSE 20 share index at time t

$P_{m(t-1)}$ NSE 20 share index at time t-1

The market model was tested to determine if it describes expected returns. In addition, the relationship between expected returns of a certain portfolio and the overall market factor, firm size (ME) and book-to-market equity (BE/ME) was investigated.

First, the market model was tested to determine if it describes expected returns.

The basic time series model is; $R_{pt} - R_{ft} = \alpha_{pt} + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt}$

R_{pt} - Average return of a certain portfolio

R_{ft} - Risk free rate at the start of each month as approximated by the 91 day treasury bill rate

In addition, the relationship between expected returns of a certain portfolio and the overall market factor, firm size (ME) and book-to-market equity (BE/ME) was investigated by employing the following model;

$$R_{pt} - R_{ft} = a_{pt} + b_p (R_{mt} - R_{ft}) + s_p \text{SBM} + h_p \text{HML} + \varepsilon_{pt}$$

R_{pt} - Average returns of a certain portfolio (S/L, S/M and S/H; B/L, B/M and B/H)

SBM-difference each month between the returns on a portfolio of small stocks and the portfolio of big stocks

s_p and h_p are the slopes in the time series model.

Coefficient of determination - (R^2) was used to measure the total variation in the dependent variable that was accounted for by variation in the independent variable.

F – Test was used to test for the significance of the overall model. The null hypothesis was rejected when the significance value F - statistic was less than 0.05.

T – Test was used to test for the significance of each predictor variables (constant and asset structure) in the model. Any t – statistic value under consideration less than -2 or more than +2 was considered significant.

Durbin Watson test was used to test for autocorrelation in the model. It tested the autocorrelation for any of the six size to book-to-market equity portfolios. Durbin Watson value above 2 showed the absence of autocorrelation.

3.6 Portfolio formation

At the end of December each year, t stocks were assigned to two portfolios of size (small and big) based on whether their December market equity (ME) defined as closing price times number of shares outstanding is above or below the median ME. The same stocks were allocated in an independent sort to the three BE/ME portfolios (low, medium and high) based on the breakpoints for the bottom 33.33% and the top 66.67%

Low portfolios consisted of firms with breakpoints less than 33.33% of the median book-to-market equity. High portfolios consisted of firms with break

points more than 66.67% of median book-to-market equity and the balance firms were assigned the median portfolios.

Six ME-BE/ME portfolios were formed at the intersection of the two size portfolios and three book-to-market equity portfolios.

Size	Book-to-market equity		
	Low	Medium	High
Small Stocks	S/L	S/M	S/H
Large Stocks	B/L	B/M	B/H

Value weight monthly returns of the six portfolios were computed from the following January to December

Book equity (BE) is defined as the book value of common shareholders' equity plus the balance sheet deferred taxes (if any) but minus the book value of preferred stocks.

BE/ME ratio used to form portfolios in December each year t is the book common equity for the fiscal year ending in calendar year $t-1$. Negative book-equity firms will be excluded as they don't have meaningful explanations.

The robustness of the single factor model was compared with that of the multifactor (FF) model. Specifically, the following questions were asked;

Is beta risk the only risk needed to explain variation in average stock returns and can an overall market factor, firm size, and book-to-market equity value explain the cross sectional patterns of stock returns in a meaningful manner?

CHAPTER FOUR: RESEARCH FINDINGS AND ANALYSIS

This study aimed at comparing the explanatory power of a single index model with the multifactor asset pricing model of Fama and French (FF) (1996).

4.1 Explanatory power of single index

Table 1a below shows the average excess returns and standard deviations on the six size and book-to-market equity portfolios for main investments market segment at the Nairobi Stock Exchange. It also shows the average excess returns and standard deviations on the overall market.

The table shows that the excess return on a broad market portfolio generates an average excess return of -1.01 percent per annum. The table also shows that three small stocks portfolio S/L, S/M and S/H yield slightly lower returns than the large stocks portfolio B/L, B/M and B/H. The three small stocks portfolio generate a combined return of -0.27142 percent per month, while the three big stocks portfolio generate a combined return of -0.26992 percent per month. All portfolios underperformed the market

Table 1a
Mean monthly returns for the period 1999 to 2005

Portfolio	RPTRFT		RMRFT	
	Mean	Standard Deviation	Mean	Standard Deviation
S/L	-0.08948	0.04581	-0.08427	0.08502
S/M	-0.08937	0.04571	-0.08427	0.08502
S/H	-0.09257	0.05475	-0.08427	0.08502
B/L	-0.08743	0.04928	-0.08427	0.08502
B/M	-0.09081	0.04804	-0.08427	0.08502
B/H	-0.09168	0.04730	-0.08427	0.08502

On Table 1b below are the regression parameters. The results show that the intercepts, a coefficient, are statistically distinguishable from zero for all

portfolios. At the same time, it shows that the intercept is statistically significant for all the portfolios. It is also observed that the overall market factor, beta coefficient is significant at the 5% level for all portfolios. It is to be noted that beta coefficient is in the range of 0.422 and 0.439. The average R^2 for the six portfolios is 0.577 meaning that the market variable explains 57.7% of the variations in the cross section of average stock returns

Table 1b
Mean monthly returns for the period 1999-2005

$$R_{pt} - R_{ft} = \alpha_{pt} + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt}$$

Portfolio	a		b		Adjusted R^2	F	DW
	Mean	t statistics	Mean	t statistics			
S/L	-0.05387	-12.223	0.42200	11.440	0.615	130.872	0.863
S/M	-0.05379	-12.261	0.42200	11.484	0.617	131.889	0.863
S/H	-0.05655	-8.908	0.42700	8.033	0.440	64.535	1.469
B/L	-0.05047	-10.106	0.43900	10.482	0.573	109.867	1.076
B/M	-0.05378	-11.490	0.43900	11.204	0.605	125.535	1.263
B/H	-0.05497	-12.050	0.43600	11.393	0.613	129.809	1.056

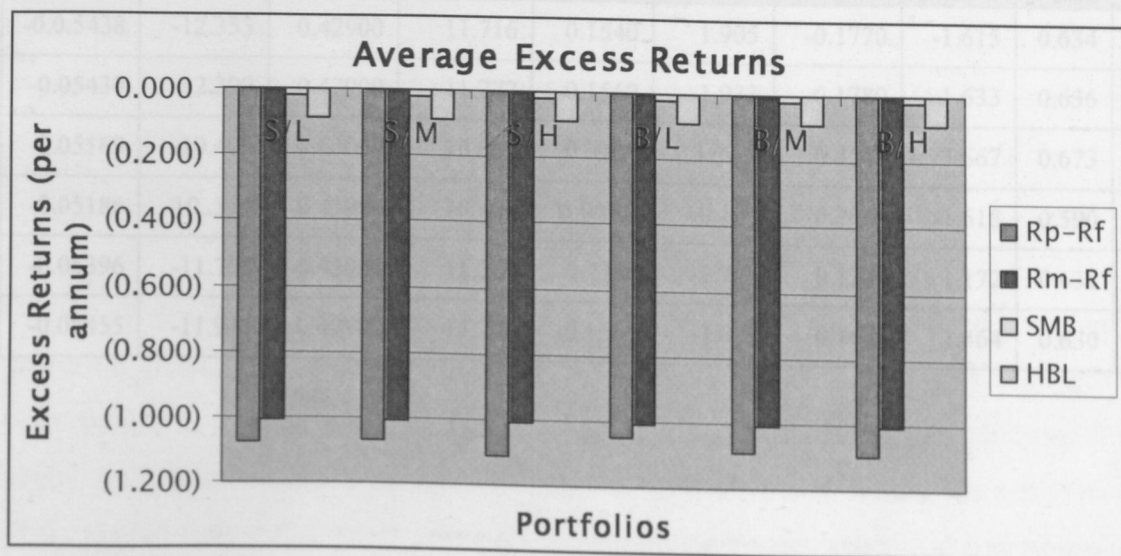
4.2 Explanatory power of Firm Size and Book-to-market Equity

In Table 2a below, is the average excess returns on the six sizes to book-to-market equity portfolios. It shows that the overall market factor generates an average excess return of -1.01 percent per annum, while the mimic portfolios for size and book-to-market equity generate an annual return of -0.0179 and -0.0880 percent respectively. Hence, the findings show that small stocks and high book-to-market equity stocks generate higher returns than bigger stocks and lower book-to-market equity stocks. Since small and high book-to-market equity stocks generate higher returns than big and low book-to-market equity stocks, it is suggested that such firms carry risk premium as demonstrated in Figure 5.

Table 2a
 Mean monthly returns for the period 1999-2005

Portfolio	RPTRFT		RMRFT		SMB		HBL	
	Average excess returns	Standard deviation	Average excess returns	Standard deviation	Average excess returns	Standard deviation	Average excess returns	Standard deviation
S/L	-0.08948	0.04581	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378
S/M	-0.08937	0.04571	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378
S/H	-0.09257	0.05475	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378
B/L	-0.08743	0.04928	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378
B/M	-0.09081	0.04804	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378
B/H	-0.09168	0.04730	-0.08427	-0.08502	-0.00149	0.04596	-0.00733	0.03378

Figure 5
 Average Excess Returns



On Table 2b below are the regression coefficients of the three factor model. The results show that the intercept, a coefficient, is statistically insignificant for all the six size and book-to-market equity portfolios. It can also be noted that the overall market factor, beta coefficient, ranges between 0.429 and 0.440 and is statistically significant for all six size and book-to-market equity portfolios at 5% level. The s coefficient is positive for all but B/L and B/H portfolios. In addition, the s coefficient is statistically significant for portfolios except the B/L portfolio.

The h coefficient is negative for S/L, S/M and B/L portfolios but positive for S/H, B/H and B/M portfolios. This suggests that high book-to-market equity stocks have positive loadings on the HML. The coefficient is statistically significant for all six portfolios at 5% level. The average R^2 for the six portfolios is 0.6335 which implies that the independent variable explains 63.35% of the variation in the cross section of average stock returns. It is to be noted that the average R^2 was 0.577 when beta was the sole explanatory variable. Hence, the findings for Kenya suggest that the multifactor model explains the variations in average stock returns better than the traditional CAPM.

Table 2b

$$R_{pt} - R_{ft} = a_{pt} + b_p(R_{mt} - R_{ft}) + s_pSBM + h_pHML + \varepsilon_{pt}$$

Portfolio	a		b		s		h		R^2	F	DW
		<i>t statistic</i>		<i>t statistic</i>		<i>t statistic</i>		<i>t statistic</i>			
S/L	-0.05438	-12.353	0.42900	11.716	0.1540	1.905	-0.1770	-1.615	0.634	46.103	0.883
S/M	-0.05430	-12.399	0.42900	11.772	0.1560	1.933	-0.1780	-1.633	0.636	46.550	0.883
S/H	-0.05169	-10.405	0.44000	10.639	0.3200	3.510	0.4540	3.667	0.673	54.936	1.077
B/L	-0.05186	-10.357	0.43900	10.456	0.0120	0.130	-0.2020	-1.618	0.590	38.409	1.045
B/M	-0.05396	-11.768	0.43000	11.263	-0.2280	-2.700	0.1340	1.172	0.638	47.091	1.097
B/H	-0.05455	-11.941	0.42900	11.280	-0.1540	-1.839	0.1670	1.464	0.630	45.379	0.932

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study suggests that small and high book-to-market equity firms generate higher returns than big and low book-to-market equity firms respectively. Since small and high book-to-market equity firms outperform big and low book-to-market equity firms, I suggest that such firms carry risk premium. Hence, mean variance efficient investors should be able to obtain higher returns by simply shifting their portfolios in favour of these characteristics.

The findings of the study have implications for corporate finance in the spirit of cost of capital, investors who seek mean variance efficient portfolios, the rational market hypothesis and the returns of portfolio managers. The findings document evidence of a firm size and book to market equity effect and suggest that the premium is a compensation for risk that is not captured by the CAPM. In terms of cost of capital, is concerned, small firms challenge the existence of the CAPM as the cost might be underestimated for these firms.

Bishop *et al* (2000) characterised small firms with high growth rates, suggesting dramatic changes in their thinking levels. They also stated that small firms have high variance and specific risk since there is little or no diversification. They argue that these factors present difficulties in estimating betas for small firms. They stated that if CAPM is retained, it should be recognised that the betas and hence the cost of capital might be underestimated for small firms. The alternative way is to move away from the traditional CAPM to a multiple risk factor model.

The findings also have implications for evaluating the returns of portfolio managers. The results suggest that benchmark measures based on the CAPM alone are inadequate to evaluate performance of portfolio managers who invest in a wide choice of assets besides investing in large firms. Therefore, a multiple

factor model like the one studied here is an appropriate model for evaluating portfolio performance rather than the one factor CAPM.

5.2 Limitations of the study

Some quoted companies at Nairobi stock exchange were not included in the sample due to unavailability of data and other companies had no debts in their balance sheets. This reduction in sample size would have affected the calculations of this study.

The size of the Nairobi Stock Exchange is relatively small in respect to the number of listed companies and the volume of transactions. As a result, the quality of the outcome of the study may have been affected.

5.3 Suggestions for further research

It is important that a similar study be conducted for a longer duration for instance ten years in order to determine if there would be any difference in results.

A study could be done to include other market segments in addition to the main investments segment. This would represent a broader market profile in the outcome of such a study

Appendix

Listed companies as at 31st December, 2005

Main Investment Market Segment

Agricultural

1. Unilever Tea Kenya Ltd Ordinary 10.00
2. Kakuzi Ordinary 5.00
3. Rea Vipingo Plantations Ltd Ordinary 5.00
4. Sasini Tea & Coffee Ltd Ordinary 5.00

Commercial and Services

5. Car & General (K) Ltd Ordinary 5.00
6. CMC Holdings Ltd Ordinary 5.00
7. Hutchings Biemer Ltd Ordinary 5.00
8. Kenya Airways Ltd Ordinary 5.00
9. Marshalls (E.A.) Ltd Ordinary 5.00
10. Nation Media Group Ordinary 5.00
11. TPS Ltd Ordinary 5.00 (Serena)
12. Uchumi Supermarket Ltd Ordinary 5.00

Finance and Investment

13. Barclays Bank Ltd Ordinary 10.00
14. C.F.C Bank Ltd Ordinary 5.00
15. Diamond Trust Bank Kenya Ltd Ordinary 4.00
16. Housing Finance Company Ltd Ordinary 5.00

- 17. I.C.D.C Investments Co Ltd Ordinary 5.00
- 18. Jubilee Insurance Co. Ltd Ordinary 5.00
- 19. Kenya Commercial Bank Ltd Ordinary 10.00
- 20. National Bank of Kenya Ltd Ordinary 5.00
- 21. NIC Bank Ltd Ord 5.00
- 22. Pan Africa Insurance Holdings Ltd Ordinary 5.00
- 23. Standard Chartered Bank Ltd Ordinary 5.00

Industrial and Allied

- 24. Athi River Mining Ordinary 5.00
- 25. B.O.C Kenya Ltd Ordinary 5.00
- 26. Bamburi Cement Ltd Ordinary 5.00
- 27. British American Tobacco Kenya Ltd Ordinary 10.00
- 28. Carbacid Investments Ltd Ordinary 5.00
- 29. Crown Berger Ltd Ordinary 5.00
- 30. Olympia Capital Holdings Ltd Ordinary 5.00
- 31. East Africa Cables Ltd Ordinary 5.00
- 32. East Africa Portland Cement Ltd Ordinary 5.00
- 33. East African Breweries Ltd Ordinary 2.00
- 34. Sameer Africa Ltd Ordinary 5.00
- 35. Kenya Oil Co Ltd Ordinary 0.50
- 36. Mumias Sugar Co. Ltd Ordinary 2.00
- 37. Kenya Power & Lighting Ltd Ordinary 20.00
- 38. Total Kenya Ltd Ordinary 5.00
- 39. Unga Group Ltd Ordinary 5.00

Alternative Investment Market Segment

40. A. Baumann & Co. Ltd Ordinary 5.00

41. City Trust Ltd Ordinary 5.00

42. Eaagads Ltd Ordinary 1.25

43. Express Ltd Ordinary 5.00

44. Williamson Tea Kenya Ltd Ordinary 5.00

45. Kapchorua Tea Co. Ltd Ordinary 5.00

46. Kenya Orchards Ltd Ordinary 5.00

47. Limuru Tea Co. Ltd Ordinary 20.00

48. Standard Group Ltd Ordinary 5.00

Fixed Income Securities Market Segment

Preference Shares

49. Kenya Power & Lighting Ltd 4% Preference 20.00

50. Kenya Power & Lighting Ltd 7% Preference 20.00

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