# "ACCOUNTING DETERMINED MEASURES OF SYSTEMATIC RISK AT NAIROBI STOCK EXCHANGE: AN EMPIRICAL STUDY"

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## DECLARATION

This project is my original work and has not been presented for a degree in any other University.

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This project has been submitted for the examination with my approval as University Supervisor.

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Date: 20 - 9 - 2000

## DEDICATION

**TO MY PARENTS WHO WORKED TIRELESSLY SO THAT I COULD GET EDUCATION.**

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## ABSTRACT

The study contained in this report investigated whether the accounting numbers can be employed to determine the "market risk" measure where the stock market risk measure is not easily obtainable. The data used was obtained from Nairobi Stock Exchange for period between 1991 to 1998.

The general objective was to use accounting numbers to determine the "market risk". To achieve the objective, the Secondary data was collected from Nairobi Stock Exchange and Registrar of Companies for the eight years.

The data was divided into two classes. The first class was based on Return on asset for each company for the Eight years. The Second data was based on Return on Equity for each company for the eight years.

The data was analysed using regression analysis. The F-ratio was used to test the significance of the overall model with confidence level of 95%. The data analysis related to the beta factor was analyzed by one of the summary statistics - f-value. We summarised all those companies where F-values were considered significant under the Asset Return. The same was done to those companies whose F-values were considered significant under the Equity Return.

A further summary was done for those companies whose significant values overlapped. The findings of this study were as follows:-

(1) That results from the study suggested that accounting beta had some information content which could be useful for a study in the market risk.

(2) Test based on Return on Asset showed that 46 companies had positive beta factor coefficient whereas on 38 companies with Return on Equity had positive beta factor coefficient.

(3) There was theoretical relationship between" market based" measure of systematic risk and accounting numbers.

(4) The companies whose Asset Return and Equity Return were considered significant were less than 24% of the sample.

The findings obtained led us to the following conclussion:-

(1) That there is no direct link between accounting numbers of individual companies and the market risk.

We therefore recommend further research on the following areas:-

1. A study on companies which are operating in the same Sector.

2. A Study on comapnies which have similar gearing.

3. The period under study should be longer than the period we took.

4. Use disaggregated data like breaking Assets and Profits on monthly basis then computing return on Asset and Equity based on monthly figures.

# CHAPTER 1

## 1.1.0 INTRODUCTION

### 1.1.1 BACKGROUND TO THE STUDY

Investors, Financial Analysts, Security analysts, shareholders are interested in return that investments are likely to give them. The returns are associated with the risks that these people are likely to bear. Generally, it is expected that a rational investor when faced with two portfolios whose returns are the same but with different risks, would invest in that portfolio with a lower risk. Similarly, where he has two portfolios with the same risk but different returns, he is expected to choose that portfolio with a higher return.

When experienced investors want to size up risk, they use at least one statistical measure that most individuals overlook. This statistical measure is called beta. In developed economies where stock markets are active, these experienced investors will determine beta through stock market performance. In these economies, the stock markets are large and active. Thus the experts would determine the beta of security through the market movement against the individual securities in the stock market.

### 1.1.2 CONCEPT OF BETA

The return on a security will depend on the return on the market as a whole. There are factors that affect the market. These factors include, inflation rate in the economy, the interest rates, legal/political factors etc. These factors may have more effect on the return on a security much more than the market as a whole. This will lead to fluctuation in return on individual portfolios. Thus commonly associated with measuring volatility of individual stocks, beta tracks how closely a portfolio follows up and down of the stock market.

### 1.1.3 MEANING OF BETA

Beta is a measure of risk. One might ask what is risk? And why is beta a measure of risk. How is it related to the mean rate of return on the securities under consideration?

Investors would like to maximize the market value of their existing stocks of equity. A direct implication of this assumption is that the firm should choose its investment programme and financing policy so as to maximize the price value of its common stock. This in turn requires some sort of model of the forces which influence and determine stock prices.

Today's securities market in the developed countries is a complex mechanism incorporating thousands of decision variables, and therefore any attempt to gain an insight into the workings of such a market requires a high degree of abstraction from reality. Thus the fascinating world of brokers, speculators and market tips will be ruthlessly shunted aside in order to focus our attention on all important relationship between risk and return. The assumption here is that there is a perfect capital market.

Sharpe (1964) and Lintner (1965) developed a model which incorporated risk and return in a security. Their model CAPM related the return from a portfolio with risk which that return is associated with. The risk that was associated with return is what we call beta. Risk in each security (portfolio) can be segregated into two parts namely:- unsystematic risk and systematic risk. Unsystematic risk is that risk that can be eliminated through diversification. Systematic risk is risk that is associated with the market and this risk cannot be eliminated through diversification.

Systematic risk arises from general market fluctuations or more specifically from that component of a security. It is this non-diversifiable portion which gives rise to the risk premium that is attached to a security. The unsystematic risk requires no such premium since it can be eliminated through diversification.

The higher a security's beta, the higher is its non-diversifiable risk and therefore the higher is expected return on this security.

### 1.1.4 MEASURE OF BETA

In practice, we calculate the beta of a security by applying CAPM. In order to apply the capital Asset Pricing model, a method must be found for estimating each firm's future beta. That is the component of its risk which cannot be eliminated through diversification. Although beta might be estimated solely on the basis of subjective probability, it is common practice to use past data to estimate future betas. However, where one expects the historical relationship between the rates of return on a given security and the rates of return on the market portfolio to be materially different in the future, the observed ex-post relationship should be modified to reflect such changes.

Thus, where securities are traded regularly in a stock market, we have the following variables:

a) The price of a particular security at the end of period 0
b) The price of that security at the end of period 1
c) The dividend received between period 0 and period 1
d) The total market price at the end of period 0 and period 1
e) The minimum return associated with the market. (This is referred to as riskless return. Usually considered a return from treasury bond).

The above variables can be broken down to relate to the individual security and to the market. Thus return for individual security can be expressed as follows:

$$\frac{P_1 - P_0}{P_0} + \frac{D_1}{P_0}$$

The difference between $P_1 - P_0$ is the capital gain (loss) that arises during the price movement over a period. This gain (G) is expressed as a percentage of the price at the beginning of the period.

$$\frac{G}{P_0} \times 100$$

The dividend yield is

$$\frac{D}{P_0} \times 100$$

Where D = Dividend per share

Total return on a security can then be expressed as follows

$$R_s = \frac{(P_1 - P_0) + D_1}{P_0} \times 100$$

Likewise market return can also be expressed as

$$\text{Market Return} = \frac{P_{1m} - P_{0m} + D_m}{P_{0m}}$$

Where $P_{1m}$ = Market capitalization at end of period 1

$P_{0m}$ = Market capitalization at end of period 0

$D_m$ = Total dividend for the market

Security return will be influenced by the minimum return expected in the market (the risk free rate), the market return and the systematic risk.

This market model relates return of a security to these variable commonly expressed as:

$$R_{it} = a_t + (R_{mt} - a_1)b$$

$R_{it}$ = Return on security i at period t

$a_t$ = Risk free rate at period t

$R_{mt}$ = Market return at period t

b = Beta factor (market risk)

In the model above, we have seen how we can obtain $a_t$=risk free rate (return on treasury bonds), market return as the difference between total security prices at period 1 less total security prices in period 0. The only variable that we have not determined is the market risk.

We can determine the market risk by running a regression model. The assumption in the regression on return on security will be dependent variable whereas the return on the market is independent variable that is, a return on a security will be influenced by market return except in the specialized investments. Levy, H and Sarnat, M (1978). Statistical beta of security t can be determined as follows:

$$b_{it} = \frac{\text{cov}\ (R_i, R_m)}{\underline{ó}^2\ (R_m)}$$

where $b_{it}$ is = Market risk

cov $(R_i, R_m)$ = Regression of security return and market return

$\underline{ó}^2\ (R_m)$ = Variation of market return

To estimate beta we take observations on rate of return in security t and rate of return on the market. The longer the observation periods, the better the results are more likely to be, Blume (1975).

The assumption is that we can use beta for security t to determine the expected return. If the beta is more than 1 then we will consider it a risky security and therefore we will require a higher return to compensate for the risk. This concept works well where the stock market is active and large. In such a case many securities are traded regularly. This will help in reflection of market and security pricing to be accurate and fair. However, such a situation is not common in developing countries. Where there are stock markets, they are generally small and inactive. Thus we find that the listed companies' securities are not traded regularly. Quite often securities of some listed companies are not traded for a long time, thus if we are estimating on a monthly forecasting model but only available time frame for a given variable is six months or 12 months this would lead to a lot of estimation being done in determining return on a security. The resulting scenario would necessitate the need to modify the model or eliminate it altogether because it would be unreliable and of lesser use to investors.

The limitations found in the stock market model in under developed countries support the need to look into other alternatives through which we can determine market risk of securities. In other words where there is a market failure we have

to look at alternative approaches to risk estimation. One of the ways of determining beta other than through the use of stock market model is by the use of accounting numbers.

In Kenya many limited liability companies prepare annual accounts. These annual accounts are subjected to Audits as a requirement for income tax purposes. Users therefore have no reason of not relying on such information. The financial statements contain information such as profit before tax, tax, profit after tax, earnings per share and return on assets, etc.

This paper intends to determine market risk indicator using the return on asset for Kenyan Companies. The return on asset for each company will be determined by dividing profit after tax by the total assets that the company owns at end of its financial year. The total return on asset for all companies that are listed in the stock exchange will be added to give the total market return. This will lead us to the model below:-

$$R_A = a + bR_m$$

Where:

$R_A$ = Return on Asset

$a$ = Alpha (constant)

$b$ = beta

$R_m$ = Return on the Market

The beta obtained from the above model for each company could be compared with the beta obtained by use of stock market model. The study will try to determine whether there are any similarities which may lead us to the use of Accounting numbers in determining betas of companies. Much as we understand the link of market beta through investors perception at the market place, the link on accounting numbers would be that these firms compete for resources.

## 1.2.0 STATEMENT OF PROBLEM

Given the problems that are associated with less developed and small stock markets in developing world, the use of stock markets in estimating market risk is difficult.

(a) In Kenya many companies are not traded in the stock market (NSE). This places a big problem on investors, lenders, financial analysts, financial advisors where decision making must be made. For example where investment is to be made, what basis should such an investor use to decide on whether to invest in a security or would he/she consider himself/herself a mere speculator?

(b) Where a company wants to enter the stock market, investors, financial analysts and financial advisors must determine the price at which to place the new securities. They would not sit and watch helplessly. These experts must estimate the intrinsic value of such securities and make recommendations.

(c) The valuation of privately held companies may also present a problem. There are many contracts in which estimates need to be placed on the value of companies that are not traded in an organized market for example:-

(i) When determining the value of an estate of a deceased shareholder

(ii) When determining the price at which a company could go public

(iii) When determining the value of a dissenting minority shareholder's interest in squeeze out merger context.

(iv) When estimating the value of stock options in the executive compensation plan of privately held company.

(d) In Academic Research, several areas of research in accounting, business strategy, economics and financial literature may want to know the market value of equity securities. An understanding of the determinants of these market values facilitate the construction of better research designs in these literatures and the more careful drawing of references from research results.

The above problems can be solved by the use of accounting numbers since in all the situations cited above, there are accounting data that are available. Once we determine the beta factor, we can proceed to determine the facts that are required.

## 1.3.0 OBJECTIVE OF THE STUDY

This study is going to focus on companies that are listed in Nairobi stock exchange, with two aims namely:-

(i) To determine the relationship between return on equity of individual company and the market return for companies quoted in the stock market

(ii) To determine the relationship between Asset return for individual company and the total market return on Assets for companies that are quoted in the stock market.

If the above have any relationships we can further work out the beta factors for return on equity and return on Asset. Then we shall compare whether these beta factors obtained through the use of Equity and Assets are similar for those companies that are selected.

## 1.4.0 IMPORTANCE OF THE STUDY

The study is considered significant for the following reasons:

(i) We can use the beta factors determined through accounting numbers in decision setting where stock markets are inactive or relatively small.

(ii) For companies that are listed in stock markets but are not regularly traded, we can use the beta factors obtained by use of Accounting numbers to evaluate the risks that are associated with their securities.

(iii) The use of Accounting numbers can also be used where a new company would like to go public. These companies have generally prepared their annual financial statements therefore have the Accounting numbers that can be used in determining the beta factors.

(iv) There are certain companies that have trading division that are not related. For example, the Unilever in Kenya. It has a division that specializes in food production and another division that specializes in earth moving and industrial machinery. In this case it operates in two different risk spectrum. The use of accounting numbers would be more appropriate in assessing the risks since the two divisions will be evaluated separately.

(v) The use of Accounting risk measures could be used by those companies that are not listed in stock exchange.

(vi) Academicians can use this to carry out a research in several areas such as in Finance, Accounting and Business in general

(vii) Finally, this study can be used as a second method in screening risk for those companies that are regularly traded in the stock market.

# CHAPTER 2:

# 2.0 LITERATURE REVIEW

## 2.1 INTRODUCTION

The stock Exchange is the most significant institution of the Capital markets. A stock Exchange is a market where small and large investors can buy and sell shares and other securities. Investors are attached to share investments from two primary reasons: to increase the return of funds invested and to spread the risk in their portfolio. Investment in shares has the major benefit of a loose link to inflation in the long run, as economy grows and inflation rises, so a company's turnover, profits and assets all tend to rise.

**Market Index**

The index measures the overall share price movement of the market, for in a certain day some share prices will go up and some down and the rest will probably not change. An increase in the index implies an improvement in market activities in terms of price, trade volume or both and vice verse. If the index falls many share prices are declining and many investors incur losses as has been the case in Kenya since 1997.

The Nairobi Stock Exchange index is based on shares of 20 companies, chosen to be representatives of the whole stock market and is calculated on a daily basis. Stock exchange index is used in several ways among them:-

(i) As a base measure of how well investor's portfolio has been performing. Since security prices tend to move together, investors think that their portfolio should perform as well as the market index.

(ii) As a future determinant of price movement by technical analysts who believe stock prices move in identifiable patterns.

(iii) To determine if there is a relationship between historical price movement and economic variables such as interest rates, money supply and Gross National Product. It can be used for forecasting future economic trends.

(iv) As a determinant of systematic risk for individual securities and portfolios.

A number of authors among then Van Horne (1970) advocated first the use of industry average index as opposed to the general stock exchange index in that it approximate more closely underlying stock price movement of the type associated with stock being listed. Lack of industry index in NSE has necessitated the use of the whole stock exchange index although such has also been used in other studies such as Kelohargiu (1993).

The stock exchange market model utilizes the market index to estimate the rate of return on a given security. This is associated with the systematic risk (beta) that such a security will have.

The return on various securities are related only through common relationship with some basic underlying factors which is the rate of return on a broad market index. To isolate the effects of an event on the price of a share, it is necessary to control other factors that will affect the market wide information on individual share return.

The market index model proposed by Sharpe (1964) and tested by Blume (1975) provides a particularly simple and effective way to do so. The model assumes linearity, that is, individual security return Ri, is linearly related to the return on a market portfolio, ($R_m$) and that the usual assumptions of the regression model are satisfied.

The systematic part of a security's return is presumed to be captured by its normal relationship to the return on the market portfolio or representative sample of the whole security market. Any return not accounted for by a security's normal relationship to the market will be impounded in the error term which thus presumably captures the effects of the company specific influences.

The market model can be said to have been started by Sharpe (1965). Horie (1990) states in his article that "there is no theory behind the market model. It is purely a statistical description of the association between return on stock and the markets as a whole."

Fisher (1972) argues that the general problem of making adjustment for market movement in security price on individual common stock return has received considerable attention.

Estimation of these coefficients in the Capital Asset Pricing Model (CAPM) requires use of several price observations before the event of interest. This would enable one to focus the expected return at the time of event which is then related to the actual return. We can make adjustment for market effect on new issues return by using market index (Fisher (1972) and Puxty (1991).

## 2.2 REASON FOR NOT USING NSE TO DETERMINE BETA FACTOR

We have seen that the stock market in Kenya (NSE) is small and inactive for the following reasons:

(i) Most companies that operate in Kenya are owned by families who value their control secrecy more and a such are unwilling to release more shares to the public because this would dilute their control.

(ii) Quotations are supposed to be essentially a means of raising finance from the public. But many companies in Kenya are quoted to give a chance for Kenyans to acquire ownership. This has been seen in many cases where investors do not consider risk elements because a few shares are released in the market.

(iii) Some companies are subsidiaries of Multinationals which are already quoted in their homeland. Therefore the investing public may be forced to buy at high prices without considering the risk involved.

As a result of the above reasons, NSE may not be reliable enough for an Investor to gauge the market risk for a security.

## 2.3 RESEARCH DONE ON ACCOUNTING BETA

Hamada (1969) carried out research on the relationship between portfolio analysis and corporate finance. He showed that systematic risk of a firm's common stock should be positively correlated with the firm's leverage.

Lev, B (1975) used the same approach adopted by Hamada that the firm's operating leverage (the ratio of fixed to variable operating costs) is a variable affecting systematic risk.

Pettit and Westerfield (1972) assumed a discounted cashflow valuation model and separated individual security return into cashflow and capitalization rate components. They proceeded to analytically develop a two factor model of beta, the equity beta and debt beta to get the Asset beta.

Ball and Brown (1969) carried out a research into association between market based beta and accounting beta. The accounting beta was expressed as the covariability of the firm's accounting earnings with accounting earnings of the market portfolio. This was expressed in the following equation:-

$$biA = \frac{Cov\ (xi\ ,\ Xm)}{\underline{ó}^2(Xm)}$$

They concluded that the market based measure of systematic risk was directly related to the accounting beta. Beaver; W.; Kettler and Scholes (1970) found in a model using accounting variables to forecast market risk that using earnings variables was more appropriate in estimating the market risk than using accounting variables. Their conclusions could be challenged in two ways:-

(i) The assumptions of theory may not be applicable to the universe being tested.

(ii) The theoretical variables may be measured with error.

Brown; G.R. (1979) tried in his paper to establish whether there was theoretical relationship between systematic risk and financial (accounting) variable. He looked at:- earnings variability, Dividend payout, Capital structure and growth. He concluded that:-

(i) Systematic risk was not a function of earnings variability, growth, size of a firm or dividend payout.

(ii) There was a theoretical relationship between systematic risk and the firms leverage and accounting beta.

The study of individual firm's risk as related to their underlying characteristics began with work of Beaver, Kettler and Scholes (Oct. 1970) which examined the relationship of certain accounting ratios (dividend payout, liquidity, earnings variability, leverage, Asset size and covariability of earnings) to firm's systematic risk and found a strong and significant association between them.

Using a similar set of explanatory variables on cross-section monthly regressions, Breen and Lerner (1973) presented additional evidence in support of this relationship. They found that although the variables' signs, on the whole, conformed to traditional literature, many of the reported coefficients were not significantly different from Zero; those which were significant displayed such wide variations from sample to sample that they could not have been drawn from the same underlying population. In particular, the sign, magnitude and statistical significance of the leverage variables were most unstable, a result which the authors viewed as a reflection of leverage - risk theoretical controversy.

Along the similar lines, Rosenberg and McKibben (1973) have analysed the joint influence of the firm's accounting data and its historical stock returns on the systematic and specific risk of its common stock. They had used an intuitively suggested set of 32 explanatory variables, with mixed results: of the 13 variables for which empirical results were given, four had the expected sign, three had the opposite sign, and four had a strong effect when no strong effect was expected.

Melicher (1974) and Melicher and Rush (1974) reported results similar to those obtained in previous studies using data on 71 electric utility firms and selecting explanatory variables on the basis of factor analysis rather than intuition.

## 2.4 SUMMARY OF LITERATURE REVIEW AND ITS LINK WITH THIS RESEARCH.

From the researches done this study would like to find out if accounting numbers can be useful in estimating "market risk".

We have seen from the research done by Ball and Brown (1969) where they came up with a conclusion that market based measure of systematic risk was directly related to accounting beta. We would like to test this relationship.

Likewise Brown; G.R (1979) while trying to establish whether there was theoritical relationship between systematic risk and financial variables, concluded that there was a theoritical relationship.

This research would like to see whether that relationship can be exploited and possibly used in estimating market risk by use of accounting numbers. This research paper is going to use 51 companies to try to test whether we can use acounting numbes in place of stock market.

We shall use the accounting numbers namely return on assets and return on equity. Any of these that prove to be useful can then be used as a systematic risk determinannt.

## CHAPTER 3:

# 3.0 RESEARCH DESIGN

## 3.1 INTRODUCTION

This chapter deals with research designs used in conducting the study. It covers the population of the study, the sample selected for the study and data collection process.

The aim of this section is to give an overview of the companies that comprise the sample and whose data were analyzed.

The population of the study was based on all limited liability companies that were in Kenya and operating between January 1991 to December 1998. This was taken on the understanding that all limited liability companies prepare annual accounts regularly. These annual accounts are audited by external auditors which add to their credibility.

## 3.2 POPULATION

The population consisted of a large number of companies. All companies that qualified for the study were at one time limited liability during the period covered in this study.

## 3.3 SAMPLE FRAME

The sample consisted of 51 companies that were quoted in NSE between January 1991 to December 1998. The sample was chosen based on availability of data at the NSE
(see appendix 1).

## 3.4 DATA COLLECTION

The data used in this study was secondary data obtained from NSE secretariat and Registrar of Companies. Specifically the following data was collected:-

1. Return on Asset for each year of trade per each company.
2. Return on Equity for each year of trade per each company.
3. The average Return on Asset for each company for the selected years of trade.
4. The average Return on Equity for each company for the selected years of trade.
5. The average Asset Return (market return) for each year for all the selected companies.
6. The average Equity Return (market return) for each year for all the selected companies.

# CHAPTER 4:

## 4.0 DATA ANALYSIS AND FINDINGS

### 4.1 INTRODUCTION

The secondary data was gathered at the Nairobi Stock Exchange secretariat. The data consisted of all the Annual Audited Accounts of all the listed companies during the period under study that were to be used for in Asset and Equity Returns.

A table was made for all companies that formed the sample. For each year, return on Asset was calculated for each company based on profit after tax divided by the total Assets for that particular company. The Asset Return per each company was totalled to get the market return. An average was then obtained after dividing the market return by the number of companies listed in N.S.E in that particular period.

As for equity return, we obtained a return from N.S.E for each company that was listed in stock exchange for each year under study. We also obtained the annual market return. This was done for all the eight years (see appendix 2,3)

Having obtained the Asset return and Equity return for all the companies in the eight years of our study, We used of descriptive statistics to determine the precision of estimated parameters on our original model: $R = a+bR_m$.
Some of the descriptive statistics that we used taking an example of one company - Bbond is on appendix (4).

## 4.2 DATA ANALYSIS

Regression analysis tells us how one variable is related to another by providing an equation that allows us to use the known value of one or more variables to estimate the unknown value of the remaining variable (Lagan 1990). Also related to this is correlation analysis which tells us the degree to which the two variables are related (the strength of the relationship). Levin (1987) summarizes it well, regression and correlation analysis will show us how to determine both the nature and strength of a relationship between two variables.

In regression analysis, we developed a regression equation, that was mathematical. This enabled us to try to determine the beta of return on Assets and did the same for return on equity. Then we tried to relate them to see if there was any similarities for individual companies.

To test the fitness of the overall model as the line of best fit, the following statistics were used.

**(1) Coefficient of Determination (r2)**

The coefficient of determination, expresses the amount of variation in the dependent variable that is explained by regression equation.

It measures the proportion of variation in the dependent variable that can be explained by variation in the independent variable. In other words, it is the total variation of dependent variable attributed to the estimated regression equation. Normally the value lies between Zero and One. In the study we have expressed this as percentage. A percentage less than 50% was considered low therefore insignificant. What this meant was that less than 50% of the variation in the market rate could be explained by return on Asset or return on Equity.

(ii) **Correlation Coefficient (r)**

Correlation coefficient is used to measure the strength of the relationship between the two or more variables. It shows how closely the two variables can move together. It indicates how well the regression line explained the variation in the values of the dependent variables. Correlation coefficient expresses the strength of the relationship as a quantity between negative one and positive one. The sign signifies the position of relationship, that is, direct or inversely related and must agree with the shape of regression line. Where the data exhibits a curvelinear relationship and the coefficient is given as zero it could be incorrect to conclude that there is no relationship. Therefore, correlation coefficient must be restricted to instances where the underlying relationship between the independent and dependent variable is believed to be linear. Otherwise a different procedure is required to calculate the strength of association for data that have a curvilinear relationship. The results can be expressed as a percentage. Thus a less than 50% result indicates that there is a weak and positive relationship between the returns to the market return.

To carry out this test, We used a five steps procedure:-

Testing the Null hypothesis

**Step 1**. Formulated the Null hypothesis

The null hypothesis (Ho) (for Asset beta)

Ho $b_A = 0$

The alternative Hypothesis H1

H1 $b_A \neq 0$

The null hypothesis (Ho) (for Equity beta)

Ho $b_E = 0$

The alternative Hypothesis H1

$$H1\ b_E \neq 0$$

The assumption is that if beta = 0 then the value of market return will be = 0.

To determine whether the return on Asset had a significant association with stated market return.

The null hypothesis assumption was that none of the predictor variables had any significant association with the market return. And the alternative hypothesis assumption was that at least one of the predictor variables had a significant association with the dependent variable. The same was applied to the return on Equity.

**Step 2**

Selected the test statistic and the procedure. A value of F served as the test statistic.

**Step 3**

Obtained the significance level and identified the acceptance and rejection regions. We used 5% level of significance giving critical value of 5.99

**Step 4**

The value of test statistic was computed for each company.

**Step 5**

The decision was made, based on the critical values as given by 5% level of significance. As noted above, critical values provided the acceptance and rejection levels.

## 3 PRESENTATION ON FINDINGS

### TABLE 1

### RESULTS ON REGRESSION ANALYSIS ON ASSET RETURNS

| CO-CODE | ALPHA | BETA | RSQ | S | T | P | F | LEVEL OF SIGNIFICANCE | | SIGNIFI CANT OR NOT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | T | Fcr | |
| 1 Bbond | 1.264 | 1.331 | 14.29% | 13.07 | 0.95 | 0.379 | 0.90 | 2.447 | 5.99 | NS |
| 2 Eaag | -3.7 | 2.03 | 28.4% | 15.06 | 1.26 | 0.277 | 1.58 | 4.541 | 18.51 | NS |
| 3 GWK | -8.8 | 1.48 | 33.3% | 8.4 | 1.73 | 0.134 | 2.99 | 2.447 | 5.99 | NS |
| 4 kakuzi | -5.706 | 1.23 | 72.5% | 3.06 | 3.97 | 0.007 | 15.79 | 2.447 | 5.99 | S |
| 5 Kapch | -4.4 | 1.1114 | 17.8% | 9.631 | 1.14 | 0.297 | 1.30 | 2.447 | 5.99 | NS |
| 6 Ltea | -14.3 | 5.26 | 45.7% | 23.16 | 2.25 | 0.066 | 5.04 | 2.447 | 5.99 | NS |
| 7 Pejeta | 0.30 | 0.195 | 39.7% | 0.9695 | 1.99 | 0.094 | 3.95 | 2.447 | 5.99 | NS |
| 8 Sasini | -46.34 | 5.00 | 74.5% | 11.83 | 4.18 | 0.006 | 17.50 | 2.447 | 5.99 | S |
| 9 Bauma | -8.02 | 0.966 | 38.3% | 4.947 | 1.93 | 0.102 | 3.73 | 2.447 | 5.99 | NS |
| 10 C & G | 4.07 | 0.102 | 0.7% | 5.104 | 0.20 | 0.849 | 0.04 | 2.447 | 5.99 | NS |
| 11 CMC | 15.1 | -0.496 | 18% | 4.283 | -1.15 | 0.295 | 1.31 | 2.447 | 5.99 | NS |
| 12 Express | -9.35 | 1.52 | 87.8% | 2.29 | 6.58 | 0.001 | 43.36 | 2.447 | 5.99 | S |
| 13 Hutch | -6.97 | 0.501 | 12.1% | 5.453 | 0.91 | 0.398 | 0.83 | 2.447 | 5.99 | NS |
| 14 KQ | -22.2 | 2.88 | 93.1% | 1.613 | 5.19 | 0.035 | 26.92 | 6.965 | 161.0 | NS |
| 15 Lonrho | 8.2 | 0.41 | 2.2% | 10.91 | 0.37 | 0.725 | 0.14 | 2.447 | 5.99 | NS |
| 16 Marsh | -1.73 | 0.722 | 22.1% | 5.471 | 1.310 | 0.239 | 1.71 | 2.447 | 5.99 | NS |
| 17 NMG | 25.5 | 0.247 | 3.5% | 5.234 | -0.47 | 0.657 | 0.22 | 2.447 | 5.99 | NS |
| 18 Pearl | -17.8 | 1.38 | 25.2% | 9.611 | 1.42 | 0.204 | 2.03 | 2.447 | 5.99 | NS |
| 19 Snews | 16.2 | -0.80 | 9.4% | 10.05 | 0.79 | 0.460 | 0.62 | 2.447 | 5.99 | NS |
| 20 TPS | -14.7 | 2.77 | 27.9% | 9.376 | 0.62 | 0.65 | 0.39 | 6.965 | 161.0 | NS |
| 21 Uchumi | 4.88 | 1.67 | 70.3% | 5.089 | 3.07 | 0.037 | 9.45 | 4.541 | 18.5 | NS |
| 22 BBK | 4.69 | 0.133 | 12.9% | 1.401 | 0.94 | 0.382 | 0.89 | 2.447 | 5.99 | NS |
| 23 CFC | 5.87 | 0.018 | 0.1% | 2.034 | 0.09 | 0.934 | 0.01 | 2.447 | 5.99 | NS |
| 24 C Trust | 20.6 | 0.11 | 0.1% | 16.28 | 0.07 | 0.948 | 0.00 | 2.447 | 5.99 | NS |

| CO-CODE | ALPHA | BETA | RSQ | S | T | P | F | LEVEL OF SIGNIFICANCE | | SIGNIFI CANT OR NOT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | T | Fcr | |
| 25 DTB | -2.81 | 0.440 | 18.5% | 3.734 | 1.17 | 0.288 | 1.36 | 2.447 | 5.99 | NS |
| 26 HFCK | 2.53 | 0.139 | 14.1% | 1.385 | 0.99 | 0.359 | 0.99 | 2.447 | 5.99 | NS |
| 27 ICDC | 23.3 | -0.394 | 8.1% | 5.347 | -0.73 | 0.494 | 0.53 | 2.447 | 5.99 | NS |
| 28 KCB | 1.30 | 0.273 | 26.7% | 1.824 | 1.48 | 0.190 | 2.19 | 2.447 | 5.99 | NS |
| 29 NBK | 0.62 | 0.101 | 3.2% | 2.259 | 0.44 | 0.674 | 0.20 | 2.447 | 5.99 | NS |
| 30 Rea | -4.6 | 1.55 | 52.8% | 3.019 | 1.49 | 0.274 | 2.23 | 6.965 | 161.0 | NS |
| 31 NIC | 2.37 | 0.382 | 38.1% | 1.963 | 1.92 | 0.103 | 3.70 | 2.447 | 5.99 | NS |
| 32 SCB | 8.13 | -0.219 | 42.2% | 1.035 | -2.09 | 0.081 | 4.38 | 2.447 | 5.99 | NS |
| 33 Jubilee | 4.59 | 0.0126 | 0.5% | 0.7359 | 0.17 | 0.871 | 0.03 | 2.447 | 5.99 | NS |
| 34 Pan | 3.55 | 0.026 | 0.6% | 1.346 | 0.19 | 0.853 | 0.04 | 2.447 | 5.99 | NS |
| 35 Athi | -18.2 | 2.42 | 72.7% | 2.968 | 1.72 | 0.335 | 2.95 | 6.965 | 161.0 | NS |
| 36 Banb | 6.12 | 0.476 | 25.9% | 3.245 | 1.45 | 0.197 | 2.10 | 2.447 | 5.99 | NS |
| 37 BAT | 11.4 | 0.891 | 23.6% | 6.474 | 1.36 | 0.222 | 1.85 | 2.447 | 5.99 | NS |
| 38 Berger | 4.60 | 0.882 | 33.8% | 4.989 | 1.75 | 0.131 | 3.06 | 2.447 | 5.99 | NS |
| 39 BOC | 20.9 | -0.411 | 25.9% | 2.806 | -1.45 | 0.198 | 2.10 | 2.447 | 5.99 | NS |
| 40 Cables | 11.3 | 1.68 | 82.9% | 3.083 | 5.39 | 0.002 | 29.09 | 2.447 | 5.99 | S |
| 41 Dun | -12.1 | 3.12 | 55.8% | 11.21 | 2.75 | 0.033 | 7.56 | 2.447 | 5.99 | NS |
| 42 EABL | 6.59 | 0.358 | 15.7% | 3.344 | 1.06 | 0.331 | 1.12 | 2.447 | 5.99 | NS |
| 43 EAP&C | -2.3 | 1.31 | 24.2% | 9.356 | 1.38 | 0.216 | 1.91 | 2.447 | 5.99 | NS |
| 44 Fire | -48.0 | 7.68 | 89.1% | 12.59 | 5.71 | 0.005 | 32.58 | 2.447 | 10.13 | S |
| 45 Kenol | 15.5 | 0.32 | 1.4% | 10.92 | 0.29 | 0.784 | 0.08 | 2.447 | 5.99 | NS |
| 46 Knmill | -14.4 | 1.42 | 33.6% | 8.059 | 1.74 | 0.132 | 3.04 | 2.447 | 5.99 | NS |
| 47 KPLC | 18.7 | -0.812 | 41.4% | 3.898 | -2.06 | 0.085 | 4.25 | 2.447 | 5.99 | NS |
| 48 Port | -18.4 | 1.69 | 32.7% | 9.776 | 1.71 | 0.139 | 2.91 | 2.447 | 5.99 | NS |
| 49 Total | -7.36 | 2.18 | 75.8% | 4.947 | 4.33 | 0.005 | 18.79 | 2.447 | 5.99 | S |
| 50 Unga | -3.7 | 0.675 | 11.3% | 7.654 | 0.87 | 0.416 | 0.76 | 2.447 | 5.99 | NS |
| 51 Carb | 24.4 | -0.418 | 7.2% | 6.055 | -0.68 | 0.521 | 0.47 | 2.447 | 5.99 | NS |

The above results were obtained after working out return on asset (profit after tax divided by the total value of assets) for each company for each year over the years that the company was in operation with a maximum period of 8 years. The total asset return for each company for the period covered was averaged to get $R_A$ for each company. The market asset return was obtained by totalling the individual company asset returns then dividing this by total number of companies. We used regression statistics to obtain the above data shown on Table 1.

## TABLE 2

## RESULTS ON REGRESSION ANALYSIS ON EQUITY RETURN

| CO-CODE | ALPHA | BETA | RSQ | S | T | P | F | LEVEL OF SIGNIFICANCE | | SIGNIFICANT OR NOT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tcr | Fcr | |
| 1 Bbond | -0.7 | 0.685 | 8.3% | 14.83 | 0.74 | 0.488 | 0.55 | 2.447 | 5.99 | NS |
| 2 Eaag | 8.9 | 0.488 | 10.6% | 11.02 | 0.69 | 0.528 | 0.47 | 2.447 | 5.99 | NS |
| 3 GWK | 2.6 | 0.305 | 5.0% | 8.661 | 0.56 | 0.594 | 0.32 | 2.447 | 5.99 | NS |
| 4 kakuzi | 3.20 | 3.20 | 33.5% | 2.669 | 1.74 | 0.133 | 3.02 | 2.447 | 5.99 | NS |
| 5 Kapch | 4.59 | 0.204 | 2.6% | 8.173 | 0.404 | 0.703 | 0.16 | 2.447 | 5.99 | NS |
| 6 Ltea | -80.5 | 8.85 | 52.0% | 5.52 | 2.55 | 0.044 | 6.50 | 2.447 | 5.99 | S |
| 7 Pejeta | -451 | -0.166 | 9.7% | 3.312 | -0.80 | 0.452 | 0.65 | 2.447 | 5.99 | NS |
| 8 Sasini | -23.9 | 2.18 | 70.8% | 9.118 | 3.82 | 0.009 | 14.57 | 2.447 | 5.99 | S |
| 9 Bauma | -14.0 | 1.18 | 79.3% | 3.933 | 4.80 | 0.003 | 23.01 | 2.447 | 5.99 | S |
| 10 C & G | -34.8 | 1.54 | 39.7% | 12.41 | 1.99 | 0.094 | 3.94 | 2.447 | 5.99 | NS |
| 11 CMC | 15.9 | -0.267 | 9.2% | 5.468 | -0.78 | 0.465 | 0.61 | 2.447 | 5.99 | NS |

| CO-CODE | ALPHA | BETA | RSQ | S | T | P | F | LEVEL OF SIGNIFICANCE | | SIGNIFICANT OR NOT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tcr | Fcr | |
| 12 Express | -17.1 | 1.92 | 91.4% | 3.847 | 7.98 | 0.00 | 63.66 | 2.447 | 5.99 | S |
| 13 Hutch | -15.7 | 2.27 | 19.2% | 30.44 | 1.19 | 0.278 | 1.43 | 2.447 | 5.99 | NS |
| 14 KQ | -18.1 | 2.82 | 64.3% | 12.00 | 2.32 | 0.103 | 5.39 | 6.965 | 161.0 | NS |
| 15 Lonrho | -28.5 | 2.51 | 14.7% | 39.52 | 1.02 | 0.348 | 1.04 | 2.447 | 5.99 | NS |
| 16 Marsh | -42.1 | 2.83 | 83.9% | 8.107 | 5.59 | 0.001 | 31.24 | 2.447 | 5.99 | S |
| 17 NMG | 23.8 | -0.372 | 14.6% | 5.862 | -1.01 | 0.349 | 1.03 | 2.447 | 5.99 | NS |
| 18 Pearl | -34.2 | 1.77 | 50.6% | 11.40 | 2.48 | 0.048 | 6.14 | 2.447 | 5.99 | S |
| 19 Snews | -27.8 | 2.25 | 13.4% | 37.41 | 0.96 | 0.373 | 0.93 | 2.447 | 5.99 | NS |
| 20 TPS | 14.3 | 0.336 | 29.6% | 1.979 | -0.65 | 0.634 | 0.42 | 2.447 | 161.0 | NS |
| 21 Uchumi | 38.4 | 0.118 | 2.8% | 5.347 | 0.34 | 0.750 | 0.12 | 4.541 | 18.0 | NS |
| 22 BBK | 24.1 | 1007 | 36.4% | 9.229 | 1.85 | 0.113 | 3.44 | 2.447 | 5.99 | NS |
| 23 CFC | 7.29 | 0.830 | 33.1% | 7.702 | 1.72 | 0.136 | 2.97 | 2.447 | 5.99 | NS |
| 24 C Trust | 0.7 | 1.47 | 13.5% | 24.26 | 0.97 | 0.371 | 0.94 | 2.447 | 5.99 | NS |
| 25 DTB | 8.2 | 0.526 | 8.9% | 10.97 | 0.77 | 0.472 | 0.59 | 2.447 | 5.99 | NS |
| 26 HFCK | 16.6 | -0.053 | 0.4% | 5.221 | -0.16 | 0.876 | 0.03 | 2.447 | 5.99 | NS |
| 27 ICDC | 27.3 | -0.388 | 10.8% | 7.277 | -0.85 | 0.427 | 0.73 | 2.447 | 5.99 | NS |
| 28 KCB | 1.80 | 1.43 | 61.8% | 7.350 | 3.11 | 0.021 | 9.69 | 2.447 | 5.99 | S |
| 29 NBK | 22.6 | -0.530 | 54.6% | 2.931 | -2.45 | 0.058 | 6.02 | 2.182 | 10.13 | NS |
| 30 Rea | -10.5 | 1.96 | 91.6% | 2.930 | 4.67 | 0.043 | 21.79 | 6.965 | 161.0 | NS |
| 31 NIC | 9.54 | 1.31 | 68.3% | 5.840 | 3.60 | 0.011 | 12.94 | 2.447 | 5.99 | S |
| 32 SCB | 40.2 | -0.209 | 2.1% | 9.271 | -0.36 | 0.731 | 0.13 | 2.447 | 5.99 | NS |
| 33 Jubilee | 4.33 | 0.035 | 0.7% | 2.780 | 0.20 | 0.846 | 0.04 | 2.447 | 5.99 | NS |
| 34 Pan | 3.50 | -0.0081 | 0.1% | 1.425 | -0.09 | 0.931 | 0.01 | 2.447 | 5.99 | NS |
| 35 Athi | -6.03 | 0.822 | 94.5% | 0.7535 | 4.16 | 0.150 | 17.30 | 6.965 | 161.0 | NS |
| 36 Banb | 6.10 | 0.055 | 4.2% | 1.724 | 0.51 | 0.625 | 0.26 | 2.447 | 5.99 | NS |
| 37 BAT | 14.0 | 0.449 | 11.8% | 7.996 | 0.90 | 0.404 | 0.81 | 2.447 | 5.99 | NS |
| 38 Berger | 52.3 | -0.842 | 18.7% | 11.48 | -1.17 | 0.285 | 1.38 | 2.447 | 5.99 | NS |
| 39 BOC | 17.9 | -0.333 | 26.9% | 3.582 | -1.49 | 0.188 | 2.21 | 2.447 | 5.99 | NS |
| 40 Cables | -8.90 | 1.11 | 73.4% | 4.368 | 4.07 | 0.007 | 16.58 | 2.447 | 5.99 | S |
| 41 Dun | 12.7 | -0.202 | 3.9% | 6.495 | -0.50 | 0.637 | 0.25 | 2.447 | 5.99 | NS |
| 42 EABL | 9.90 | 0.879 | 83.9% | 2.513 | 5.60 | 0.001 | 31.35 | 2.447 | 5.99 | S |

| CO-CODE | ALPHA | BETA | RSQ | S | T | P | F | LEVEL OF SIGNIFICANCE | | SIGNIFICANT OR NOT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Tcr | Fcr | |
| 43 EAP&C | -21.5 | 1.91 | 48.8% | 12.75 | 2.39 | 0.054 | 5.72 | 2.447 | 5.99 | NS |
| 44 Fire | -2.5 | 0.868 | 28.4% | 8.361 | 1.41 | 0.218 | 1.99 | 2.571 | 6.61 | NS |
| 45 Kenol | 18.9 | 1.59 | 83.9% | 5.414 | 4.56 | 0.010 | 20.81 | 2.447 | 7.71 | S |
| 46 Knmill | -41.3 | 2.04 | 42.3% | 15.58 | 2.10 | 0.081 | 4.40 | 2.447 | 5.99 | NS |
| 47 KPLC | 4.0 | -0.949 | 21.3% | 11.91 | 1.27 | 0.250 | 1.62 | 2.447 | 5.99 | NS |
| 48 Port | 54.6 | -2.05 | 25.3% | 21.69 | 2.52 | 0.045 | 1.78 | 2.447 | 5.99 | NS |
| 49 Total | -14.8 | 2.8 | 48.9% | 18.69 | 2.39 | 0.054 | 5.74 | 2.447 | 5.99 | NS |
| 50 Unga | -9.9 | 0.506 | 10.8% | 9.473 | 0.85 | 0.426 | 0.73 | 2.447 | 5.99 | NS |
| 51 Carb | -8.79 | 1.793 | 81.4% | 5.998 | 5.12 | 0.002 | 26.22 | 2.447 | 5.99 | S |

The above results were obtained after working out return on equity (profit after tax divided by the number of equity shares) for each company for each year over the years that the company was in operation with a maximum period of 8 years. The total equity return for each company for the period covered was averaged to get $R_E$ for each company. The market equity return was obtained by totalling the individual company equity returns then dividing this by total number of companies. We used regression statistics to obtain the above data shown on Table 2.

KEY:

S = Significant

NS = Not Significant

We selected all those companies whose F- values were considered significant as a result of using regression analysis on return on assets which are shown on the table 3 below.

## TABLE 3

| ASSET RETURN - COMPANIES WHOSE F - VALUE WERE CONSIDERED SIGNIFICANT. | | | | | | |
|---|---|---|---|---|---|---|
| | Co - code | R2 | T VALUE | F- Value | Level of significance | |
| | | | | | Tcr | Fcr |
| 1 | Kakuzi | 72.5% | 3.97 | 15.79 | 2.447 | 5.99 |
| 2 | Sasini | 74.5% | 4.18 | 17.50 | 2.447 | 5.99 |
| 3 | Express | 87.8% | 6.58 | 43.36 | 2.447 | 5.99 |
| 4 | Cables | 82.9% | 5.39 | 29.09 | 2.447 | 5.99 |
| 5 | Dun | 55.8% | 2.75 | 7.56 | 2.447 | 5.99 |
| 6 | Fire | 89.1% | 5.75 | 32.58 | 3.182 | 10.13 |
| 7 | Total | 75.8% | 4.33 | 18.79 | 2.447 | 5.99 |

We selected all those companies whose F- values were considered significant as a result of using regression analysis on return on equity which are shown on the table 4 below.

**TABLE 4**

**EQUITY RETURN COMPANIES WHOSE F - VALUE WERE CONSIDERED SIGNIFICANT.**

| | Co - code | R2 | T - Value | F -Value | Level of significance | |
|---|---|---|---|---|---|---|
| | | | | | T cr | F cr |
| 1 | Ltea | 52% | 2.55 | 6.50 | 2.447 | 5.99 |
| 2 | Sasini | 70.8% | 3.82 | 14.57 | 2.447 | 5.99 |
| 3 | Bauma | 79.3% | 4.80 | 23.01 | 2.447 | 5.99 |
| 4 | Express | 91.4% | 3.847 | 63.66 | 2.447 | 5.99 |
| 5 | Marsh | 83.9% | 5.59 | 31.24 | 2.447 | 5.99 |
| 6 | Pearl | 50.6% | 2.48 | 6.14 | 2.447 | 5.99 |
| 7 | NIC | 68.3% | 3.60 | 12.94 | 2.447 | 5.99 |
| 8 | Cables | 73.4% | 4.07 | 16.54 | 2.447 | 5.99 |
| 9 | EABL | 83.9% | 5.60 | 31.35 | 2.447 | 5.99 |
| 10 | Carb | 81.4% | 5.12 | 26.22 | 2.447 | 5.99 |
| 11 | KCB | 61.8% | 3.11 | 9.69 | 2.447 | 5.99 |
| 12 | Kenol | 83.9% | 4.56 | 20.81 | 2.447 | 5.99 |

We went further and selected those companies that had significant numbers for Asset return and Equity return as shown on table 5 below:-

**TABLE 5**

**COMPANIES WHOSE NUMBERS WERE SIGNIFICANT IN BOTH THE ASSET RETURN AND EQUITY RETURN**

| Asset Return | | Equity Return | |
|---|---|---|---|
| **Co-Code** | **f_value** | **Co-Code** | **f_value** |
| Sasini | 17.50 | Sasini | 14.57 |
| Express | 43.36 | Express | 63.66 |
| Cables | 29.09 | Cables | 16.53 |
| Total | 18.79 | Total | 5.74 |

This result suggest that accounting beta has some information content which may be useful for a study in market risk.

## 4.4 SUMMARY AND INTERPRETATION OF THE FINDINGS

Our sample of 51 companies showed the following results:

(i) On Asset Return test, 46 companies had positive beta coefficient and 5 companies had negative beta coefficient.

(ii) On Equity Return test 38 companies had positive beta coefficient and 13 companies had negative beta coefficient.

(iii) On Asset Return test only 7 companies showed significant values (See table 3)

(iv) For the Equity Return test 12 companies had significant values (See Table 4)

(v) We also related those companies whose significant values overlapped on Asset and Equity Returns and found that they were only 4 (See table 5)

We can therefore relate the above results to researches that have been undertaken in the past. Beaver, Kettler and Scholes (1970) while trying to use accounting variables to focus market risk concluded that using earnings variables was more appropriate in estimating market risk than using accounting variables.

We have seen that from the two sets of data that we were carrying research on namely Asset Return and Equity Return, the overlapping companies were few. A detailed look on the results showed that some companies that had significant values under asset return had insignificant values under Equity Return.

The variation in the market (average return of equity for the whole market), is supposed to explain return on equity for individual company. If it does not then the market average should not hold.

Wholesale use of market average as a benchmark does not hold in this case. Other reason why Return on equity may not equal Return on market is because we used aggregated data from balance sheet from time to time.

# CHAPTER 5:

## SUMMARY AND CONCLUSIONS

### 5.1 CONCLUSION AND IMPLICATIONS

The research revealed that accounting beta coefficient is not a good estimator of "Market Risk". Out of the 51 sampled companies, the accounting beta derived using accounting return on asset we found that only 7 companies showed significant values. This represented 14% of the total sample. The same beta coefficient on Equity Return also showed a similar trend though the significant samples were 12 out of 51 again representing only 24%.

The above results led us to conclude that there is no direct link between accounting numbers of individual companies that were included in this study. The use of accounting return on Equity showed a higher level of significance as compared to the Asset Return although this was still less than 50%.

From the above we can conclude that unlike the case of "market beta", where investors transfer their investments from one company to another because of the ease of disposing of shares, this is not possible with accounting variables namely return on assets and return on equity. Investors would not be able to transfer their assets from one company to another with ease the way they would do with shares. Liquidating assets, distributing them, is a long and cumbersome process.

### 5.2 LIMITATIONS OF THE STUDY

1. Although the annual reports and accounts are based on standard accounting practice, withing any accounting standard practice there are two or more ways in which an item can be treated, for example what is regarded as revenue and expense may vary from company to company, Abdiel- Khalik (1981). This factor may affect the accounting beta in a company from one year to the other.

2. Beta may not be accurately measured due to the borrowing policy of a firm from one year to the other. Heavy borrowing will increase beta factor because more interest expenses will reduce income before tax, leaving little income for equity shareholders.

3. Beta pegged to a stock market may not be used in other stock markets. Therefore our results based on NSE may not be the same if the same data were to be applied in NYSE based on Standard and Poor, Levy, H. and Sarnat, M (1978).

4. The beta on security may shift over time. Some securities are safer in youth than old age. Others are riskier in youth than in old age therefore this may have an influence on the results that are obtained.

## 5.3 SUGGESTION FOR FURTHER RESEARCH

This study may be viewed as a starting point for several other studies related to it because so far no other research have been done in Kenya dirrectly related to it.

The following areas may be of importance:-

1. A study on companies which are operating in the same sector (e.g finance based companies or Agricultural based companies)
2. Study on companies which have similar gearing.
3. A study on companies with same maturity.
4. The study involving a longer period.
5. A study using a disaggregated data like breaking assets and profits into months then computing return on assets and return on equity on monthly basis.

# APPENDICES

## APPENDIX 1:

## LIST OF SAMPLED COMPANIES AND THEIR CODES

### TABLE 6

| | COMPANY | CODE | |
|---|---|---|---|
| 1. | Brooke Bond Kenya | Bbond | |
| 2. | Eaagads Ltd | Eaag | |
| 3. | George Williamson Kenya Ltd | GWK | |
| 4. | Kakuzi Ltd | Kakuzi | |
| 5. | Kapchora Tea Company Ltd | Kapch | |
| 6. | Limuru Tea Company Ltd | Ltea | |
| 7. | Ol Pejeta Ranching Ltd | Pejeta | |
| 8. | Rea Vipingo Plantations | Rea | |
| 9. | Sasini Tea and Coffee Ltd | Sasini | |
| 10. | A Baumaan & Co. Ltd | Bauo | |
| 11. | Car & General (K) Ltd | C & G | |
| 12. | CMC Holdings | CMC | |
| 13. | Express Kenya Ltd | Express | |
| 14. | Hutchings Biemer Ltd | Hutch | |
| 15. | Kenya Airways Ltd | KQ | |
| 16. | Lonrho Motors (E.A) Ltd | Lonrho | |
| 17. | Marshalls (E.A) Ltd | Marsh | |
| 18. | Nation Media Group Ltd | NMG | |
| 19. | Pearl Dry Cleaners Ltd | Pearl | |
| 20. | The Standard Newspaper Ltd | Snews | |
| 21. | TPS Serena Ltd | TPS | |
| 22. | Uchumi Supermarkets Ltd | Uchumi | |
| 23. | Barclays Bank of Kenya Ltd | BBK | |
| 24. | CFC Bank Ltd | CFC | |

## APPENDIX 1:
## LIST OF SAMPLED COMPANIES AND THEIR CODES
## TABLE 6

| | COMPANY | CODE | |
|---|---|---|---|
| 25. | City Trust Ltd | CTrust | |
| 26. | Diamond Trust Bank Ltd | DTB | |
| 27. | Housing Finance Company of Kenya | HFCK | |
| 28. | I.C.D.C Investments Co. | ICDC | |
| 29. | Kenya Commercial Bank Ltd | KCB | |
| 30. | National Bank of Kenya | NBK | |
| 31. | NIC Bank Ltd | NIC | |
| 32. | Standard Chartered Bank | SCB | |
| 33. | Jubilee Insurance Company Ltd | Jubilee | |
| 34. | Pan African Insurance Co. Ltd | Pan | |
| 35. | Athi River Mining Ltd | Athi | |
| 36. | Bamburi Cement Ltd | Bamb | |
| 37. | BAT Kenya Ltd | BAT | |
| 38. | Crown Berger Ltd | Berger | |
| 39. | BOC Kenya Ltd | BOC | |
| 40. | E.A Cables Ltd | Cables | |
| 41. | Carbacid Investments Ltd | Carb | |
| 42. | Dunlop Kenya Ltd | Dun | |
| 43. | E.A Breweries Ltd | EABL | |
| 44. | E.A Packaging Industries Ltd | EAP & C | |
| 45. | Firestone East Africa (1969) Ltd | Fire | |
| 46. | Kenya Oil Co. Ltd | Kenol | |
| 47. | Kenya National Mills Ltd | Knmill | |
| 48. | Kenya Power & Lighting Co. Ltd | KPLC | |
| 49. | E.A Portland Cement Ltd | Port | |
| 50. | Total Kenya Ltd | Total | |
| 51. | Unga Group Ltd | Unga | |

# APPENDIX 2:

## ANNUAL RETURN ON ASSETS

## TABLE 7

| CO-CODE | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| 1 Bbond | 27.69 | 33.83 | 30.79 | 9.42 | 2.99 | 3.63 | 6.32 | 7.77 |
| 2 Eaag | - | - | 44.17 | 37.47 | 7.01 | 6.83 | 20.85 | 33.54 |
| 3 GWK | 4.36 | 12.88 | 26.59 | 4.66 | 4.91 | 8.15 | 25.31 | 3.19 |
| 4 kakuzi | 5.25 | 9.09 | 20.23 | 16.96 | 6.44 | 9.65 | 13.24 | 6.70 |
| 5 Kapch | 10.42 | 18.90 | 25.28 | -1.40 | 2.40 | 5.68 | 20.88 | 3.41 |
| 6 Ltea | 40.73 | 65.27 | 119.68 | 41.08 | 25.56 | 38.43 | 65.21 | 59.79 |
| 7 Pejeta | 2.54 | 3.68 | 4.21 | 3.44 | 4.18 | 0.87 | 2.67 | 2.05 |
| 8 Rea | - | - | - | - | 15.44 | 17.91 | 24.33 | 9.69 |
| 9 Sasini | 23.66 | 25.44 | 69.97 | 26.37 | 6.85 | 4.35 | 6.98 | 8.31 |
| 10 Bauma | 4.95 | 6.73 | 9.87 | 15.55 | 5.31 | -2.35 | -0.45 | 0.96 |
| 11 C & G | 6.09 | 6.33 | 7.25 | 7.72 | 4.84 | -5.47 | 6.19 | 10.71 |
| 12 CMC | 3.62 | 3.43 | 3.76 | 8.60 | 8.79 | 14.00 | 13.01 | 11.91 |
| 13 Express | 10.05 | 10.68 | 24.64 | 13.71 | 11.84 | 5.25 | 7.52 | 6.68 |
| 14 Hutch | 0.81 | 2.18 | .75 | 4.72 | 4.60 | 2.27 | -10.48 | -6.25 |
| 15 KQ | - | - | - | - | 18.28 | 12.76 | 11.04 | 6.14 |
| 16 Lonrho | 30.84 | 10.58 | 12.84 | 21.39 | 18.62 | 13.50 | 3.51 | -1.75 |
| 17 Marsh | 8.29 | 8.80 | 8.87 | 14.78 | 12.71 | 9.06 | 6.62 | -4.57 |
| 18 NMG | 15.03 | 15.85 | 18.47 | 25.36 | 26.28 | 23.24 | 26.22 | 26.76 |
| 19 Pearl | 6.97 | 6.62 | 6.70 | 8.83 | 6.54 | 2.40 | -12.65 | -18.01 |
| 20 Snews | -7.92 | 6.59 | -5.60 | 10.60 | -1.61 | 13.12 | 20.63 | 6.46 |
| 21 TPS | - | - | - | - | - | 25.67 | 12.32 | 11.97 |
| 22 Uchumi | - | - | 45.18 | 26.85 | 23.35 | 23.77 | 24.25 | 27.79 |
| 23 BBK | 4.12 | 4.37 | 6.90 | 8.27 | 7.17 | 7.33 | 7.02 | 6.48 |
| 24 CFC | 3.42 | 4.50 | 4.73 | 9.06 | 7.65 | 5.69 | 7.55 | 6.22 |
| 25 C Trust | 23.61 | 22.94 | 16.82 | 13.42 | 56.49 | 19.28 | 19.65 | 5.14 |
| 26 DTB | 4.92 | 4.83 | 6.32 | 6.24 | 5.38 | -1.47 | -3.98 | 3.03 |
| 27 HFCK | 2.02 | 3.05 | 5.02 | 5.49 | 4.38 | 5.86 | 5.73 | 3.74 |

# APPENDIX 2:

## ANNUAL RETURN ON ASSETS

## TABLE 7

| CO-CODE | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| 28 ICDC | 12.68 | 10.49 | 12.95 | 20.28 | 24.08 | 21.79 | 17.79 | 22.48 |
| 29 KCB | 2.97 | 3.33 | 6.32 | 5.70 | 6.35 | 6.40 | 7.09 | 1.85 |
| 30 NBK | 2.55 | 1.92 | 1.28 | 2.82 | 3.54 | 4.23 | 2.34 | -2.76 |
| 31 NIC | 3.98 | 5.24 | 9.69 | 8.88 | 10.39 | 8.92 | 7.77 | 5.68 |
| 32 SCB | 3.96 | 4.88 | 3.07 | 4.63 | 6.65 | 6.08 | 5.54 | 6.48 |
| 33 Jubilee | 6.16 | 4.00 | 5.07 | 4.73 | 4.28 | 4.86 | 4.85 | 4.14 |
| 34 Pan | 2.64 | 3.99 | 3.80 | 5.98 | 1.95 | 3.72 | 4.30 | 4.92 |
| 35 Athi | - | - | - | - | - | 13.42 | 9.15 | 5.07 |
| 36 Banb | 11.47 | 14.40 | 14.69 | 11.96 | 16.85 | 13.25 | 12.93 | 5.02 |
| 37 BAT | 22.11 | 26.16 | 36.88 | 18.05 | 16.80 | 20.21 | 18.67 | 29.19 |
| 38 Berger | 20.47 | 18.85 | 22.29 | 24.39 | 13.38 | 8.69 | 12.97 | 11.48 |
| 39 BOC | 12.25 | 12.73 | 12.38 | 14.97 | 14.74 | 16.37 | 19.14 | 20.07 |
| 40 Cables | 25.55 | 32.53 | 46.64 | 40.78 | 31.71 | 36.48 | 30.48 | 28.48 |
| 41 Carb | 8.63 | 18.96 | 17.00 | 13.31 | 19.78 | 20.86 | 23.91 | 27.10 |
| 42 Dun | 23.89 | 41.59 | 48.15 | 42.52 | 40.81 | 27.45 | 9.66 | 7.40 |
| 43 EABL | 13.46 | 12.60 | 17.01 | 7.45 | 10.90 | 11.90 | 6.29 | 11.91 |
| 44 EAP&C | 25.03 | 26.97 | 26.02 | 16.61 | 14.26 | 7.59 | 2.93 | 3.84 |
| 45 Fire | - | - | 128.38 | 52.79 | 55.83 | 50.48 | 40.51 | 35.77 |
| 46 Kenol | 7.63 | 8.27 | 15.47 | 39.57 | 19.66 | 21.08 | 21.58 | 21.84 |
| 47 Knmill | 4.75 | -1.08 | 14.27 | 14.97 | 5.24 | 13.45 | -10.65 | -1.98 |
| 48 KPLC | 4.37 | 4.93 | -1.41 | 8.81 | 12.59 | 9.68 | 11.85 | 10.46 |
| 49 Port | 9.24 | 10.28 | 16.26 | 3.51 | 2.34 | 2.81 | 11.71 | -19.94 |
| 50 Total | 18.94 | 15.92 | 43.49 | 22.60 | 25.48 | 17.06 | 13.90 | 20.24 |
| 51 Unga | -0.30 | 2.72 | 4.49 | 12.37 | 13.36 | 5.23 | 13.83 | -7.74 |
| **TOTAL** | **473.85** | **566.61** | **1017.6** | **736.27** | **667.35** | **621.42** | **619.62** | **473.46** |
| **AVERAGE** | **10.77** | **12.88** | **21.65** | **15.67** | **13.62** | **12.18** | **12.15** | **9.28** |

# APPENDIX 3

## ANNUAL RETURN ON EQUITY

## TABLE 8

| CO-CODE | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| 1 Bbond | 28.10 | 36.59 | 16.19 | 7.10 | 0.87 | 3.01 | -4.50 | 4.33 |
| 2 Eaag | - | - | 30.60 | 22.00 | 6.00 | 5.95 | 15.15 | 26.48 |
| 3 GWK | 4.17 | 7.71 | 19.90 | 1.01 | 1.17 | 5.42 | 21.79 | 2.96 |
| 4 kakuzi | 5.79 | 10.29 | 10.66 | 13.24 | 4.33 | 8.54 | 8.54 | 5.46 |
| 5 Kapch | 7.44 | 10.82 | 18.94 | -2.06 | 1.62 | 5.47 | 19.09 | 4.50 |
| 6 Ltea | 39.70 | 72.38 | 255.24 | 67.19 | 22.85 | 33.57 | 59.60 | 65.44 |
| 7 Pejeta | 0.35 | 1.02 | 1.39 | -0.40 | -0.15 | -0.21 | 9.37 | 1.06 |
| 8.Rea | | | | | 26.12 | 22.86 | 12.12 | 8.93 |
| 9 Sasini | 15.55 | 17.46 | 49.23 | 20.86 | 3.33 | 2.76 | 4.28 | 5.15 |
| 10 Bauma | 3.95 | 15.87 | 20.31 | 11.91 | 3.79 | 1.07 | -1.66 | .75 |
| 11 C & G | 1.52 | 1.96 | 3.25 | 4.94 | 0.16 | -23.74 | -34.86 | -11.96 |
| 12 CMC | 3.97 | 5.65 | 6.34 | 12.51 | 16.03 | 18.27 | 15.20 | 11.30 |
| 13 Express | 17.34 | 16.74 | 41.40 | 23.71 | 19.23 | 9.09 | 4.90 | 3.73 |
| 14 Hutch | 63.51 | 56.52 | 33.50 | 32.08 | 25.34 | 22.16 | -35.67 | 0.69 |
| 15 KQ | | | | 56.55 | 25.30 | 14.37 | 20.19 | 15.70 |
| 16 Lonrho | 71.96 | 25.72 | 13.30 | 31.01 | 36.48 | 21.52 | -4.49 | -65.61 |
| 17 Marsh | 3.30 | 14.40 | 46.20 | 9.30 | 6.45 | 5.88 | 2.99 | -21.86 |
| 18 NMG | 9.56 | 9.42 | 11.49 | 22.26 | 20.37 | 20.61 | 22.38 | 21.20 |
| 19 Pearl | 6.03 | 5.30 | 6.06 | 6.68 | 4.11 | 2.45 | -20.42 | -32.39 |
| 20 Snews | -58.86 | 39.66 | 43.14 | 6.56 | -9.34 | 24.51 | 35.92 | -2.96 |
| 21 TPS | | | | | | 9.99 | 8.49 | 11.82 |
| 22 Uchumi | | | 39.14 | 48.61 | 37.20 | 41.45 | 34.59 | 42.37 |
| 23 BBK | 28.53 | 36.62 | 49.65 | 64.00 | 46.72 | 43.26 | 39.11 | 36.72 |
| 24 CFC | 15.83 | 19.20 | 24.56 | 31.36 | 38.34 | 15.89 | 17.40 | 13.85 |
| 25 C Trust | 20.75 | 18.61 | 28.91 | 27.07 | 83.51 | 14.24 | 17.19 | 4.25 |
| 26 DTB | 18.04 | 19.76 | 23.26 | 28.30 | 20.26 | -7.18 | 19.70 | 21.77 |
| 27 HFCK | 7.06 | 9.59 | 17.17 | 18.26 | 15.21 | 19.33 | 20.41 | 18.50 |
| 28 ICDC | 12.03 | 10.42 | 14.60 | 22.91 | 28.24 | 27.92 | 21.13 | 25.70 |
| 29 KCB | 16.26 | 21.19 | 40.14 | 36.87 | 36.94 | 30.73 | 26.17 | 9.02 |

# APPENDIX 3

## ANNUAL RETURN ON EQUITY

## TABLE 8

| CO-CODE | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| 30 NBK | 17.87 | 14.94 | 6.80 | 8.47 | 12.37 | 15.74 | 11.65 | 9.85 |
| 31 NIC | 30.00 | 39.31 | 44.02 | 32.43 | 43.05 | 34.79 | 23.34 | 16.33 |
| 32 SCB | 27.83 | 3767 | 24.90 | 38.44 | 53.11 | 41.36 | 33.02 | 35.79 |
| 33 Jubilee | 5.84 | 11.02 | 4.43 | 3.27 | 3.41 | 3.53 | 4.15 | 4.02 |
| 34 Pan | 3.51 | 3.66 | 2.65 | 5.90 | 1.42 | 2.32 | 3.60 | 3.81 |
| 35 Athi | | | | | | 6.21 | 4.90 | 1.78 |
| 36 Bamb | 9.50 | 6.01 | 9.11 | 4.99 | 6.87 | 7.49 | 7.35 | 5.39 |
| 37 BAT | 26.91 | 21.79 | 37.23 | 14.68 | 14.41 | 17.45 | 16.72 | 26.38 |
| 38 Berger | 20.93 | 21.78 | 35.14 | 36.06 | 37.28 | 45.35 | 48.98 | 53.29 |
| 39 BOC | 5.90 | 14.41 | 8.71 | 9.11 | 12.60 | 12.21 | 14.86 | 17.93 |
| 40 Cables | 7.48 | 14.93 | 22.50 | 21.16 | 8.30 | 0.95 | 7.74 | 4.03 |
| 41 Carb | 21.81 | 36.97 | 40.27 | 32.44 | 33.33 | 23.99 | 8.40 | 5.72 |
| 42 Dun | 13.91 | 19.19 | 7.10 | 2.45 | 5.00 | 9.87 | 1.82 | 13.54 |
| 43 EABL | 20.84 | 26.56 | 35.04 | 30.48 | 25.03 | 28.53 | 19.61 | 18.23 |
| 44 EAP&C | 26.97 | 31.94 | 26.65 | 18.39 | 12.89 | 1.67 | -10.78 | -8.13 |
| 45 Fire | 5.21 | 14.29 | 28.06 | 16.53 | 4.86 | 6.40 | 22.10 | 32.58 |
| 46 Kenol | - | - | 67.57 | 45.19 | 53.50 | 46.65 | 39.8 | 18.79 |
| 47 Knmill | 1.53 | -4.68 | 7.63 | 12.15 | 1.72 | 9.00 | -42.19 | 25.08 |
| 48 KPLC | 5.84 | 14.37 | 26.72 | 48.04 | 16.65 | 16.62 | 20.01 | 18.79 |
| 49 Pearl | 8.66 | 4.86 | -25.26 | 32.85 | 39.78 | 28.74 | 31.00 | 24.18 |
| 50 Total | 39.62 | 36.62 | 90.11 | 17.57 | 33.47 | 18.51 | 14.12 | 29.94 |
| 51 Unga | -1.93 | 0.84 | -4.59 | 5.31 | 7.23 | 1.82 | 5.47 | -21.72 |
| **TOTAL** | **37.69** | **37.46** | **85.52** | **22.88** | **40.70** | **20.33** | **19.59** | **29.95** |
| **AVERAGE** | **14.55** | **19.78** | **28.93** | **22.08** | **19.32** | **15.26** | **12.54** | **9.87** |

## APPENDIX 4

## (WRITE-UP ON REGRESSION VARIABLES)

### (i) Variance and standard deviation

The variability or dispersion is important in dealing with financial data. The most common measure of variability is the variance or standard deviation. The variance of a group of observations is calculated as the sum of squares of deviations from the mean divided by one fewer than the number of observations.

We took an example of Return on Asset from Brooke Bond Company for a period of 8 years, and used it to explain how we could obtain the above statistical variables.

### TABLE 9

### DETERMINING VARIANCE AND STANDARD DEVIATION

| Year | Asset Return X | | Mean X | Difference Between Return & Mean (X-X) | | Squared Deviation $(X-X)^2$ |
|---|---|---|---|---|---|---|
| 1991 | 27.69 | - | 15.31 = | (12.38)2 | = | 153.26 |
| 1992 | 33.83 | - | 15.31 = | (18.52)2 | = | 342.99 |
| 1993 | 30.79 | - | 15.31 = | (15.48)2 | = | 239.63 |
| 1994 | 9.42 | - | 15.31 = | (-5.89)2 | = | 34.69 |
| 1995 | 2.99 | - | 15.31 = | (-12.32)2 | = | 151.78 |
| 1996 | 3.63 | - | 15.31 = | (-11.68)2 | = | 136.42 |
| 1997 | 6.32 | - | 15.31 = | (-8.99)2 | = | 80.82 |
| 1998 | 7.77 | - | 15.31 = | (-7.54)2 | = | 56.85 |
| | 122.44 | | | Total variance | | 1196.44 |

Mean (X) $122.44 \div 8 = 15.31$

Variance = $1,196.44 \div 7 = 170.92$ explained by regression

Therefore 170.92 is explained by regression and the balance (1196.44 - 170.92) = 1025.52 is due to errors.

The standard deviation $\sqrt{170.92} = 13.07$

The other useful statistical number is the coefficient of variation.

(ii) **Coefficient of variation ($R^2$)**

There are occasions when we wish to compare the relative amounts of variations between two variables. This is expressed in percentage terms. This compares the total variance that arose as a result of regression and that which arose due to errors. The percentage estimate would tell us whether the data we are trying to analyze is insignificant or not.

Where $R^2$ is found to be less than 50% then we would conclude that the data is insignificant. In our example of Brooke Bond, the variance explained by regression was 170.92. This expressed as percentage of total variance were

$170.92 \div 1196.4 = 14.29\%$

(iii) **Standard errors**

Suppose the tests were repeated several times, each time we would recalculate a mean. Each mean would be different. Thus there would be variability of the mean just as there are variability among individual observations in each sample. However, since each mean is averaged over 8 observations, the variation among mean would be smaller than variation among individual observation.

The variance of a mean can be calculated as the average of variances each time we run the test divided by the number of observations used for calculating each mean. The standard deviation of the mean is known as the standard error.

The standard deviation is a useful measure of the variation of an individual observation. The standard error is a useful measure of the variation of the mean.

Normally we would not repeat a test to calculate the average variation of the mean. Instead, we pretend that the variance of individual observations will remain constant from one test to another and use the value already calculated as an estimate of this average.

| | | | | |
|---|---|---|---|---|
| Variance of mean | = | 170.92 ÷ 8 | = | 21.365 |
| Standard error | = | 21.365 ÷ 7 | = | 3.05 |

The standard error or variance of a mean decreases as the number of observations increases.

(iv) **Confidence interval**

The standard error can be used to develop what is known as a confidence interval. A confidence interval is a range between upper and lower limits, which is expected to include at a given level of probability the true (or population) mean value. This is the value for which the sample in the test is providing and unbiased estimate.

In our study, we have decided to take a 95% confidence interval. This is the interval in which the true mean should lie with a 95% chance of being correct.

The purpose of analysis of variance is to estimate the overall significance of differences among each set of parameter means. It separates variations due to returns from each company and compares the magnitudes of different sources of variation with the variation which is left over due to error estimations.

The analysis of variance will take the following form.

## TABLE 10

## SUMS OF SQUARES FOR BBOND

| SOURCE OF VARIATION | df | SS | MS | F |
|---|---|---|---|---|
| Regression | 1 | 170.92 | | |
| Error | 6 | 1025.52 | | |
| **Total** | **7** | **1196.44** | | |

In our example of Brooke bond the above are the figures.

The degrees of freedom (df) for the variation on the regression is calculated as one fewer than the number of years for the sample. The error is calculated by substraction of regression df from the total df is 8-1=7 for the case of Brooke Bond (k) Ltd.

The following calculations are also important in the analysis: Sums of Squares (SS) and mean squares (MS) Regression: The formula for the regression "sums of squares" uses the total of the square each company divided by the number of years less one. Thus as is the case for Bbond, the total squares were 1196.44 ÷ 7 = 170.92. The balance from the total for the company gives us the sums of the squares which are due to errors caused in estimation.

The mean squares for Regression is found by dividing Regression ss (sums of squares) by degree of freedom

In this case Regression of MS = 170.92 ÷ 1 = 170.92

Error MS = 1025.52 ÷ 6 = 170.83

Putting the results of these calculations of Bbond into analysis of variance table we get:-

TABLE 11

MEAN SQUARE for Bbond

| Source of variation | df | SS | MS | F |
|---|---|---|---|---|
| Regression | 1 | 170.92 | 170.92 | |
| Error | 6 | 1025.52 | 170.92 | |
| Total | 7 | 1196.44 | | |

The error MS estimates the average variation among individual returns within the market return and is an estimate of average within total variance. The regression MS represents additional variation brought about by the differences in the mean market return. We can then calculate the F- value.

The magnitude of the above variation can be arrived at by dividing regression MS by the error MS to give what is known as the F value.

**F - value**

We divided regression MS by error MS to get the F value thus in this case

F = 170.92 ÷ 170.92 = 1.0.

TABLE 12

F-VALUE FOR Bbond

| Source of variation | d | S | MS | F |
|---|---|---|---|---|
| Regression | 1 | 170.92 | 170.92 | 1 |
| Error | 6 | 1025.52 | 170.92 | |
| Total | 7 | 1196.44 | | |

## t VALUE

The t values are useful in determining whether we can accept or reject the null hypothesis especially where the sample is less than 30. In our case the sample was more than 30 but we showed t values just as a supplementary item.

## APPENDIX 5

## TABLE 13

## CRITICAL f - VALUE

| Period | Fcr |
|---|---|
| 8 years | 5.99 |
| 7 years | 6.61 |
| 6 years | 7.71 |
| 5 years | 10.13 |
| 4 years | 18.51 |
| 3years | 161.0 |

## TABLE 14

## CRITICAL t - VALUES

| Period | tcr |
|---|---|
| 8 years | 2.447 |
| 7 years | 2.571 |
| 6 years | 2.776 |
| 5 years | 2.182 |
| 4 years | 4.541 |
| 3 years | 6.965 |

## APPENDIX 6

## DESCRIPTIVE STATISTICS FOR INFORMATION CONTENT

1. Mean
2. Standard Deviation
3. Standard Error
4. Mean Squares
5. Sums of Squares
6. Degree of freedom
7. f-Value
8. t-Value
9. Level of confidence = 95%
10. Variance
11. Source of Variation
12. Regression
13. Error
14. Y = Ra
15. a = Constant
16. Rm = Market Return
17. b = Coefficient of Market Return
18. Confidence interval

## REFERENCE TEXT


1. Bails, D.G. and Peppers; L.C. " Business fluctuations forecasting Techniques and applications" 2nd Edition.

2. Ball, R. and Brown, P. "Portfolio Theory and Accounting", Journal of Accounting Research (Autum 1969).

3. Beaver William, Kettle Paul and Scholes Myron," The Association between Market Determined and Accounting Determined Risk Measure", The Accounting Review Index to Volume 45 No. 4 (October 1970) Page 645 - 682.

4. Beaver W.H. and Manegold J; The association between market determined and Accounting determined risk measure of systematic risk " Some further evidence. Journal of Finance and Quantitative Analysis pp 231-284.

5. Bildersee, J.S. "The Association between a Market Determined Measure of Risk and Alternative measure of Risk," The Accounting Review (January 1975) page 81-98.

6. Beaver William, Kettle Paul and Scholes Myron," The Association between Market Determined and Accounting Determined Risk Measure", The Accounting Review Index to Volume 45 No. 4 (October 1970) Page 645 - 682.

7. Blume, M.F. "Betas and their Regression Tendencies. Some further evidence", Journal of Finance 1979.

8. Bowman, R.G.," Theoretical relationship between Systematic Risk and Financial Accounting Variables."

9. Breen and Lerner, "Corporate Financial Stategies and Market Measures of Risk and Return", Journal of Finance Vol.28 May 1973 pp 339 - 351.

10. Elgers, T.P. ; Haltner J.R., Hawthorne W.H. "Beta Regression tendencies. Statistical and Real cause", Journal of Finance 1979.

11. Fama, E and Keneth, R.F. "The Section of expected stock Return," Journal of finance (1992) page 47.

12. Foster, G." Asset pricing and Financial Statement information." 2nd edition.

13. Ibbatson, R.G. and Sinquefield:" Stocks, Bonds, Bills and inflation", SBBI 1988 quarterly market reports Chicago, Ibbotson Associates.

14. Kumar; G.R. and Rao K.C.S. " Quantitative Analysis for Managerial Decision Making".

15. Lev, B. "The Association between operating leverage and Risk" Journal of Financial and Qualitative Analysis (Sept. 1974).

16. Levy, H and Sarnat, M., "The Capital Asset Pricing Model, a Multibeta interpretation", Financial decision making under uncertainity New York academic press 1977.

17. Matti Kelohargiu "The winner's curse, legal liability and the long run price performance in IPO in Finland" Journal of Financial Economics Vol. 34 (Oct 1993).

18. Melicher, R.W. "Financial Factors which influence Beta Variations within a Homogeneous Industry Environment" Jurnal of Financial and Quantative Analysis Vol. 9 March 1974 p.p. 231 - 241.

19. Melicher, R.W. and Rush, D.F. "Systematic Risk, Financial Data and Bond Rating Relationship in Regulated Industry Environment", Journal of Finance Vol. 29 (May 1974). Pages 537 - 544.

20. Myers, S.C. and Turnbull, S.M. "Capital Budgeting and the Capital Asset Pricing Model."

21. Pandey, I.M." : Financial Management", eighth edition.

22. Puxty et al, Financial Management, 2nd edition (Chapman and Hall 1991)

23. Rosenberg B. and McKibben W. " The Prediction of Systematic and Specific Risk in Common Stock", Journal of Financial and Quantitative Analysis Vol. 8 March 1973. Page 317 - 332.

24. Ross, S., Westerfield, R.W.,and Jaffe "Corporate Finance second edition."

25. Rubinstein, M.E., A mean variance synthesis of corporate finance theory. Journal of finance vol. 28 page 167-182.

26. Schwendiman C.J. and Pinches G.E., "An analysis of alternative measures of investment risk".

27. Sharpe, W., "Capital Asset Pricing Model", A multi-beta Approach Research paper no. 183, Graduate School of Business Stanford University, September 1973.