TESTING THE PREDICTIVE ABILITY OF THE DIVIDEND VALUATION MODEL ON ORDINARY SHARES

BY

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DECLARATION

This management Research Project is my original work and has not been presented for a degree in any other university.

Signed: -------------------------------------- Date: 13th Sep. 1994

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This Management Research Project has been submitted for examination with our approval as University Supervisors.

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DEDICATION

Dedicated to the persevering hearts of my Mum and Dad for their love for education and for the risky investment they undertook to educate me, for whose value is still unpredictable

TABLE OF CONTENTS PAGE

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ABSTRACT

The valuation of ordinary shares is much more difficult than that of preferred shares and bonds because of more uncertainty and instability surrounding the income from ordinary shares. The satisfying aspect of investing in bonds is the certainty of income. Bonds have a superior claim on assets and income in the event of liquidation, and as long as the interest and principal on a bond are adequately secured and the yield satisfactory, the decision to invest is not difficult. Greater risk is associated with preferred share investment because dividends are less certain and do not represent a fixed commitment of the company. However, yields can easily be determined and whether the dividends and principal are secure can be readily established. The valuation of ordinary shares is more complicated and this has led to the development of a number of models, including the dividend valuation model and earning per share valuation model.

This study sought to determine the predictive ability of the Dividend Valuation Model on the ordinary shares. Data collected in form of share prices, market indices and dividend per share from the Nairobi Stock Exchange (NSE) secretariat were used to predict share prices for each of the thirteen companies studied. The market model was used to provide a link between the expected values which are non-observable and the real values that were used in testing the model. The predicted share prices were compared with actual prices by computing the difference between them. The differences between the two prices were subjected to t-tests. The tests of significance showed that out of the thirteen companies studied, only three showed that the differences were not significant. We therefore concluded that the dividend valuation model was a poor predictor of share prices in the NSE.

LIST OF TABLES

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

An investment is a commitment of funds for a period of time to derive a rate of return to compensate for the time the funds are invested, the expected rate of inflation during that time, liquidity premium and the risk involved (Reilly 1992:223). Specifically, an investor expects a stream of returns from his investment during the period of time that he owns it. To convert this stream of returns to a single value for the security, one must discount the stream at his required rate of return. This implies that the value of an investment is the present value of its expected returns. This can be written as follows:

$$V_0 = \frac{E_1}{(1+K_1)} + \frac{E_2}{(1+K_2)^2} + \ldots\ldots + \frac{E_t}{(1+K_t)^t} + \frac{E_n}{(1+K_n)^n} \qquad (1)$$

where V_0 = the current or present value of an investment

E_t = the expected returns at time t

K_t = the required rate of return for each period's return

n = the number of periods over which returns are expected to be generated.

The returns from an investment can take many forms, including earnings, dividends, interest payments, or capital gains (i.e. increases in value) during a period. Different applications of the above theory produce different methods to compute estimated values for alternative investments based on the different payment streams and characteristics. Major types of investments include: (1) debt, which is a contractual obligation calling for specific payments; (2) preferred shares, which is also contractual in nature but which has a claim to income and assets after the firm's debt; and (3) ordinary shares, which represents ownership and which has a residual claim to all income and assets after the claims of debt holders and preferred shareholders have been satisfied. For our case, we will focus on the valuation of ordinary shares.

The valuation of ordinary shares is much more difficult than the valuation of bonds or preferred shares because an investor is uncertain about the size of the returns, their time pattern, and the required rate of return (K). In contrast, the only unknown for a bond is the required rate of return, which is the prevailing nominal risk free rate plus a risk premium. Similarly, for preferred shares the only unknown is the required rate of return on the share. Since certain information is unavailable, an investment in ordinary shares demands that future earnings, dividends and price be estimated (Amling 1978:194). The required rate of return involved must also be determined and then weighed against the estimated return to determine whether the share is overpriced, fairly priced or underpriced.

In the valuation of ordinary shares, a concept known as the intrinsic value is commonly used as a means of estimating the anticipated return (Sprecher 1975:119). The concept implies that the shares of a firm have some central or intrinsic value that can be estimated from the historical performance of the firm. A share's intrinsic value provides an indication of the future return and risk performance of a security (Gitman and Joehnk 1988:288). The question of whether, and to what extent, a share is undervalued or overvalued is resolved by comparing its current market price to its intrinsic value.

Many of the popular valuation methods of ordinary shares are based on either earnings per share or dividends per share (Curley and Bear 1979:169, Reilly 1992:229). One can therefore choose either dividends or earnings as the stream of returns to discount so as to estimate the value of the investment. This leads us to the two valuation models commonly used to estimate the value of ordinary shares. These are (1) The dividend valuation model and (2) The earnings per share valuation model.

The dividend valuation model is a method for estimating value of a share issue as the present value of all future dividends. Generally, if we assume that the required rate of return, K_e, is constant over the holding period, the model can be written as follows:

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{(1+K_e)^t} + \frac{P_n}{(1+K_e)^n} \qquad (2)$$

where P_0 = Present Value of ordinary share

D_t = Dividend per share during period t

K_e = Required rate of return on share j

t = The holding period where t=1,2,3,.... n

As n approaches infinity, the present value of the terminal price ought to approach to zero, as it does in the final. Equation (2) can then be written as follows:

$$P_0=\sum_{t=1}^{\infty}\frac{D_t}{(1+K_e)^t} \qquad (3)$$

This formulation is derived from the assumption that price in any period is determined by expected dividends and capital gains over the holding period. This model was initially set forth by Williams (1938) and subsequently reintroduced and expanded by Gordon (1962) as cited in (Reilly 1992:229).

The intended holding period of different investors will vary. Investors with holding period shorter than infinity expect to be able to sell the stock at a price higher than they paid for it. This assumes, of course, that during that time there will be investors willing to buy it. As buyers, they will, in turn, judge the share on expectations of future dividends and future terminal value beyond that point. Consequently, the foundation for the valuation of ordinary shares must be dividend (Van Horne, 1989). These are construed broadly to mean any cash dividend distribution to shareholders, including share repurchases.

The Earnings Per Share (EPS) valuation model is also a method for estimating the value of a share issue as a multiple of its earnings per share. The EPS valuation model can be written as follows:

$$P_{it} = EPS_{it} \times \left(\frac{P}{E}\right)_{it} \qquad (4)$$

P_{it} = The estimated value of an ordinary share

EPS_{it} = The estimated earnings per share of share i at time t

$(P/E)_{it}$ = The estimated price-earnings ratio of share i at time t

Consequently, the application of the EPS valuation model requires the following estimates (Sprecher:1975); First, the analyst must select some time horizon for the analysis. Once this is done, the growth in earnings per share over this time horizon must be forecast. This EPS forecast facilitates a forecast of horizon period. This requires an analysis of many factors that will affect the profitability of the firm and the growth in earnings. Second, an appropriate price-earnings ratio must be selected. Third, the firm's performance must be considered, as well as the market performance in the horizon period.

Some investors prefer to derive the value of a share using the EPS valuation model for a number of reasons: First,the returns due to shareholders are the net earnings of the firm; Second, the method is simpler and easier to work with, and lastly, it provides a method to deal with stock that do not pay dividends (Curley and Bear:1979). Despite its apparent simplicity, however, the difficulty in estimating price-earnings ratio should not be underestimated; the major determinants of P/E ratios like dividend payout, earnings growth, and earnings volatility cannot be easily forecasted. Another problem with earnings valuation method is the definition of income: the accountant's definition of income differs from that of the economist in that to the accountant, income is what has been earned while to the economist, income is the maximum amount which can be consumed by the owners of the firm in any period without decreasing their future consumption opportunities (Francis, 1980). This therefore calls for normalisation of accounting income to obtain as nearly as possible a consistently defined series of economic income. These normalized earnings are estimated to be the earnings that would be obtained at a normal level of economic activity if the company was experiencing normal operations - that is, operations not affected by such non- recurring items as strikes, natural disasters, and so forth (Malkiel and Cragg, 1970).

The question of whether investors place the emphasis on dividends or earnings per share cannot be easily resolved. Those for dividends argue that earnings are only a means to an end and thus a share derives its value from its dividends not its earnings. They argue that the existence of uncertainty about the future suffices to make the price of a share dependent upon the dividend policy which is followed: and that in particular, the more generous is the dividend policy, the higher will be the price of the share (Brennan 1971). That is, distributed earnings have had a greater weight in determining market prices than have retained and reinvested earnings. Others like Moses and Cheney (1989) argue that a dividend declaration has an information effect in the sense that management announces its expectations of future prospects by its dividend behaviour. By influencing shareholder expectations, value would also be influenced.

Some opponents of earning have also argued that earnings are inappropriate measure of economic returns because of its flexibility in choosing the accounting methods. Accounting earnings are a reflection of a series of more or less arbitrary choices of accounting methods (Friend & Puckett: 1964, Craig et al. 1987). A firm's reported earnings can be changed substantially by adopting different accounting procedures. A switch in the depreciation method used for reporting purposes directly affects earnings per share, for example. Yet it has no effect on cash flow, since depreciation is a non-cash change (The depreciation methods used for tax purposes does affect cash flow). Other accounting choices which affect reported earnings are the valuation of inventory, the procedures by which the accounts of two merging firms are combined, the choice between expensing or capitalizing research and development, and the way the tax liabilities of the firm are reported.

Earning per share, on the other hand, is considered a key variable in determining share prices and it is for this reason it has been studied extensively in the efficient market literature (Elton, Gruber and Gultekin, 1981). Proponents of earnings argue that the share value is determined solely by real considerations. In this case the earning power of the firms assets and its investment policy and not by how the fruits of the earnings are packaged for distribution. Bolton (1962) contends that the main ingredient of stock valuation is earning power and earnings help in understanding the nature of share values.

One of the earliest studies to investigate the reaction of security prices to unexpected changes in accounting income is that of Ball and Brown (1968). They found that 85 to 90 per cent of the information contained in the annual income statement had already been reflected in released to the public. This led them to conclude that accounting earnings had information content. This was an important conclusion because, at this time, many observers felt that it was unlikely for the products of the accounting process to be of any use.

Jahnke (1975) says that in essence prices reflect earnings expectations and expected rates of return. Brown (1978) argues that earnings per share information is central to the valuation of the equity securities. Therefore, the determination of market efficiency in assimilating earning per share information is especially important but unsettled. Based on the sample chosen, results indicated that the announcement of unusual earnings per share significantly affected share prices. More recently, Benesh and Peterson (1986:35) found out that "approximately 15 to 20 percent of the variation in individual security returns is explained by either actual or unexpected earning changes".

Miller and Modigliani (1961), in their classic article on dividend policy, put forth a very strong argument for the irrelevance of dividends. They argued that it does not matter whether one capitalizes dividends or earnings, since price changes in shares would discount earnings and potential dividends and since investors could elect to receive income either as dividends or by the sale of shares. This question is unresolved to the satisfaction of all parties, but the consensus appears to be that investors do purchase a stream of dividends (Van Horne, 1989).

In reality, however, it is generally accepted that dividend policy does matter. This is due to the presence of several factors including taxation effects, transaction costs, monopolistic effects in the markets for borrowing and investment, imperfect dissemination of information, indivisible investment opportunities and "irrational" behaviour (Wilkies, 1977). It is within this framework that the dividend discount model has a strong foundation for share valuation.

The dividend and earnings valuation methods of share valuation have not gained widespread or wholehearted acceptance by investors because of the choice of the required rate of return (Keane, 1976). Theoretically, such required rate of return or hurdle rate should be the opportunity cost of capital. It has been the most difficult variable to estimate (Amling, 1979). The required rate of return on an investment is determined by (1) the economy's real risk-free rate of return, plus (2) the expected rate of inflation during the holding period, plus (3) a liquidity premium, plus (4) a risk premium (Brigham and Gapenski,1991). The rate should fairly compensate investors for both delaying immediate consumption and accepting the risk inherent in the security (Radcliffe, 1982).

March and Shapira (1987) perceive risk as the distribution of possible outcomes, their distribution and their sujective values. This perception of risk compares well with Robichek (1969) definition of risk in the context of valuation as the possibility that actual returns may vary from expected returns. Robicheck says that risk and valuation are inseparable; they are two sides of the same coin. According to Bower and Bower (1970), the required rate of return depends on both the systematic or market-related risk of the stock and its unsystematic or residual risk. These two elements of risk are separated clearly when the return for a single stock is related to the return on the market portfolio of all stocks. They demonstrated that the impact of the residual risk on the required rate of return or discount rate was very small. As a result, systematic risk was seen as the most dominant determinant of the required rate of return unless residual variation is very, very large relative to market variation, a fact which has not yet found empirical support.

The market offers the investor a risk premium in excess of the riskless rate of return for taking this systematic risk. As pointed out by Weston and Copeland (1986:413)

> Because diversifiable risk can be eliminated at virtually no cost, the market will not offer a risk premium to avoid it.

or as Elton and Gruber (1981:278) put it:

> For very well diversified portfolio, non-systematic risk tends to go to zero and the only relevant risk is systematic risk...

The systematic risk in a well diversified portfolio is equal to the covariance between the security's return to those of the market divided by the market variance, σ_m. Then the systematic risk of security i can be written as:

Systematic risk = Cov(i,M)/σ_m

and this is referred to as the beta (B_i) of a security or portfolio. Formally, the beta can be expressed as:

$$\beta_i = \frac{Cov(i,M)}{\sigma^2} \qquad (5)$$

The required rate of return of a security can be calculated, once its

$$\beta_i = \frac{Cov(i,M)}{\sigma^2} \qquad (5)$$

beta is known, using the Security Market Line equation (Elton and Gruber 1981:282, Reilly 1992:580) which defines the line along which efficient portfolios would lie. The equation is usually given as:

$$E(R_i) = R_f + (E(R_m) - R_f)\,B_i \qquad (6)$$

where $E(R_i)$ = The required rate of return on security i

R_f = The risk free rate

$E(R_m)$ = The expected market return

β_i = The systematic risk of security i

The Security Market Line, also referred to as the basic Capital Asset Pricing Model (CAPM) can be used to value assets like ordinary shares. Equation (6) indicates that the required rate of return on an individual security is represented by a risk-free rate of interest plus a risk premium. Capital market theory shows the risk premium to be equal to the market risk premium, $E(R_m) - R_f$, weighted by the index of the systematic risk, β_i, of the individual security.

The β_i for an individual security reflects industry characteristics and management policies that determine how returns fluctuate in relation to variations in overall market returns (Weston and Copeland, 1986:432). If the general economic environment is stable, if industry characteristics remain unchanged and management policies have continuity, the measure of β_i of security i will be relatively stable when calculated for different time periods. However, if these conditions of stability do not exist, the value of β_i will vary.

All of the parameters of equation (6) except $ß_i$ are market- wide constants. If $ß_i$s are stationary across time, the measurement of the required rate of return is straight forward. This gives us numerical measures of the amount of the risk premium that is added to the risk-free return to obtain a risk- adjusted discount rate or the required rate of return. The risk- free rate and the market risk premium (The excess of the market return over the risk free rate) are economy-wide measures. They vary for different time periods but provide a basis for measurements that can be used in making judgmental decisions.

As indicated elsewhere in this section, the nominal rate of return on any security is determined by a function of four variables: the expected real rate of return over the life of the security, expected inflation, a liquidity premium, and a risk premium. The second term of equation (6) is the risk premium. The risk-free rate, R_f, includes:

R_f = f(expected real rate, expected inflation, liquidity)

In this way, the CAPM includes all the four elements of the required rate of return.

Since $ß_i$=Cov(R_m,R_i), equation (6) can be written as:

$$E(R_i) - R_f + Cov(R_m, R_i) \frac{[E(R_m) - R_f]}{\sigma^2} \qquad (7)$$

Because $E(R_m)$, R_f and σ_m are market constants, they can be replaced by λ in equation (7) to have:

$$E(R_j) = R_f + \lambda Cov(R_m, R_j) \qquad (8)$$

As equation (8) is an ex ante equlibrium model, a way has to be found of converting it into an ex post model. To do this, the concept of a fair game is introduced. This postulates that, on the average, what is expected will be obtained (Copeland and Weston, 1988:212). The model then becomes

$$R_j = R_f - \lambda Cov(R_m, R_j) \qquad (9)$$

$$Where \quad \lambda = \frac{R_m \; R_f}{\sigma^2}$$

For this model to be useful in our study, Beta must remain constant over time. Equation (9) can be substituted in equation (2) to replace K_e, that is, in the dividend valuation model to get the value of an ordinary share as follows:

$$P_0 = \sum_{t=1}^{n} \frac{D_t}{[(1+R_f+\lambda Cov(R_m, R_j)]^t} + \frac{P_n}{(1+R_f+\lambda Cov(R_m, R_j))^n} \qquad (10)$$

Thus the CAPM allows us to determine the appropriate discount rate for discounting expected dividends and terminal value to their present value. The rate used will be the risk-free rate plus a premium sufficient to compensate for the systematic risk associated with the expected returns i.e. the dividend stream and the terminal value.

However, one must be aware that the model has a number of simplifying assumptions. Some of these do not hold in the real world. To the extent that they do not, unique or unsystematic risk may become a factor affecting valuation. Nonetheless, the CAPM serves a useful framework for evaluating financial decisions. The basic tenets of the model hold even when assumptions are relaxed to reflect real-world conditions (Brigham & Gapenski 1991:77)

Assuming the basic CAPM on the Nairobi Stock Exchange (NSE), Omosa (1989) used both the dividends and earnings valuation methods to predict the ordinary share prices. Both the basic CAPM and the accounting rate of investment were used to derive the discounting factors. She found out that the basic CAPM model was a poor predictor of share prices on the NSE. She attributed this to, among other factors, inefficiencies and imperfections in the market, and inappropriate discount factors. This can probably be attributed to two factors, namely (1) the beta values that were used in the basic CAPM and (2) the usage of accounting based rate of investment (ROI). The betas that were used were those derived by Parkinson (1987) when he attempted to find out the relationship between excess company return and excess market return using simple linear regression. He found out that the relationship was significantly low, never exceeding 23%. He rejected the linear pricing of risk in the CAPM. Since the major purpose of Parkinson's study was to test the market efficiency, the beta values he derived were unlikely to estimate the riskness of each company.

Further, the accounting based measure of risk, that is the rate of investment (ROI) used by Omosa (1989) may have been an inappropriate measure of risk for each of the company studied for a number of reasons. First, ROI mathematically expressed as the ratio of net income to the total investment in assets has been criticized as bearing little if any relationship to economic returns (Aakar and Jacobson, 1987). Second, it has been criticized on the basis that it does not properly relate a stream of profits to the investment that produced such profits. This is because the earnings used in the ROI formula are a consequence of investment decisions made in the past whereas the assets figure (the denominator) can be expected to not only have influenced past and current earnings but also future earnings as well. The result is a mismatch between earnings and the investment producing such earnings which renders the ROI invalid as a proxy for risk. A third criticism against accounting ROI is that it is very sensitive to accounting policies which have nothing to do with economic developments or realities (Weston and Bringham, 1978). The value of ROI will therefore be affected with such accounting policies as depreciation, amortisation and the valuation policies for the assets and liabilities (Craig et al. 1987). Such policies are often changed to meet variuos goals among them being to portray a better level of economic performance than would otherwise be under existing policies. It is in recognition of the diversity of these policies and the distortion that they cause in the communication of economic information that acounting standards are established and enforced by accounting authorities worldwide. Needless to say, even after the standardisation of accounting practices, ROI remains a poor indicator of economic returns.

This study focused on the dividend valuation model for a number of reasons. First, it is intuitively appealing as dividends are indeed the flow of returns received. Secondly, there is no sound methodology for evaluating the price-earnings ratio which in essence is the reciprocal of the required rate of return. As growth and risk elements are recognized, together with other variables which may have impact on it, the price-earnings multiples tends to become very complex. Thirdly, the dividend valuation model has been used extensively by others. There is evidence that more complex dividend valuation models improve accuracy of the forecast and therefore are very useful in selecting shares (Fuller and Chi-Cheng 1984, Sorenson and Williamson 1985, Reilly:1992). Finally, it has been argued that the dividend valuation model provides a consistent and plausible framework for imbedding analysts' judgements of share value (Michaud and Davis, 1982). They say that the discipline implicit in the model, requiring considerations of current price and future cash flows, earnings etc., may lead to improved security valuation. The forecast dividends are often not intended as literal forecasts of future dividends but as the vehicle for analysts' valuation judgement. As a qualification of security value, the discount valuation model is often a first and critical step in a quantitative investment management program.

The basic CAPM was used to derive the required rate of return for each of the companies to be studied. The beta values were computed using the market model. Forces within the economy and the stock market have a common and significant influence on changes in the prices of many if not all stocks. It has been found that price changes in most stocks have some degree of sensitivity or responsiveness to broad market forces and that this same degree of sensitivity tends to persist overtime (Blume, 1971). The term degree of sensitivity to the general market means the degree of magnitude of change in the price of a given stock associated with a concurrent change in the general price level of the stock market. According to standard statistical procedures, this relationship may be expressed by the following simple linear regression equation:

$$E(R_i) = a_i + B_i R_m - e_i \qquad (11)$$

where $E(R_i)$=average monthly rate of return of a given share i

$_i$ = alpha regression coefficient, a constant.

β_i = Beta, the market sensitivity of share i.

R_m = monthly rate of return of a Nairobi Stock Exchange index.

E_i = random variable representing the variability in $E(R_i)$ that is not associated with variations in R_m.

Equation (11) is the market model. The beta coefficient of the market model has gained wide acceptance as a relevant measure of risk in portfolio and security analysis (Klemkosky and Martin, 1975). An essential prerequisite for using beta to assess future portfolio risk and return is a reasonable degree of predictability over future time periods. Customarily, beta is estimated from past data by least-squares regression procedures (Oldrich, 1973). The least-squares techniques consists of fitting a linear relationship between the rates of return on market index and the rate of return on individual securities, so that the sum of squared differences between the security's actual and those implied by the relationship is minimized.

1.2 Statement of the problem

Investing in ordinary shares involve expected cashflows and stated market prices and one must evaluate the market prices and determine if they are consistent with his required return. To do this, one must estimate the values of the securities based upon the expected cashflows and his required rate of return.

The main problem which this study addresses is that of testing the dividend valuation model of share valuation on the Nairobi Stock Exchange (NSE). In general the null hypothesis tested was:

> **H_o: There is no significant difference between the actual share prices and predicted share prices using the dividend valuation model.**
>
> **H_1: There is a significant difference between the actual and predicted share prices using the dividend valuation model.**

1.3 Objectives of the study

The objectives of this study were:

(a) To use the dividend valuation method to predict share prices for ordinary shares for selected companies listed in the NSE.

(b) To test the above predictions by comparing these prices with actual prices.

1.4 Motivation for the study

The ability to predict future share prices is an issue which has tended to occupy a central position in the minds of investors in their attempt to maximize return from their investment in corporate shares (Van Horne 1989:26). They must ensure that they receive their required return on an investment. This can only be done by estimating the value of the investment at the required rate of return and then comparing this estimated value to the investment's prevailing market price. It is my interest therefore to test whether the results of using the Dividend Valuation model on the ordinary shares are reliable.

The issue of share valuation is a particularly important one in our Kenyan economy because of the on-going privatisation of state corporations. The determination of the share price to be offered to the public is not an easy task. It is hoped that this study can bring into focus the variables of most importance during the investment valuation process either by way of literature review or by the study itself.

Lastly, it is also hoped that such study can stimulate further research in this area.

CHAPTER TWO

LITERATURE REVIEW

2.1 Approaches to Valuation

There are essentially three main main schools of thought on the matter of security value and the Behaviour of security prices (Fisher & Jordan, 1975). These include (1) Fundamentalists, (2) Technicians, and (3) Random-walk theorists. Fundamentalists argue that, at any time, the price of a security is equal to the discounted value of the stream of income from the security; that in the main, price is a function of a set of anticipated returns and anticipated capitalization rates corresponding to future time. Prices change as anticipations change. Reilly (1992:610) says fundamental analysts believe that at any time, the aggregate stock market, various industries, or individual securities have basic, intrinsic values and that these values depend upon underlying economic factors. Investors must therefore determine the intrinsic value at a point in time by examining the variables that determine value such as current and future earnings, interest rates, and risk variables.

Technical analysis stands on the assumption that the value of a share is primarily dependent upon supply and demand, having very little to do with such things as earnings and dividends. They base their trading decisions on examinations of prior price and volume data to determine past market trends, from which they predict future behaviour for the market as a whole and for individual securities (Levy 1966:33). Underlying supply and demand are influenced by rational and irrational forces. Information, moods, opinions, and guesses (good and bad) as to the future intermix. Disregarding minor fluctuations, prices move in trends which persist for an appreciable length of time. Technical analysis focuses upon the study of the stock market itself and not upon external factors (such as economic conditions) which influence the market. External factors are presumed to be fully reflected in share prices and the volume of the stock exchange trading. Thus all information for analyzing and predicting stock price behaviour is assumed to be provided by the market itself.

Random-Walk theorists are directly at odds with the technicians. They argue that one cannot forecast future share prices on the basis of past history alone. They contend that securities markets are perfect, or at least, not too imperfect. In such a market, security prices should reflect all the information available to market participants and all price changes should be independent of any past history about a company that is generally available to the public (Jensen and Benington:1970, Fama:1970,1991). This has been eloquently stated by Pinches (1970) as follows:

> "...when statisticians hypothesize that the course of stock prices describes a random walk, they do not imply that a skilled student of the subject cannot forecast price changes. They merely imply that one cannot forecast the future based on past history alone".

In this form, the random walk theory implies that all past data of a technical nature should be irrelevant in attempting to forecast future price movement.

The technical analysis contrasts sharply with the fundamental analysis. It also contradicts the random walk theory which contends that past performance has no influence on future performance or market values. While the economic data that fundamental analysts consider are usually independent of the market, the technical analysts uses data from the market itself believing that the market is its own predictor.

The major challenge to technical analysis is based on the random walk theory. It has been argued that technical trading rules can generate superior returns with similar risk after transaction costs only when the market is slow to adjust prices to the arrival of new information, that is, when it is inefficient (Reilly, 1992:413). The vast majority of studies that have tested the weak-form efficient market hypothesis have found that prices adjust rapidly to stock market information, supporting the random walk theory (Fama:1970, 1991).

Most security analysts are in support of fundamental analysis (Reilly, 1992:359). Even the technical analysts admit that a fundamental analyst with good analytical ability, and a good sense of information's impact on the market should achieve above-average returns. According to technical analysts, the fundamental analysts can experience superior returns only if they obtain new information before other investors and process it correctly and quickly. However, they argue that it is not possible for an investor to consistently get new information and process it correctly and quickly.

Investors who engage in fundamental analysis believe that occasionally, for short periods of time, market prices and intrinsic value differ, but eventually investors recognize any discrepancy and correct it. As indicated elsewhere in this paper, one has to carry out the market, industry and the economy analysis in order to derive the intrinsic value. The random walk theory does not contradict the value of such analyses, but implies that one needs to both understand the variables that affect returns and do a superior job of estimating movement variables. To demonstrate this, Malkiel and Cragg (1970) developed a model that did an excellent job of explaining past stock price movements using historical data. When it was employed to project future stock price changes using past company data, however, the results were consistently inferior to those of a buy-and-hold policy. This implies that, even with a good valuation model, investors cannot select stocks using only past data.

Another study by Benesh and Peterson (1986) showed that the crucial difference between the stocks with the best and worst price performance during a given year was the relationship between earnings expected by professional analysts and actual earnings; if actual earnings substantially exceeded expected earnings, stock prices increased, and prices fell when earnings did not reach expected levels. Thus, if one can do a superior job of projecting earnings and his expectations differ from the consensus, he will probably have a superior stock selection record.

In short, all forms of fundamental analysis are useful, but they are difficult to implement because they require the ability to estimate future values for relevant economic variables. In doing a fundamental analysis, that is, estimating the relevant variables, the security analyst should know that it is as much an art as a science. The superior analyst or successful investor must understand what variables are relevant to the valuation process and have the ability to do a superior job of estimating these variables.

2.2 The effect of dividends on share prices

Share valuation is an attempt to develop a mathematical formulation of the variables (and their relationships) that determine value. Numerous studies have been done in this area as noted by Keenan (1970)

> "...over one hundred doctoral dissertations have now been written in this area and probably an even greater number of master's theses. Researchers at dozens of academic institutions and a comparable number of private organizations have spent thousands of man hours and millions of dollars in trying to find the determinants of equity value".

Most of these studies had the main objective of finding the determinants of share prices. In this study, we have assumed that the value of a share is determined by its dividend policy. The impact of a firm's dividend policy on its value is an unresolved issue. We will therefore re-examine the position as to whether dividends really affect share prices.

Williams (1938) and Gordon (1962) developed a model relating an equity's value to its dividend income. They hypothesized that the present value of a share of stock is equal to the summation of all dividends expected to be received from it and its terminal value, discounted to the present at an appropriate rate of interest. They argued that tangible income to the investor, dividends, was the only appropriate base for consideration in the valuation of shares.

The logical question to be raised concerning the dividend model is why do the shares of companies that pay no dividends have positive, often quite high values? Answering this question, Van Horne (1989) notes that investors expect to be able to sell the stock in the future at a price higher than they paid for it. Instead of dividend income plus terminal value, they rely only on terminal value. In turn, terminal value will depend on the expectations of the market place at the end of the horizon period. The ultimate expectation is that the firm eventually will pay dividends, broadly defined, and that future investors will receive a cash return on their investment. In the interim, however, investors are content with the expectation that they will be able to sell the stock at a subsequent time because there will be a market for it. In the meantime, the company is reinvesting earnings and, it is hoped, enhancing its future earning power and ultimate dividends.

Miller and Modigliani (1961), in their classic article on dividend policy, put forth a very strong argument for the irrelevance of dividends. They point out that if the corporation does not let its dividend policy affect its investment decisions, and if we ignore taxes and transaction costs, a corporation's dividend policy should not affect the value of its share at all. They argue that the price of the dividend-paying stock drops on the ex-dividend date by about the amount of the dividend. The dividend just drops the whole range of possible stock prices by that amount. This, in essence, is the Miller and Modigliani theorem. It says that the dividends a corporation pays do not affect the value of its shares or the returns to investors, because the higher the dividend, the less the investor receives in capital appreciation, no matter how the corporation's business decision turns out.

Challenges to the dividend irrelevance proposition have focused on imperfections. This includes the presence of several factors including taxation effects, transaction costs, monopolistic effects in the markets for borrowing and investment, monopolistic dissemination of information, indivisible investment opportunities and "irrational" behaviour (Wilkies, 1977). In our analysis, we will focus on two of the factors that have been put forth in favour of relevance of dividends in determining share prices. These are (1) that dividends usually have some information content, and (2) the effect of taxation on dividend income and capital gains.

Some people have argued that information is conveyed from a corporation's top management to its shareholders through the firm's dividend policy. Dividend changes, or the fact that the dividend doesn't change, may tell investors more about what the managers really think than they can find out from other sources. Thus, investors will interpret an increase in current dividend payout as a message that management anticipates permanently higher levels of cashflows from investment. One may therefore expect to observe an increase in share prices associated with public announcement of a dividend increase. These share price changes are permanent if the company in fact does as badly, or as well, as the dividend changes indicated (Black, 1976).

A number of empirical studies have examined whether dividends contain information. The first study to look at this issue was the stock split study of Fama, Fisher, Jensen, and Roll (1969) as cited in Fama(1976). They found that when splits were accompanied by dividend announcements, there was an increase in adjusted share prices for the group that announced dividend increases and a decline in share prices for the dividend decrease group. Other studies of the effect of unexpected dividend changes on share prices have been made by Pettit (1972), Watts (1973), Kwan (1981) and Ahorony and Swary (1980) .

Watts(1973) found a positive dividend announcement effect but concludes that the information content is of no economic significance because it would not enable a trader with monopolistic access to the information to earn abnormal returns after transaction costs. On the other hand, Pettit (1972) found a clear support for the proposition that the market uses dividend announcements as information for assessing security values.

Pettit's results have been criticized because he used the observed dividend changes rather than the unexpected dividend changes. Kwan (1981) has improved on Pettit's design by forming portfolios based on unexpected dividend changes and he found statistically significant abnormal returns when firms announce unexpectedly large dividend changes. A study by Aharony and Swary (1980) separates the information content of quarterly earnings reports from that of unexpected quarterly dividend changes. They examined only those quarterly dividend and earning announcements made public on different dates within any given quarter. Their findings support the hypothesis that changes in quarterly cash dividends provide useful information beyond that provided by corresponding quarterly earning numbers. Others like Kane, Lee, and Marcus (1984) provide empirical findings that confirm the earlier studies that found that both earnings and dividend announcements have a significant effect on share price, and in addition they find a significant corroboration effect.

Asquith and Mullins (1983) studied the effect on shareholders' wealth of the initial dividend announcement - the firm's first dividend. They found a statistically significant two-day announcement abnormal returns for initial announcements. The abnormal volume increases during the announcement week that are related to the information content of dividend. However, this provides a weak support for clientele adjustments.

In sum the evidence in support of the information content of dividends is overwhelming. Unexpected dividend changes do convey information to the market about expected future cash flows. However, as Black (1976) pointed out, the fact that dividend changes often tell us things about corporations making them, does not explain why corporations pay dividends. Ross (1977) argues that an increase in dividend payout is an unambigous message because (1) it cannot be mimicked by firms that do not anticipate higher earnings and (2) management has an incentive to "tell the truth". The dividend per se does not affect the value of the firm (Copeland and Weston, 1988:584). Instead it serves as a message from management that the firm is anticipated to do better. If dividend changes are to have an impact on share values, it is necessary that they convey information about future cashflows, but it is not sufficient. The same information may be provided to investors via other sources.

The only serious challenge to those who believe that dividend policy does not matter comes from those who stress the tax consequence of a particular dividend policy. This is because the tax effect has some portfolio implications for the investor.

Dividends income is taxed at a higher rate than capital gains, and this suggests a negative wealth impact. Even MM freely state that "the tax differential in favour of capital gains is undoubtly the major systematic imperfection in the market." This implies that the existence of differential taxes on income and capital gains should make the shares of corporations that pay low dividends more desirable, and thus that corporation can increase the value of its shares by reducing its payout ratio. Nevertheless, MM still conclude that dividend policy has no effect on share values. They say (MM, 1961:431)

"If, for example, the frequency distribution of corporate payout ratios happened to correspond exactly with the distribution of investor preferences for payout ratios, then the existence of these preferences would clearly lead ultimately to a situation whose implications were different in no fundamental respect from the perfect market case. Each corporation would tend to attract to itself a 'clientele' consisting of those preferring its particular payout ratio, but one clientele would be entirely as good as another in terms of the valuation it would imply for the firm"

This implies that if a corporation could increase its share price by increasing (or decreasing) its payout ratio, then many corporations would do so, which would saturate the demand for higher (or lower) dividend yields, and would bring about an equilibrium in which marginal changes in a corporation's dividend policy would have no effect on the price of its stock. This will be true even if we take into account all kinds of "institutional factors" such as differential taxes on income and capital gains, and trust instruments that allow only the dividends from common stock held in trust to be distributed to the income beneficiary.

MM therefore suggested that the clientele effect is a possible explanation for management reluctance to alter established payout ratios because such changes might cause current shareholders to incur unwanted transaction costs.

Elton and Gruber (1970) as cited in Copeland and Weston (1988:579) attempted to measure clientele effects by observing the average price decline when a stock goes ex-dividend. They argued:

"...the lower the firm's dividend yield the smaller the percentage of his total return that a stockholder expects to receive in the form of dividends and the larger the percentage he expects to receive in the form of capital gains. Therefore, investors who held stocks which have high dividend yields should be in low tax brackets relative to stockholders who hold stocks with low dividend yield" (Elton and Gruber, 1970)

They found out that the implied tax bracket decreases when dividend payout increases. They concluded that the evidence suggest that Miller and Modigliani were right in hypothesizing a clientele effect.

This clientele theory has been tested by a number of researchers by looking directly at the relationship between dividend payout and the price per share of equity. These include Friends and Puckett (1964), Black and Scholes (1974), and Litzenberger and Ramaswamy (1982).

Friend and Puckett (1964) used cross-sectional data to test the effect of dividend payout on share value. Prior to their work, most studies had related stock prices to current dividends and retained earnings, and reported that higher dividend payout was associated with higher price-earnings ratios (Copeland and Weston, 1988:588). The "dividend multiplier" was found to be several times the "retained earnings multiplier". The usual cross-section was

$$P_{it}=a+bDiv_{it}-cRE_{it}+E_{it} \qquad (12)$$

Div_{it} = Aggregate dividend paid out.

RE_{it} = Retained earnings.

E_{it} = The error term.

Friend and Puckett criticized the above approach on three major points. First, the equation is misspecified because it assumes that the riskiness of the firm is uncorrelated with dividend payout and price-earnings ratios. Consequently, the omission of a risk variable may cause an upward bias in the dividend coefficient in equation (1). Second, there is no measurement error in dividends, but there is considerable measurement error in retained earnings. They argued that accounting measures of income often imprecisely reflect the real economic earnings of the firm. The measurement error in retained earnings will cause its coefficients to be biased downward. Third, Friend and Puckett argue that even if dividends and earnings do have different impacts on share prices, we should expect their coefficients in (1) to be equal. In equilibrium, firms would change their dividends payout until the marginal effect of dividends is equal to the marginal effect of retained earnings. This will provide the optimum effect on their price per share.

No theory had been developed to allow the pricing of risk when they wrote their paper, but Friend and Puckett were able to eliminate the measurement error on retained earnings variable based on a time series fit of the following equation:

$$\frac{\left(\frac{NI}{P}\right)_{it}}{\left(\frac{NI}{P}\right)_{kt}} = a_1 - b_1 t + e_{it} \qquad (13)$$

where $(NI/P)_{it}$ = the earnings/price ratio for the firm

$(NI/P)_{kt}$ = the average earnings/price ratio for the industry

e_{it} = the error term.

When normalized retained earnings were calculated by substracting dividends from normalized earnings and then used in equation (1), the difference between the dividend and retained coefficient was reduced.

Black and Scholes (1974) used the capital asset pricing theory to control for risk. Their conclusion is quite strong:

> "It is not possible to demonstrate, using the best empirical methods, that the expected returns on high yield common stock differ from the expected returns on low yield common stocks either before or after taxes."

They pointed out that the assumption that capital gains tax rates are lower than income tax rates does not apply to all classes of investors. Some classes of investors might logically prefer high dividend yields. They include: (1) corporations, because they usually pay higher taxes on realized capital gains than on dividend income; (2) certain trust funds in which one beneficiary receives the dividend income and the

other receives capital gains; (3) endowment funds from which only the dividend income may be spent; and (4) investors who are spending from wealth and may find it cheaper and easier to receive dividends than to sell or borrow against their share. Alternatively, investors who prefer low yield will be those who pay higher taxes on dividend income than on capital gains. They argue that with all these diverse investors, it is possible that there are clientele effects that imply that if a firm changes its dividend payout, it may lose some shareholders, but they will be replaced by others who prefer the new policy. Thus dividend payout will have no effect on the value of an individual firm.
Litzenberger and Ramaswamy (1982) also tested the relationship between dividends and security returns. They concluded that risk-adjusted returns are higher for securities with higher dividend yields. This implied that dividends are undesirable; hence higher returns are necessary to compensate investors in order to induce them to hold high dividend yield stocks.

Theoretically, a rational investor should choose a dividend policy for his portfolio that will maximize his after-tax expected return for a given level of risk. This implies that a taxable investor, especially one who is in high tax bracket, should emphasize low dividend stocks while a tax exempt should emphasize high dividend stock. One problem with this strategy is that an investor who emphasizes a certain kind of stock in his portfolio is likely to end up with a less well-diversified portfolio than he would otherwise have. Black an Scholes (1974) showed that it is not as possible to construct a high yield portfolio whose returns are perfectly correlated. There are systematic differences between high yield and low yield stocks that ensure that an investor who concentrates his portfolio in high stocks (or low stocks) will hold a portfolio that is not a well diversified as a portfolio that could be constructed containing both high and low yield stocks. This means that an investor has no incentive to slant his portfolio towards one particular group of stocks and will, therefore, invest in a well-diversified portfolio of high- and low-yield stocks.

The tax argument against high payouts is persuasive, but its advocates have so far failed to answer an important question: If generous dividends lead to generous taxes, why do companies pay such dividends? (Brealy, 1981). It is difficult to believe that companies are really foregoing such a simple opportunity to make their shareholders better off. Maybe there are offsetting advantages to dividends that we have not considered, or perhaps investors have ways to get round those extra taxes.

The answer to the above question, is to test whether high yielding stocks offer higher returns. However, the empirical tests cited above do not show whether investors who prefer dividends or investors who avoid dividends have a stronger effect on the pricing of securities. If investors do demand dividends, then corporations should not eliminate all dividends. As Black (1976) noted, it is difficult or impossible to tell whether investors demand dividends or not. So it is hard for a corporation to decide whether to eliminate its dividends or not.

From this point of view, it seems that either corporations or investors are not acting rationally. Either investors are demanding dividends in spite of the cost in terms of higher taxes, or corporations are failing to reduce their dividends, even when this would increase the price of their share because of increased demand by tax-paying investor.

Summary and conclusion

It is difficult to summarize the dividend puzzle, and harder still to draw firm conclusions. As Black (1976) noted, "the harder we look at the dividend picture, the more it seems like puzzle, with pieces that just don't fit together".

There is now substantial agreement within the academic community, based on many careful, scientific statistical studies, that there is no systematic, exploitable relation between a firm's dividend policy and the value of its shares. That value is governed by its earnings or, more precisely, by its earning power. It is really only the earnings that ultimately matter. In a world of rational expectations, unexpected dividends provide the market with clues about unexpected changes in earnings. And these in turn trigger off the price movements that look like responses to the dividends.

On the other hand, there are empirical tests that tend to indicate an adverse tax effect on stock prices from higher dividends. In setting the target payout, therefore, one should not dismiss entirely the tax argument against generous dividends. At the very best, management should adopt a target payout that, on the basis of its future capital requirements, is sufficiently low to minimize its reliance on external equity. In addition, the target payout should probably recognize that surplus funds can better be used to repurchase stock than to pay dividends.

There is little doubt, however, that sudden changes in dividend policy can cause dramatic changes in stock price. The most plausible reason for this reaction is the information investors read into dividend announcements. It is therefore important to define the firm's target payout as clearly as possible and to avoid unexpected changes in dividends. If it becomes necessary to make a sharp change in the level of the dividends, or in the target payout ratio, management should provide as much forewarning as possible, and take considerable care to ensure that the action is not misinterpreted.

2.3 Valuation of new issues

Since the issue of privitisation of government corporations is a hot topic in Kenya, we have deemed it appropriate to discuss briefly on how the theory of share valuation using the fundamental analysis can be used to determine the prices to be offered to the general public for subcription.

In theory, the equity valuation model developed previously can be applied to unseasoned new issues: where a firm offers ordinary shares to the general public for the first time. Basically, the valuation process is the same as that of any other company. As indicated by Reilly (1973), the price of a firm's share is influenced by all factors that affect the expectations of the firm and its share. While some of the factors influencing expectations are unique to a firm and its securities, the factors exerting the greatest influence on expectations, and therefore on share price changes, are those factors affecting an entire industry or affecting an entire economy. For this reason, Reilly (1992) recommends a three-step valuation process:

(1) Examining the influence of the general economy on all firms.

(2) Analysing the prospects for various industries in this economic environment, and finally
(3) Analysing individual firms in chosen industries.

There are general economic factors that by their very nature exert a force on all industries in the economy. These include monetary and fiscal policies, political upheavals in foreign countries or international monetary devaluating. Monetary and Fiscal policy measures enacted by various agencies of national governments influence the aggregate economies of those countries. The resulting economic conditions influence all industries and all companies within the economy. A number of models have been developed which have found an important linkage between the money supply and the level of share prices (Hamburger and Kochin, 1972; Homa and Jaffee, 1971; and Kraft and Kraft, 1977). Also Chen et al. (1986) found out that inflation, industrial production, risk premium, and the slope of the term structure of interest rates are the main factors that affect expected returns. These factors produce changes in the business environment that add to the uncertainty of sales and earning expectations, and therefore the risk premium required by investors.

Security analysts should also be able to identify industries that will prosper or suffer in the projected aggregate economic environment. In general, an industry's prospects within the global business environment determine how well or poorly an individual firm will fare; so industry analysis should precede company analysis. Few companies perform well in poor industries, so even the best company in a poor industry is a bad prospect for investment.

After determining that an industry's outlook is good, an investor can analyse and compare individual firms' performance within the entire industry using financial data (Page and Paul, 1979). In practice, this will prove to be difficult for those firms offering ordinary shares to the general public for the first time because financial data provided in the prospectus are likely to be limited to a short period of time. This does not imply that the models of share valuation should be abandoned because that would result in an arbitrary investment decision

(McDonald and Fisher, 1972). But it does suggest two modifications of the analytical procedure which recognise forecasting uncertainty and taxes.

First, it is probably a good strategy to minimize the assumed holding period, limiting it initially to one year or less. The forecasting error is likely to be large for any new firm in a stage of high anticipated growth where the time series of financial data is limited. In addition, unseasoned new issues differ from other securities when they are subsequently traded in the secondary after-market (Reilly and Hatfield, 1969). By definition, investors who purchase new issues in a primary market are in short term capital gain or capital loss position for the next 12 months (McDonald and Fisher, 1972_). If the stock does poorly, investors will be motivated to sell the shares within a year to take advantage of the short-term capital loss; if it does well, they will be motivated to hold for at least one year to take advantage of the long-term capital gain. Timing, therefore, becomes critical in the case of a new issue and the problem is especially important as the anniversary of the original floatation nears.

Second, particular attention should be directed to the question of risk. While this is always important in equity valuation, it is particularly critical in the case of new issues. Given inadequate data, statistical estimates of dispersion are likely to be unreliable. For that reason, it is useful to experiment with forecast values in order to evaluate the degree of error required to break even and/or result in a given loss. This type of sensitivity analysis is simple but an effective tool for assessing downwide risk. In the case of an unseasoned firm where dividends are unlikely, and assuming a one-year holding period, expected rate of return depends on the price-earning ratio and earnings per share, together with any assumed relationship between them (McDonald and Fisher, 1972). These variables can be changed systematically and the effect on the rate of return can then be observed.

Lastly, it is important to remember that ordinary share valuation is essentially an art, not a science. As Benesh and Peterson (1986) noted, the success of the valuation process depends on the skills of the analyst in making accurate forecast and using an appropriate model. However, the possibility of inaccurate data should be obvious in the valuation model (Brennan, 1973) Any estimates (i.e. growth rates, the expected return on the market, the beta coefficient) may be incorrect, in which case the resulting valuation would be incorrect. This does not mean that the use of models in financial decision making is undesirable. Without such models there would be no means to value an asset. Hunches, intuition, or just plain guessing would then be used to value and select assets. By using theoretical models, the financial manager is forced to identify real economic forces (e.g. earnings and growth rates) and alternatives (e.g. the risk free rate and the return earned by the market as whole).

CHAPTER THREE 3

RESEARCH DESIGN

3.1 POPULATION

The population for the study was all the companies quoted at the Nairobi Stock Exchange (NSE) as at 31st December 1988. The study covered only those companies that trade in ordinary shares and therefore exclude those trading exclusively in preferred shares.

3.2 SAMPLING PLAN

Companies listed at the NSE continuously for ten years to 31st December 1988 were included in the sample. The assumption made here is that investors require about five years to assess the risk of a certain stock. The study covered five years to December 1988. The five year period was chosen so as to fall within the period used in a previous study (Muli, 1991). Muli's study dealt with estimation of systematic risk for the Nairobi Stock Exchange and his findings, especially the market portfolio beta and the percentage of diversification of the total unsystematic risk, are crucial to this study. The assumption that the market portfolio beta is approximately 1 can only be assured by using the period that was used to estimate the beta. He estimated the market return to be nearly six per cent. With one-year Government of Kenya Treasury Stocks having a coupon rate of 15 per cent (July, 1991 issue), a market return of 21 per cent was used in the CAPM.

Stratified sampling was employed to select an appropriate sample for the study. The quoted companies on the NSE were stratified into two groups: The actively traded and the non- actively traded companies. Stratifying minimizes differences among sampling units within strata, and maximizes differences among strata. Stratifying was done by observing changes in the shares' prices and the rate of buying and selling using the daily price lists supplied by NSE secretariat. Thirteen companies were classified as actively traded and that constituted our sample (see Appendix 1). The first five months of 1989 will be used to test the predictive ability of the model. This period was chosen because it was expected that over such period the parameters involved were almost constant.

3.3 DATA COLLECTION

Data required was collected from the NSE in the form of secondary data. In particular, Bid prices were used in all cases. There are three reasons for using bid prices. First, transaction prices were not recorded in a consecutive order and therefore there was no rationale for a particular transaction to be picked. Second, mid-market prices (the bid offer averages) were not used due to possible bid-offer spread effect (West, 1986:33). Third, a pilot survey conducted by the researcher showed that actual transactions occur at either the bid or close to it most of the time. This implies that there were 120 data points for each company. The annual dividends per share were be used as monthly dividends per share. This is because an investor's reaction to these figures is the same irrespective of whether they are looked at from a monthly or annual point of view.

3.4 DATA ANALYSIS

As indicated elsewhere in this paper, the price of a share is viewed as the present value of expected dividends in each period, $E(D_t)$, to some time horizon, n, plus the present value of the expected share price at the time horizon, $E(P_n)$. The discount rate or the required rate of return, K_e, is assumed to be constant and to include an appropriate premium for risk.

$$P_0 = \frac{D_1}{(1-K_e)} + \frac{D_2}{(1-K_e)^2} + \ldots + \frac{D_t}{(1-K_e)^t} + \frac{(D_n+P_n)}{(1-K_e)^n} \qquad (14)$$

This model provides the variables to be estimated so that the model can be tested. These variables are the expected dividend, $E(D_t)$, the expected terminal price, $E(P_n)$, and the required rate of return, K_e. These expected values are, however, non- observable. The dividend valuation model presents a formal notation for the statement that share prices depend on expected returns, but this is not sufficient to make the statement testable. The model lacks a more detailed specification of the link between expected values and real values. Therefore, a model of equilibrium is required to provide a link between the expected values which are non-observable and the real values that can be used in the model. In particular, such model would improve our understanding on how prices are formed in the real-world.

Since any test in finance is simultaneously a test of efficiency and of assumptions about the characteristics of market equilibrium

(Fama,1976:137), we used a model of market equilibrium that has been used to test for market efficiency. This model is called the market model. It assumes that the joint distribution of security returns is multivariate normal.

To understand this model, the following symbols are defined:

ϕ_{t-1} = the set of information available at time t-1, which is relevant for determining security prices at t-1.
ϕ^m_{t-1} = the set of information that the market uses to determine security prices at t-1. Thus ϕ^m_{t-1} is a subset of ϕ_{t-1};ϕ^m_{t-1} contains at most the information in ϕ_{t-1}, but it could contain less.
$P_{j,t-1}$= price of security j at time t-1, j=1,2,......n, where n is the number of securities in the market.
$f(P_{1,t+i},....P_{n,t+i}|\phi^m_{t-1})$ = the joint probability density function for security prices at time t+i>=0 assessed by the market at time t-1 on the basis of the information ϕ^m_{t-1}.
$f(P_{1,t+i},....P_{n,t+i}|\phi_{t-1})$ = the "true" joint probability density function for security prices at time t+i(i>=0) that is "implied by" the information ϕ_{t-1}.
R_{jt} = the return on security j from time t-1 to time t.
R_{mt} = the average of the returns on these stocks from t-1 to t.

This model is presented here as explained by Fama,1976:151-166.

In any model of price formation like the market model, at any time t-1 the "market" assesses a joint distribution for security prices at time t,$f_m(P_{1t},...P_{nt}|\phi^m_{t-1})$ on the basis of the information ϕ^m_{t-1}. From this assessment of the distribution of prices at t, the market then determines appropriate current prices, $P_{1,t-1},....P_{n,t-1}$, for individual securities.

The market model assumes that the true joint distribution of the prices of different securities at time t, $f(P_{1t},...P_{nt}|\phi^m_{t-1})$ is multivariate normal and thus the joint distribution of security returns,

$f(R_{1t},...R_{nt}|\phi_{t-1})$ is also multivariate normal. If one takes the bivariate normality of R_{it} and R_{mt}, that is, the regression function of R_{it} on R_{mt}, the expected value of R_{it} conditional on R_{mt}, is

$$E(R_{it}|R_{mt})=a+B_iR_{mt},\ t=1,2,..T \qquad (15)$$

with $B_i=Cov(R_{it},R_{mt})/\sigma(R_{mt})$ and

$a=E(R_{it}|\phi_{t-1})-B_iE(R_{mt}|\phi_{t-1})$, $t=1,2,...T$

The return on security j from time t-1 to time t is

$$R_{jt}=\frac{(P_{jt}-P_{j,t-1})}{P_{j,t-1}} \qquad (16)$$

If the joint distribution of security returns, $f(R_{1t},...R_{nt}|\phi_{t-1})$ is multivariate normal, the market model will be

$$E(R_{jt}|\phi_{t-1},R_{mt})=a+B_jR_{mt} \qquad (17)$$

with $B_j=Cov(R_{jt},R_{mt})/\sigma(R_{mt})$ and

$a=E(R_{jt}|\phi_{t-1})-B_jE(R_{mt}|\phi_{t-1})$, $t=1,2,...T$

The return on security j at time t will not, of course, be equal to its conditional expected value as given by equation (17). The return at t can be described in terms of the market model equation

$$R_{jt}=a+\beta_jR_{mt}+e_{jt} \qquad (18)$$

where the disturbance E_{jt} is the deviation of R_{jt} from its conditional expected value, and equation (13) implies

$$E(e_{jt}|\phi_{t-1}, R_{mt}) = 0.0 \qquad (19)$$

In economic terms, $f(R_{mt}|\phi_{t-1})$ is presumed to capture the uncertainty at time t-1 about information that will become available at time t which will affect the returns on all securities. The market model coefficient ß in (17) and (18) therefore measures the sensitivity of the return on security j to R_{mt} and thus, indirectly, to information about marketwide factors.

Specifically, in deriving our expected values using the market model, we will assume that during each period the market sets prices so that $f_m(R_{jt}, R_{mt}|\phi^m_{t-1})$, its perceived bivariate normal distribution of R_{jt} and R_{mt}, is constant through time. This means that the market sets prices so that a^m_j, $ß^m_j$, and its perceived distribution on E_{jt} are the same, period after period. Moreover, it is assumed that it is possible for the market to set prices so that the true joint distribution of R_{jt} and R_{mt}, $f(R_{jt}, R_{mt}|\phi_{t-1})$, is constant through time, which means a_j, $ß_j$, and the true distribution of E_{jt} are the same, period after period.

The expected terminal price will be computed from the market model. To derive the model for each company to be studied, we will compute the monthly returns for each company. The market portfolio m will contain all ordinary shares on the Nairobi Stock Exchange (NSE). To derive monthly R_{mt}, we will average the returns on these shares for each month for the period 1984-1988. The estimators of the market model coefficients ß and a_j involve substituting unbiased estimators of $E(R_{jt})$, $E(R_{mt}$, and $Cov(R_{jt}, R_{mt})$ into (2). The unbiased estimators of these parameters are

$$R_j=\sum_{t=1}^{T}\frac{R_{jt}}{T} \qquad R_m=\sum_{t=1}^{T}\frac{R_{mt}}{T} \tag{20}$$

$$S^2(R_m)=\sum_{t=1}^{T}\frac{R_{mt}-\overline{R_m}}{(T-1)} \tag{21}$$

$$S_{jm}=\sum_{t=1}^{T}\frac{(R_{jt}-\overline{R_j})(R_{mt}-\overline{R_m})}{(T-1)} \tag{22}$$

so that the estimators of β_j and a_j are

$$B_j=\frac{S_{jm}}{S^2(R_m)} \qquad a_j=R_j-B_jR_m \tag{23}$$

The basic CAPM was used to derive the required rate of return, K_e, for each of the companies to be studied. The β_js computed for each company will be our beta values. The one-year Government of Kenya Treasury stocks having coupon rate of 15% plus the market return, R_m, to be computed when deriving the market model, will give us the full market return. Our risk-free rate will thus be 15%.

To determine the average market return, R_m, we computed the monthly return using the following equation:

$$R_{mt} = \frac{(M_t - M_{t-1})}{M_{t-1}} \qquad (24)$$

where R_{mt} = monthly market return at period t

M_t = market index at period t

M_{t-1} = market index at period t-1

The forecasted values for DPS and share prices were used to derive the predicted price using the dividend valuation model. All the results of the above procedures were summarised using descriptive statistics such as means and standard deviations. Each of the prices to be obtained was then compared to the actual price for that period. This was done by finding the difference between the actual and predicted prices and then testing whether the differences between the two are significant. This was deemed appropriate because the study intended to test whether the two population means are equal for the same variable, i.e., ordinary shares.

Since the standard deviation was unknown, it was computed from the sample and in this case, it has been suggested that the t-test was the most appropriate. The test statistic was be:

$$t = \frac{(d-\mu)}{s\sqrt{n}} \qquad (25)$$

where d = the mean of the differences between the two samples

s = the standard deviation of the differences

n = No. of observations

The dividend valuation model will qualify to be a good model depending on the number of companies for which it predict share prices that are not significantly different from the actual one.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This study sought to determine the predictive ability of the dividend valuation model on the ordinary shares. In this chapter, the research hypothesis posed in chapter one, section 1.2, is therefore investigated in detail. Data collected in form of share prices, market indices and dividend per share were used to predict share prices for each of the company' studied. The share prices were first transformed into monthly returns and thereafter analysed (see Appendix B). The study focused on thirteen companies.

4.2 The Market Model

The monthly returns computed from the share prices and market indices were used to derive the market model for each of the companies (Appendix C). This gave us our beta values to be used in the CAPM which was assumed in estimating the required rate of returns. Table 4.1 shows the summary of the market model and beta values computed. The market model was thereafter used to forecast expected share prices for the first five months of 1989. Table 4.2 shows the summary of the actual prices, prices predicted by the market model, and the differences between the actual and predicted prices for all the thirteen companies studied. To determine the significance of the relationship between the two prices, the differences computed were used to carry out a hypothesis testing for each company. The results of the analysis done using Statgraphic Computer Package -One Sample Analysis - are shown in Appendix D. Table 4.3 shows the summary of the average of the differences in the two prices, their variance, standard deviation, the computed t-statistics and the decision rule.

Out of the thirteen companies studied, the market model was a good predictor of ordinary share for seven companies, that is, about 54 per cent.

TABLE 4.1 THE MARKET MODEL DERIVED FOR EACH COMPANY

NAME OF THE COMPANY	MARKET MODEL	BETA
B.A.T	R = 0.001325+0.3721RM	0.3721
BAMBURI PORTLAND	R = 0.007599+0.3091RM	0.3091
BROOKE BOND KENYA	R = 0.0278-0.6625RM	-0.6625
CMC HOLDINGS	R =-0.001729+1.3498RM	1.3498
DIAMOND TRUST KENYA	R =-0.000628+0.8364RM	0.8364
E.A. OXYGEN	R = 0.0112+5.5381RM	5.5381
GEORGE WILLIAMS	R = 0.013+0.0365RM	0.0365
KAKUZI LTD	R = 0.0099 + 0.1828RM	0.1828
KENYA BREWERIES	R = 0.0097 +0.4323RM	0.4323
KENYA POWER & LIGHT.	R = 0.0143 + 0.1696RM	0.1696
MOTOR MART LTD	R = 0.0525 - 0.2325RM	-0.2325
NATIONAL INDUST.	R = 0.00094+0.4445RM	0.4445
SASINI TEA & COFFEE	R = 0.0286 - 0.4262RM	-0.4262

TABLE 4.2 PREDICTED SHARE PRICES USING THE MARKET MODEL

COMPANY	MONTHS	1/89	2/89	3/89	4/89	5/89
B.A.T KENYA	ACTUAL	42.00	45.50	42.30	43.50	43.50
	PREDICTED	41.66	41.78	41.80	41.88	42.04
	DIFFERENCE	0.34	3.72	0.45	0.42	1.46
BAMBURI PORTLAND	ACTUAL	3.75	3.75	1.75	2.00	2.00
	PREDICTED	3.79	3.82	3.85	3.88	3.91
	DIFFERENCE	-0.04	-0.07	-2.10	-1.88	-1.91
BROOKE BOND	ACTUAL	44.00	45.00	41.50	42.50	43.25
	PREDICTED	43.50	44.57	45.88	47.11	48.22
	DIFFERENCE	0.50	0.43	-4.38	-4.61	-4.97
CMC HOLDINGS	ACTUAL	15.25	14.50	14.00	14.00	14.50
	PREDICTED	15.11	15.18	15.10	15.11	15.21
	DIFFERENCE	0.14	-0.68	-1.10	-1.11	-0.71
DIAMOND TRUST	ACTUAL	27.00	27.25	27.25	27.25	27.50
	PREDICTED	27.13	27.22	27.15	27.17	27.29
	DIFFERENCE	-0.13	0.03	0.10	0.08	0.21
E.A. OXYGEN	ACTUAL	12.75	11.90	12.00	12.25	12.50
	PREDICTED	12.57	13.03	13.01	13.28	13.88
	DIFFERENCE	0.18	-1.13	-1.01	-1.03	-1.38
GEORGE WILLIAMS	ACTUAL	15.00	15.00	15.10	15.00	15.50
	PREDICTED	15.20	15.40	15.60	15.80	16.01
	DIFFERENCE	-0.20	-0.40	-0.50	-0.80	-0.51
KAKUZI	ACTUAL	18.00	17.75	18.00	18.00	18.10
	PREDICTED	18.20	18.40	18.57	18.76	18.97
	DIFFERENCE	-0.20	-0.65	-0.57	-0.76	-0.87
KENYA BREWERIES	ACTUAL	27.75	27.85	28.00	27.00	27.50
	PREDICTED	27.84	28.17	28.41	28.71	29.07
	DIFFERENCE	-0.09	-0.32	-0.41	-1.71	-1.57
KENYA POWER & LIG.	ACTUAL	31.75	32.00	33.00	33.00	33.50
	PREDICTED	33.05	33.55	34.02	34.51	35.04
	DIFFERENCE	-1.30	-1.55	-1.02	-1.51	-1.54
MOTOR MART	ACTUAL	24.00	22.50	24.00	22.50	23.50
	PREDICTED	21.02	22.10	23.27	24.49	25.74
	DIFFERENCE	2.98	0.40	0.73	-1.99	-2.24
NATIONAL INDUST.	ACTUAL	20.00	20.00	17.50	20.75	20.25
	PREDICTED	19.07	19.13	19.12	19.16	19.23
	DIFFERENCE	0.93	0.87	-1.62	1.59	1.02
SASINI TEA & COF.	ACTUAL	29.75	29.75	29.75	29.75	29.75
	PREDICTED	30.01	30.80	31.72	32.60	33.45
	DIFFERENCE	-0.26	-1.05	-1.97	-2.85	-3.70

TABLE 4.3 AN ANALYSIS OF THE DIFFERENCES BETWEEN THE ACTUAL SHARE PRICES AND THOSE PREDICTED BY THE MARKET MODEL USING MONTHLY SHARE RETURNS.

COMPANY	AVER.	VARIANCE	STD. DEVIAT.	COMPUT D T.STATI.	NULL HYPOTHESIS
B.A.T	1.278	2.07452	1.44032	1.98407	DO NOT REJECT
BAMBURI	-1.200	1.09975	1.04869	-2.55870	DO NOT REJECT
BROOKE BOND	-2.606	7.90403	2.81141	-2.07269	DO NOT REJECT
CMC HOLDING	-0.692	0.25847	0.50840	-3.04359	REJECT HO
DIAMOND	0.058	0.01537	0.12398	1.04611	DO NOT REJECT
E.A.OXYGEN	-0.874	0.36883	0.60731	-3.21798	REJECT HO
GEORGE	-0.482	0.04712	0.21707	-4.96512	REJECT HO
KAKUZI	-0.610	0.06535	0.25564	-5.33571	REJECT HO
KENYA BREW.	-0.820	0.57640	0.75921	-2.41511	DO NOT REJECT
KENYA POWER	-1.384	0.05183	0.22766	-13.5935	REJECT HO
MOTOR MART	-0.024	4.63703	2.15338	-0.02492	DO NOT REJECT
NATIONAL	0.558	1.56447	1.25079	0.99755	DO NOT REJECT
SASINI TEA	-1.966	1.88443	1.37275	-3.20242	REJECT HO

Key: Level of significance = 0.05
Degrees of freedom = 4
Critical T = 2.776

4.3 The Dividend Valuation Model

In order to test the dividend valuation model, we first estimated the required rate of return for each company using the CAPM as shown in Table 4.4. The rates were then used to discount the forecasted dividend per share and terminal prices to their present value for each company for the first five months of 1989. Table 4.5 shows the summary of the actual prices, prices predicted by the dividend valuation model, and the difference between the actual and predicted prices for all the thirteen companies. These results were also tested for significance by carrying out a hypothesis testing on the difference for each company. The results of the analysis done using Statgraphics Computer Package - One Sample Analysis - are shown in Appendix E. Table 4.6 shows the summary of the average of the difference in the two prices, their variance, standard deviation, the computed t-statistics and the decision rule.

TABLE 4.4 THE REQUIRED RATES OF RETURN COMPUTED FOR EACH COMPANY

NAME OF THE COMPANY	CAPM RATES (PER CENT BETA
B.A.T	17.23
BAMBURI PORTLAND	16.85
BROOKE BOND KENYA	11.03
CMC HOLDINGS	23.10
DIAMOND TRUST KENYA	20.02
E.A. OXYGEN	48.23
GEORGE WILLIAMS	15.22
KAKUZI LTD	16.10
KENYA BREWERIES	17.60
KENYA POWER & LIGHT.	16.02
MOTOR MART LTD	13.61
NATIONAL INDUST.	17.67
SASINI TEA & COFFEE	12.44

TABLE 4.5 PREDICTED SHARE PRICES USING THE DIVIDEND VALUATION MODEL

COMPANY	MONTHS	1/89	2/89	3/89	4/89	5/89
B.A.T KENYA	ACTUAL	42.00	45.50	42.30	43.50	43.50
	PREDICTED	35.30	36.26	37.38	38.70	40.24
	DIFFERENCE	6.70	9.24	4.87	3.60	3.26
BAMBURI PORTLAND	ACTUAL	3.75	3.75	1.75	2.00	2.00
	PREDICTED	1.79	2.09	2.44	2.86	3.35
	DIFFERENCE	1.96	1.66	-0.69	-0.86	-1.35
BROOKE BOND	ACTUAL	44.00	45.00	41.50	42.50	43.25
	PREDICTED	75.32	70.96	66.14	60.78	54.83
	DIFFERENCE	-31.32	-25.96	-24.64	-18.3	-11.58
CMC HOLDINGS	ACTUAL	15.25	14.50	14.00	14.00	14.50
	PREDICTED	8.02	8.93	10.05	11.43	13.13
	DIFFERENCE	7.23	5.57	3.95	2.57	1.37
DIAMOND TRUST	ACTUAL	27.00	27.25	27.25	27.25	27.50
	PREDICTED	15.79	17.33	19.19	21.41	24.08
	DIFFERENCE	11.21	9.92	8.06	5.84	3.42
E.A. OXYGEN	ACTUAL	12.75	11.90	12.00	12.25	12.50
	PREDICTED	4.05	4.82	5.97	7.66	10.17
	DIFFERENCE	8.70	7.08	6.03	4.59	2.33
GEORGE WILLIAMS	ACTUAL	15.00	15.00	15.10	15.00	15.50
	PREDICTED	11.31	12.01	12.81	13.73	14.79
	DIFFERENCE	3.69	2.99	2.29	1.27	0.71
KAKUZI	ACTUAL	18.00	17.75	18.00	18.00	18.10
	PREDICTED	12.70	13.61	14.67	15.90	17.32
	DIFFERENCE	5.30	4.14	3.33	2.10	0.78
KENYA BREWERIES	ACTUAL	27.75	27.85	28.00	27.00	27.50
	PREDICTED	19.40	20.75	22.34	24.23	26.45
	DIFFERENCE	8.35	7.10	5.66	2.77	1.05
KENYA POWER & LIG.	ACTUAL	31.75	32.00	33.00	33.00	33.50
	PREDICTED	24.48	26.01	27.80	29.87	32.26
	DIFFERENCE	7.27	5.99	5.20	3.13	1.24
MOTOR MART	ACTUAL	24.00	22.50	24.00	22.50	23.50
	PREDICTED	20.78	21.53	22.39	23.36	24.47
	DIFFERENCE	3.22	0.97	1.61	-0.86	-0.97
NATIONAL INDUST.	ACTUAL	20.00	20.00	17.50	20.75	20.25
	PREDICTED	12.09	13.09	14.27	15.66	17.30
	DIFFERENCE	7.91	6.91	3.23	5.09	2.95
SASINI TEA & COF.	ACTUAL	29.75	29.75	29.75	29.75	29.75
	PREDICTED	27.00	28.01	29.15	30.42	31.85
	DIFFERENCE	2.75	1.74	0.60	-0.67	-2.10

TABLE 4.6 AN ANALYSIS OF THE DIFFERENCES BETWEEN THE ACTUAL SHARE PRICES AND THOSE PREDICTED BY THE DIVIDEND VALUATION MODEL.

COMPANY	AVER.	VARIANCE	STD. DEVIAT.	COMPUT D T.STATI.	NULL HYPOTHESIS
B.A.T	5.534	6.11158	2.47216	5.00550	REJECT HO
BAMBURI	0.144	2.38293	1.54367	0.20859	DO NOT REJECT
BROOKE BOND	-22.36	57.8237	7.60419	-6.57395	REJECT HO
CMC HOLDING	4.138	5.44172	2.33275	3.96650	REJECT HO
DIAMOND	7.690	9.78890	3.12872	5.49597	REJECT HO
E.A.OXYGEN	5.746	5.89793	2.42857	5.29055	REJECT HO
GEORGE	2.190	1.48420	1.21828	4.01960	REJECT HO
KAKUZI	3.130	3.08810	1.75730	3.98276	REJECT HO
KENYA BREW.	4.986	9.16063	3.02665	3.68362	REJECT HO
KENYA POWER	-4.784	10.9029	3.30196	-3.23970	REJECT HO
MOTOR MART	0.784	3.10743	1.76279	1.00717	DO NOT REJECT
NATIONAL	5.218	4.80552	2.19215	5.32254	REJECT HO
SASINI TEA	0.464	3.68313	1.91915	0.54062	DO NOT REJECT

Key: Level of significance = 0.05
Degrees of freedom = 4
Critical T = 2.776

Out of the thirteen companies studied, only three indicated that the dividend valuation model is a good predictor of ordinary share prices on the NSE. This is a small percentage, that is about 23 per cent, and thus one cannot conclude that the model is a good predictor of shares. This implies that we generally reject our null hypothesis and conclude that the dividend valuation model is not a good predictor of share prices on the NSE. This can be attributed to a number of factors including the preposition that dividends do not affect share prices, lack of an efficient market, the existence of information differentials, inappropriate discounting factors and of course, measurement and evaluation problems.

In this study, we assumed that share prices are determined by the expected dividend per share and thus one can use the same to predict future share prices. Since the results indicates to the contrary, one can conclude that dividends do not determine share prices. This supports the now widely accepted view within the academic community that there is no systematic, exploitable relation between a firm's dividend policy and the value of its shares. That value is governed by its earnings or, more precisely, by its earning power (see Chapter Two).

Another factor that might have contributed to the results is the inappropriate discounting factors that were used. The basic assumptions for the application of CAPM may have been non-existent. For instance, the assumption that the NSE is a perfect market or at least not too imperfect, may not be realistic. Without sounding unduly critical, NSE did not have an active secondary market during the period of study. Active trading provides liquidity and enables investors to buy and sell shares at a price directly related to market's assessment of its value. A strong secondary market, therefore, gives investors confidence that they will be able to sell their securities quickly and cheaply. To date, the state of efficiency of the NSE is still inconclusive. Without a perfect and complete market, the basic CAPM may not be applicable.

Furthermore, due to the possibility of lack of a perfect and complete market, the market return and risk free rate assumed in the study may have been inappropriate in deriving the required rate of return. Therefore, the Muli (1991) results used in the study may not be reliable. Moreover, the Government of Kenya Treasury Bonds that was used as surrogates for risk free rate were not market determined. Until recently (July 1991), prevailing interest rates were determined by central authorities and may not represent the opportunity cost of capital relevant to a given firm. One can therefore conclude that there was no risk free rate that had constant returns in every state of nature. In sum, to the extent that this simplifying assumptions of CAPM do not hold, unique or unsystematic risk may have influenced the valuation of the shares. Nonetheless, the CAPM serves a useful framework for evaluating financial decisions. Most probably, these assumptions would have been relaxed to reflect real-world conditions (Bringham & Gapenski 1991:77).

The possibility of existent of information differentials may have also contributed to the results. Noise also causes markets to be inefficient but often prevents one from taking advantage of the inefficiencies (Fisher 1976). Noise could be in the form of expectations or uncertainty about future tastes and technology by sectors. Noise makes it very difficult to test either practical or academic theories about the way market works. This means that the estimated and/or actual prices obtained above might be made up of both noise and information. The existence of noise could therefore have led to imperfect observations so that knowledge of expectations on the stocks was limited. These implies that the actual and/or predicted price of a stock as derived for the various firms might be a noisy estimate of its value and hence the cause of the variations.

Finally, as Brennan (1973) noted, the possibility of inaccurate data should be obvious in any valuation model. Any estimate like beta coefficients, expected market return, etc. may be incorrect. As Omosa (1989) indicated, it should therefore be remembered that whatever parameters that may be used, differences in prices may still arise due to:

(a) Underspecification bias
(b) Heteroscedacticity
(c) Normality and other assumptions
(d) Measurement errors especially when predictions are involved.

(e) Joint hypothesis. For instance, in our study we were testing both the dividend valuation models and the underlying assumptions concerning the NSE
(g) Thin-trading leading to delays in price adjustments
(h) Performance evaluation. A test consistent with a hypothesis does not always mean that the test provides much support for the hypothesis; more so when the selection of the level of significance is arbitrary.

All the above factors imply that any empirical results are heavily dependent on the methodology employed in the tests.

CHAPTER FIVE

CONCLUSIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

5.1 Introduction

This chapter summarises the findings of the research, and shows how they relate to the objectives put forward in chapter 1. Limitations of the study and the suggestions for further research are also discussed.

5.2 Conclusions

The main objective of our study was to determine the predictive ability of the dividend valuation on the ordinary shares of selected companies listed in the NSE. To achieve the same, share prices were predicted using the dividend valuation model. This predicted share prices were then compared with actual prices by computing the differences between them. T-tests were carried out on the differences to determine whether the two prices were significantly different from each other. The test of significance showed that out of the thirteen companies studied, only three companies showed that the differences were not significant. We therefore concluded that the dividend valuation model was a poor predictor of share prices in the NSE.

This conclusion that there was a significant variation between the dividend valuation model predicted share prices and the actual prices was attributed to among other factors, the absence of a perfect market, inappropriate discounting factors and the possibility of the irrelevance of dividend policy in determining share prices.

More important, it is evident from the study that the valuation of ordinary shares is quite difficult since the variables being dealt with - future dividends and future prices - are uncertain in amount and time of occurrence. The valuation models used are only good as the assumptions used in estimating these variables. As indicated elsewhere in this report, the possibility of inaccurate data should be quite obvious in such a study, in which case the resulting valuation would be incorrect. This does not mean that the use of such models in financial decision making is undesirable. To draw such a conclusion solely on the basis of the model's unrealistic assumption is to forget what modelling is all about. Without such models there would be no means to value an asset. Hunches, intuition, or just plain guessing would then be used to value and select assets. By using such theoretical models, the financial manager is forced to identify real economic forces that affect share prices. In the process, valuation models bring the reward-to-risk characteristics of a particular share which may improve the quality of the investment decision.

Lastly, these conclusions should be understood in light of the research limitations underscored in the next section.

5.3 Limitations of the study

(a) This study assumed the basic CAPM in deriving the discounting factors. The CAPM provides under fairly stringent assumptions a theoretical relationship between the expected rate of return and the risk of an asset under conditions of market equilibrium. Virtually every one of the assumptions under which the CAPM is derived is violated in the real world. However, it is possible to extend the model to relax the unrealistic assumptions without drastically changing it. We did not relax any of these assumptions and therefore, the results should be read in light of this limitation.

(b) Related to (a) above is the applicability of the market model in deriving expectational data. Although the market model is frequently used in finance, there are some problems with its use that can lead to biased tests. First there is measurement error in the coefficients and if this varies systematically with the test statistic, it can lead to an appearance of a relationship when none exists (Elton et al, 1981). The second problem is its difference from a capital asset pricing model. There are numerous general equilibrium models that have been derived. If one of these ultimately is shown to be correct, then better estimates of returns should be obtained by using that model rather than the market model. Brennan (1979) has shown that the use of alternative models can make some difference. Therefore, the results obtained may be inferior to those that may have been obtained had a another framework of analysis been adopted.

(c) Historical dividends per share were used to get surrogates for the expected dividend per share via the least square method. In reality, this forecasted DPS may not necessarily reflect expected DPS. This methodology has been found to be statistically inadequate in deriving expectational data and more elaborate models have been advanced (Fabonzzi and Francis 1978). However, these latter approaches are not easily testable.

(d) Much as the population under study was well defined, a sample of only thirteen companies was selected. Further still, the procedure which was applied in selecting the said sample was subjective and judgmental. It is therefore difficult to generalize the results from this analysis to be representative of the predictive ability of the dividend valuation model in Kenya.

(e) It is also felt by the researcher that the time frame chosen for the study may have not been appropriate to enable him to draw generalized conclusions. The period of study i.e. 1984-1988 may not have been very active in the NSE as anticipated. For instance, the market index at the end of 1984 was 386.43 and at end of 1990 was 915.34 i.e a more than 136 per cent increase. Therefore the sample selected may have been unrepresentative.

5.4 Suggestions for further research

(a) As indicated in section 5.3 above, the major limitation of this study was the lack of the underlying assumptions for the application of CAPM in deriving the discounting factors. However, it is possible to extend the model to relax the unrealistic assumptions without drastically changing it. For instance, the applicability of the basic CAPM was hampered by the lack of a risk-free rate that has constant returns in every state of nature. This problem can be solved by applying what has come to be known as Black (1972) CAPM version or the two-factor model. He argued that in absence of a risk free rate, one should use a Zero-beta portfolio and concluded that beta is still the appropriate measure of systematic risk for an asset, and the linearity of the model still holds. It would therefore be interesting for one to construct such a portfolio so as to provide a substitute for the risk free rate.

(b) In view of 5.3 (e) above, it is felt by the researcher that if a more recent time frame is chosen for the same study, there would be an improvement on the statistical significance of the results. This suggestion is made on the assumption that the NSE is now more active than it was in late 1980's, given that the Capital Market Authority is operational and there is full support from the government because of its policy of privatising of state corporations.

(c) The issue of the role of expectations in share prices formation should be re-addressed. As indicated in chapter two, the price of a firm's share is influenced by all factors that affect the expectations of the firm and its shares. It would therefore be interesting for one to look at the question of the role of actual future changes in dividends on share returns, the role of expected changes in dividends, and finally the role of the changes in expectations.

APPENDIX A

SAMPLE OF COMPANIES

NAME	CODE
B.A.T KENYA LTD	X1
BAMBURI PORTLAND CEMENT LTD	X2
BROOKE BOND KENYA LTD	X3
CMC HOLDINGS LTD	X4
DIAMOND TRUST OF KENYA LTD	X5
E.A. OXYGEN LTD	X6
GEORGE WILLIAMS KENYA LTD	X7
KAKUZI LTD	X8
KENYA BREWERIES LTD	X9
KENYA POWER AND LIGTHING LTD	X10
MOTOR MART GROUP LTD	X11
NATIONAL INDUSTRIAL CREDIT LTD	X12
SASINI TEA AND COFFEE LTD	X13

APPENDIX B
MONTHLY RETURNS FOR THE MARKET AND SAMPLE COMPANIES

	Market Return	X1	X2	X3	X4	X5	X6
1	0.0039	0.0744	0.0714	0.2258	0.0167	0.0000	0.1154
2	0.0016	0.0154	0.0667	0.0526	-.0164	0.0147	0.0690
3	-0.0003	-0.0303	0.0000	0.1000	0.0000	-.0290	-.2258
4	-0.0004	0.0078	-0.375	0.0227	0.0417	0.0149	0.1250
5	0.0017	0.0155	0.0400	0.0556	0.0000	0.0294	-.1111
6	-0.0002	0.0229	0.0000	0.0105	0.0000	0.0143	0.0000
7	0.0006	0.0075	0.1538	0.0208	-.0800	-.0704	0.0000
8	0.0011	-0.0222	0.0000	0.1020	0.0435	-.0608	0.0833
9	-0.0001	0.0000	0.0000	0.0556	0.0417	-.0161	0.0385
10	0.0011	0.0227	0.0000	-0.0877	0.0800	0.0393	0.0000
11	0.0003	0.0074	0.0000	0.0385	0.0074	-.0379	0.0741
12	-0.0004	0.0000	0.0000	0.0370	0.0147	0.0328	0.0345
13	-0.0007	0.0147	0.0000	0.0625	0.0145	0.0635	-.0333
14	0.0031	0.0000	0.0000	0.0168	-.0357	-.0448	0.1034
15	0.0098	-0.0362	0.0000	-0.0093	0.0000	0.0469	-.0938
16	0.0197	-0.0075	0.0000	0.0500	0.0222	0.0149	0.0069
17	0.0030	0.0455	0.0000	0.0714	0.0145	0.0000	0.1301
18	0.0029	0.0072	0.0000	0.0074	0.0357	-.3529	-.0303
19	0.0037	0.0000	0.0000	0.0221	0.0000	0.0000	0.0625
20	0.0113	0.0144	0.0000	0.0072	0.0138	0.0909	0.0000
21	0.0155	-0.0142	0.0000	-0.1000	0.0136	0.1250	0.0000
22	0.0129	0.0000	0.0000	0.0317	0.0000	0.0185	-.9118
23	0.0036	0.0000	0.0000	0.1538	0.0000	0.0182	0.0000
24	0.0018	-0.0302	0.0000	-0.1000	0.0067	0.0893	0.0000
25	0.0236	0.0237	0.0000	0.0148	0.0933	0.0656	-.0256
26	0.0215	0.0145	0.0000	0.0146	-.0549	0.0462	0.0368
27	0.0177	-0.0571	0.0333	-0.1799	0.0000	0.0588	-.0508
28	0.0044	0.0303	0.0000	0.0088	0.0323	0.0556	-.0374
29	0.0215	0.0221	0.0000	0.0348	0.0125	0.0263	0.0000
30	0.0175	0.0072	-.4355	0.0168	0.0185	-.2692	0.0333
31	0.0150	0.1429	0.1429	0.0496	-.0303	0.1053	0.0215
32	0.0113	0.0000	0.0000	0.0394	0.0000	0.0635	-.0526
33	0.0116	0.0000	0.0000	0.0000	0.0000	0.0896	0.0000
34	0.0244	0.0000	0.0000	0.0379	0.0625	0.0027	0.0000
35	0.0157	0.0000	0.0000	0.0000	0.0118	0.0656	0.0000
36	0.0014	0.0000	0.0000	0.0073	0.0174	0.0000	0.0000
37	0.0080	0.1250	0.1250	0.0072	0.0286	0.0256	0.0556
38	0.0210	0.1556	0.1556	0.0072	-.0556	0.0750	0.0526
39	0.0187	0.0577	0.0577	-0.0286	0.0000	-.0233	0.0650
40	0.0266	0.0182	0.0182	0.0221	0.0294	0.0238	0.0695
41	0.0369	0.0357	0.0357	0.0000	0.0286	0.0233	0.0000
42	0.0743	0.0172	0.0172	0.0216	0.0889	0.0341	0.0200
43	0.0463	0.1017	0.1017	0.0282	0.0204	0.0352	-.0196
44	0.0198	0.0769	0.0769	0.0317	0.0350	0.0297	-.0500
45	0.0317	0.2143	0.2143	-0.0811	0.1930	0.0309	0.0000

46	0.0538	-0.0588	-.0588	0.0221	0.2105	0.0400	0.0526
47	0.0229	0.0000	0.0000	0.0216	-.0635	0.0096	0.0000
48	0.0214	0.0625	0.0625	0.0141	0.1071	0.0095	0.1000
49	0.0223	0.1176	0.1176	0.0278	0.0323	0.0189	0.0909
50	0.0174	-0.1053	-.1053	0.0270	0.0625	0.0093	-.8958
51	0.0255	-0.0412	0.0588	-0.0395	-.0735	0.0092	5.9600
52	0.0195	0.0061	-.5556	0.0137	0.0349	0.0000	0.0345
53	0.0293	0.0122	0.1250	0.0270	-.0184	0.0182	0.0278
54	0.0074	0.0000	0.0000	0.0263	-.0625	-.0804	-.0270
55	0.0147	0.0000	0.0000	0.0256	-.0333	0.0019	0.0556
56	0.0043	0.0000	0.1111	0.0063	0.0345	-.0019	-.0526
57	0.0076	-0.0361	0.3000	-0.0062	-.0667	0.0097	0.1667
58	0.0011	0.0036	0.1538	0.0313	0.0000	0.0192	0.0952
59	0.0016	0.0559	0.0000	0.0303	0.0714	0.0189	0.0435
60	0.0059	-0.0235	0.0000	0.0000	0.0000	0.0000	0.0000

	X7	X8	X9	X10	X11	X12	X13
1	0.1765	0.2632	0.0600	0.0392	0.3333	-.2500	0.3889
2	0.0750	0.0083	0.0189	0.0000	0.0000	0.4902	-.0400
3	0.0698	-0.0702	0.0000	0.0000	-.1091	-.2632	0.0625
4	0.0435	0.0444	-.0556	-0.0755	-.1837	0.0357	0.0196
5	0.0208	-0.0638	0.0196	0.1020	0.0000	-.0345	0.1731
6	0.1224	0.0000	0.0192	0.0000	0.0000	0.0714	0.0164
7	-0.0182	0.1364	0.0377	0.0185	0.0000	-.0133	0.0645
8	0.0000	0.0000	0.0364	0.0182	0.0000	0.0135	0.0000
9	0.0370	-0.0400	0.0000	-0.0714	0.1500	0.0067	0.0182
10	0.0000	0.0833	0.0000	0.0385	0.0870	-.0066	-.1518
11	0.1071	-0.0769	-.0526	0.0556	0.0400	0.0067	0.0526
12	-0.0645	0.0000	0.0000	0.0175	0.0000	-.1391	0.1500
13	-0.3966	0.0000	0.0185	0.0000	0.0577	0.0269	0.0580
14	0.2286	0.0208	0.0036	0.0069	-.0909	0.0187	0.0411
15	0.0233	0.0612	0.0399	0.0411	0.2400	-.0184	0.0158
16	0.0455	0.0192	-.0244	-0.1053	0.1290	0.0412	0.0363
17	0.0652	0.0189	0.0250	0.0662	0.0714	-.0827	0.0750
18	0.0408	0.0370	0.0279	0.0172	0.0000	0.0588	0.0000
19	0.0196	0.0357	0.0169	0.0169	0.0000	0.1667	0.0698
20	0.0000	0.0000	0.0333	0.0167	0.0000	0.0357	0.0130
21	0.0000	-0.1034	0.0323	0.0984	0.0667	0.0000	0.0515
22	0.0000	0.0000	0.0000	-0.0597	0.0000	-.1034	0.0000
23	-0.1538	0.0000	-.1031	0.0317	0.1250	0.0269	-.1429
24	0.0909	0.0000	0.0174	0.0031	0.1111	-.0075	0.0714
25	0.1250	0.1538	0.1096	0.0123	0.0000	0.0566	0.1778
26	0.0185	0.0500	0.1111	0.0303	0.0000	0.0536	-.0566
27	-0.0545	0.0286	0.0194	0.0588	0.0500	0.0068	-.0500
28	0.0000	-0.0741	-.0191	-0.0139	0.0000	-.0067	0.0421

29	0.0385	-0.0167	0.0417	0.0704	0.0000	0.0169	0.0505
30	-.0185	-0.0508	0.0533	0.0263	0.0000	0.0167	0.0000
31	0.0189	0.0714	0.0380	0.0128	0.1429	-.0033	0.0000
32	0.0185	0.0000	0.0732	0.0000	-.0417	0.0526	0.0000
33	0.0182	0.0333	0.2273	0.1266	0.0435	0.0469	0.0096
34	0.0000	0.0484	0.0000	0.0562	0.0000	-.0448	0.1333
35	-0.1071	0.0000	-.2593	0.0213	0.0000	0.0156	-.0504
36	0.0600	0.0154	0.0000	0.0208	0.0000	0.0462	-.1150
37	0.0377	0.0000	0.1250	0.0204	0.0000	0.0000	0.0400
38	-0.0182	-0.0303	0.0667	0.0360	-.0833	0.0294	0.0358
39	0.0185	0.0000	0.0000	0.0039	0.0909	0.0000	-.0611
40	0.0182	0.0156	0.0000	0.0192	0.0833	0.0286	0.0059
41	-0.0179	0.0000	0.0208	-0.0566	0.0385	0.0417	0.0196
42	0.0182	0.0000	0.0204	0.0400	0.0000	0.0400	0.0000
43	0.0179	0.0462	0.0000	0.0962	0.0000	0.0128	0.0577
44	0.0175	0.0000	0.0000	0.0614	0.0000	0.0000	0.0000
45	0.0172	-0.0294	0.0400	-0.0165	0.1111	0.1392	0.0000
46	0.0169	0.0303	0.0192	0.0252	0.0667	0.0444	0.0091
47	0.0000	0.0588	0.0189	0.0082	0.0625	0.0213	-.0090
48	-0.0667	0.0000	0.0000	0.0000	0.1765	0.0000	0.0909
49	0.0714	0.0278	0.0481	-0.0894	0.0250	0.0417	0.0333
50	0.0167	0.0000	0.0092	0.0000	0.1707	0.0000	0.0000
51	0.0164	0.0270	0.0455	0.0089	-.1458	0.0600	-.1613
52	0.0000	0.0526	-.0261	0.0088	0.3659	-.0189	0.0000
53	0.0323	0.0000	0.0179	0.0000	0.0000	-.3269	0.0577
54	0.0000	0.0000	-.0175	0.0088	0.0000	0.0000	0.0000
55	0.0313	0.0000	0.0286	0.0087	0.0357	0.0857	0.0000
56	0.0152	0.0000	0.0069	0.0000	0.0000	0.0132	0.0000
57	0.0000	-0.1500	0.0000	0.0690	0.3103	0.0130	0.0000
58	0.0448	0.0000	0.0000	0.0000	0.0132	0.0000	-.0091
59	-0.2000	0.0588	-.0517	0.0484	0.0260	-.0513	0.0734
60	0.0714	0.0000	0.0000	0.0015	0.0127	0.0270	0.0000

APPENDIX C

A REPRODUCTION OF THE COMPUTER PRINTOUTS FOR MARKET MODELS

Simple regression of X1 on RM			
Parameter	estimate	standard error	T Value
Intercept	1.325E-3	8.699E-3	0.1524
Slope	0.3721	0.4398	0.8460

Simple regression of X2 on RM			
Parameter	estimate	standard error	T Value
Intercept	7.599E-3	0.0231	0.3294
Slope	0.3091	1.1663	0.2650

Simple regression of X3 on RM			
Parameter	estimate	standard error	T Value
Intercept	0.02783	9.964E-3	2.7938
Slope	-0.6625	0.5038	-1.3151

Simple regression of X4 on RM			
Parameter	estimate	standard error	T Value
Intercept	-1.73E-3	8.831E-3	-0.1958
Slope	1.3498	0.4465	3.02325

Simple regression of X5 on RM			
Parameter	estimate	standard error	T Value
Intercept	-6.28E-4	0.01285	-0.0489
Slope	0.8364	0.6496	1.2876

Simple regression of X6 on RM			
Parameter	estimate	standard error	T Value
Intercept	0.01119	0.1416	0.07904
Slope	5.5381	7.1607	0.77341

Simple regression of X7 on RM			
Parameter	estimate	standard error	T Value
Intercept	0.01299	0.01511	0.8596
Slope	0.03650	0.76395	0.0478

Simple regression of X8 on RM			
Parameter	estimate	standard error	T Value
Intercept	9.852E-3	0.01060	0.9294
Slope	0.1828	0.5360	0.3410

Simple regression of X9 on RM			
Parameter	estimate	standard error	T Value
Intercept	9.734E-3	0.01052	0.9257
Slope	0.4323	0.5316	0.8131

Simple regression of X10 on RM			
Parameter	estimate	standard error	T Value
Intercept	-1.73E-3	8.831E-3	-0.1958
Slope	1.3498	0.4465	3.02325

Simple regression of X11 on RM			
Parameter	estimate	standard error	T Value
Intercept	0.05245	0.01947	2.6938
Slope	-1.2325	0.98453	-0.2362

Simple regression of X12 on RM			
Parameter	estimate	standard error	T Value
Intercept	9.479E-4	0.01836	0.05163
Slope	0.4445	0.92829	0.47879

Simple regression of X13 on RM			
Parameter	estimate	standard error	T Value
Intercept	0.05246	0.01947	2.6938
Slope	-0.2325	0.98454	-0.2362

APPENDIX D

A REPRODUCTION OF THE COMPUTER PRINTOUTS FOR THE ONE-SAMPLE t - TEST FOR THE DIFFERENCES BETWEEN ACTUAL PRICES AND THOSE PREDICTED USING THE MARKET MODEL

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX1

SAMPLE STATISTICS: No. of Obs. 5
                   Average      1.278
                   Variance     2.0745
                   Std. Dev.    1.4403
                   Median       0.45

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 1.9841
Significance Level  = 0.11825
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX2

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -1.2
                   Variance     1.0998
                   Std. Dev.    1.0487
                   Median      -1.88

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-2.5587
Significance Level  = 0.06272
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX3

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -2.606
                   Variance     7.9040
                   Std. Dev.    2.8114
                   Median      -4.38
Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-2.07269
Significance Level  = 0.10690
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX4

SAMPLE STATISTICS: No. of Obs. 5
                   Average    -0.692
                   Variance    0.2585
                   Std. Dev.   0.5084
                   Median     -0.71

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-3.04359
Significance Level  = 0.03837
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX5

SAMPLE STATISTICS: No. of Obs. 5
                   Average     0.058
                   Variance    0.0154
                   Std. Dev.   0.1240
                   Median      0.08

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 1.04611
Significance Level  = 0.11825
Decision Rule       = Do no reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX6

SAMPLE STATISTICS: No. of Obs. 5
                   Average    -0.874
                   Variance    0.3688
                   Std. Dev.   0.6073
                   Median     -1.03

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-3.21798
Significance Level  = 0.03234
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX7

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -0.482
std. Dev. = 0.2171 Variance     0.0471

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-4.96512
Significance Level  = 7.6781E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX8

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -0.61
                   Variance     0.0654
                   Std. Dev.    0.2556
                   Median      -0.65

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-5.3357
Significance Level  = 5.9424E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX9

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -0.820
                   Variance     0.5764
                   Std. Dev.    0.7592
                   Median      -0.41

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-2.41511
Significance Level  = 0.07315
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX10

SAMPLE STATISTICS: No. of Obs. 5
                   Average    -1.384
                   Variance    0.0518
                   Std. Dev.   0.2277
                   Median     -1.51

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-13.5935
Significance Level  = 1.6956E-4
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX11

SAMPLE STATISTICS: No. of Obs. 5
                   Average    -0.024
                   Variance    4.6370
                   Std. Dev.   2.1534
                   Median      0.4

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-0.02492
Significance Level  = 0.98131
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX12

SAMPLE STATISTICS: No. of Obs. 5
                   Average     0.558
                   Variance    1.5645
                   Std. Dev.   1.2508
                   Median      0.93

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 0.99755
Significance Level  = 0.37495
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX13

SAMPLE STATISTICS: No. of Obs. 5
                   Average     -1.966
                   Variance     1.8844
                   Std. Dev.    1.3728
                   Median      -1.97

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-3.20242
Significance Level  = 0.03283
Decision Rule       = Do reject Ho
```

APPENDIX E

A REPRODUCTION OF THE COMPUTER PRINTOUTS FOR THE ONE-SAMPLE t-TESTS FOR THE DIFFERENCES BETWEEN ACTUAL PRICES AND THOSE PREDICTED USING THE DIVIDEND VALUATION MODEL

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX1

SAMPLE STATISTICS: No. of Obs.  5
                   Average      5.534
                   Variance     6.1116
                   Std. Dev.    2.4722
                   Median       4.87

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 5.0055
Significance Level  = 7.4613E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX2

SAMPLE STATISTICS: No. of Obs.  5
                   Average      0.144
                   Variance     2.3829
                   Std. Dev.    1.5437
                   Median      -0.69

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 0.20859
Significance Level  = 0.84496
Decision Rule       = Do not reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX3

SAMPLE STATISTICS: No. of Obs.  5
                   Average     -22.356
                   Variance     57.824
                   Std. Dev.    7.6042
                   Median      -24.64
Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    =-6.57395
Significance Level  = 2.77E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX4

SAMPLE STATISTICS: No. of Obs. 5
                   Average     4.138
                   Variance    5.4417
                   Std. Dev.   2.3328
                   Median      3.95

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 3.9665
Significance Level  = 0.0166
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX5

SAMPLE STATISTICS: No. of Obs. 5
                   Average     7.69
                   Variance    9.7889
                   Std. Dev.   3.1287
                   Median      8.06

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 5.49597
Significance Level  = 5.34E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX6

SAMPLE STATISTICS: No. of Obs. 5
                   Average     5.746
                   Variance    5.8979
                   Std. Dev.   2.4286
                   Median      6.03

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 5.29055
Significance Level  = 6.1262E-3
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX7

SAMPLE STATISTICS: No. of Obs. 5
                   Average     2.19
std. Dev. = 1.2183 Variance    1.4842

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 4.0196
Significance Level  = 0.0158
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX8

SAMPLE STATISTICS: No. of Obs. 5
                   Average     3.13
                   Variance    3.0881
                   Std. Dev.   1.7573
                   Median      3.33

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 3.98276
Significance Level  = 0.01636
Decision Rule       = Do reject Ho
```

```
STATGRAPHICS ONE SAMPLE ANALYSIS DX9

SAMPLE STATISTICS: No. of Obs. 5
                   Average     4.986
                   Variance    9.1606
                   Std. Dev.   3.0267
                   Median      5.66

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 3.68362
Significance Level  = 0.02113
Decision Rule       = Do reject Ho
```

STATGRAPHICS ONE SAMPLE ANALYSIS DX10		
SAMPLE STATISTICS:	No. of Obs.	5
	Average	4.566
	Variance	5.7164
	Std. Dev.	2.3909
	Median	5.20
Confidence Interval	= 95% Alpha = 0.05	
Hypo. for Ho: Mean	= 0	
Computed T Stat.	= 4.2703	
Significance Level	= 0.01295	
Decision Rule	= Do reject Ho	

STATGRAPHICS ONE SAMPLE ANALYSIS DX11		
SAMPLE STATISTICS:	No. of Obs.	5
	Average	0.794
	Variance	3.1074
	Std. Dev.	1.7628
	Median	0.97
Confidence Interval	= 95% Alpha = 0.05	
Hypo. for Ho: Mean	= 0	
Computed T Stat.	= 1.00717	
Significance Level	= 0.37083	
Decision Rule	= Do No reject Ho	

STATGRAPHICS ONE SAMPLE ANALYSIS DX12		
SAMPLE STATISTICS:	No. of Obs.	5
	Average	5.218
	Variance	4.8055
	Std. Dev.	2.1922
	Median	5.09
Confidence Interval	= 95% Alpha = 0.05	
Hypo. for Ho: Mean	= 0	
Computed T Stat.	= 5.32254	
Significance Level	= 5.995E-3	
Decision Rule	= Do reject Ho	

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STATGRAPHICS ONE SAMPLE ANALYSIS DX13

SAMPLE STATISTICS: No. of Obs. 5
                   Average     0.464
                   Variance    3.6831
                   Std. Dev.   1.9192
                   Median      0.60

Confidence Interval = 95% Alpha = 0.05
Hypo.  for Ho: Mean = 0
Computed T Stat.    = 0.54062
Significance Level  = 0.61747
Decision Rule       = Do not reject Ho
```

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