THE CURRENT ROLE OF MODERN PORTFOLIO THEORY IN ASSET MANAGEMENT PRACTICE IN SOUTH AFRICA

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ABSTRACT

This research examines the role that modern portfolio theory (MPT) plays in current South Africa asset management practice in comparison to other portfolio management techniques and security evaluation methods. The purpose of asset management is to pool complementary financial market expertise, in order to generate returns in excess of the market return on the investments of the owners of financial resources that are entrusted to the firm, since the owners of financial resources might not be able to make superior investment decisions on their own.

The research presents and discusses the literature pertaining to modern portfolio theory, traditional portfolio theory (fundamental and technical analyses), and behavioural finance theory. The implication of the efficient market hypothesis in relation to all the portfolio management theories is also presented and discussed.

In line with a positivist paradigm, the survey research methodology, which combines both qualitative and quantitative aspects, was adopted. The instrument used for data collection was a questionnaire, which was found to be reliable and valid for this research. The questionnaire encompassed the Lickert scale to measure the data. The results of the analysis were interpreted using descriptive statistics.

The results of this research suggest that modern portfolio theory does not play a significant role in the management of portfolios and security evaluation in South Africa. South African asset managers regard fundamental analysis as the most significant method of security evaluation in the management of portfolios. Technical analysis and econometric models are regarded as playing a moderate role and complement fundamental analysis whilst behavioural finance models play the least role. This research recommends an integrated portfolio management strategy that incorporates MPT, traditional portfolio theory and behavioural finance models to enhance investor value and protection.

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DECLARATION

This masters thesis represents my own work and due acknowledgement is given in the references whenever information is derived from another source. No part of this master's thesis has been or is being concurrently submitted for another qualification at any University.

SIGNED……..DATE: 31 JANUARY 2005

TABLE OF CONTENTS

CHAPTER THREE

FUNDAMENTAL ANALYSIS

CHAPTER SIX

THE EMPIRICAL INVESTIGATION

CHAPTER SEVEN

PRESENTATION AND DISCUSSION OF RESULTS

TABLE OF FIGURES

TABLE OF TABLES

CHAPTER ONE

INTRODUCTION, AIMS AND PROBLEM STATEMENT

1.1 INTRODUCTION

Portfolio management is one of the most challenging decision-making processes in modern business. It is an integrated process that is undertaken in order to create and manage properly constructed combinations of financial or physical assets (Philippatos, 1998). It deals with future events, and the information used for making decisions is uncertain. It is an adaptive process that reacts to new information from the market, as manifested in the changing strategies of the portfolio manager; hence the status of the portfolio continuously changes when new information becomes available (Philippatos, 1998). Portfolio management is sufficiently diverse and flexible to make it applicable to any organisational form, such as unit trust companies, investment firms, insurance companies, and financial and non-financial businesses.

According to Dye and Pennypacker (1999), more than 100 documented portfolio selection methods can be found, but none of them seem to be dominant and problem free. However, there are three approaches to portfolio management that are prominent, namely, modern portfolio theory, traditional portfolio theory and behavioural finance (Fischer and Jordan, 1987).

Modern portfolio theory (MPT) is a broad approach to portfolio management based on risk management (Dobbins, Witt and Fielding, 1994). Three models that fall under MPT are the mean-variance analysis, capital asset pricing model (CAPM) and arbitrage pricing theory (APT). Traditional portfolio theory has two subdivisions, which are fundamental analysis and technical analysis. Behavioural finance plays an integral part in both approaches, although it has a significant effect on the investment decision-making process on its own.

Modern portfolio theory and traditional portfolio theory have attracted attention from both academics and practitioners in respect of the effectiveness of each approach in reaching investment decisions. Phillips and Ritchie (1983: 2) amongst others state:

> "Empirical and theoretical studies during the last decades have raised questions regarding the philosophical basis of the traditional approach (*i.e*. fundamental and technical analysis) to investment decisions. That approach concentrates on the selection of the best stock. However, it overlooks the interrelationship that exists between rates of return on financial assets and the possibility of reducing risk through diversification. Modern portfolio theory concentrates on exploiting these interrelationships through the use of mathematical models, wherein the basic input are return data and the volatility of these returns".

Modern and traditional portfolio theories approach the investment decision-making process from different angles. Modern portfolio theory is concerned with the reduction of risk through efficient diversification, whilst traditional portfolio theory is concerned with the intrinsic value of a security for inclusion in a portfolio. Risk is defined as the volatility of an expected outcome, which is the dispersion or spread of the likely returns around an expected return (Fischer and Jordan, 1987).

Modern portfolio theory (MPT) emanates from the 1952 Journal of Finance article titled “Portfolio Selection” by Henry Markowitz. According to the theory, rational investors are risk averse, *i.e.* they are willing to accept more risk (volatility) for a higher return and will accept lower returns for less volatility or risk. MPT suggests that diversification is rational, given that investors should take on only that part of risk (market risk) for which they expect to be rewarded. The risk of an individual security is of little importance to the investor; what matters is its contribution to the portfolio's risk as a whole (Jaranson, 2001).

The efficient markets hypothesis (EMH) is an integral part of MPT. The assumption under this theory is that markets are efficient and that all information is available to all the players. Any new or shock information is immediately incorporated into the share price. Therefore, it is not important to identify securities that are undervalued or overvalued, as all securities are regarded as being efficiently priced.

Sharpe (1964), in a model he developed called Capital Asset Pricing Model (CAPM), proposed a computationally efficient method of solving the mean-variance analysis equation by taking into account security risk in relation to the market. He argued that if there was a portfolio of securities offering a higher return than the market at only the market level of risk, then the natural forces of demand and supply would force the price of those securities back in line. Sharpe (1964) concluded that the optimal way to construct a portfolio is to choose an appropriate level of risk, invest in the market portfolio to the extent of its (market portfolio) risk bearing ability and then invest the remaining funds in low risk assets such as treasury bills.

The arbitrage pricing theory (APT) developed by Ross (1976) is based on the law of one price, which says that the same asset cannot sell for two different prices. If the same asset does sell for different prices, the arbitrageurs will buy the asset where it is cheap, thereby bidding up the low price, and simultaneously sell the asset where the price is higher, thereby driving the high price down. The arbitrageurs will continue this activity until all prices for the asset are equal (Francis, 1991). This approach is concerned with the price differential between markets and securities.

Fundamental analysis focuses on the intrinsic value of a security to identify whether the security is undervalued or overvalued. The analyst proceeds from an in-depth study of the economy and its implications for industries and companies, to the valuation of a security based on the future earning power and dividend paying expectations (Phillips and Ritchie, 1983). Some financial practitioners equate this to stock picking. Fundamentalists argue that at any time, the price of a security is equal to the discounted value stream of income from a security; that in the main, the price is a function of a set of anticipated returns and anticipated discount rates corresponding to future time periods (Fisher and Jordan, 1987). Graham and Dodd (1988) proposed security analysis by examining the virtues of each company through an analysis of the financial strength, earnings, debt, sales success and many other measures that management use. Research by Fama and French (1992) find that stocks with lower price to earnings ratios or price to book ratios, as well as smaller capitalisation companies provided the highest returns over time. Stocks are more positively related to those measurements than beta or other risk criteria.

Technical analysis, which relies heavily on historical data, endeavours to predict future price levels of securities by examining one or many series of past data from the market itself (Fischer and Jordan, 1987). The basic premise of technical analysis is that past security prices and data relating to past trading activity can be used to predict future prices (Dobbins, *et al.*, 1994). Technical analysis may be regarded as valuable when applied to markets where there is reason to believe that the adjustments of price to fundamental supply and demand factors are relatively inelastic or where overreactions exist. This method of analysis attempts to identify recurring and hence predictable trends in the market prices exclusively on the basis of past prices and trade volumes (Arnswald, 2001). The efficient market hypothesis refutes this statement. Advocates of the EMH believe that security price changes are a series of random numbers that occur in reaction to the random arrival of news. Period-to-period price changes should be random and statistically independent; therefore, prices cannot be accurately forecasted.

Behavioural finance studies real-life economic behaviour, applying behavioural insight to improve understanding of economic phenomena (Shefrin and Statman, 1985). The investment decision-making process includes *quasi-rational* motives, which satisfy psychological needs (Menkhoff, 1995). The markets are continually changing, which puts pressure on the portfolio managers. The findings of behavioural finance theory indicate that human beings working under such conditions tend to simplify the decision task in line with their experiences. Investment decisions may be taken to appear comprehensible and reasonable to other market observers (Arnswald, 2001). Contrary to EMH, investors are assumed to be loss averse, which suggests that loss aversion is an irrational bias (Tversky and Kahnemann, 1992). Financial markets have been known to overreact but without any rational explanation; therefore, behavioural finance models seek to quantify and explain human behaviour in relation to security prices.

The method chosen by a portfolio manager has a direct bearing on the performance of a portfolio. It is therefore imperative that a portfolio manager chooses an investment approach that suits particular investment objectives of a portfolio or fund, whilst aligning those objectives with the mandates of clients. Although, investors have become better informed and educated about their investment requirements, the investment decision-making process still rests with portfolio managers, as they primarily devise mechanisms and methodologies to

meet their clients' requirements. Phillips and Ritchie (1983) state that any investment aims at increasing wealth through generating pecuniary gain in the form of interest, dividend income and or capital gain. However, these gains depend on the methods chosen by asset managers in reaching their investment decisions.

1.2 PROBLEM DEFINITION

No one can deny that handsome returns can be reaped by a variety of investment decision-making methods (modern, traditional portfolio theory and behavioural finance) ranging from sheer genius to the occult. The unfortunate thing about most of the techniques is that they are difficult to duplicate consistently by everyone (Fisher and Jordan, 1987). The method chosen by a portfolio manager depends on the particular style that is adopted to meet the investment objectives of a portfolio or fund. However, with the existence of many portfolio management companies in South Africa, it is not clear whether modern portfolio theory plays a role in practice as opposed to traditional portfolio theory and behavioural finance.

The investment decision-making process has become such a complex issue is today's dynamic economic environment. Some investors have seen their investments diminish in value because of inappropriate methods and/or investment approach taken by some portfolio managers, whilst other investors have had better returns on their investments. This is directly linked to some portfolio managers consistently outperforming the market, whilst others have had mediocre results. The methods chosen by portfolio managers have a direct bearing on the performance of a portfolio (Jensen, 1964).

The methods used by asset managers in reaching their investment decisions are not publicly available for an investor to make an informed decision when selecting an asset manager. The main concern of a rational investor is the risk-return equilibrium on an investment; hence the challenge is to identify a portfolio manager who can reduce exposure caused by market volatility, whilst at the same time providing satisfactory returns.

1.3 AIMS OF THE STUDY

The research is conducted in a South African asset management context. The research seeks to identify the methods (modern, traditional portfolio and behavioural finance models) currently favoured by South African asset managers, in particular the extent to which use is made of modern portfolio theory in the management of portfolios and security evaluation. Based on the results of the findings, appropriate recommendations are made.

Portfolio management theory can be applied to all types of assets. In this regard, the research takes a holistic view and does not exclude any asset management company based on specialisation. In this regard, all portfolio theory and behavioural finance models are reviewed to evaluate the importance attached to each model by South African asset managers.

1.4 CHAPTER ORGANISATION

The present chapter starts with an introduction, which gives a brief overview of portfolio management. The problem definition, its setting and a brief literature review are presented. A summary of the aims of the study is presented in the third section. The chapter concludes with a section on chapter organisation.

Chapter two begins with an introduction, in which modern portfolio theory, risk and return are defined, and presents assumptions underlying modern portfolio theory. Utility theory, which explains investor attitude towards risk and return, is given in the second section. The mean-variance analysis, which is a portfolio optimisation approach, is explained in the third section. The CAPM, which is an equilibrium model, is reviewed in the fourth section of the chapter. The capital asset pricing model is extended to the APT, in section five, which is based on the law of one price (Ross 1976). Section seven of this chapter reviews different performance measurements used to assess the performance of a portfolio and portfolio managers. A summary is presented at the end of the chapter.

Chapter three discusses the first part of traditional portfolio theory, namely fundamental analysis, which focuses on the intrinsic value of a security, using such valuation models as

dividend discount, price to earnings and market to book ratios (Fama and French, 1992). The chapter also discusses and presents economic, industry and company analyses as foundation for security valuation. The chapter ends with a summary on fundamental analysis.

The second part of traditional portfolio theory, which is technical analysis, is discussed in detail in Chapter four. The chapter demonstrates and presents the technical analysis tools available to asset managers. The implication of the efficient market hypothesis on technical analysis is also explored in section four. The chapter concludes with section five, which summarises the literature reviewed on technical analysis.

Chapter five discusses behavioural finance, the factors that affect investor attitudes and their implications for portfolio management. The chapter presents theory that contradicts the EMH assumption on investor attitudes towards risk and return. A summary of behavioural finance concludes the chapter.

Chapter six, the empirical investigation, lays out the methodology adopted in conducting the research. The research design and the research population and sample are presented and discussed. The method of testing the reliability and validity of the measuring instrument is discussed. The pilot study and main study are outlined, leading to the method of data analysis. The chapter ends with a summary of the research methodology.

Chapter seven is the final chapter, in which the findings are presented, interpreted and discussed. The implications of the results for asset management in South Africa are also highlighted and discussed. The benefits and shortfalls encountered during the research are highlighted before the chapter proceeds to make recommendations and to point out areas that need further research. The chapter ends with a conclusion on the research.

CHAPTER TWO

MODERN PORTFOLIO THEORY

2.1 INTRODUCTION

This chapter discusses in detail the literature pertaining to modern portfolio theory. Risk and return, which form the crux of modern portfolio theory, are defined. The assumptions underlying modern portfolio theory are listed and discussed. Since diversification is known to reduce portfolio risk, this chapter will explain the components of risk and the effect they have on decisions pertaining to portfolio diversification.

Investors display rational behaviour when faced with investment decisions under uncertain conditions. The utility theory, which explains investor attitude towards risk and return under conditions of uncertainty, is discussed thereby forming the platform for introducing the mean-variance analysis and efficient frontier theorem. An evaluation of the implications of the mean-variance analysis for investment decision-making in practice is discussed.

Mean-variance analysis, which is a portfolio optimisation approach, is extended to the capital asset pricing model, an equilibrium portfolio model comprising a combination of a risk-free asset and a risky asset. A demonstration of the capital and security market lines indicating the risk-return trade-off is graphically illustrated and discussed. The criticism of the capital asset pricing model and its implications for portfolio management in practice is discussed.

The arbitrage pricing theory, which is based on the law of one price, marks the end of the literature review on modern portfolio theory models. The discussion of APT is followed by a discussion of different portfolio performance measurements used to assess the performance of both the portfolio and the portfolio manager. In conclusion, a summary is given on the literature review presented in the chapter.

2.2 WHAT IS MODERN PORTFOLIO THEORY?

2.2.1 Constituents of modern portfolio theory

Modern portfolio theory began with the fundamental work of Harry Markowitz (1952) that gave a clear mathematical definition to *risk* in portfolio analysis. No work prior to Markowitz (1952) was able to give a mathematical explanation of how diversification reduces risk in a portfolio of securities (Gao, 2003). Diversification may be defined as combining assets that are not positively correlated in order to reduce portfolio risk without sacrificing portfolio returns (Francis, 1991). Diversification can be explained in simple terms by the old adage that says: "*Do not put all your eggs in one basket*."

The MPT is a broad passive portfolio management strategy encompassing three risk-return portfolio selection theories, which are the mean-variance analysis (MVA), capital asset pricing model (CAPM) and the arbitrage pricing theory (APT). The utility theory forms the platform for assessing the rationality of investor behaviour towards risk and return given the above portfolio selection theories.

Investment decisions are arrived at with the sole purpose of earning some expected return for as little risk as possible. Modern portfolio theory states that there is a trade off between risk and return. Markowitz (1952) developed the mean-variance portfolio analysis model (MVA) as a way of solving portfolio optimisation problems, based on the expected utility principle. Investors are generally assumed to be risk averse, which means that they would prefer less risk for a higher return, and make investment decisions that maximise expected utility. Depending on the individual investor's utility, indifference curves can be developed from which an investor can choose a portfolio with the required risk and return trade off.

Sharpe (1964), Lintner (1965) and Mossin (1966) developed the capital asset pricing model (CAPM) as an extension of the mean-variance analysis (MVA). It is a general equilibrium model of portfolio decisions made by investors with mean-variance preferences, investing in a single risk free asset with a finite number of risky assets, whose joint probability distribution is known to all investors. In other words, investors have homogenous needs, the same investment horizon and equal access to information. The CAPM is based on the beta co-efficient value, which is defined as a measure of volatility of a security relative to the market

(Sharpe, 1964). CAPM generally tries to devise an equilibrium position on which risk should equate return.

However, the MVA and CAPM do not take into account a security's exposure to other factors, such as macro-economic conditions. The arbitrage pricing theory (APT) developed by Ross (1976), incorporates macro-economic factors into the pricing model as each security is deemed to have factors that are unique. The APT states that if the security's unique factors are not taken into consideration, the security will experience price differentials that will activate arbitrageurs to speculate in the market until the price of a security reaches equilibrium in all the markets (Chen, Roll and Ross, 1986).

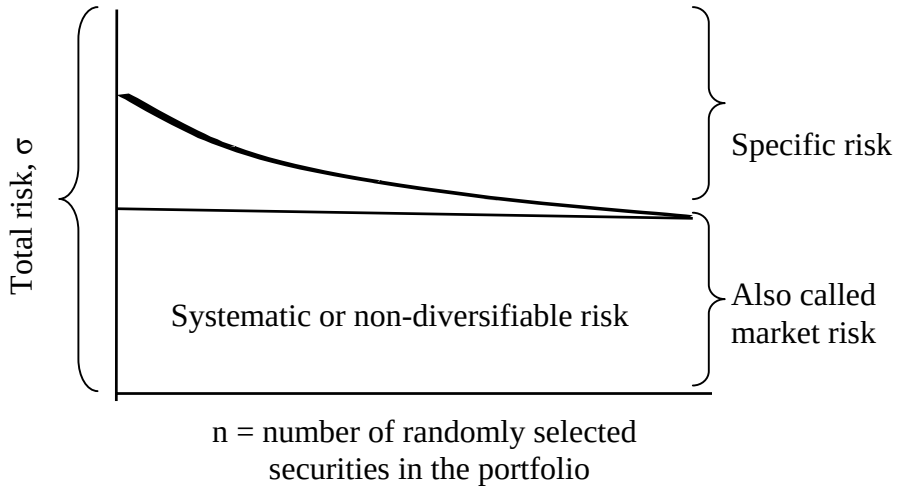
2.2.2 Definition of risk

Markowitz (1952) defines risk as the deviation of returns from the expected return as measured by the variance or standard deviation. Standard deviation, which is the square root of the variance, measures the total risk of an investment. According to Arditti (1967), standard deviation is a risk surrogate, not a synonym for risk. Since securities carry varying degrees of expected risk, an investment in a single security implies acceptance of total risk. Portfolio risk can be divided into two parts, which are diversifiable risk and non-diversifiable risk (Francis, 1991).

Diversifiable risk is that part of a security's total risk which is unique or unsystematic to that particular security. The unsystematic risk relates to all the factors that are unique to a particular security. The unsystematic risk can be diversified away by combining securities with different levels of correlation (Francis, 1991).

The non-diversifiable risk or systematic risk relates to market risk. This type of risk cannot be diversified away as it affects all securities on the market. The market risk is measured by the beta coefficient, which is an index of systematic risk. Changes in macro-economic and political conditions affect the whole market, which in turn affect all securities (Francis, 1991). Figure 1 below depicts graphically the two elements of risk (Dobbins *et al.*, 1994: 7).

Figure 1: Components of total risk



The systematic nature of the non-diversifiable risk of a security's return is given by the following equation (Francis, 1991: 265):

$$E(r_i) = a_i + b_i E(r_m)$$

Where $E(r_m)$ is the expected return of the market portfolio, a_i is the alpha coefficient and b_i is the beta coefficient. The beta is an index of non-diversifiable risk that gauges how much the **i-th** security return typically reacts to a change in the market portfolio's return.

2.2.3 Definition of return

Return is defined as the reward for risk taken on an investment. Return comes in two forms, either in the form of dividend/interest income or capital gain (Fischer and Jordan, 1987). The return of an individual investment can be measured as follows (Dobbins *et al.*, 1994: 5):

$$\frac{R_t = P_t - P_{t-1} + D_t}{P_{t-1}}$$

where R_t is the periodic return, P_t is the price at the end of the period, P_{t-1} price at the beginning of the period, $P_t - P_{t-1}$ is the capital gain or loss and D_t is the dividend received at the end of the period.

The expected rate of return of a portfolio is the weighted average rate of return using the probability of each rate of return as the weight. A portfolio's expected return for the **n-th** asset portfolio is given by the equation below (Dobbins *et al.*, 1994: 7):

$$\mathbf{E\ (R_p) = \sum_{i=1}^{n} X_i\ E\ (R_i)}$$

where **E (R_p)** is the portfolio's expected return, $\mathbf{X_i}$ the fraction or weight of the total value of the portfolio invested in **i-th** asset and **E (R_i)** denotes the expected rate of return from the i-th asset. The return of a portfolio is therefore measured in terms of the expected return of the combination of assets within a portfolio given the weighting of each individual asset.

2.2.4 Assumptions underlying MPT

MPT relies on the following key assumptions (Dobbins *et al.*, 1994):

- There are no transaction costs in buying and selling securities. There are no brokerage fees, no spread between bidding and asking prices. No taxes are paid and only risk plays a part in determining which securities an investor should buy.
- An investor can take any position of any size in the market. No one can move the market and liquidity is infinite.
- The investor is indifferent to receiving dividends or capital gains.
- Investors are rational and risk averse. They are completely aware of all the risks in an investment and will take positions based on the determination of risk, demanding higher returns for accepting greater volatility.
- Investors, as a group, look at the risk-return relationship over the same time horizon.
- Investors as a group have a similar view on how to measure risk.
- Investors have the same information and will buy and sell based on an identical assessment of the investment and all expect the same return from the investment.

- Capital markets are in equilibrium.
- Investors can lend and borrow at the risk-free rate.
- Politics and investor psychology have no effect on the market.

The above MPT assumptions are consistent with the strong form of the efficient markets hypothesis (EMH) which states that, at any point in time, security prices fully reflect all available information, any new or shock information being immediately incorporated into the security price (Fama, Fisher, Jensen and Roll, 1969). The assumptions form an integral part of MVA, CAPM and APT when quantifying the risk-return trade-off in a portfolio.

2.3 UTILITY THEORY

Expected utility theory (EUT) states that the investment decision maker chooses between risky or uncertain prospects by comparing their expected utility values, *i.e.* the weighted sums obtained by adding the utility values of outcomes multiplied by their respective probabilities (Mongin, 1994). The expected utility theory under conditions of uncertainty is based on the work of von Neumann and Mogernstein (1947). A risky situation implies that the outcomes of alternatives available to an investor are known in probabilistic form and MPT has been developed specifically to deal with such conditions (Dobbins *et al.*, 1994). The EUT is based on the assumption that investors are risk averse; therefore, would try to avoid risk where possible.

A risk averse investor experiences diminishing marginal utility of wealth, which is defined as the additional utility that an investor gets from a small change in wealth. An investor will experience increasing marginal utility when the utility function rises at an increasing rate, whereas the reverse is true of decreasing marginal utility. Therefore, it is assumed that an individual possesses quadratic utility functions, which may be specified in terms of return. This means that for every quadratic utility function specified in terms of wealth, a corresponding quadratic utility function may be derived, specified in terms of the rate of return (Ryan, 1978). The utility function may be stated in the form of an equation as (Dobbins *et al.*, 1994: 23):

$$E [U (W)] = a + bE (R) – c [E (R)]^2 - c V (R)$$

where **E** is the expectations operator, **U** denotes utility, **W** denotes wealth, **R** is the rate of return **V (R)** denotes the variance of return and **a, b,** and **c** are arbitrary constants which vary among individuals, with **b>0** and **c>0**.

The utility function of an investor can be graphically illustrated by indifference curves. The indifference curves are based on the law of diminishing marginal utility. Indifference curves represent the combinations of risk and return, which yield the same utility or satisfaction to the investor (Ryan, 1978). They are curved reflecting the risk aversion by the investor. Steeper indifference curves reflect a higher degree of risk aversion (Francis, 1991: 328).

Figure 2: An investor's utility curves

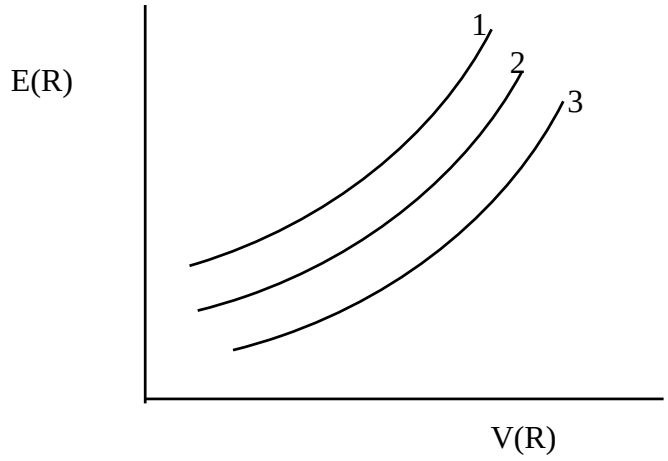


Figure 2 shows a set of indifference curves for an individual investor and is indifferent between any combination of expected return **E (R)** and standard deviation **V (R)** on any particular curve. A higher indifference curve represents a higher level of utility. A rational investor wishes to be on the highest indifference curve in order to maximise utility. Therefore, before the construction of a portfolio, whether using MVA or CAPM or APT, investor attitudes towards risk and return need to be stated in terms of the investor's utility function to enable the efficient allocation of wealth amongst available assets.

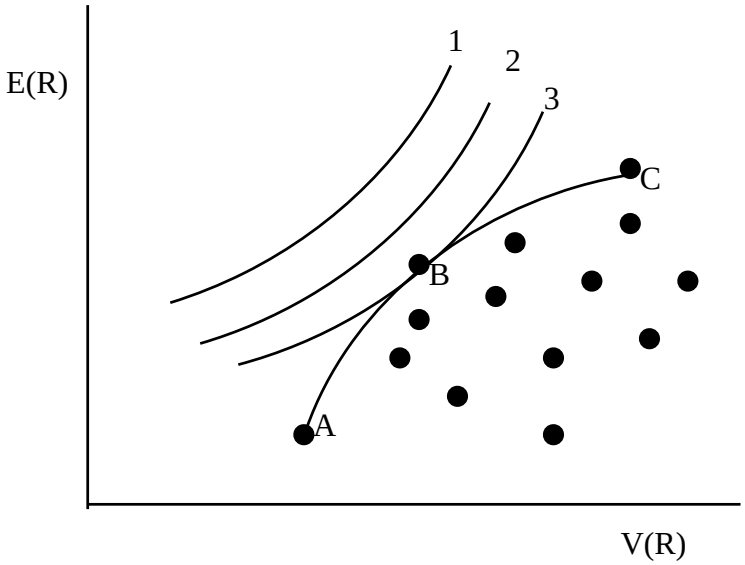
2.4 MARKOWITZ MEAN-VARIANCE ANALYSIS

2.4.1 The efficient frontier

Markowitz (1952) defined as *efficient*, portfolios that minimise risk for a given level of return and maximise return for a given level of risk. The set of all efficient portfolios is called the *efficient frontier*. The theory shows how rational investors can build portfolios under conditions of uncertainty.

The efficient set theorem states that an investor faced with a choice of a set of portfolios will choose a portfolio that offers maximum expected return for varying levels of risk, and offers minimum risk for varying levels of expected return (Tobin, 1958). Figure 3 below depicts an efficient frontier and a set of attainable portfolios, which are represented by the dots in the area under the line **ABC**.

Figure 3: The efficient frontier without a risk-free asset

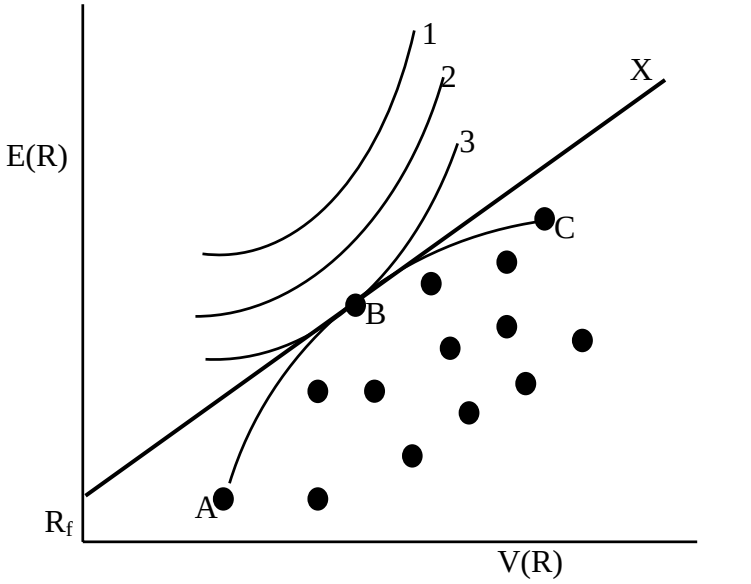


The black dots in Figure 3 represent all attainable portfolios that can be achieved with available securities. The line **ABC** denotes the efficient market frontier, which represents all efficient portfolios. Portfolio **A** (possibly a single share) has the least possible risk and return, whereas portfolio **C** (also a single share) has the highest risk and return. A rational investor with the depicted utility curves would prefer portfolio **B**, which is given by the tangency on utility curve **3,** which represents an efficient portfolio. Portfolio **B** is an efficient portfolio

comprising risky securities. The assumption in Figure 3's efficient frontier is that there is no risk-free asset since it comprises risky assets only (Engels, 2004: 12).

Tobin (1958) introduced the separation theorem, which states that each investor forms an optimal portfolio by dividing wealth between the risk-free asset and the market portfolio. Under the separation theorem, there is borrowing and lending at the risk-free interest rate. The efficient frontier in Figure 4 depicts the efficient frontier using Tobin's separation theorem (Engels, 2004: 17).

Figure 4 The efficient frontier with a risk-free asset



The portfolio **B** in Figure 4 represents the market portfolio comprising risky securities. The line $\mathbf{R_fX}$ represents the capital market line (CML). The part of the risk free asset efficient frontier to the left of the tangency point represents the lending line, whereas to the right represents the borrowing line. This assumes that an investor can borrow or lend at the risk-free rate.

The efficient frontier theorem is an important tool for portfolio construction and selection. The identification of an efficient portfolio leads to efficient diversification by equating risk and return based on investor objectives and risk tolerance levels. Changes in investor attitudes towards risk and return ultimately shifts the efficient frontier thereby highlighting the need to change the portfolio composition.

2.4.2 Mean-variance analysis

The efficient frontier theorem when transformed into a mathematical model forms the basis for the mean-variance approach for portfolio optimisation and diversification (Markowitz, 1952). The MVA is a portfolio optimisation process of analysing a portfolio and managing the assets within it to obtain the highest return at a given level of risk (Francis, 1991). In order to optimise a portfolio, an investor needs to choose an efficient combination of assets.

Markowitz (1952) developed the mean-variance analysis to find an optimum portfolio when an investor is concerned with return distributions over a single period. An investor is assumed to estimate the expected return and variance of return of each security being considered for the portfolio over a single period, *i.e.* the correlation and co-variances between securities need to be estimated. The mean-variance analysis is a mathematical computation of the risk and return of a portfolio.

The mean-variance approach is not based on a single optimal portfolio. It provides a series of portfolios, which are efficient in terms of risk, and return in that each portfolio offers maximum expected return corresponding to a given level of risk or the minimum risk for a given level of expected return. The variance of return for an **n**-asset portfolio is given by the equation (Correira, Flynn, Uliana and Wormald, 2003: 414).

$$\sigma_p^2 = \sum_{i=1}^{n} w_1^2 \sigma_i^2 + 2\sum_{i=1}^{n-1} \sum_{j=1+1}^{n} w_i w_j \sigma_{ij}$$

where σ_p^2 is the portfolio variance, σ_i^2 is the variance of security ***i***, $\mathbf{W}_i$ and $\mathbf{W}_j$ are the proportions of each asset in the portfolio, whilst σ_{ij} is the covariance between returns of securities ***i*** and ***j***.

The covariance may be substituted by the correlation coefficient ($\sigma_{ij} / \sigma_i \sigma_j$), which is a measure of the degree of movement of security returns in a portfolio. The correlation coefficient ranges from -1 to +1. A negative correlation coefficient indicates that both securities move in the opposite direction, with -1 being the most extreme, where the returns are completely inversely correlated. A positive correlation coefficient shows that the returns

of securities in a portfolio tend to move in the same direction, with a +1 being an extreme case of perfect correlation (Dobbins, *et al*, 1994).

A portfolio return can be optimised by diversifying with securities that are not positively correlated. A low correlation of return between securities in a portfolio results in a low variance of return of a portfolio. Conversely, a high correlation of return of securities leads to a high variance of return in a portfolio. Newbould and Poon (1991) proved empirically that by randomly selecting between 50 and 60 securities, diversification could substantially reduce risk. Empirical research by Dusak (1963) and Bodie and Rosansky (1980) show that share price indices, bond price indices and commodity price indices all tend not to be correlated. A risk averse investor will therefore need to diversify across these indices.

2.4.3 Mean-variance analysis in practice

The mean-variance analysis is restricted to static models; hence most investors can make decisions only at the beginning of the period and adjust their portfolios only at the end of the investment horizon (Dobbins *et al.*, 1994). In the dynamic global economy, investors and portfolio managers are faced with many challenges that require a change of portfolio composition from time to time. The difficulties encountered may be summarised as:

- The universe of available investments can change.
- Estimating the input parameters for a model is expensive.
- There is always an error in the parameter estimates.
- Parameters change over time.
- It is expensive to change portfolio composition often; *i.e.* transaction costs play a role in determining the cost effectiveness of adjusting a portfolio.

Markowitz (1959) recognised these limitations and proposed downside risk, also called semi-variance as the preferred measure of risk. The MVA treats all risk as the same, *i.e*. on the upside is treated the same as on the downside. Variance is a *symmetric* risk measure, which is counter-intuitive in practice. Intuition argues just the opposite, that in a bull market an investor seeks as much volatility as possible, whereas in a bear market volatility is avoided.

In practice, it is not always possible to maintain a truly optimal portfolio. The portfolio composition might need to be adjusted if the estimates for the input parameters change. Therefore, any profits made by the portfolio might be wiped out by continuously changing or adjusting a portfolio. Besides, Baumol (1963) notes that some of the efficient portfolios in the mean-variance portfolio composition are likely to be dominated by other combinations of securities and suggested an alternative efficiency criterion, which restricts portfolio consideration to a subset of the Markowitz efficient frontier.

Since the MVA is a single period model, an investor with a multi-period investment faces a problem in estimating the mean return and the variance of return of the multi-period. However, research by Merton (1990), Mossin (1969) and Fama (1970), amongst others, found that under several sets of assumptions, the multi-period scenario can be solved as a sequence of single period problems. Therefore, the utility function of a multi-period is derived from a set of single utility functions over the multi-period.

Theoretically, the biggest drawback of the MVA is that it is a multi-index model, which places huge data requirements on the analyst. For example, a portfolio of 100 securities requires not less than 4590 correlation coefficients. However, it has been replaced by the single index capital asset pricing model.

2.5 THE MARKET MODEL

Sharpe (1963) developed the market model as an extension of the Markowitz's (1952) mean-variance analysis. The market model is also referred as the *index model or equilibrium model.* The market model assumes that each security's price movement can be related to the price of the market portfolio and that investors can lend and borrow at the risk-free rate. The market portfolio is defined as a portfolio consisting of all securities where the proportion invested in each security corresponds to its relative market value. The relative market value of a security is simply equal to the aggregate market value of the security divided by the sum of the aggregate market values of all securities ((Dobbins *et al.*, 1994).

Tobin (1958) derives a separation theorem, which states that an investor's choice of risk is completely independent of the problem of deriving an optimal portfolio of risky securities; therefore, the market portfolio represents the optimal combination of risky securities. The key to the theorem is that investors simply keep the proportion of the risk free asset and risky assets constant for varying risk tolerance levels. Elton and Gruber (1995) prove that the separation theorem holds whether short sales of risky assets are allowed or disallowed. A short sale occurs when an investor sells to another investor an asset borrowed from a third person. The portfolios on the efficient frontier are a linear combination of any other efficient portfolios (Black, 1972).

The market model is given by the equation (Dobbins *et al.*, 1994: 46):

$$\mathbf{R_i = \alpha + \beta_i R_m + U_i}$$

where $\mathbf{R_i}$ is the return of the **i-th** security, **i** is the unique expected return of a security, $\boldsymbol{\beta_i}$ the sensitivity of security **i** to the market movement, $\mathbf{R_m}$ the return on the market, and $\mathbf{U_i}$ is the unique risky return of a security and has a mean of zero and a variance $\boldsymbol{\sigma^2 U_i}$.

The risk of a security may be split into two parts: the systematic risk, which is perfectly correlated with the market and the unsystematic risk, which is independent of the market and can be diversified away. The variance of a security may be broken down into systematic and unsystematic components as follows (Dobbins *et al.*, 1994: 47):

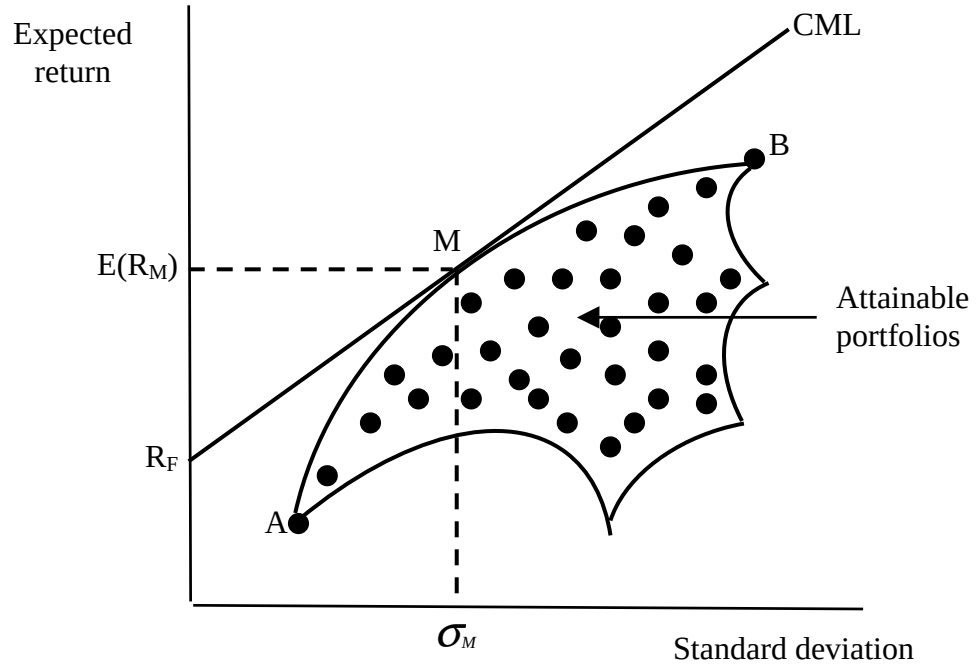
$$\mathbf{V\,(Ri) = E\,[R_i - E\,(R_i)]^2}$$

where **V** denotes the variance and **E** denotes expected value.

In a rational world, there should be a clear trade-off between risk and return. The market model clearly shows this trade-off through the capital market line, CML. The assumption is that there are borrowing and lending opportunities in the portfolio (Tobin, 1958). Portfolio expected returns are measured along the vertical axis, and portfolio risk is measured along the horizontal axis.

Figure 5 below, shows that there is a trade-off between risk and return and that the trade-off is positive and linear; with each increase in risk being associated with an increase in expected return. Some securities, such as government bonds, are virtually risk free, as the probability of the government defaulting is zero (Dobbins *et al.*, 1994: 59).

Figure 5: The capital market line



R_f represents these risk free securities, which offer a small return for zero risk. The portfolio **M** represents the total market, which is the weighted average of all the securities in a portfolio and is referred to as the market portfolio. If an investment is made in the **M** portfolio, the return offered is **E (R_M).** In reality, no one ever holds portfolio **M**, but a highly diversified portfolio can be closer to the market portfolio (Dobbins *et al.*, 1994).

If an investor has access to risk free assets in addition to other risky assets, then the investor can construct a set of portfolios as depicted by the **R_fM** line. The risk free asset has zero correlation to all other securities in a portfolio. The capital market line is given by the equation (Dobbins *et al.*, 1994: 51):

$$\mathbf{E\ (R_p) = [R_f + [(E\ (R_m) - R_f) / \sigma_m] \sigma_p}$$

where $\mathbf{E(R_p)}$ is the expected rate of return of any portfolio on the CML, $\mathbf{R_f}$ is the risk free rate of interest, $\mathbf{E(R_m)}$ is the expected rate of return of the market portfolio, $\boldsymbol{\sigma_m}$ is the risk (standard deviation of return) of the market portfolio and $\boldsymbol{\sigma_p}$ is the total risk (standard deviation of return) of a portfolio on the CML.

The expected rate of return for a portfolio on the CML comprises the risk free rate of return and a risk premium. The risk premium is given by $\mathbf{[E(R_m)-R_f]/\sigma_m}$, multiplied by the risk of the portfolio. The CML depicts the expected return of a perfectly diversified portfolio as a function of risk.

2.6 THE CAPITAL ASSET PRICING MODEL

Sharpe (1964), Lintner (1965), Mossin (1966) advanced the market model to what is now commonly known as the Capital Asset Pricing Model (CAPM). CAPM assumes that the price of a portfolio in equilibrium is given by the function of the risk free interest rate, the mean expected returns generated by holding that portfolio and the covariance of the expected returns on all assets in the market portfolio (Sharpe, 1964) and (Lintner, 1965). According to Varian (1993), the CAPM is a demand side model, often complemented with a single factor model, a black box supply side model of how the rates of return are generated. The CAPM is based on beta (β); a measure of the market sensitivity to returns, which represents the extent to which the return of an individual security or portfolio moves with some broad based index that is representative of the economy.

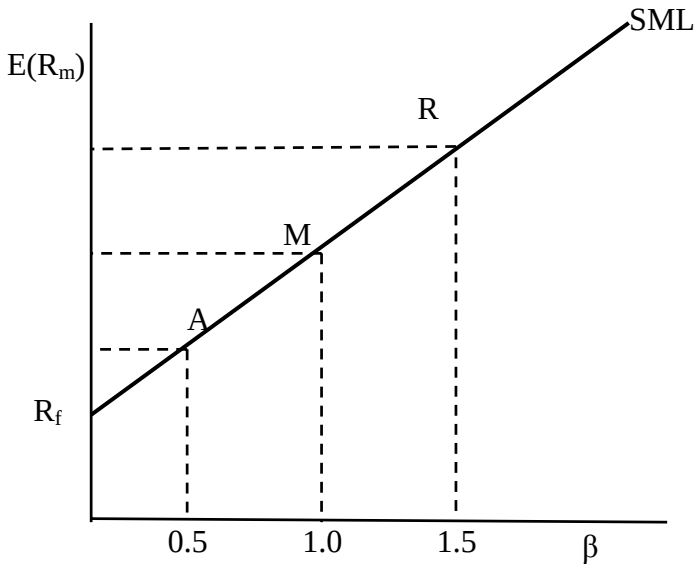
Sharpe (1964) and Jensen (1972) developed the security market line (SML), which is the equilibrium expected return of an individual security. The SML is given by the equation (Dobbins *et al.*, 1994: 56):

$$\mathbf{E(R_i) = R_f + \beta_i [E(R_m) - R_f]}$$

where $\mathbf{E(R_i)}$ is the expected return of a security, $\mathbf{R_f}$ is the risk-free rate, $\boldsymbol{\beta_i}$ is the beta factor of security **i** and $\mathbf{E(R_m)}$ is expected market return.

The SML equation may be depicted graphically, as shown in Figure 6. The SML states that the expected excess return of a security is equal to the security's **β** factor multiplied by the expected market excess return. There is a linear relationship between expected excess returns and systematic risk for a correctly priced security. In efficient markets all correctly priced securities lie on the SML and security **M** represents the market portfolio where the **E (R_m)** and **β** factor equal unity (Dobbins *et al.*, 1994: 59).

Figure 6: The security market line



Securities with **β** <1 are called defensive, since they tend to rise less rapidly than the market when the market is moving up and tend to fall less rapidly than the market when it is moving down. Securities with **β** > 1 are termed aggressive securities (Sharpe, 1966). The SML; therefore, measures the market risk premium in relation to an individual security.

2.4.4 Criticism of capital asset pricing model

The CAPM assumes that investors have the same expectations and investment horizon. Homogeneous expectations imply that every investor has the same risk-return profile for any given security. In reality, the financial markets do not operate that way, because investors take different positions based on different views and expectations. In other words, there would be no financial markets at all, since there would be no buyers and sellers of securities.

According to Peters (1994), the stability of the financial markets exists because of different expectations and investment horizons. However, Somerville and O'Connell (2002:364) state:

> "One must use extreme caution when interpreting the procedure of tracing out an efficient frontier and then locating the equilibrium tangency portfolio, because all variables of interest are determined jointly. Beta coefficients are also endogenous and will change in value for any parametric changes that do not change asset values equi-proportionately. Changes in risk aversion affect beta values, but changes in the risk-free rate do not."

Although investors can borrow and lend a risk-free asset at the risk-free rate, in reality it is highly unlikely that the transactions will be at the same rate. The borrowing rate is always higher than the lending rate. Besides, with so many brokerage houses and the portfolio managers' need for reward on superior performance, transaction costs are incurred. The transaction costs put a strain on the returns of the portfolio, as these costs will have to be deducted from the return.

Fama and French, (1992: 454) state "...beta as the sole variable in explaining returns on stocks is dead, *i.e.* the volatility of an equity doesn't tell much about the stock's return..." Frankfurter and Phillips (1977) state that determining the efficacy of a portfolio selection process depends on identifying securities according to their systematic response to general economic phenomena.

Critics of CAPM contend that there is no such thing as equilibrium price. Bernstein (2002: 2) states:

> "… in an efficient market everyone gets the price right immediately, but in the real world, however, everybody gets it wrong. Prices are moving all the time, therefore there is no such thing as an equilibrium price..."

Studies by Jensen and Scholes (1972) and Blume and Friend (1973) show that securities with high beta values tend to yield correspondingly high rates of return and the relationship

between the beta value and the return is linear. Therefore, it is possible to achieve returns closer to the market return.

The CAPM assumes that markets are efficient or perfect, but in reality seldom can a portfolio lie on the capital market line. Empirical studies by Jensen (1972), which examined implications for relaxing CAPM assumptions, concluded that the theory is reasonably robust with regard to violation of the assumptions, as many assumptions are not essential for the derivation of the important results of CAPM.

2.5 ARBITRAGE PRICING THEORY (APT)

The arbitrage pricing theory (APT) developed by Ross (1976) is based on the law of one price, which states that the same asset cannot sell for two different prices. If the same asset does sell for different prices, the arbitrageurs will buy the asset where it is cheap, thereby bidding up the low price, and simultaneously sell the same asset where the price is higher, thereby driving the high price down. The arbitrageurs will continue this activity until all prices for the asset are equal (Francis, 1991).

Arbitrage pricing theory states that a security's return depends on its sensitivity to a number of macro-economic factors. An investor may diversify away a security's unique risk, but cannot diversify away a security's exposure to a variety of macroeconomic factors. Chen, *et al.,* (1986) identified the following macroeconomic variables as important:

- An index of industrial production.
- Changes in default risk premium.
- Changes in the yield curve.
- Unanticipated inflation.

Groenewold and Fraser (1997) chose macroeconomic variables, on the general hypothesis that returns are influenced by three classes of factors: real domestic activity, other domestic influences and foreign variables. They find that it is mainly the inflation rate and the monetary variables that affect most of the securities on the Australian stock market.

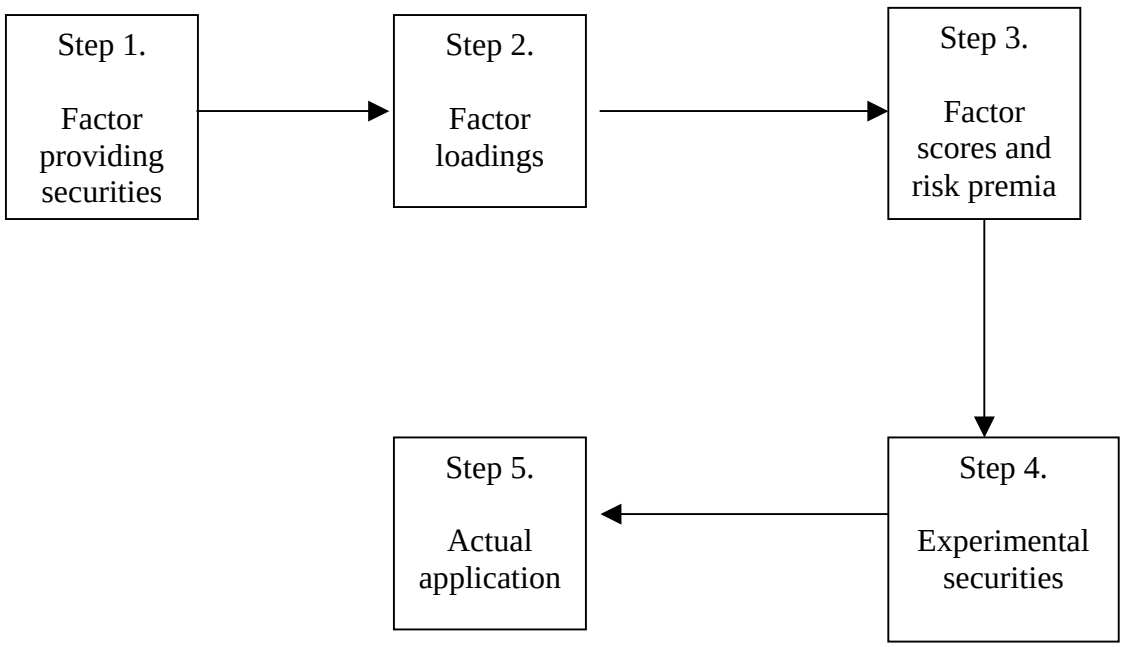
Dhrymes, Friend and Gultekin (1984) show that the number of factors extracted using a statistical procedure increases with the number of securities in a portfolio. Therefore, they argue that the number of pervasive factors may not be small. Trzcinka (1986) shows that while the number of statistically estimated factors increase with the sample size, the market factor remains dominant. However, Roll and Ross (1984) argue that what matters is the number of priced factors and not the number of statistical factors extracted from the co-variance matrix.

The return on APT can be stated as (Dobbins *et al.*, 1994: 131):

Return = *a* + β1 (factor 1) + β2 (factor 2) +……..+ βn (factor n)

To estimate the factor scores and risk premia, one has to rely on statistical methods after choosing the securities to be used for estimating the factor scores and risk premia. These factor-providing securities may either be the same as the experimental securities or may be an independent set of securities. Lehmann and Modest (1987) show that the choice of the number of securities makes a difference on the characteristic of the estimated model. Lehmann and Modest (1987) propose a process in the application of APT as illustrated in Figure 7 (Shukla, 1997: 38).

Figure 7: Steps in the application of APT



A major disadvantage of the APT is that, the theory gives no insights into what macro-economic factors should be considered when calculating a security's return. Roll and Ross (1980) carry-out a factor analysis test to identify the number of common factors which affect a security's return and what weights to give to each of these common factors. The test identifies four factors in significantly priced securities, but these factors were found to be statistical artefacts and have no direct economic interpretation. Poon and Taylor (1991) attempt to replicate a study by Chen *et al.,* (1986) using United Kingdom data, but the study proves unsuccessful. They criticised the APT on econometric grounds, as the APT was unable to determine what factors should be included in the model, thereby severely limiting its practical applications.

2.6 PERFOMANCE MEASURES UNDER MODERN PORTFOLIO THEORY

2.7.1 Risk level and the market performance

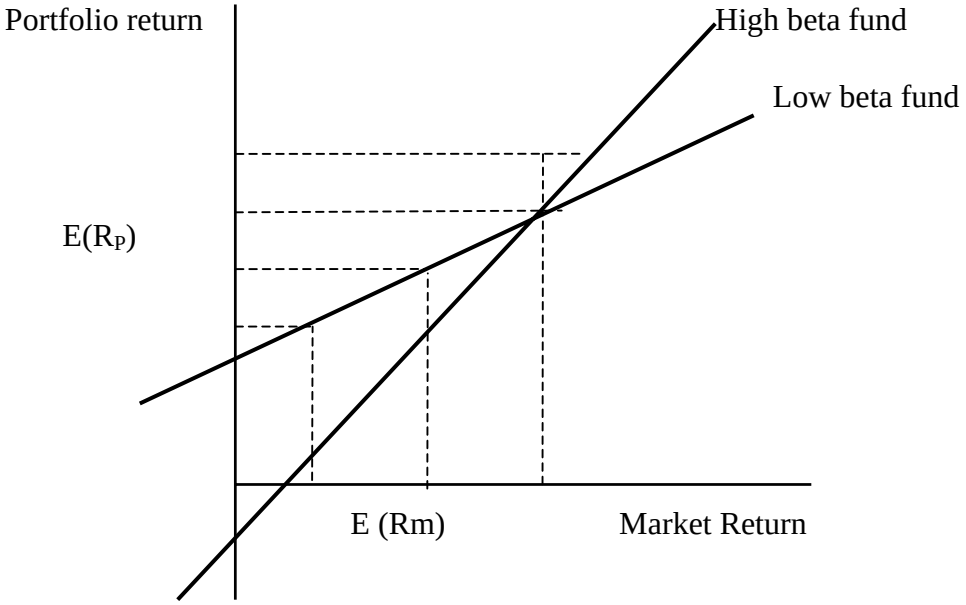
The evaluation of a portfolio is concerned with comparing the return achieved on a particular portfolio with that of some benchmark portfolio (Philippatos, 1998). An investor needs to understand the reasons for achieving a particular performance. There are various factors that contribute to varied performances, such as sheer good or bad luck due to the performance of the market or the skills of the portfolio manager. Auckenthaler (1994: 18) states that:

> "Portfolio measurement has not only the goal to inform about the quality of a portfolio performance but what is even more important is to decompose and analyse the success factors of a portfolio."

When portfolios have different betas, the realised return of such portfolios varies as the performance of the market changes. Figure 8 illustrates a comparison of a high beta and a low beta portfolio. During a bull market, a high beta portfolio out-performs a low beta portfolio (Francis, 1991). Conversely, in a bear market, a low beta portfolio demonstrates better performance than a high beta portfolio. In this instance, an assessment of whether a portfolio manager has beaten the market due to superior skills or due to high or low beta

becomes difficult (Fischer and Jordan, 1987). It therefore becomes imperative to assess the performance through MPT risk-adjusted measurements. Figure 8 depicts the dependence of risk and the market performance (Sharpe and Alexander, 1990: 91).

Figure 8: Dependence of the risk and the market performance



Beta is not the only measure of performance of a portfolio or investment manager. Spremann and Gantenbein (2000) identify four important performance measures, which are:

- Reward to variability of returns.
- Differential returns to total risk.
- The excess returns to non-diversifiable risk.
- The differential returns to non-diversifiable risk.

2.7.2 Reward to variability of returns (Sharpe ratio)

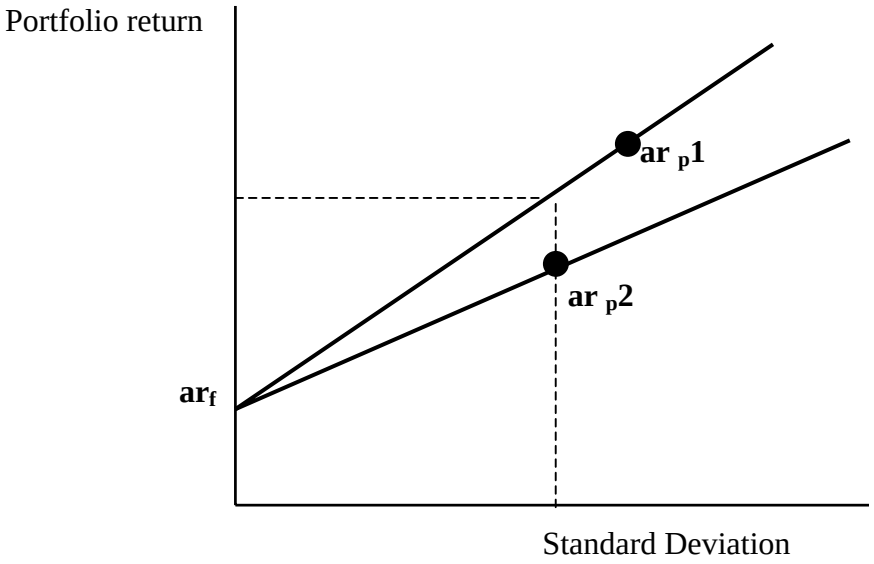
Sharpe (1966) introduced a performance measure, which he termed the reward-to-variability ratio. Other researchers came up with various names for the reward to variability ratio, such as the Sharpe index ratio (Radcliff, 1990) and (Haugen 1993), Sharpe measure (Bodie, Kane and Marcus, 1993), (Elton and Gruber, 1995) and the Sharpe ratio (Morningstar, 1993). The Sharpe ratio or the reward to variability ratio is a measure that divides realised portfolio returns (adjusted for the risk free rate) by the total risk in the portfolio (Haugen, 1997:315):

$$S_p = \frac{E(R_p) - R_F}{\sigma(R_p)}$$

where S_p is the Sharpe index; **Rp** is the average return on a portfolio: R_F is the riskless rate of interest and $\sigma(R_p)$ is the standard deviation (risk) of the security in a portfolio.

Figure 9 shows that the index measures the slope of the starting line from the risk free rate outward to the portfolio's rate of return and the line represents a combination of the risk free asset and the risky portfolio. Given the two portfolios P1 and P2 and a risk free rate, all investors would prefer P1 to P2 because P1 generate higher returns at the same level of risk than any other combination of P2 and the risk free rate. Figure 9 shows the reward to variability graph (Spremann and Gantenbein, 2000: 10).

Figure 9: Reward to variability



Investments are ranked by a ratio that purports to weight their absolute returns by a standard measure of the risk involved (Sharpe, 1966). The Sharpe ratio helps an investor make a decision when more or less all his assets are invested in a single fund. The concern of the investor is the full risk of the fund. A high Sharpe ratio implies management skill.

2.7.3 Excess returns to market risk (Treynor ratio)

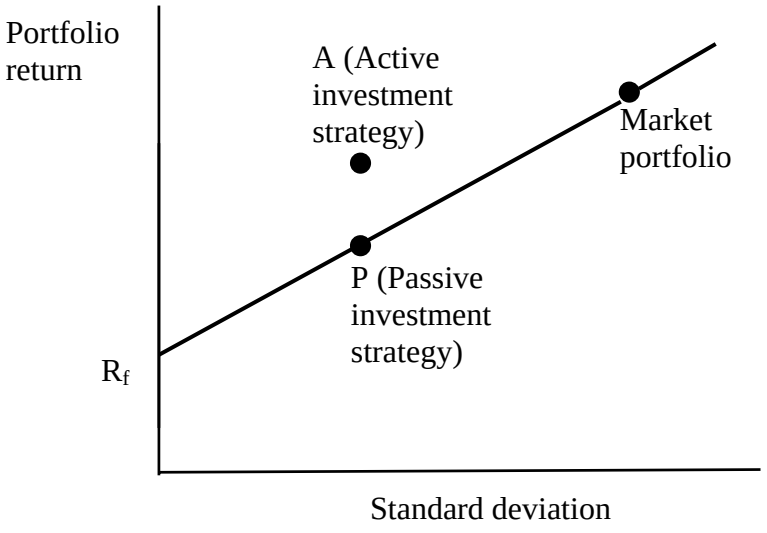
Treynor (1965) proposes the excess returns to non-diversifiable or systematic (market) risk (Treynor ratio), which is based on the assumption that portfolios are exposed only to market risk. The Treynor ratio is a measure of the risk premium earned by the portfolio per unit of risk taken. The ratio compares the performance of the active portfolio strategy against the passive portfolio strategy. An active portfolio manager tries to beat the market, whereas the passive portfolio manager tries to emulate the market portfolio.

The Treynor ratio is given by the equation (Haugen, 1997: 315):

$$T_p = \frac{E(R_p) - R_F}{\beta (R_F)}$$

where T_p is the Treynor ratio; R_p is the average return of a portfolio; R_F is the risk free rate and $\beta(R_p)$ is the standard deviation of the return of the portfolio. The Treynor ratio is graphically depicted in figure 10 (Spremann and Gantenbein, 2000: 8).

Figure 10: Treynor ratio



Investors expect a higher return represented by portfolio **A**, which they compare with portfolio **P.** The difference between portfolio **A** and portfolio **P** represent the performance of a portfolio manager given two portfolios, *i.e.* an active portfolio and a passive portfolio.

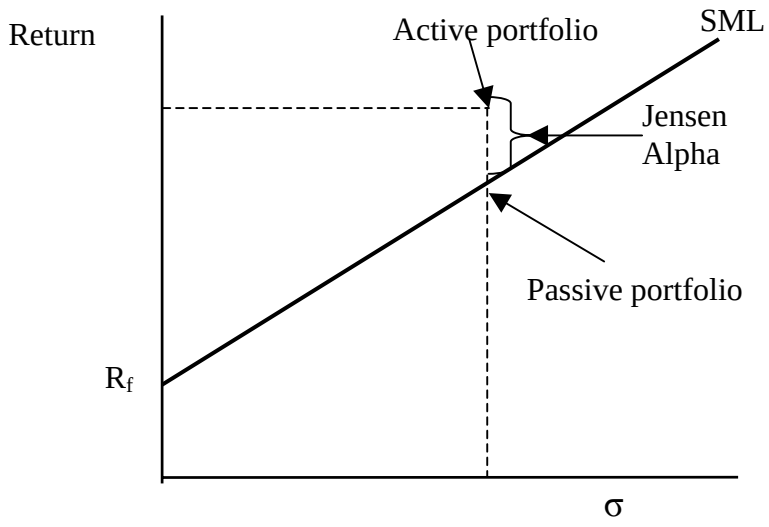
2.7.4 The Jensen Alpha

The Jensen Alpha attempts to construct a measure that is based on the security market line (Jensen, 1969). The index shows the difference between the expected return of the portfolio and the expected return of a benchmark portfolio that would be positioned on the security market line. The Jensen Alpha is calculated as follows (Haugen, 1997:312):

$$J_P = [(R_p) - R_f] - [(Rm - R_f)\,\beta p]$$

where J_P is the Jensen ratio; R_f is the risk free rate; R_m is the return on market portfolio and β_p is the Beta coefficient (Spremann and Gantenbein, 2000: 11).

Figure 11: Jensen Alpha



The evaluation of a portfolio is concerned with comparing the return achieved on a particular portfolio with some benchmark. For such a comparison to be valid, the benchmark portfolio must be in the same risk class as the portfolio under evaluation. A portfolio manager's performance is then evaluated based on achieved returns against a benchmark (Sharpe, 1966). A positive alpha illustrates a good performance, which is above the SML, whereas a negative alpha indicates poor performance below the SML.

2.8 CONCLUSION

This chapter presented the literature on modern portfolio theory and its components were defined and discussed. MPT provides an investor with insight to a set of investment alternatives, given a universe of portfolios or securities. In the literature reviewed, MPT demonstrates that an investor needs to know the investment horizon chosen for a particular investment and then define the risk and return tolerances. Furthermore, given an investor's attitude towards risk and return, an investor is able to compute a utility function, which will give an efficient set of portfolios from which the most efficient in terms of risk and return is chosen.

The MVA computes the risk-return trade off based on mean distributions or variance of returns. The MVA is a utility function that seeks to identify an efficient set of portfolios (Markowitz, 1952). Therefore, a rational investor would choose an efficient portfolio that is given by the tangency of the efficient frontier and the CML.

The capital market model introduces the concept of a risk-free asset in the analysis of a portfolio and portfolio selection. Investors are assumed to borrow and lend at the risk-free interest rate. The concept of risk-free assets enables an investor to reduce portfolio risk through diversification of a portfolio that combines a risky asset and risk-free asset. An efficient portfolio would then lie on the capital market line, thereby eliminating unsystematic risk, which is risk unique to an individual security (Sharpe, 1964). A discussion on the effectiveness of CAPM as a tool for portfolio selection and evaluation in practice concluded that CAPM is useful in practice, although some of its assumptions are not practical.

As an alternative to CAPM, the APT assumes that an individual security has unique factors, which cannot be ignored as these unique factors cause price differentials, which in turn causes arbitrageurs to speculate until the price of the security is in equilibrium (Chen, *et al.*, 1986). However, the factors advocated under APT cannot be statistically computed and analysed. Furthermore, there is a problem in identifying the factors unique to the price of a security, which in practice limits its practical application.

CHAPTER THREE

FUNDAMENTAL ANALYSIS

3.1 INTRODUCTION

The previous chapter presented modern portfolio theory, an asset allocation strategy, which concentrates on risk and return in the construction and management of a portfolio. This chapter presents and discusses the first part of traditional portfolio theory that is fundamental analysis, an active asset selection and allocation strategy, which determines the intrinsic value of a security (Graham and Dodd, 1988).

Fundamental analysis may be simple (intuitive) or complicated (using quantitative models) (Fischer and Jordan, 1987). Intuitive analysis uses a basic understanding of economic variables to hypothesise price changes. On the other hand, quantitative analysis combines knowledge of economic and accounting theory together with statistical models to determine the intrinsic value of a security (Phillips and Ritchie, 1983). Fundamental analysis follows a process of a detailed analysis of factors surrounding a particular security, *i.e.* an in-depth assessment of economic factors, industry factors, company specific factors and financial statement analysis (Phillips and Ritchie, 1983). These fundamental factors have a direct impact on the value of a security since any change will affect the intrinsic value of a security. However, after the fundamental factors that influence a particular security have been identified, the intrinsic value of a security can be determined by utilising relative valuation techniques, the dividend discount models or both techniques.

There are four factors, which forms the core of fundamental analysis: which are economic analysis, industry analysis, company analysis and security analysis. These four factors are presented and discussed in the following sections.

3.2 ECONOMIC ANALYSIS

Fundamental analysis of the economy concentrates on four main indicators: inflation, interest rate, the exchange rate and economic growth. The philosophy underlying fundamental analysis is that the intrinsic value of a security is affected by underlying economic variables. Fundamental analysts analyse and estimate macroeconomic prospects such as economic growth, inflation and interest rates to identify industries and firms that will gain or lose most from these conditions.

Investors want to receive at least the real risk-free rate to compensate them for the opportunity cost of parting with their money. Zhou (1996) studies the relationship between interest rates and stock prices using regression analysis and finds that interest rates have an important impact on stock returns. In addition, Campbell (1987) shows that long-term interest rates explain a major part of the variation in price-dividend ratios and suggests that the high volatility of the stock market is related to the high volatility of long-term bond yields and may be accounted for by changing forecasts of discount rates. Therefore, the analysis of term structure of interest rates is effective in predicting excess returns on the stock market (Campbell, 1987). Higher interest rates are hypothesised to depress stock prices through the substitution effect (interest-bearing assets become more attractive relative to shares), *i.e.* an increase in the discount rate reduces the present value of future expected returns, thereby having a depressing effect on investment and hence on expected future profits.

Inflation affects the time value of money and investors want to be compensated for the expected loss in purchasing power. Inflation is defined as the percentage change in the general price level (Samuelson, 1965). Fama (1998) argues that expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market; therefore, stock market returns should be negatively correlated with expected inflation. Spyrou (2001) also studies the relationship between inflation and stock returns and finds that inflation and stock returns are negatively related. Fama and Schwert (1977) and Stulz (1986) investigate the ability of common stocks to provide high real returns against inflation and conclude that real returns are negatively related to inflation.

Fang (2002) argues that exchange rates could also influence stock prices. His results confirm that currency depreciation adversely affects stock returns and increases market volatility. The implication for investors is that they have to evaluate the stability of foreign exchange markets prior to investing in stock markets. Therefore, the exchange rate has an influence on stock prices and investor profits.

Chen (1991) argues that stock market returns are a function of expected economic growth. McQueen and Roley (1990) argue that higher than expected economic growth during a depression might indicate the end of the recession and hence influence the stock market positively. On the other hand, higher than expected economic growth in an economic expansion might induce fears of an overheating economy, which might prompt monetary authorities to raise interest rates. Higher GDP increases profits and hence share prices should rise, while depreciation boosts the profitability of domestic producers of tradables (exports and import substitutes) relative to foreign competitors. The real stock prices are positively related to real GDP and negatively related to the long-term interest rate (McQueen and Roley, 1990).

Economic analysis plays an important role in fundamental analysis by providing fundamental information on the direction that the economy is taking; therefore, given the above economic signals, investors' investment decisions are partly influenced by them.

3.3 INDUSTRY ANALYSIS

Empirical researches in accounting find a relationship between a firm's profitability and that of other firms in the same industry. Prior studies by Brown and Ball (1967) and Lev (1989) document a co-variation among accounting numbers of firms in the same industry. This co-variance suggests that the firms' earnings are affected by factors common to an industry; therefore, a forecasting model partitioned by industry should improve predictive performance relative to a model developed across industries (Foster, 1970).

Black and Fraser (1995) argue that the predictable variation in excess stock returns is a rational response to the general level of expected business conditions. Fama and French

(1988) argue that when business conditions are poor, income is low and expected returns on bonds and stocks must be high to induce substitution from consumption to investment. By contrast, when times are good and income is high, the market clears at lower levels of expected returns. The relationship between the stock market and the business cycle has important implications for stock market investments and investment strategies. Brocato and Steed (1998) show that total returns of equity assets rise during expansions while those of fixed income debt instruments do better during downturns. Therefore, business condition proxies play substantially different roles in explaining variations in expected stock and bond returns. Moore (1980) concludes that the business cycle tends to turn down several months before the bear market begins and turn up for several months after the bull market; hence, accurate forecasting should be broken down into quarters, if forecasting is to be effective.

Selling and Stickney (1989) argue that firms face different environments in the markets where their products compete. These differences result from the firms pursuing different activities in response to their competitive environments. Because of the differences in strategies and products, the relations between earnings and firms' activities are expected to vary across industries. If an earnings forecasting model including financial statement information captures information beyond prior years' earnings, industry specific forecasting models should reduce model error. Firms in the same industry face similar competitive environments; therefore, it is easier to interpret the relations between the financial statement variables and future earnings (Foster, 1970).

Grodinsky (1953) draws a comparison between industry growth and the human lifecycle. Companies enter a pioneering stage when they are formed. During this period, there is often a rush by many companies to enter the field. This initial period is usually associated with a rapid growth phase, which is followed by a period where others exit the industry leaving relatively few survivors. Although there is strong growth during this period, the rate of growth is slower than the initial phase. Grodinsky (1953) named these two phases the pioneering stage and the expansion stage. After these two phases, industries either stop growing or there is relatively stable existence for an extended period. Investing in industries that are in a pioneering stage can be risky, as there is no history of performance to measure and to enable forecasting of future earnings. Therefore, the ideal situation is to invest in

companies whose earnings have grown and are expected to grow at a faster rate than the industry as a whole (Grodinsky, 1953). These are what are termed growth stocks or shares.

Although industry analysis can be useful as a factor for reaching an investment decision, there are some limitations to it. Elton and Gruber (1971) show that industry groupings often include companies whose operations and performances are so dissimilar from one another, that the so-called industry factors may be misleading rather than helpful in attempting to assess future potential returns from an investment in the companies.

It is important when conducting industry analysis to ascertain the stage at which the company is in its life cycle, within that industry (Grodinsky 1953). Valuation can be skewed because of market psychology, since analysts and investors interpret industry activity differently. Growth shares may be bought at too high a price and bring negative returns to the investor; alternatively, the low growth industries when bought at a low price might bring positive returns. Generally, growth shares sell at a higher P/E ratio during the growth phase than those that are near the end of their growth patterns (Elton and Gruber, 1971).

3.4 COMPANY ANALYSIS

3.4.1 Financial statement analysis

Financial statement analysis forms an integral part of company analysis as it involves looking at the historical data to estimate future performance. Data on items such as revenues, expenses, assets and liabilities is what fundamentalists believe will give insight into how a particular security will perform in future (Fischer and Jordan, 1987). Penman and Zhang (2002b) state that a structured financial statement analysis helps forecast the next-period return on net operating assets as well as to explain the cross-sectional variations in the price-earnings ratios. Financial statement analysis deals with the information content of the financial statements to determine security prices. Lev and Thiagarajan (1993) and Fairfield, Sweeney and Yohn (1996) examine the role of particular financial statement components and ratios for forecasting and they conclude that understanding of the components of financial statement analysis leads to a reduction of random errors in valuation.

Financial statements are prepared in accordance with generally accepted accounting principles (GAAP). However, GAAP is open to various interpretations, since financial statement analysis and earnings per share can be affected by several accounting conventions that treat accounting transactions differently, either through manipulation or inappropriate use of accounting standards (Francis, 1991). Companies in similar industries can have different accounting polices, but they should adhere to the generally accepted accounting practice (Hackel and Livnat, 1992). However, if financial statement analysis is to be effective for security valuation, a proper understanding of the components of financial statements and the treatment of accounting entries is required to avoid random valuation errors (Nissim and Penman, 1999).

The most important part of financial statement analysis is ratio analysis. Ratio analysis compares ratios of individual firms against benchmarks from comparable firms, both in the past and the present to detect abnormalities (Nissim and Penman, 1999). Time series and cross-sectional analyses are used to analyse ratios since the analysis of one ratio on its own does not yield any significant result. Time series analysis is used to search for systematic patterns that offer a basis for performance predictions (Chudson, 1937), whereas the cross-sectional analysis implies comparison with industry-wide measures as a check on selective measures against benchmarks (Horrigan, 1967). Ratio analysis aims at a comprehensive evaluation of a firm's economic situation; therefore, the interdependencies between various ratios must be recognised (Lev 1974). Ultimately, valuation of securities depends on accurate ratios that can be used to forecast future earnings.

3.4.2 Company management

The quality of management at the company's disposal generally indicates its potential success. It is the duty of management to put in place polices and procedures to ensure the company's success. Measuring the quality of management is normally qualitative and subjective in nature. In order to reduce an element of subjectivity, an investor would need to study closely the management policies put in place and the credentials of management (Fischer and Jordan, 1987).

Annual reports usually provide these policies, which guide the analysis of past performance and realisation of stated goals. Adherence to corporate governance is one measure that can

highlight the decision making structure of a company. A company that is not adhering to corporate governance may indicate non-transparency in the decision making process.

The issue of succession plans assists an analyst in identifying the strength of management and the faith it has in its employees. An ageing management may be associated with a slow down, whereas the introduction of new blood reflects the constant adaptation to change and reinforcement of management thinking (Francis, 1991). The valuation of a security is affected by the perception that investors and analysts have concerning the management of a company. Since management makes the decisions that affect the future earnings of a company, its actions contribute to the intrinsic value of a security.

3.5 SECURITY ANALYSIS

3.5.1 Definition of security analysis

Lorie and Hamilton (1973: 114) state "the purpose of security analysis is to detect differences between the value of a security as determined by the market and a security's intrinsic value." Security analysis affords the investors a reliable method of assessing the risks inherent in the financial position, capital structure and the earnings variability of a company. Graham and Dodd (1988: 84) give a more detailed definition of security analysis as:

> "The functions of security analysis may be described under three headings: descriptive, selective and critical. In its more obvious form, descriptive analysis consists of marshalling the important facts relating to an issue and presenting them for coherent, readily intelligible manner. This function is adequately performed for the entire rage of marketable securities by the various manuals. A more penetrating type of description seeks to reveal the strong and weak points in the position of an issue, compare its exhibit with that of others of similar character. Analysis of this kind is applicable to almost every corporate issue. In its selective function, security analysis goes further and expresses specific judgements of its own. It seeks to

determine whether a given issue should be bought, sold, retained or exchanged for some other issue."

When a security's market price is below its theoretical value, it is regarded as undervalued, whereas it is overvalued if the price exceeds the underlying value. There are various approaches to security valuation, but for the purposes of this study, the dividend discount models and relative valuation models will be examined and reviewed in the next sections.

3.5.2 Relative valuation models

3.5.2.1 Price-earnings ratio

Since the seminal work of Ball and Brown (1968) and Beaver (1968), a large body of financial research has been devoted to the usefulness of accounting earnings. The market valuation approach is commonly used to study the association between earnings and stock prices. The findings of Lev (1989), Cho and Jung (1991) and Dumontier and Labelle (1994) suggest that the market returns are explained in part by accounting earnings. Fama and French (1995) also show that earnings-to-price ratios and book-to-price ratios are positively related to future returns. Studies by Beaver and Morse (1978) show the predictive power of price-earnings ratio (P/E), whilst Ou and Penman (1989) demonstrate that P/E ratios have predictive value and that P/E ratios can be used to improve analysts' forecasts.

The price-earnings ratio for a share is calculated by dividing a share's price by its earnings per share (Capaul *et el.*, 1993: 27):

$$\textbf{Earnings multiplier = Price-earnings ratio} = \frac{\textbf{Price per share}}{\textbf{Earnings per share}}$$

A high multiplier or P/E ratio is associated with high earnings growth, whereas the reverse is true. In practice, an attempt is made to view the P/E ratio of a given security in relation to a P/E ratio prevailing in regard to some broad-based market index such as the JSE all-share index, which is given as (Capaul *et el.*, 1993: 28):

$$\textbf{Price-earnings relative} = \frac{\textbf{Share price-earnings ratio}}{\textbf{Market index price-earnings}}$$

Whitbeck and Kisor (1963) identify four main factors that analysts consider when estimating a P/E ratio for the valuation of a share as:

- the capitalisation rate
- the growth rate of the dividend stream
- the duration of the expected dividend stream and
- the dividend payout ratio.

Whitbeck and Kisor (1963) speculate that the differences in P/E ratios between shares could be explained by the above factors mentioned. They conclude that P/E is an increasing function of growth and dividend payout and is inversely related to the variation in growth rate. A survey of practising analysts by Bing (1971) indicates that 75% preferred the simple multiplier technique.

According to Heckel and Livnat (1992), earnings are subject to managerial discretion, such as having latitude in applying accounting standards to their specific situation, *i.e*. that firms may have different approaches to revenue recognition, expense recognition and allocation of costs across periods. The earnings approach to valuation may become inaccurate because of the above factors; therefore, they recommend the market-to-book value approach and the free cashflow approach.

3.5.2.2 Market-to-book value

Rosenberg, Reid and Lanstein (1985) find that the average returns on stocks are positively related to the ratio of a firm's book value to the market value. Fama and French (1992) also find that there is a strong relation between average returns and book value of equity and that the positive relationship between price to book ratio and average returns persist in both the univariate and multivariate tests. Chan, Hamao and Lakonishok (1991) find that the book to market value ratio has a strong role in explaining the cross-section of average returns on the Japanese stock market. Capaul, Rowley and Sharpe (1993) extend the analysis to price to book ratios across other international markets and conclude that value stocks, *i.e.* stocks with low price to book ratios, earn excess returns in every market analysed.

The market-to-book value is calculated by dividing a share's market price by its book value using the formula (Capaul *et el.*, 1993: 30):

$$\textbf{Market-to-book value (M/B) ratio} = \frac{\textbf{Price per share}}{\textbf{Book value per share}}$$

The market-to-book value ratio provides an indication of how investors perceive the firm. Institutions with relatively high rates of return on equity generally sell at higher multiples of market-to-book value than those with low returns. In short, the lower the market value relative to book value, the higher the probability of default (Capaul *et el.*, 1993).

The market-to-book value ratio is widely used as a proxy for Tobin's q, which is a measure of growth and investment opportunities available to a firm (Skinner, 1993). The basic idea behind Tobin's q is that the firm should acquire more assets when Tobin's q exceeds one. Therefore, a high Tobin's q indicates good growth opportunities, while a low Tobin's q implies poor or unrecognised opportunities (Smith and Watts, 1992).

3.5.2.3 Free cashflow model

According to Miller and Modigliani (1961) the free cashflow method can be defined in accounting-oriented terms in the form of an equation as (Francis, 1991: 384):

Free cashflow = revenue to the firm - firm's operating costs
- investment to sustain earnings.

Therefore, to find the intrinsic value of a share, the present value of the future cashflows need to be discounted using a capitalisation rate, as shown in the equation below (Damodaran, 1997: 188):

$$\textbf{Present value per share = Intrinsic value} = \sum_{t=1}^{t=n} \frac{\textbf{CF to Equity}_t}{(1+k_e)}$$

where **CF to Equity** is the expected cashflow to equity in period **t** and $\mathbf{k_e}$ is the cost of equity.

The calculation of the free cashflow valuation model is similar to the dividend discount model, except that free cashflows are used instead of dividends. Basu (1983), Lakonishok Schleifer and Vishiny (1994) show that various measures of cashflows scaled down by price are positively related to future stock returns. Henkel and Livnat (1992) believe that free cashflows are superior to an earnings approach, since management can manipulate accounting standards to suit their specific requirements. Therefore, the free cashflow approach provides a more stable valuation approach.

3.5.2.4 Limitation of relative valuation models

Although relative valuation models have as their strength the ease of implementation as valuation tools, they also have their weaknesses. Relative valuation allows portfolio managers to find under-valued securities with ease, though the under-valuation implies that, if there is a price correction in the sector, the under-valued security will lose less in value than comparable securities. Since the better choice for a portfolio manager would have been to avoid the sector altogether, relative valuation can lead to returns that are lower than the discounted cashflow models since the market might be priced too high (Lakonishok, *et al*, 1994). In theoretical models that assume complete and perfect markets, measures of book value and earnings are redundant alternatives for valuation (Beaver and Demski, 1979).

3.5.3 Dividend discount models

The dividend discount models are based on the time value of money. Under conditions of uncertainty, a security's intrinsic value is the discounted present value of all future cashflows. Weiss (1930) states that "The proper price of any security, whether a bond or stock, is the sum of all the future income payments discounted at the current rate of interest in order to arrive at the present value."

Since securities such as ordinary equity offer no legal obligation to pay dividends or return the principal amount, uncertainty is created amongst the investors, since the return will depend on the success of the company. Williams (1938) was part of the early crusade of academics that

developed the discount models, but an inherent weakness in his model was that it treated all cashflows as certainties. Gordon (1962) developed the dividend discount model, known as the Gordon's dividend discount model, which incorporates dividend growth and earnings growth.

Miller and Modigliani (1961) state that the main sources of intrinsic value are the dividends and growth in dividends. Thus, the factors that affect the security price are the expected dividends, the growth rate in expected dividends and the factors that are proxy for the risk of a security. Therefore, the main explanatory variables of security prices are the dividends, earnings, retained earnings, size, variability in earnings and the debt to equity ratio (Graham and Dodd, 1988).

3.5.3.1 Single period discount model

The single period discount model assumes that an investor wishes to hold a security for a single period. The model is given by the equation (Drobezt, 2002: 3):

$$\mathbf{P_o = \frac{D_1 + P_1}{1 - r}}$$

where: $\mathbf{D_1}$ = dividend to be received at the end of period **1**; **r** = required rate of return or discount rate; $\mathbf{P_1}$ = market price at the end of period **1**; $\mathbf{P_o}$ = market price at the beginning of the period.

The single stage dividend discount model serves as a basis for formulating advanced discount models, as it is of limited practical use, since, in reality, firms operate for an indefinite period. The single period model does not take into account the dividend growth factors (Fischer and Jordan, 1987).

3.5.3.2 Two stage discount model

In reality, most firms do not grow at a constant rate, since some firms enter a period of increasing growth followed by a stage where growth is stable for an unlimited period of time.

The two-stage model is synonymous with the two-phase business lifecycle. Given this growth pattern, the following equation is applied to value the security (Drobezt: 2002: 15):

$$P_o = \sum_{t=1}^{t=n} \frac{DPS_t}{(1+r)^t} + \frac{P_n}{(1+r)^n}$$

Where $P_n = \dfrac{EPS_n * (1 + g_n) * \text{New payout ratio}}{r - g_n}$

3.5.3.3 Multiple periods discount model

Unless an investment is of a speculative nature, investors normally hold securities for multiple periods. The multiple periods discount model estimates the present value of a security as the sum of the present value of all dividends to be received over the holding period, which is added to the present value of the market price at the end of the period.

Gordon (1962) hypothesise that the value P_o of a security equals the present value of the infinite stream of dividends that is received by an investor. The following equation gives the intrinsic value for a security held for multiple periods (Fischer and Jordan, 1987: 88):

$$P_o = \sum_{t=1}^{\infty} [D_0 [d_t / (1 + r_s)^t\} + P_3 (1 + r_s)^n$$

where: P_o is the present value of a stream of dividend for multiple periods, d_t = dividends per share at period **t**; **r** = discount rate; P_3 = present value of one security at period t.

3.5.3.4 Constant growth discount model

The assumption under the constant growth model is that the firm will maintain a stable dividend policy, *i.e.* keep the retention rate constant and earn a stable return over time. The model is given by the following equation (Fischer and Jordan, 1987: 89):

$$P_0 = [D(1 + g) / (1 + r)] + [D(1 + g)^2 / (1 + r)]^2 + [D(1 + g)^3 / (1 + r)]^3 + ...+ [D(1 + g)^n / (1 + r)]^n$$

In terms of this model, securities that have theoretical prices above their actual market price are considered a good buy, whereas those with theoretical prices below the market price may be sold.

3.5.3.5 Limitations of discounted cashflow valuation

Francis (1991) states that the constant valuation model is a simplification of reality since the model always indicates the optimal dividend payout as either zero, 100 percent or irrelevant. The dividend policy, which actually maximises the owner's wealth, is rarely indicated in this oversimplified model. Furthermore, Francis (1991) states that the discount rate varies directly with the level of the firm's risk. The present value of the firm's income moves inversely with the discount rate. Therefore, by assuming that the discount rate is constant, the model excludes the effects of risk on the value of the firm.

The discounted cashflow valuation model is information intensive, which makes it unsuitable if portfolio managers are to pick from a large universe of securities. Furthermore, it requires inputs many years into the future, although future cashflows are uncertain. The input parameters can be moved around by changing one parameter for the other, thereby revealing analysts' biases.

3.6 CONCLUSION

Fundamental analysis facilitates security valuation by concentrating on identifying the intrinsic value of a security. The pricing of securities through valuation techniques based on the dividend discount models and the relative valuation models were discussed in this chapter. Security valuation using the dividend discount model, price-earnings ratios, market-to-book ratios and free cashflow ratios is not enough without a thorough understanding of the economic, industry and company specific circumstances which affect the valuation of a security. Empirical research has shown that the above factors have a direct bearing on the

value of a security as well as affecting the buy, hold and sell decisions (Graham and Dodd, 1988).

Although fundamental analysis does theoretically identify securities that are undervalued or overpriced, it contradicts the efficient market hypothesis (EMH) (Fama, 1970). The EMH states that a security's market value represents its fair price; therefore, there is no advantage to be gained from the valuation using fundamental analysis. Fundamental analysis models have trouble explaining the price movements of the overall market. However, fundamental analysis remains an important portfolio management approach to asset selection and allocation (Bing, 1971).

CHAPTER FOUR

TECHNICAL ANALYSIS

4.1 INTRODUCTION

The previous chapter presented fundamental analysis, which is the first part of traditional portfolio theory. This chapter presents and discusses the second part of traditional portfolio theory, which is technical analysis, another active asset management strategy. As an approach to financial forecasting, technical analysis is based on the belief that historical price series, trading volume and other market statistics exhibit regularities (Li and Tsang, 1999). Technical analysis does not attempt to measure the intrinsic value of security; instead it looks for patterns and indicators on the security's charts that will determine a security's future performance and more importantly to help portfolio managers adapt to trends that are changing direction (Pring, 1997).

Technical analysis is concerned with how the forces of supply and demand impact upon a security's price (Nicholson, 2000). Technical analysis recognises that there are other forces at play that shape supply and demand of a security and cause its price to deviate significantly from a consistent relationship with the security's intrinsic value (Nicholson, 2000). However, the technical analysts study changes in the level of supply and demand for the traded security directly since it considers fundamental, political, psychological and other factors as factored into the market price of a security (Pring, 1997). Yong (1991) states that technical analysis is used primarily to assist with the timing element of the decision-making process, where an investor or trader seeks to:

- identify the beginning of an upward trend in a stock
- buy a position in the stock
- identify the end of the trend
- sell the position in the stock.

The securities markets are known to fluctuate, with each fluctuation given a name signifying the effect of that trend (Francis, 1991). A bull market (upward trend) is associated with a rise in activity on the market because of a change in the business cycle and corporate performance, whereas the bear market (downward trend) is the reverse (Pring, 1997) as depicted in Figure 12. In essence, all investors are concerned with market timing on when to buy or sell securities and they would prefer to buy low and sell high.

In order to identify trends, technical analysts employ the use of graphs (charts) to detect some hidden patterns in prices; the appearance of the patterns is usually considered to indicate a predictable movement of subsequent prices (Yong, 1991). While a security's price may spike up or down daily, over time its price tends to move in one direction as observed using a trendline as depicted in Figure 12. Technical analysts identify patterns in these trendlines of individual securities from graphs in the same way they identify patterns in the overall market. Technical analysts then base their buy or sell recommendations on a security's price trendline (Elder, 1993).

Figure 12: FTSE/JSE ALSI trend chart

Source: I-Net Bridge, 2003.

An upward trendline is bullish where investors tend to sell their assets to other investors who are optimistic; a downward trendline is bearish where some investors buy assets at a lower price (Francis, 1991). If a technical analyst's assumptions about market overreaction are correct, then excess returns can be earned as markets correct themselves over time.

Practitioners' reliance on technical analysis charts is well documented. Frankel and Froot (1990a) note that the majority of market professionals tend to include technical analysis in forecasting the market.

Since the seminal work of Friedman (1953) and Fama (1970), the role of technical analysis as a forecasting mechanism continues to remain controversial in the literature. The efficient market hypothesis (EMH) implies that technical analysis is without merit, since the current price of a security reflects all available information, including the history of prices and trading volume (Fama, 1970). However, technical analysts contend that price trends are often lengthy and repeat themselves, which creates an opportunity for profit (Frankel and Froot, 1990a). However, it is not the aim of this chapter to provide theoretical or empirical justification for technical analysis, but to highlight the technical methods and tools frequently used in practice, whilst the EMH presents another school of thought contrary to technical analysis.

4.2 ASSUMPTION OF TECHNICAL ANALYSIS

It is best to let the technical analysts provide the basis for their approach in their own words. Edwards and Magee (1958) argue that:

> "It is futile to assign an intrinsic value to a stock certificate. One share of US Steel, for example, was worth $261 in the early fall of 1929, but you could buy it for only $22 in June 1932. By March 1937, it was selling at $126 and just one year later for $38. This sort of thing, this wide divergence between presumed value and intrinsic value, is not the exception; it is the rule; it is going on all the time. The fact is that real value for US Steel is determined at any time solely, definitely and inexorably by supply and demand, which are accurately reflected in the transactions consummated on the floor of the exchange."

Therefore, according to Edwards and Magee (1958) the assumptions that underlie technical analysis are:

- Market value is determined by the interaction of supply and demand.
- Supply and demand is governed by numerous factors, both rational and irrational.
- Security prices tend to move in trends that persist for an appreciable length of time, despite minor fluctuations in the market.
- Changes in a trend are caused by shifts in supply and demand.
- Shifts in supply and demand, no matter why they occur, can be detected sooner or later in the charts of market transactions.
- Some chart patterns tend to repeat themselves.

The shifts in supply and demand result from the fact that some market participants over-react to new information whilst others change their positions frequently and often irrationally. Furthermore, there is a group of investors that leads the market, which signals other investors to follow in either direction based on their views about the market (Malkiel, 1995). Based on these external forces of supply and demand that govern the up or down movements in the markets, technical indicators and charting patterns allow investors to see the cycles in security prices that enables them to make timely investment decisions (Edwards and Magee, 1958).

In order to identify whether the market is in a bull or bear market and to time the market, technical analysts rely on a number of technical indicators, which measure the direction taken during different periods of economic activity. For the purposes of this study, only the most established technical indicators are be discussed.

4.3 TECHNICAL INDICATORS

4.3.1 Dow theory

Technical analysis was derived from the Dow theory, a theory developed by Dow (1900), where the stock market averages were constructed based on opening stock price movements now famously known as the Dow Jones Industrial Average (DJIA). Dow (1900, 1) states that:

> "The market is always considered as having three movements, all going at the same time. The first is the narrow movement from day to day. The second is the short swing running from two weeks to a month or more; and the third is the main movement, covering at least four years in duration."

According to Dow (1900), the stock market does not perform on a random basis, but is influenced by three distinct cyclical trends that guide its general direction. The cyclical trends are classified as:

- Primary trends are commonly called bear or bull markets, which are the long-range cycles that carry the entire market up or down.
- Secondary trends, which last only a few months. They act as a restraining force on the primary trends; hence, they are sometimes called corrections.
- Minor or tertiary trends, which are simply daily fluctuations. The Dow theory assumes that the minor trends are meaningless in predicting anything.

The chart in Figure 13 below depicts the trend on the FTSE/JSE ALSI from September 2002 to October 2003. The FTSE/JSE ALSI is constructed along the same lines as DJIA.

Figure 13: FTSE/JSE ALSI trend chart

Source: I-Net Bridge, 2003.

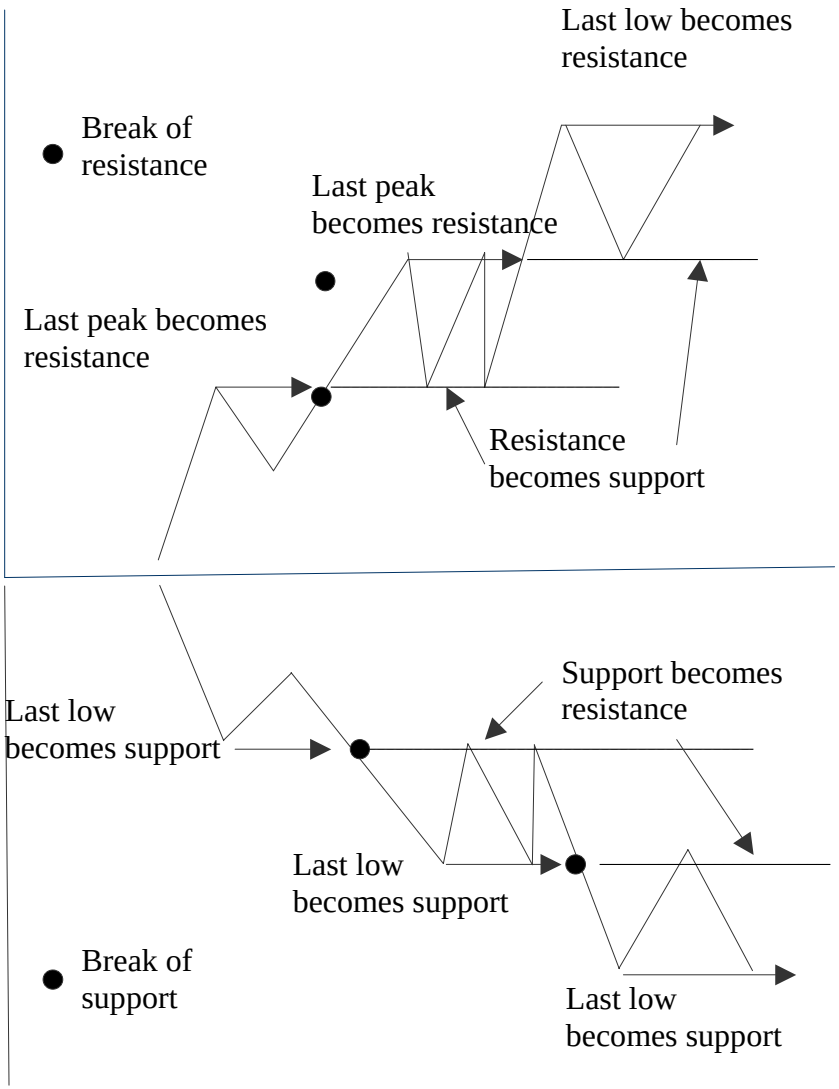
As can be seen from Figure 13, the ALSI went through minor trends from September 2002 to January 2003. Thereafter, the trend was significantly downwards from January 2003 to April 2003, where it reached a trough. This downward trend is what is called the primary trend, which depicts a bear market. As from the end of April 2003, the market entered a bull market up to October 2003. That upward trend is still a primary trend, although a combination of minor and secondary trends occurred in between. The line chart illustrated in figure 2 is constructed by plotting each day's closing or opening prices and connecting them with a continuous line.

4.3.2 Support and resistance levels

Murphy (1986, 59) defines support and resistance levels as: "support is a level or area on the chart under the market where buying interest is sufficiently strong to overcome selling pressure. Consequently, a decline is halted and prices turn back again. Resistance is the opposite of support." Pring (1997, 199) states that "support and resistance levels represent a concentration of demand and supply sufficient to halt a price move at least temporarily." Arnold (1993, 67) observes that " a support level is a price level at which sufficient demand exists to at least temporarily halt a downward movement in prices." Support and resistance levels are price levels at which price movements should stop or reverse direction and they tend to act as a floor or a ceiling to future price movements (Edwards and Magee, 1958).

As shown in Figure 14, once the share price penetrates below the support level, it becomes the resistance level until it penetrates above the resistance level and moves to become a support level. Support and resistance (S/R) levels vary in strength and length leading to certain price levels being designated as major or minor S/R levels. When a stock declines to its support level, the low price attracts buyers, whose buying then supports the price and keeps it from declining further. When a security's price increases to its resistance level, the high price attracts sellers, whose selling then hinders a further rise in price (Brock, Lakonishok and Lebaron, 1992). The chart in figure 14 depicts the support and resistance levels (Bertschi, 1999:8).

Figure 14: Support and resistance levels



4.3.3 Moving averages

The effect of a moving average (MA) is to slow down the price movement so that the long-term trend becomes smoother (or less volatile) and therefore, more obvious. The longer the period of the moving average, the smoother the price movement is (Achelis, 1986). Variants of the moving average include the dual MA system, the triple MA system and the t-ratio on MA. The dual MA uses of two moving averages while the triple MA uses of three moving averages. The t-ratio is the ratio of the simple MA standard deviation. The most widely used moving average is the n-day MA given by the formula of Kaufman (1987):

n-day MA = (1/n x new settle price) + [(1-1/n) x yest MA]

where **yest MA** is yesterday's security closing price.

An investor employing the MA system buys a security when the closing price rises above the MA and sells when close falls below the MA. If the market is moving sideways or if there is excessive volatility, there could be false signals, which can prompt wrong investment decisions (Wong, Manzur and Chew, 2002).

4.3.4 Breath of the market

The *advance* versus *decline* ratio is the number of securities that have increased to the number of securities that have declined. Measurement of the *advance* versus the *decline* determines the breath or dispersion of price increases or declines (Francis, 1991). Technical analysts plot daily *advance* versus *decline* ratios on a graph to produce an advance/decline (A/D) line that gives them an indication of market breadth trends. The formula for the A/D line is (Francis, 1991):

A/D line = (no. of up issues - no of down issues) + yesterday's A/D value

The fact that the A/D line includes yesterday's A/D value gives the indicator a cumulative effect and thus shows the net number of securities that have increased or declined over a period. The absolute value of the A/D line is not important since the A/D value depends on the zero reference date that is used. The importance of the A/D line lies in its relative value to other days and its chart patterns (Eng, 1988).

The A/D line confirms price trends and identifies divergences, which warn of trend reversals. During a market rally, an increasing A/D line confirms the trend by showing that the majority of securities are participating in the rally, whilst on the other hand, a sideways or declining A/D line in a market rally signals a divergence and caution to the bull market (Francis, 1991). A declining A/D line in a rally shows that the majority of issues are declining and that the market rally is being fuelled by a minority of securities, which may not be able to continue carrying the market higher (Frost and Robert, 1985).

4.3.5 Relative strength index

The relative strength approach assumes that a bull market will be accompanied by a large number of shares attaining new highs thereby exhibiting relative strength, whereas the reverse is true in a bear market (Wilder, 1978). The analysis may be applied to an individual security or to industries. Through this approach, investing in a security that has demonstrated relative strength in the past will earn higher returns for an investor, since the relative strength of a security sometimes continues for a period of time. The relative strength index (RSI), is given by the following formula (Francis, 1991):

$$\mathbf{RSI = 100 - [100 / (1 + RS)]}$$

where **RS** = (average of n-day up closes)/ (average of n-day down closes).

The relative strength index ranges from 0 to 100. A security considered *overbought* will have an RSI level closer to 100 and an investor should consider selling the security. Likewise, if the RSI moves closer to 0, the security is considered *oversold* and an investor should consider buying the security. The RSI is regarded as most effective in increasing confidence before making an investment decision, although investors should be aware of big surges and drops in security prices that could dramatically affect the RSI, resulting in false buy or sell signals (Wilder, 1978).

4.3.6 Volume indicator

The major driver on any exchange is the volume of transactions that go through the market each day. A large trading volume is often associated with a large change in price. Blume, Easley and O'Hara (1994) demonstrate that volume may provide relevant information if prices do not react immediately to new information. Jain and Joh (1988) state that security transactions are sometimes grouped into two categories, which are liquidity trading and information trading. A large volume of liquidity trading can take place without causing any price change. Volume that is substantially above normal signifies (or confirms) a pattern in a direction of prices. Datar, Naik and Radcliffe (1998) show that low volume securities earn higher returns than high volume securities, though they attribute the differential returns to a

liquidity premium on the former. Lee and Swaminathan (1998) examine the interrelationship between price and volume and show that it is more pronounced for higher volume securities. A price increase or decrease that is accompanied by strong volume is more likely to continue into the next period.

If overall volume has been listless for months and then suddenly jumps dramatically, a technical analyst would view this change in trading volume as the beginning of a trend. During a bull market, volume increases with price advances and decreases with price declines (Francis, 1991). The reverse is also true for a bear market. The bear market is close to an end when falling prices and high volumes are considered to be bullish (Francis, 1991).

4.3.7 Confidence indicators

The confidence index is defined as the ratio of high-grade bond yield divided by low-grade bond yield (Francis, 1991). The ratio measures how investors are willing to take investment risks. When the yield spread between high and low quality bonds narrows, investors attitude towards risk diminishes, leading to a rise in the confidence index. The confidence index is normally a leading indicator that shows investor attitude towards the economy and how investors expect the markets to perform. There is positive correlation between the index and the market, although at times the correlation may be negative because of false alarms (Francis, 1991).

4.4 TECHNICAL ANALYSIS AND EMH

The EMH refutes the claim that technical analysis can predict the future price of a security. A number of tests have been conducted by various academics on the implications of EMH for traditional portfolio theory. Such tests are the weak EMH, semi-strong EMH and strong EMH.

Weak form tests of EMH conducted by Bachelier (1900), Working (1934), Osborne (1959), Fama (1965), and Samuelson (1965) prove that stocks move in a random manner in highly competitive and active stock markets. Historical price information provides little, if any,

information, which can be used to achieve abnormal returns. Short price movement trends can be identified, although the trends are too short; therefore, any exploitation of these trends is cancelled by transaction costs.

The strong form tests of the EMH support the view that capital markets are efficient and, that portfolio managers concentrate on evaluating risk and diversifying their portfolios. Successful past performance cannot be used as a predictor of future success (Friend, Brown, Herman and Vickers, 1962; Sharpe, 1966; Jensen, 1969 and Firth, 1978).

The above tests prove that it is not necessary for an individual to take a view on the appropriateness of the current share price. An investor should accept the existing market price as the best estimate or intrinsic vale of the security. It is neither important to study the past price movements of securities in order to predict future prices or achieve excess returns (Fama, 1970). However, technical analysts believe that prices move in an identifiable manner and can be detected by studying the pattern of past price movements. Furthermore, technical analysts believe that the price trends can be exploited to the advantage of the investor (Phillips and Ritchie, 1983).

4.5 CONCLUSION

Technical analysis played a prominent role in financial markets decades before the birth of mean-variance analysis and Sharpe ratios, and it remains in widespread use today. In spite of this, the use of technical methods to predict future prices remains in conflict with the efficient market hypothesis and there remain no theoretical underpinnings to technical analysis. If, instead of increased first-moment returns, technical analysis is viewed as a method of increasing risk-adjusted returns, there is no longer a conflict with weak-form efficiency. The EMH states that a security's market value represents its fair price; therefore, there is no advantage to be gained from the valuation methodologies under fundamental analysis and technical analysis.

Followers of technical analysis believe that they can identify patterns in prices or volume movements and that by observing and studying the past behaviour patterns of given securities,

they can use this accumulated information to predict the future price movement in the security. Literature has highlighted that technical analysts follow these price movement or trends using charts.

Although the use of technical analysis by practitioners is well documented in literature, indirectly technical analysts study market behaviour, which is discussed in the next chapter as behavioural finance.

CHAPTER FIVE

BEHAVIOURAL FINANCE

5.1 INTRODUCTION

The preceding three chapters discussed mainstream investment theory: in particular, modern portfolio theory, fundamental analysis and technical analysis. Much of the mainstream investment theory is based on the assumption that investors act rationally, processing all available information in their decision-making. However, research conducted on the ways that human beings arrive at the decisions and choices when faced with uncertainty has uncovered that this is not necessarily the case (Tversky and Kahneman, 1974). In this chapter, behavioural finance theory, which is based on the assumption that investors act irrationally is presented and discussed.

The focus of behavioural finance is on a positive description of human behaviour especially under risk and uncertainty, rather than on a normative analysis of behaviour which is more typical of the mainstream finance approach based on expected utility maximisation (Starmer, 2000). Many investors have long considered that psychology plays a key role in determining the behaviour of markets. However, it is only in recent times that a series of concerted formal studies have been undertaken in this area. Slovic's (1972) paper on individual's misperceptions about risk and Tversky and Kahneman's (1974) papers on heuristic driven decision biases and decision frames have played a seminal role.

Although several definitions of behavioural finance exist, there is considerable agreement between them. Lintner (1998: 7) defines behavioural finance as being "the study of how humans interpret and act on information to make informed investment decisions." Thaler (1999: 17) defines behavioural finance as "simply open-minded finance" claiming that "sometimes in order to find the solution to a financial empirical puzzle, it is necessary to entertain the possibility that some of the agents in the economy behave less than fully rationally some of the time." Olsen (1998: 11) asserts that "behavioural finance does not try to define rational behaviour or label decision-making as biased or faulty: it seeks to

understand and predict systematic financial market implications of psychological decision processes."

Under the paradigm of traditional financial economics, decision-makers are considered rational and utility maximising. By contrast, cognitive psychology under behavioural finance suggests that human decision processes be subject to several cognitive illusions. These can be grouped into two classifications: illusions due to heuristic decision processes and illusions caused by the adoption of mental frames based on prospect theory.

5.2 COGNITIVE BEHAVIOURAL BIASES

5.2.1 Heuristic decision process

Heuristics refer to mental shortcuts and "rules of thumb" when the problem to be solved is particularly complex and far-reaching under uncertain environments (Tversky and Kahneman, 1974). The decision making process is not a strictly rational one where all relevant information is collected and objectively evaluated; rather the decision maker takes mental 'short cuts' in the process (Tversky and Kahneman, 1974). Heuristics can lead to poor decision outcomes and involve "blunders" which might be eliminated with a more rational analysis. However, there may be good practical reasons for adopting a heuristic decision process, particularly when the time available for decision-making is limited.

Investors are confronted with a confusing array of information, which encourages them to focus only on salient information (Shiller, 2001). This makes the average investor particularly subject to fads (Shiller, 2000b) and to manipulation by others (Daniel, Hirshleifer and Teoh, 2002). At the same time, investors take time to digest new information, even when it is actually relevant, which may lead to conservatism bias. Shiller (2000b, 2001), states that attention and saliency may have a social basis, which is the reason why past price increases may attract attention on certain financial assets in future and determine a self-fulfilling spiral of rising price and increased optimism, until ultimately the bubble bursts. Lack of attention may also lead to investor credulity, where owing to limited computational capabilities, investors do not adequately discount the incentives of others in manipulating and presenting

information (Daniel *et al.*, 2002). Typical examples of illusions resulting from the use of a heuristic decision process include representativeness, overconfidence, anchoring, gambler's fallacy, and availability bias.

5.2.1.1 Representativeness

Barberis, Shleifer and Vishny (1998) developed a model in which agents react in an exaggerated manner to new information because of representativeness bias. Representativeness bias refers to the tendency of decision-makers to make decisions based on stereotypes *i.e.* to see patterns where perhaps none exist. Representativeness also arises in the guise of the law of small numbers whereby investors tend to assume that recent events will continue into the future. In financial markets this can manifest itself when investors seek to buy 'hot' stocks and to avoid stocks that have performed poorly in the recent past. This behaviour provides an explanation for investor overreaction (DeBondt and Thaler, 1985).

5.2.1.2 Overconfidence

Overconfidence leads investors to overestimate their predictive skills and to believe they can time the market. Studies have shown that one side effect of investor overconfidence is excessive trading (Hong and Stein, 1999). Overconfidence is by no means limited to individual investors. There is evidence that financial analysts are slow to revise their previous assessment of a company's likely future performance, even when there is notable evidence that their existing assessment is incorrect (Daniel *et al.*, 1998). Statman and Thorley (1999) find empirical confirmation of the fact that in a bull market, where the overconfidence of most investors is high, trading increases.

5.2.1.3 Anchoring

Anchoring arises when a value scale is fixed or anchored by recent observations. This can lead investors to expect a share to continue to trade in a defined range or to expect a company's earnings to be in line with historical trends, leading to possible under reaction to trend changes (DeBondt and Thaler, 1985).

5.2.1.4 Gamblers' fallacy

Gamblers' fallacy arises when people inappropriately predict that a trend will reverse. This tendency may lead investors to anticipate the end of a run of good (or poor) market returns (Ang, Bekaert and Liu, 2000). Gamblers' fallacy is considered an extreme belief in regression to the mean. Regression to the mean is found in many human systems and implies that an extreme trend will tend to move closer to the mean over time (Gomes, 2000). Sometimes regression to the mean is incorrectly interpreted as implying that, for example, an upward trend must be followed by a downward trend in order to satisfy the law of averages.

Gomes (2000) propose a model in which investors are more willing to take risks after a loss, while being more conservative after a gain. After a loss, investors are willing to "gamble for resurrection", while after a gain, they want to protect their achievement. Thus, investors tend to sell winners and hold on to losers, consistent with the disposition effect. According to Gomes (2000), heterogeneity in risk attitudes due to past history of investors (whether they have previously experienced gains or losses) can also explain trading in financial markets.

5.2.1.5 Availability bias

Availability bias emerges when people place undue weight on available information in making a decision. Availability bias results in investors being subjective on the type of information they want to use for the decision-making process, especially information in newspapers and financial magazines (Shiller, 2001).

Although the above five cognitive illusions are widely observed, behavioural finance does not claim that all investors will suffer from the same illusion simultaneously. The susceptibility of an individual investor to a particular illusion is likely to be a function of several variables. For example, there is suggestive evidence that the experience of the investor has an explanatory role in this regard with less experienced investors being prone to extrapolation (representativeness) whilst more experienced investors commit gamblers' fallacy (Shefrin, 2000).

Overall, cognitive biases might distort asset prices and lead to a pricing bias to the extent that investors who demand a certain asset are incapable of processing the information underlying a

rational pricing of the same asset. If the cognitive biases are sufficiently systematic, the market as a whole might be subject to biases and a pricing bias might result.

5.3 PROSPECT THEORY

The second group of illusions that can impact on decision processes is conveniently grouped in Prospect Theory (Kahneman and Tversky 1979). This theory proposes a descriptive framework for the way people make decisions under conditions of risk and uncertainty and embodies a richer behavioural framework than that of subjective expected utility theory, which underlies many economic models. Barberis and Thaler (2002) state that prospect theory is firmly grounded as a key pillar of the behavioural finance literature, but it departs from the behavioural biases literature, since it is consistent with rational behaviour as normally defined in the mainstream approach. The key new element of prospect theory is its reference dependence. Preferences are not represented by an immutable utility function but rather depend on the situation and the agent's expectations and norms (Barberis and Thaler, 2002).

Prospect Theory may be represented in a number of ways, but in essence, it describes several states of mind that can be expected to influence an individual's decision-making processes. The key concepts addressed by the theory include loss aversion, regret aversion, mental accounting and self-control.

5.3.1 Loss aversion

Loss aversion is based on the idea that the mental penalty associated with a given loss is greater than the mental reward from a gain of the same size (Barberis and Thaler, 2002). If investors are loss averse, they may be reluctant to realise losses. This can explain the sunk cost effect whereby decision-makers persist in including past costs when evaluating current decision alternatives (Gomes, 2000). Loss aversion need not imply that investors are consistent in their attitude to risk. A key assumption of economic theory is that investors are risk adverse. This may not always hold true in the real world. There is evidence that people

play safe when protecting gains but are willing to take chances in an attempt to escape from a losing position (Gomes, 2000).

5.3.2 Regret aversion

Regret aversion arises because of people's desire to avoid feeling the pain of regret resulting from a poor investment decision. Regret aversion embodies more than just the pain of financial loss. It includes the pain of feeling responsible for the decision, which gave rise to the loss. The wish to avoid regret may bias new investment decisions of investors as they may be less willing to invest new sums in investments or markets which have performed poorly in the recent past (Koening, 1999). However, selling a security exposes the investor to the risk of regret if the security price were to later rise.

The notion of regret aversion may encourage investor herding behaviour, for example, to invest in respected companies as these investments carry implicit insurance against regret (Koening, 1999). This aversion may also impact on the behaviour of professional fund managers who may sell loss-making securities to avoid having to explain to investors why they are holding funds in poorly performing securities.

5.3.3 Mental accounting

Mental accounting is the name given to the propensity of individuals to organise their world into separate mental accounts (Shefrin and Statman, 1994, 2000). Investors tend to treat each element of their investment portfolio separately. This can lead to inefficient decision-making. Shefrin and Statman (1994) note that people are often not consistent in making their investment decisions. The tendency to adopt mental accounting has implications for portfolio rebalancing whereby investors may be less willing to sell a losing investment because its account is showing a loss. Another aspect of mental accounting relates to observations that people vary in their attitudes to risk between their mental accounts. Investors may be risk adverse in their downside protection accounts and risk seeking in their more speculative accounts.

Framing wealth into separate mental accounts has the drawbacks noted by Markowitz (1952) that covariances between accounts are ignored and investment portfolios lie below the efficient frontier. This framing may be explained by imperfect investor self-control. As noted by Thaler and Shefrin (1981), investors are subject to temptation and they look for tools to improve self-control. By mentally separating their financial resources into capital and available-for-expenditure pools, investors can control their urge to over-consume (Shaffr, Diamond and Tversky (1997).

5.4 POTENTIAL IMPLICATIONS FOR FINANCIAL MARKETS AND THE EMH

Shefrin (2000,5) contends, "heuristic driven bias and framing effects cause market prices to deviate from fundamental values." Olsen (1998) suggests that behavioural finance may explain empirical evidence, which casts doubt on existing financial models. DeBondt and Thaler (1985) argue that because investors rely on the representativeness bias, they could become overly optimistic about past winners and overly pessimistic about past losers and that this bias could cause prices to deviate from their fundamental level.

If the proponents of behavioural finance are correct, several implications may arise regarding possible behavioural patterns in financial markets. There may be: over-reaction or under-reaction to price changes or news, extrapolation of past trends into the future, lack of attention to fundamentals underlying a security, focus on popular securities and seasonal price cycles (Fama, 1988a). If such patterns exist, there may be scope for investors to exploit the resulting pricing anomalies in order to obtain superior risk adjusted returns. If exploitable pricing anomalies exist, the current credibility of the EMH is undermined.

Traditional financial theorists have undertaken a strong defence of the EMH model. Fama (1998a: 16) argues that "apparent overreaction of stock prices to information is about as common as under-reaction" and suggests that this finding is consistent "with the market efficiency hypothesis that the anomalies are chance events." Michaud Bergstrom, Frashure and Wolaham (1996) test several popular stock market anomalies, using data drawn from several stock markets and find that none of the behavioural factors had consistent impact on

the security returns across all stock markets. The EMH does not require that all investors necessarily act in a rational manner. The principles of arbitrage, if arbitrage can be undertaken efficiently, would quickly drive prices to their correct level if one of the parties were rational.

Fama (1991) states that market efficiency is not testable. Market efficiency must be tested jointly with a model of expected returns such as an asset-pricing model. Hawawini and Keim (1998) conclude that finance has no tests powerful enough to distinguish market inefficiency from bad asset-pricing models. Consequently, there is no way to conclusively disprove the claims of either the traditional or the behavioural theorists. Statman (1999: 21) suggests that this results in an impasse where "standard finance proponents regard market efficiency as fact and challenge anomalies which are inconsistent with it."

5.5 CONCLUSION

Behavioural finance provides the theoretical and empirical foundations for many of the irregularities that are often observed in the financial markets. Whilst behavioural finance factors play a role in the decision-making processes of individual investors, behavioural finance is a necessary but not significant in determining security prices in the market as a whole. Furthermore, it is not consistent with the EMH, which assumes that markets are efficient and investors are rational players (Fama, 1991). However, behavioural finance is a rapidly growing area of finance, which provides insight into psychological factors that affect security prices other than fundamental demand and supply factors. Further research in this area of finance is still being conducted to factor behavioural factors into asset pricing models.

CHAPTER SIX

THE EMPIRICAL INVESTIGATION

6.1 INTRODUCTION

This study is concerned with establishing whether modern portfolio theory plays a role in current asset management practice in South Africa. Chapter one introduced and outlined the aims of the study, which was then followed by four chapters that discussed the literature pertaining to portfolio theory and behavioural finance. Portfolio theory is divided into modern portfolio theory and traditional portfolio theory whilst behavioural finance is a relatively new discipline in finance literature. Based on the literature reviewed in the previous chapters on portfolio theory and behavioural finance, there are many methods at the disposal of portfolio managers for making investment decisions. However, the literature does not indicate which methods portfolio managers mostly favour in practice. This chapter presents and discusses the research methodology used in this study.

6.2 RESEARCH METHODOLOGY

Research methodology is a "structured set of guidelines or activities to assist in generating valid and reliable research results" (Mingers, 2001: 242). Research methodology may either be quantitative, qualitative or a combination of both. Although it is always desirable to select a methodology that maximises generalisability, realism, and precision, all research methodologies are inherently flawed in some respect (Dennis and Valacich, 2001). The limitations of using one research perspective can be addressed by using an alternative approach that compensates for another's weaknesses.

Quantitative research is "generally characterised by a methodology of formulating hypotheses that are tested or answering a research question through controlled experiments or statistical analysis" (Kaplan and Duchon, 1988: 571). Examples of quantitative methods include survey methods, laboratory experiments, formal methods (*e.g.* econometrics) and numerical methods such as mathematical modelling (Myers, 1997). The underlying assumption in quantitative

research is that research designs should be based on the positivist approach. Positivism assumes an objective reality, which can be described by measurable properties that are independent of the researcher and research instruments. The positivist approach "has its origins in a school of thought within the philosophy of science known as 'logical positivism' or logical empiricism" (Lee, 1991: 343). Logical positivism advocates a research approach that satisfies the standards of the "natural science model" of scientific research, dealing with positive facts and observable phenomena (Lee, 1991).

On the other hand, qualitative research "involves the use of qualitative data to understand and explain social phenomena" (Myers, 1997: 186). The most common qualitative data collection methods include observations, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions (Myers, 1997). Qualitative research methods are described by their interpretative perspective, which assumes that methods of natural science are inadequate to study social reality (Lee, 1991). Studies based on the interpretative approach assume that people create and associate their own subjective meanings of reality as they interact with the world around them.

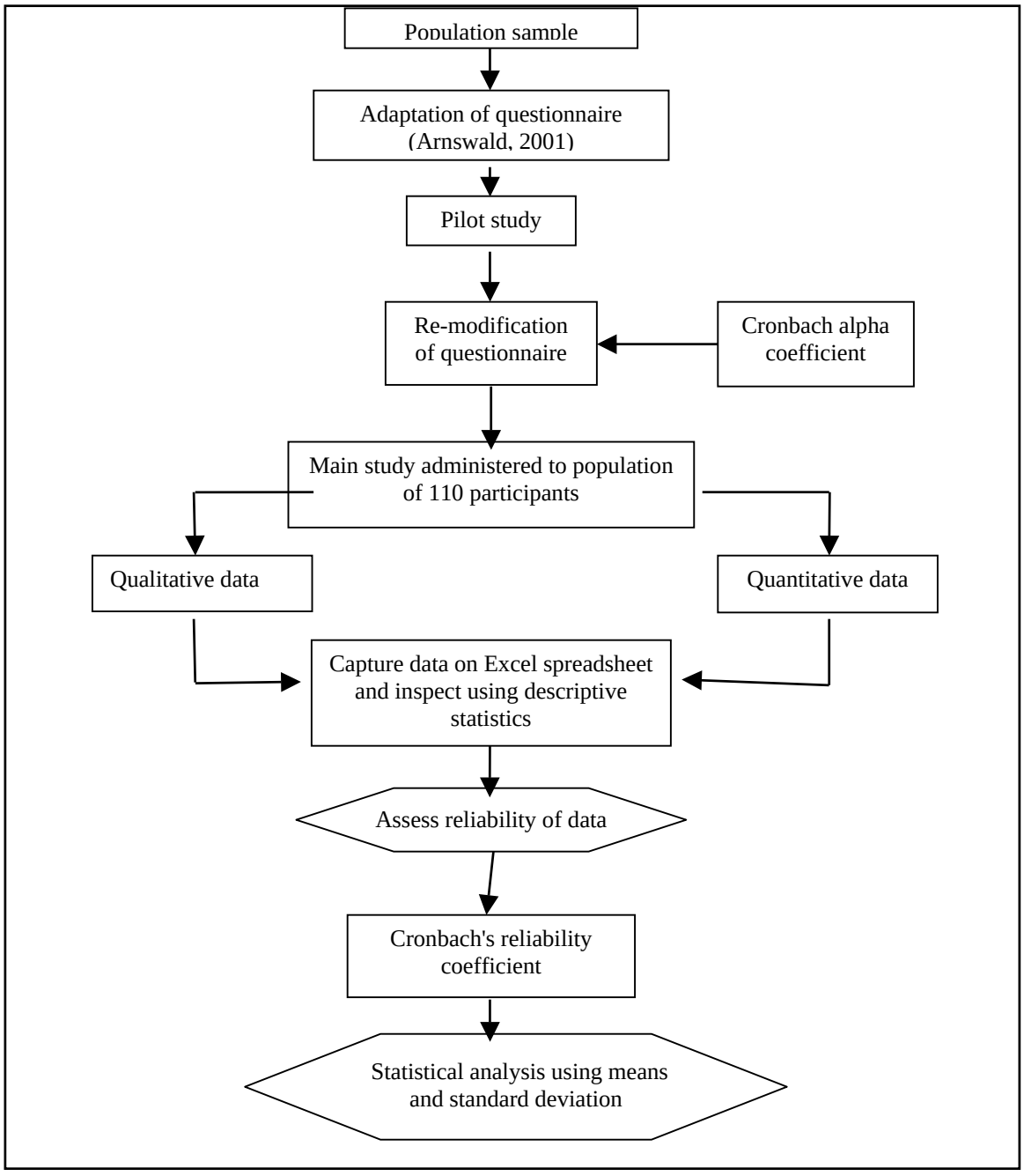
Sogunro (2002:1) states that, "for all practical purposes, both quantitative and qualitative methods have different but complementary roles to play in a research process and outcome." As Kaplan and Duchon (1988) point out, using multiple methods increases the robustness of results because findings can be strengthened through cross-validation. Moreover, combining these methods may lead to a richer understanding of the phenomena under investigation. By incorporating multiple modes of analysis into the design, additional insights may be revealed that would otherwise remain undiscovered using a single methodological approach (Trauth and Jessup (2000). Based on the above discussions, this study employs both quantitative and qualitative methods to gain a richer understanding of the phenomena of interest.

6.3 SURVEY RESEARCH

There are four main types of research designs: explorative, descriptive, diagnostic and hypotheses testing. According to Adams and Schvaneveldt (1985: 1030):

"Research design refers to a plan, blue print, or guide for data collection and interpretation - set of rules that enable the investigator to conceptualise and observe the problem under study."

Figure 15: A schematic representation of the research design



This study is based on the explorative research design. The purpose of exploratory research is to determine whether a phenomenon exists, and to gain familiarity with such phenomenon. Figure 15

presents a schematic representation of the research design in this study (Welman and Kruger, 2001: 68).

Given that this study employs both quantitative and qualitative research methods, survey research methodology was found appropriate. Survey research is the systematic gathering of information from respondents for the purpose of understanding and/or predicting some aspect of the behaviour of the population of interest (Welman and Kruger, 2001). In survey research:

- a large number of respondents is chosen to represent the population of interest,
- systematic questionnaire or interview procedures are used to elicit information from respondents in a reliable and unbiased manner, and
- statistical techniques are applied to analyse the data.

The main advantage of survey research is that it gives the researcher a quantitative and qualitative approach for establishing relationships and making generalisations about known populations. Cheung and Chinn (1999) advocate the use of the survey as a valid instrument in financial markets research. Therefore, in order to answer the research questions, survey methodology served as an appropriate tool for this study.

6.4 QUESTIONNAIRE DESIGN

The questionnaire comprises closed questions and is based on a Lickert scale ranging from 0 to 5, with 0 being the least pertinent and 5 the most pertinent. The questionnaire (see Appendix 1) was designed to collect four broad types of information: investment objectives of an asset manager, primary methods of investment analysis, secondary evaluation criteria and the potential buy and sell signals for securities in a portfolio. The four questions in the questionnaire were chosen mainly for their focus on the core functions of asset management. The first question highlights the main objectives of South African asset managers in the management of their portfolios, while the second question is designed to highlight the primary method of security analysis used for reaching investment decisions. Furthermore, asset

managers use other evaluation criteria in support of the primary method of security analysis and portfolio analysis, which forms question three. The final question on potential buy and sell signals of securities is designed to check for consistency on the other questions in line with the investment objectives.

A further important aspect of the design process was to avoid alienating respondents by asking them long lists of factual questions they are unable to answer. In order to obtain additional information not covered in the questionnaire, a further section was provided where the participants could add information unique to their circumstances, as part of the qualitative part of the study.

6.5 RESEARCH POPULATION AND SAMPLING METHODS

The participants for this study were obtained from the Financial Markets Directory (FMD), which lists asset management companies and financial advisory companies registered with the Financial Services Board (FSB). The Financial Markets Directory contains 322 entries. All members listed in the FMD were telephonically contacted to establish if their core business was asset management. A total of 91 entries were eliminated from the list leaving 231 asset management companies eligible to participate. For the purposes of this study, the 231 asset management companies are regarded as the entire population.

As it was not practical to have the entire population participate in the study, a random sampling procedure was adopted. Random sampling is a statistical procedure that gives each element of the population an equal probability of being chosen (Creswell, 1994). For any probability sample of the population, there is a requirement for a frame that either lists all or at least nearly all the members of the population (Creswell, 1994). A total sample of 110 participants was randomly chosen representing 50 percent of the entire population.

6.6 PILOT STUDY

A pilot study was conducted amongst ten asset managers to ascertain the ease with which the questions could be answered. The nature of the research was explained to them in order for them to relate the questions to the objectives of the study. The ten participants were asked to comment and give suggestions pertaining to the relevancy of the questions to the current practices they employ in their decision-making process.

Based on the results from the pilot study, some questions from the original questionnaire were modified whilst others were eliminated as they were considered to fall out of the scope of the research. The results of the pilot study were tested for reliability and validity using the Cronbach's alpha coefficient. The reliability coefficient was 0.592, which is considered poor; therefore, the questionnaire was further modified to include semantic changes to make questions clearer and simpler. As a result the reliability and validity improved to 0.82, which is considered good.

6.7 MAIN STUDY

6.7.1 Data collection and capturing

The questionnaires were sent to the participants in September 2003. A covering letter specifying the purpose of the research and the instructions necessary to complete the questionnaire were sent electronically to the participants. In order to obtain a higher response rate, all participants were promised the results of the research for their future reference. Furthermore, those that did not respond after two weeks were sent reminders in order to encourage a greater return. To guarantee confidentiality, the participants were asked not to write their names and that of their companies on the completed questionnaires.

A total of 45 responses were received by the end of October 2003 representing a response rate of 41%. The answered questionnaires were checked for completeness, accuracy and to see if the participants followed instructions. Of the 45 questionnaires that were completed none were rejected, indicating that the respondents took their time in understanding the nature of the questions being asked and that the questionnaire was properly formulated. Twenty-one

respondents gave additional information on the space provided for that purpose, which was used for a qualitative assessment. The data from the respondents were numerically coded in the order of receipt and entered into an Excel spreadsheet.

6.7.2 Statistical analysis

The analysis of the coded data captured on a Microsoft Excel spreadsheet was conducted using Microsoft Excel Solver. Through content analysis of the comments made by the portfolio managers, (*i.e.* coding, frequency counts and ranking), meanings were assigned to qualitative data, while through mean distributions and standard deviations, quantitative and qualitative data were made more meaningful. However, before the calculation of the mean distribution and standard deviations, the reliability and validity of the measuring instrument (questionnaire) had to be tested using Cronbach's alpha coefficient.

6.7.2.1 Reliability

Reliability is the degree of authenticity of the source or measuring instrument (Eriksson and Wiedersheim-Paul, 2001), which means that the extent to which a measure is free from random error indicates the reliability of the measure. For the measuring instrument to be reliable, it must show the same results for repeated studies (Sekeran, 1992).

6.7.2.2 Validity

Validity is the requirement that a measuring instrument examines what it is supposed to measure (Eriksson and Wiedersheim-Paul, 2001). This means that the extent to which a particular measure is free from both systematic and random error indicates the validity of the measure. According to Lundahl and Skarvard, (1999), if the requirement for examining what an instrument is suppose to measure is not fulfilled, even though it is regarded as reliable, the results may not be valid. Therefore, a measuring instrument can be reliable but it is not a sufficient condition for validity, as the measurement obtained could still contain systematic error (Nunnally, 1978).

6.7.2.3 Cronbach's alpha coefficient

The reliability and validity of the final modified questionnaire was tested using the Cronbach alpha coefficient. This reliability coefficient is based on the average correlation of items within a

test. Cronbach's alpha coefficient is typically equated with internal consistency (De Vellis, 1991). The Cronbach alpha coefficient value ranges from 0 to 1 (Coakes and Steed, 1997). When calculating Cronbach's reliability coefficient, reliabilities less than 0.6 are considered poor, reliabilities within the 0.7 range are considered good, and those coefficients over 0.8 are considered very good. The closer the reliability coefficient is to 1, then the better the reliability of the instrument (Sekaran, 1992). The final modified questionnaire for this study achieved a Cronbach alpha of 0.84, which is above the threshold of 0.70 (Nunnally, 1978: 245): therefore, the questionnaire was considered reliable.

6.8 CONCLUSION

This chapter presented the methodology used in this study. The research framework adopted was explained and the justification for using a combination of qualitative and quantitative researches methodology advanced. Since this research is of both quantitative and qualitative nature, the method of statistical data analysis that combines both methods was reviewed in detail. Research methodology literature has shown that there is no best method for conducting research. Therefore, this study used both quantitative and qualitative methods with the aim of obtaining improved results.

The nature of the measuring instrument (questionnaire) was defined and its reliability and validity tested using the Cronbach alpha coefficient. The questionnaire was administered on the defined representative sample followed by a pilot study to test the effectiveness of the methodology chosen and the instrument used. The instrument was refined after the pilot study and tested for reliability and validity.

The process of the main study and data collection methods were discussed which led to the process of data capturing for statistical analysis; the data was coded and statistically analysed through mean distributions and standard deviations, using Microsoft Excel Solver.

CHAPTER SEVEN

PRESENTATION AND DISCUSSION OF RESULTS

7.1 INTRODUCTION

The previous chapter focused on the research methodology adopted for this study, detailing the methods of data collection and processing thereof. Once data was collected from the asset managers, descriptive statistics was used to analyse the data. The Cronbach reliability coefficient was calculated to test the reliability and validity of the instrument used in this research and a Cronbach co-efficient of 0.82 was achieved, which is regarded as good.

This chapter presents and discusses the results of the findings based on the questionnaire in appendix 1. The questionnaire is based on a Lickert scale of 0 (representing not significant) to 5 (representing very significant) as measured by mean scores. The questionnaire was prepared in reverse order to check for consistency in answers given in all the sections and to eliminate an element of bias. The comments made by asset managers, which form part of the qualitative nature of the study, were also objectively analysed to check for consistency with the answers given in other sections of the questionnaire. Furthermore, the research implication and recommendations are discussed. The research limitations and areas that need further research are identified and discussed in this chapter.

The task of an asset manager is to identify and evaluate securities in which to invest and incorporate in a portfolio. In order to carry out this task, an asset manager needs to adopt an acceptable, appropriate and objective criterion on which to base investment decisions. The main objective of this study is to obtain an insight into the ways in which asset managers in South Africa set about the management of their portfolios with which they are entrusted; in particular, to determine the role that modern portfolio theory plays in current asset management practice against other investment decision-making methods such as fundamental analysis, technical analysis and behavioural finance models.

7.2 PRESENTATION AND DISCUSSION OF RESULTS

7.2.1 Investment objectives

7.2.1.1 Presentation of results on investment objectives

Asset managers pursue certain investment objectives listed in Table 1, based on the expected risk and return expectation of the portfolio. Listed in descending order of importance, the results on the investment objectives adopted by South African asset managers are presented in Table 1. An above-average portfolio performance, diversification of risk and above-average dividends are regarded as playing a significant role as part of the investment objectives of asset managers, with mean scores of 3.87, 3.37 and 3.36 respectively. Other aims, which are unique to a particular asset manager received a mean score of 1.89, whilst a specific index replication with the least mean score of 1.20 is regarded as playing a minor role.

TABLE 1: INVESTMENT OBJECTIVES

Investment objectives	Mean	Median	Standard deviation	Valid responses
Above average performance	3.87	4	1.34	n=45
Diversification of risk	3.47	4	1.32	n=45
Above average dividend and payout	3.36	4	1.42	n=45
Other aims	1.89	4	1.48	n=45
Specific index replication	1.20	4	1.53	n=45
0 mean (plays no role or not important) to 5 mean (plays a role or very important)				

7.2.1.2 Discussion of results on investment objectives

7.2.1.2.1 Above average performance

If the EMH is not entirely accepted, an asset manager adopts an active asset management style, which uses fundamental analysis to identify undervalued securities consistent with the desired risk level. If an asset manager rejects the weak form of EMH, it is possible to beat the market by identifying when a security or the market is overbought or oversold by using technical analysis to predict the level of security prices in the immediate future. A comparison of the predicted price and the actual price level indicates whether the security or the market is currently too high or too low (Pring, 1987).

In their quest to beat the market using either fundamental analysis or technical analysis, asset managers achieve above average performance through what they believe are superior analytical skills and informational advantage. The results in Table 1 confirm that above average performance of a portfolio or security is a significant part of the investment objectives of South African asset managers. The literature in chapters 3 and 4 highlighted that an above average performance of a portfolio or security can only be achieved by method of fundamental and technical analyses, which are based on the assumption that the markets are not efficient.

7.2.1.2.2 Diversification of risk

The results in Table 1 indicate that South African asset managers regard diversification of risk as playing a significant role as an investment objective for managing the risk of a portfolio. Risk analysis using fundamental analysis is based on the financial leverage of a particular firm through financial statement analysis, whilst the volatility of a security's price as represented by price trends depicts the risk profile of a security using technical analysis (Philips and Ritchie, 1983). If diversification of a portfolio were conducted by equating risk and return, then a beta coefficient representing risk would need to be part of the valuation model. Given that the results in Table 1 indicate an above average portfolio performance and an above average dividend and dividend payout, diversification of portfolios is not being conducted using MPT models. Diversification that approximates the market portfolio involves the construction and maintenance of a portfolio on the capital market line (CML).

7.2.1.2.3 Above average dividend and dividend payout

Ross (1977) points out that a firm or security is valued on the basis of the perceived stream of cashflows it generates and that changes in dividend policy could alter the market's perception and thus affect security valuation. Miller and Modigliani (1961) state that the main sources of intrinsic value are the dividends and dividend growth. Thus, the factors that affect the security's price are the expected dividends, the growth rate in expected dividends and the factors that are proxy for the risk of a security. Given the importance placed on dividends and dividend payout by South African asset managers, there is a realisation that any change in dividends or dividend policy affects the future profitability and intrinsic value of a security. For example, if dividends were reduced, the market might interpret this reduction as implying

a reduction in future profitability, resulting in the sale of shares, thereby putting downward pressure on the market price and the share's intrinsic value estimations, whereas the reverse might be true.

7.2.1.2.4 Other aims

Due to the confidential nature pertaining to the asset management sector, it was assumed in this study that there might be other aims, which South African asset managers might pursue in the management of their portfolios. However, the results in Table 1 show that, whatever these other investment objectives they might be, they do not play a significant role in the management of portfolios. These other aims or objectives were not mentioned by any asset manager indicating that they are not important or they are confidential and, therefore, cannot be disclosed to the public.

7.2.1.2.5 Index replication

Index replication is a passive asset management strategy consistent with the EMH. Such a management style requires in-depth market knowledge, particularly with respect to the composition and calculation of the index. Index replication involves the construction and maintenance of a portfolio that always lies on the capital market line (CML). An asset manager adopting an index replication strategy accepts that it is impossible to achieve superior returns than the market and thus attempts to minimise transaction and research costs. Therefore, a portfolio replicating a specific index such as the FTSE-JSE All Share Index is an attempt to match the performance of such an index. The results in Table 1 indicate that index replication does not play a significant role in the management of portfolios except for a few index funds that participated in this study.

7.2.1.3 Summary of results on investment objectives

The results presented in this section confirm that, an above-average portfolio performance, diversification of risk and an above average dividend and dividend payout are significant investment objectives (Table 1). Apart from the diversification of risk, the results indicate that South African asset managers pursue active asset management strategies aimed at out-performing the market, and such strategies are consistent with fundamental and technical

analyses valuation methodologies reviewed in literature. These results indicate that South African asset managers' value creation rests on the deliberate exploitation of suspected comparative advantages in the access and analysis of information. By contrast, index replication does not play a significant role except for a few index fund managers that participated in this study. These findings are consistent with the results presented in the following sections.

7.2.2 Primary method of analysis

7.2.2.1 Presentation of results on primary method of analysis

The methods chosen for the investment decision-making process should be consistent with the investment objectives and philosophy of the asset manager. The investment objectives and philosophy influence the methods of evaluation and management of securities and these methods of evaluation are determined by whether an active or passive portfolio management approach is adopted. The results on the primary methods of analysis are presented in Table 2 below.

TABLE 2: PRIMARY METHODS OF ANALYSIS

Investment objectives	Mean	Median	Standard deviation	Valid responses
Fundamental analysis	3.98	4	1.27	n=45
Technical analysis	2.29	3	1.70	n=45
Econometric models	2.13	2	1.60	n=45
Portfolio optimisation (MPT)	1.98	2	1.67	n=45
Behavioural finance models	1.84	2	1.61	n=45
0 mean (plays no role or not important) to 5 mean (plays a role or very important)				

The results presented in Table 2 indicate that fundamental analysis is by far the most significant method of analysis (mean score of 3.98), whilst technical analysis and econometric models were ranked as being of moderate significance (mean scores of 2.29 and 2.13 respectively). A portfolio optimisation and behavioural finance models play a minor role (mean scores of 1.98 and 1.84 respectively).

7.2.2.2 Discussion of results on primary methods of analysis

7.2.2.2.1 Fundamental analysis

If an active asset management approach is adopted, the analysis of securities should naturally gravitate towards those methods of analysis, which are in keeping with the basic conception of how the markets function, *i.e.* of how price-efficient the financial markets are. Therefore, advocates of active portfolio management use either fundamental analysis or technical analysis or a combination of both methods in the pursuit of returns greater than the market returns (Arnswald, 2001).

Fundamental analysis is ultimately directed towards the future as it attempts to determine the intrinsic value of a security by forecasting trends in economic conditions, corporate profits, dividends and interest rates, without first having to arrive at a structural estimate of the intrinsic value of a security. Fundamentalists assume additional returns only if their evaluation methods indicate that market prices do not fully reflect generally accessible, relevant information (Arnswald, 2001). Empirical studies by Fairfield and Whisenant (2002) concluded that fundamental analysis can be used to detect signals of a deteriorating firm's performance and that these signals in publicly available data are not priced by the market. Therefore, the results presented in Table 2 support the view that South African asset managers regard superior analytical skills and exploitation of informational advantage as key to value creation and greater portfolio returns.

7.2.2.2.2 Technical analysis

Technical analysis is regarded as valuable when applied to markets where there is reason to believe that the adjustments of price to fundamental supply and demand factors are relatively inelastic or where overreactions exist. This method of analysis attempts to identify recurring and hence predictable trends in market prices exclusively on the basis of past prices and trade volumes (Pring, 1997). However, Alexander (1961) and Cootner (1962) argue that if professional investment managers could identify overpriced and underpriced securities using technical analysis, then they would help stabilise the market prices and consistently achieve abnormal returns, which is rejected by the EMH. The results in Table 2 show that South African asset managers regard technical analysis as playing a important role and use it either

on its own or to complement fundamental analysis in the evaluation of securities and portfolios.

7.2.2.2.3 Econometric models

The results in Table 2 show that econometric models play a complementary role to fundamental and technical analysis for security evaluation and management of portfolios through the analysis of the global and domestic economies to determine the impact of economic fundamentals on the markets and portfolios. Econometric models rely on statistical procedures to estimate relationships for models specified on the basis of theory, prior studies, and domain knowledge. Given good prior knowledge about relationships and good data, econometric methods provide an ideal way to incorporate expert judgement and quantitative information. As implied by their name, econometric models are primarily used by economists, but other disciplines have also contributed to the methodology. The use of econometric models extends beyond economics; however, since the models rely on economic data, one has to be a trained economist in order to use and implement these models.

7.2.2.2.4 Portfolio optimisation

If a passive asset management strategy is adopted, there is an acceptance that the markets are efficient and the method of security analysis should gravitate towards those methods consistent with MPT. Models such as CAPM, multi-factor models, mean-variance analysis and arbitrage pricing theory (APT), which form part of MPT, belong in essence, to the realm of so-called quantitative methods since they are heavily dependent on past data. These MPT models include not only the construction of efficiently diversified portfolios through single and multi-factor models such as mean-variance analysis and CAPM, but also the use of the beta factors as a risk measurement. Therefore, for a portfolio to be efficiently diversified, risk as measured by beta should equate return. The results presented in Table 2 indicate that MPT plays a minor role. Some of the reasons given for not using MPT models result from the reliability of the beta coefficient. Furthermore, the opportunities presented by interest rate and security price movements cannot be adequately factored in the valuation methodology using MPT models.

7.2.2.2.5 Behavioural finance

Behavioural finance merges concepts from financial economics and cognitive psychology in an attempt to construct a more detailed model of human behaviour in financial markets (Lintner, 1998). Given that behavioural finance is still in its infancy, there is no detailed framework at present incorporating the varying strands of behavioural finance and mainstream finance models, which could be the reason why South African asset managers regarded it as the least significant in evaluating securities (Table 2). Advocates of EMH argue that behavioural finance has indeed uncovered some interesting insights but the potential to build portfolio strategies that relies on them vanishes once significant attention is focused on them (Brabazon, 2000).

7.2.2.3 Summary of results on primary methods of analysis

From the comments made by assets managers in the qualitative section of the study, it is clear that, while acknowledging the existence of MPT as a prospective tool in portfolio management, MPT is being used only in a most general way in the management of their portfolios. The problem arose, in part, because of the limitations of public domain data and because of the uncertainty implicit in the forecasting of security risk and return characteristics. The comments made by South African asset managers are highlighted in literature where Markowitz (1995) argues that:

> "Finance theory tells us what is to be estimated in the form of future risk and return and how estimates for specific securities are to be combined to form estimates for the portfolio as a whole. However, theory does not tell us how to make the estimates of returns, variance and covariance. These parameters are not known with certainty and some form of estimation bias is inevitable, given that some combination of historic data and/or forward looking subjective or expectancy data has to be used."

The results of this study presented in Table 2 indicate that MPT does not play a significant role in current asset management practice, whilst fundamental analysis plays the more important role in the selection and management of portfolios. Furthermore, technical analysis and econometric models do play a moderate role; hence, they may be used to complement

fundamental analysis. Behavioural finance, which ranks almost the same as MPT, plays the least role in influencing investment decisions. However, Bruns and Meyer-Bullerdiek (1996:12) state that, "in practice, portfolio managers tend to employ different evaluation strategies at the same time." Quantitative instruments such as econometric models may be used to pre-select securities out of an investment universe while individual choices are ultimately made in accordance with the results of fundamental analysis.

7.2.3 Secondary evaluation criteria

7.2.3.1 Presentation of results on secondary evaluation criteria

Several studies suggest that asset managers make a deliberate effort to meet certain secondary criteria in the evaluation and management of their portfolios to complement their primary methods of analysis (Falkenstein, 1995). The results of the secondary evaluation criteria are presented in Table 3.

TABLE 3: SECONDARY EVALUATION CRITERIA				
Investment objectives	**Mean**	**Median**	**Standard deviation**	**Valid responses**
Corporate developments	2.96	3	1.24	n=45
Market capitalisation	2.96	3	1.30	n=45
Trading costs	2.38	3	1.48	n=45
Reporting of independent analysts	2.24	3	1.54	n=45
Availability of tradable derivatives	1.07	1	1.39	n=45
0 mean (plays no role or not important) to 5 mean (plays a role or very important)				

According to the survey, the South African asset managers typically regard corporate developments (a mean score of 2.96), market capitalisation (a mean score of 2.96), trading costs (a mean score of 2.38) and reporting of independent analysts (a mean score of 2.24) as being of equal and considerable importance as secondary evaluation criterion. Availability of tradable derivatives is regarded as not a significant criterion (a mean score of 1.07).

7.2.3.2 Discussion of results on secondary evaluation criteria

7.2.3.2.1 Corporate developments

One type of criteria relevant to the choice of portfolio holdings includes all stock characteristics, which in the eyes of the fund manager, influence indirectly the expected risk-return profile of a portfolio (Arnswald, 2001). Asset managers follow corporate developments that examine company specific circumstances and these circumstances translate into the perception of the quality of a security (Table 3). Although past corporate trends and market performances have no predictive value per se: general market acceptance can be treated as a quality category whenever a choice has to be made. The quality of a security is a subjective assessment of risk based on such factors as the quality of management and other operational factors that affect future earnings. Piotroski (2000) states that firms with stronger fundamentals are much more likely to have a better realisation of earnings and are much less likely to de-list from a stock exchange for performance related reasons.

If asset managers are to pursue a fundamental analysis approach, corporate developments become an important factor in the valuation estimates of intrinsic value. By contrast, in terms of MPT, such factors as corporate developments do not affect the valuation methodology as they are considered as factored in the market price of a security.

7.2.3.2.2 Market capitalisation

A more conservative evaluation criterion for choosing stocks is market capitalisation, which could serve as proxy for the size and reputation of a public holding company. Market capitalisation is the market value of a firm or security *i.e.* the number of shares times the market price of the share. Financial leverage such as gearing ratios could be used to detect the level of risk in a security. However, the results are contrary to the EMH. In efficient markets, the market capitalisation of a company represents its fair value; therefore, there is no value to be gained by analysing the market capitalisation on a firm. The results in Table 3 are consistent with the findings in Table 2, where fundamental analysis was by far the most important valuation tool used by South African asset managers.

7.2.3.2.3 Trading costs

MPT suggest that investors should construct and maintain their efficient portfolios to avoid transaction costs by pursuing buy and hold policies, revising the portfolios occasionally to maintain the preferred risk as measured by β (Dobbins *et al.*, 1994). The choice of portfolio composition is not influenced by transaction costs but by the risk and return profile of a portfolio. In terms of MPT, it is not possible to properly account for the differential impact of transaction costs and taxation that vary from investor to investor. Therefore, in practice, it is difficult to adjust MPT models to factor transaction costs, taxation and other economic fundamentals.

If fundamental and technical analyses valuation models are adopted, transaction costs become a significant factor in the expected return equation; hence, South African asset managers regard transaction costs as moderately important (Table 3).

7.2.3.2.4 Reporting of independent analysts

The availability of independent analysts' valuations is an indicator of the amount of attention surrounding, and the flow of information concerning, a particular stock. Such attention to a particular security increases market sentiment, which in turn influences the securities' prices. South African asset managers regard the reporting of independent analysts as playing a significant role in influencing the intrinsic value of a security contrary to EMH which states that such reporting is immediately factored into the security price; therefore, there no value is gained from analysing such reports.

7.2.3.2.5 Availability of tradable derivatives

Gompers and Metrick (1998) in their study of the US stock market document that fund managers prefer large and liquid assets that have tradable derivatives. The availability of tradable derivatives enable risk transformation and offer, in principle, additional information on market expectations and uncertainty on the value of the underlying asset (Falkenstein, 1995). Due to the fact that the derivatives market in South Africa is still in its infancy and the availability of tradable derivatives is still limited, there is little to be gained by using them as a secondary evaluation criterion since only a few securities have tradable derivatives. The

information value of derivatives is limited to a few South African hedge funds that trade and manage hedge portfolios, *i.e.* index funds.

7.2.3.3 Summary of results on secondary evaluation criteria

The results on the secondary evaluation criterion support the view that South African asset managers do not use MPT in the management of their portfolios. The factors presented in this section confirm the results tabled in section 7.2.2 on the primary methods of analysis, where fundamental analysis and technical analysis were regarded as significant evaluation criteria. Corporate developments and market capitalisation are fundamental analysis factors whilst transactions cost due to trading relate to both fundamental and technical analyses.

7.2.4 Potential buy and sell signals

7.2.4.1 Presentation of results on potential buy/sell signals

The potential buy and sell signals results presented in Table 4 indicate that expectations concerning higher dividends (a mean score of 3.31) and a low valuation by sector or industry comparison (a mean score of 3.24) are considered important buy or sell criteria, whilst corporate earnings estimates by independent analysts (a mean score of 2.84) and price stability (a mean score of 2.00) are regarded as playing a moderate role. The results on market turnover (a mean score of 1.49) and observed purchases by others (a mean score of 1.02) indicate that South African asset managers regard them as not playing a significant role as potential buy and sell signals.

TABLE 4: POTENTIAL BUY AND SELL SIGNALS

Investment objectives	Mean	Median	Standard deviation	Valid responses
Dividend expectations	3.31	4	1.64	n=45
Valuation by sector or industry comparison	3.24	4	1.58	n=45
Corporate earnings estimates by independent analysts	2.84	4	1.55	n=45
Price stability	2.00	2	1.72	n=45
Market turnover	1.49	1	1.59	n=45
Observed purchases by others	1.02	1	1.20	n=45
0 mean (plays no role or not important) to 5 mean (plays a role or very important)				

The results on market turnover (a mean score of 1.49) and observed purchases by others (a mean score of 1.02) indicate that South African asset managers regard them as not playing a significant role as potential buy and sell signals.

7.2.4.2 Discussion of results on potential buy/sell signals

7.2.4.2.1 Dividend expectation

Dividend expectation does play a significant role in influencing the investment decisions of South African asset managers. Dividends are more correlated with permanent earnings and are a better proxy for the earnings potential upon which fundamentally oriented investors base their valuations (Miller and Modigliani, 1961). As noted in section *7.2.1.2.3* the informational value of dividend affects the intrinsic value estimation when there is a change in the dividend payments and policy (Brief and Zarowin, 2000).

7.2.4.2.2 Valuation by sector or industry comparison

A low valuation by sector or cross-market comparison as a buy or sell signal is exclusively a fundamental analysis approach. Cross-sectional analysis implies comparison with industry-wide measures as a check on selective performance. Chudson (1937) argues that significant differences can be found amongst industry groupings when cross-sectional analysis using financial ratios is used to evaluate a firm's economic situation relative to the industry. Ratios such as price-earnings (P/E) can be used to filter through a number of securities, the basis being that securities with a low P/E than the market consistently outperform the market. If the actual P/E is less than the theoretical P/E, the security is undervalued and regarded as a buy (Blume, 1977).

7.2.4.2.3 Corporate earnings estimates by independent analysts

The investment decisions of South African asset managers are strongly influenced by such factors as higher profit forecasts of analysts and corporate announcements that are judged positive (Table 4). Good news should result in a security price increase, and bad news in a decrease. However, the semi-strong EMH states that the market anticipates economic events; therefore, abnormal returns cannot be made by reacting to publicly available information, which is immediately incorporated into the security price (Ball and Brown, 1968).

7.2.4.2.4 Price stability

An above-average rise in market price, accompanied by increasing turnover, is generally regarded as a clear buy signal from a chart-analytical standpoint. By contrast, a security price that has stabilised at a level markedly lower than its peak values represents an anti-cyclical buying opportunity since a reversal of the trend is expected on the basis of support levels hitherto sustained (Pring, 1997). Since the results confirmed that technical analysis plays a moderate role in current asset management practice, it would be expected that price formation should be an important potential buy or sell signal.

7.2.4.2.5 Market turnover and observed purchases by others

Many financial markets practitioners consider a market up-turn based on volume movements a plus sign, whereas the downturn is considered a negative sign. However, the weakness in this theory is the fact that the greatest optimism brings out the greatest volume at or near the market peaks; conversely, the greatest pessimism generates the greatest volume at or near the market low, thereby signalling a sell. Furthermore, observed purchases by others result in investor herding where asset managers follow the trend in the market due to fear of failure or being caught on the wrong side of the investment crusade.

7.2.4.3 Summary of finds on potential buy or sell signals

The results in Table 4 indicate that South African asset managers regard the South African financial markets as inefficient; therefore, there are gains to be made by pursuing buy and sell strategies consistent with active asset management.

7.3 RESEARCH IMPLICATIONS AND RECOMMENDATIONS

Asset managers operate as the experts in the field of investments; therefore, they are supposed to be better informed, smarter, have lower transaction costs and be better investors than ordinary investors. A study by Jensen (1969) concluded that most asset managers break even against the market after adjusting for transaction costs, whilst the majority under-perform the market even after adjusting for transaction costs. Given this background, the South African asset management sector has been criticised in the past for under- performing, whilst the investing public is not aware of the complexities involved in the investment decision-making

process. Wierzyka, (2004:5) states that "The investment industry has come under intense pressure in the past and has been criticised for destroying value for investors..." Fischer and Jordan (1987:1) state:

> "None can deny that handsome returns have been reaped in the market by a variety of methods ranging from sheer genius to the occult. The unfortunate thing about most of these techniques is that they are difficult to duplicate consistently by everyone. Often they just cannot be verbalised in a way that permits systematising."

Although the findings indicate that the main objective of South African asset managers is the pursuit of returns greater than the market through an active asset management approach, the EMH argues that none can beat the market. Furthermore, superior analytical skills are difficult to duplicate or identify; therefore, value creation for investors can only be achieved by striving to have an efficient portfolio on the capital market line (CML).

Given that the investment decision-making process is complicated, no single investment approach can be said to be the best. However, the results in this study indicate an over-reliance on the traditional approach to portfolio management (*i.e.* fundamental and technical analyses). The implication of relying on one approach to security evaluation and management of portfolios could result in loss of investors' funds since the financial markets are dynamic which calls for an approach that changes with the market conditions.

Traditional portfolio theory (*i.e.* fundamental and technical analyses) is concerned with the classification of individual financial assets according to various investment criteria or quality. By contrast, MPT is concerned with the construction and maintenance of an efficient portfolio that lies on the SML. The investor's choice of risk level is purely a financial decision on whether to hold a lending or a borrowing portfolio.

However, in order to avoid the pitfalls of relying on one investment approach, the integrated investment approach is recommended. The first phase of the integrated approach would start with security analysis using either fundamental analysis and/or technical analysis to determine in which classes assets will be placed and to determine which particular securities should be

purchased within a class. Once the class of assets has been determined, the next step is to analyse the chosen set of securities to identify relevant characteristics of the assets such as the expected return and risk. This analysis also attempts to uncover securities that are mis-priced. If a security is under-priced for the returns it seems to offer, it is an attractive buy, whereas, if it is over-priced, it is either omitted from the asset class or sold if it is already part of a portfolio.

The second phase of the integrated approach involves portfolio construction using MPT models such as mean-variance analysis, CAPM or APT. Portfolio construction using an MPT approach identifies those securities that maximise the expected rate of return for any given level of risk and simultaneously minimise the level of risk exposure required to achieve a given level of return, although an important factor is the extent of diversification. Diversifying a portfolio across many assets may reduce risk but it involves increased transaction costs. The portfolios should only be reorganised when there is a change in the investor's utility function or market portfolio. Therefore, an integrated approach provides an asset manager with the advantage of a comprehensive framework that is established on the bases of both traditional and modern portfolio theories.

7.4 RESEARCH LIMITATIONS

At the design and analysis stages, the research limitations were recognised and appropriate decisions were made to optimise the validity and reliability of the data. Rigorous attention to detail was undertaken at all phases of the research process with appropriate measures instituted to control for various factors potentially influencing results, including questionnaire design.

The instrument (questionnaire) used in this study was adopted from Arnswald (2001) and modified to suit the intended purpose. The modification of the instrument had to be carried out a number of times during the pilot study until the reliability and validity improved. Reliability is defined as the degree of random error associated with a measurement. Reliable measures are those that produce consistent and dependable data (O'Sullivan and Rassel, 2003).

However, in order to assess the instrument's validity – the degree to which an item accurately measures what is intended – the instrument was tested in pilot studies.

Another limitation that was reflected in the data obtained from the questionnaire was that asset management encompasses a broad and diverse array of responsibilities. Therefore, the opinions, perceptions, attitudes and experiences of asset managers were not measured which in turn could have resulted in measurements that are based upon unequal exposure to the items being measured.

The aforementioned limitations were addressed to the extent that they could not affect the reliability and validity of results, given the research design and the resources available for this study. Despite these limitations, the overall research design meets social science standards for this type of a research.

7.5 FUTURE RESEARCH

This research did not test for correlation between the nature of education of asset managers and the methods used in the investment decision-making process. Education plays a vital role in influencing and shaping the beliefs and attitude of an individual. In suggesting research in this area, the assumption is that education plays a vital role in shaping the beliefs, perceptions and attitudes of an individual. Therefore, the choice and implementation of investment decision-making criteria rest on such beliefs, perceptions and attitudes towards certain decision-making criteria.

Another area for further research can examine whether South African asset managers who favour fundamental and technical analyses do indeed beat the market. The research could look at the long-term correlation between fund performance and the methods chosen for making investment decisions. This research could be conducted in a South African context, although prior research elsewhere by amongst others Fama (1970) show that methods such as fundamental and technical analysis do not generate superior returns than the market portfolio.

7.6 CONCLUSION

The study explored the role played by modern portfolio theory in current asset management practice in South Africa. The results of this study show that modern portfolio theory does not play a significant role in current asset management practice, but that it has a minor complementary effect on the investment decision-making process of some asset managers. It is clear that, while acknowledging the existence of MPT as a prospective tool in portfolio management, MPT is being used only in a most general way in the management of portfolios. The problem arose, in part, because of the limitations of public domain data and because of the uncertainty implicit in the forecasting of security risk and return characteristics.

Literature has highlighted traditional portfolio theory incorporating fundamental and technical analyses, modern portfolio theory, and behavioural finance as the basis for making investment decisions. However, the choice of the investment decision-making criteria has an impact on security evaluation and portfolio management. Asset managers can adopt either an active or passive asset management approach. Active and passive management of securities and portfolios represent two fundamentally different investment philosophies based on the view of how the markets function. If the EMH is not entirely accepted, an asset manager adopts an active asset management style. Active asset management relies on superior analytical skills to construct a portfolio, which, if properly managed, will consistently outperform the market by generating above average portfolio returns. Active asset management relies upon fundamental analysis and technical analysis for security and portfolio evaluation.

If EMH is accepted, a passive asset management approach is adopted. MPT is consistent with the efficient markets hypothesis, which assumes that the market is efficient; therefore, it is impossible to construct a portfolio that is superior to a market portfolio. A passive portfolio management strategy diversifies fully across assets within each asset class. When this approach is followed, the strategy is no longer to beat the market but to replicate the market return at the required level of risk.

Behavioral finance, which is gaining momentum in academic and practical applications in the developed world, is lagging behind in South Africa. Behavioural finance models assume that there are anomalies in the markets. Anomalies in the financial markets affect investment

decisions by clouding judgement. For example, a study by Weber (1999) between Chinese students and their European and American counterparts identified cultural differences in risk perception. In the absence of behavioral finance, one would not be in a position to identify and understand the nature and beliefs of market participants.

The research recommended an integrated portfolio management approach, which incorporates both traditional portfolio theory (*i.e.* fundamental analysis and technical analysis) and modern portfolio theory as tool for the investment decision-making process. An integrated approach adapts to dynamic financial markets conditions. Furthermore, this study highlighted areas for further research, especially the influence of education on the choice of the investment decision-making criteria.

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APPENDIX 1

A survey of the role of modern portfolio theory in current South African asset management practice

Questionnaire for a Master of Commerce in Financial Markets degree thesis

by

Masimba Garaba
Student number 602G3902

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Q1. Investment objectives

Which of the following best describes the guiding principle which you pursue in compiling your present portfolio?

Please **tick all** categories.

5=plays a dominant role 0=plays no role.

Practical relevance:	**5**	**4**	**3**	**2**	**1**	**0**
I expect above-average dividends and pay-outs in future from each of the shares included in your portfolio.	☐	☐	☐	☐	☐	☐
I expect each of the securities included in my portfolio to experience above-average increase in market prices.	☐	☐	☐	☐	☐	☐
I expect each of the securities included in my portfolio to contribute to a diversification of market risk.	☐	☐	☐	☐	☐	☐
I include securities in my portfolio such that a specific stock market index is replicated.	☐	☐	☐	☐	☐	☐
I am guided by other expectations (e.g. tax or balance-sheet advantages for investors):	☐	☐	☐	☐	☐	☐

Q2. Primary method of analysis

Which method of analysis do you primarily apply to the selection of securities?

Please **double click on the box chosen** on **all categories**

5=plays a predominant role ↔ 0= plays no role

Practical relevance:	**5**	**4**	**3**	**2**	**1**	**0**
Technical analysis of price trends, price formation and turnover trends.	☐	☐	☐	☐	☐	☐
Fundamental analysis based of forecast factors.	☐	☐	☐	☐	☐	☐
A structural econometric estimate of single multi-factor models	☐	☐	☐	☐	☐	☐
Behavioural finance models or instinct or gut feel.	☐	☐	☐	☐	☐	☐
A portfolio optimisation approach, based on estimated yields and co-variances of securities.	☐	☐	☐	☐	☐	☐

Q3. Secondary evaluation criteria

To which other criteria do you attribute special importance when taking investement decisions?

Please double click on the box chosen on all categories.

5=plays a predominant role ↔ 0= plays no role

Practical relevance	**5**	**4**	**3**	**2**	**1**	**0**
Trading costs, such as bid-offer spread	☐	☐	☐	☐	☐	☐
Market capitalisation	☐	☐	☐	☐	☐	☐
Frequent reports and availability of independent analysts' estimates.	☐	☐	☐	☐	☐	☐
Previous corporate development as well as performance on the market.	☐	☐	☐	☐	☐	☐
Availability of tradable derivatives for transactions or as a source of additional information.	☐	☐	☐	☐	☐	☐

Q4. Potential buy and sell signals

Please rate the importance of the following potential signals for the inclusion of securities in the portfolio that you manage.

Please **double click on the box chosen on all categories.**

5=strongly buy signal ↔ 0= no purchasing demand

Strength of the buy signal;	**5**	**4**	**3**	**2**	**1**	**0**
An above-average rise in the market price accompanied by an increase in turnover.	☐	☐	☐	☐	☐	☐
A market price that has stabilised at a level significantly lower than its all time high.	☐	☐	☐	☐	☐	☐
Expectations concerning higher dividends.	☐	☐	☐	☐	☐	☐
The raising of corporate earnings estimates by analysts.	☐	☐	☐	☐	☐	☐
Observed purchases by the other investors.	☐	☐	☐	☐	☐	☐
A low valuation, on a cross-market or cross-sector comparison, based on profit expectations for the coming financial years.	☐	☐	☐	☐	☐	☐

Further comments

If you wish to provide any further information (participation entirely optional), we would, of course, be greatly interested in learning more about your views on the topics mentioned in the questionnaire. Please make brief informal comments (e.g. using key words) in the space provided below.

To show my appreciation I have reserved a copy of the research study in which you have just participated for your own personal use.

Thank you for your assistance

Masimba Garaba