

**Investment potential analysis: An assessment model for
technology shares**

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Preamble

My interest in shares investment was kindled during a period that I spend working in the United States of America. Most of my acquaintances held diversified portfolios and I had all kinds of questions as I attempted to understand the world of shares investment. When the opportunity arose for me to do a dissertation based in Financial Management and specifically directed at shares investment I jumped at the chance.

This dissertation is therefore much more than just the final requirement in completion of my MBA – it is the fulfilment of a deep desire to understand something of the world where the creation of wealth has so many aspects and intriguing facets. I would like to think that this work will contribute, if only even at the smallest scale, to assisting private investors in the process of identifying good investments.

The theoretical research was done with a specific goal in mind – to understand the process of wealth creation within organizations because it is within the organization that the whole process begins after all. A principle of Warren Buffet that seems to stand out in most of the work written about his investment prowess is that the investor should know the company that an investment is planned in. Conceptual understanding of valuation of organizations is thus paramount.

The empirical part of the study led ultimately to the realisation that investment in shares is hard work and that the successful investors are those that can apply the tools of the trade in a disciplined fashion. My wish is that the “new analysis model” proposed in this dissertation, can be a useful tool in the toolkit of the private shares investor.

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CHAPTER 1

INTRODUCTION

Shares investment can be considered an important part of any well diversified portfolio of investments. The realization that organizations listed on stock exchanges all over the world are the creators of opportunities and wealth for their owners is the basic premise of owning shares in a company. In essence the owner of shares becomes a part owner of these companies. Furthermore the fact that most global pension funds are invested in shares, leads to the comprehension that sharing in this wealth creation process can be as simple as owning shares in listed companies. However choosing the actual company, or more ideally, companies to own shares in can be a daunting task. The crux of this is in the appropriateness of the investment. The essence of investing is in the ability of the investment to realize a positive return, which is the first fundamental requirement. The risk involved with the investment is the next fundamental that requires managing. Many ways exist to manage investment risk of which diversification is the most well known. The ability to choose consistently good investments, that is choosing those shares or projects that will have a positive return and thus decreasing risk, is the ultimate goal of the investment process.

1.1 Background

The well known investor, Warren Buffet and his investment methods have been studied by many students of financial management and shares investing over the years in an attempt to determine the 'secrets' to his ability to choose good investments. The background of this study is therefore investing and more to the point, finding good investments on the Johannesburg Stock Exchange and doing so consistently. Although it needs to be kept in mind at all times that shares investing remains a potential high return, high risk part of a diversified portfolio this study will attempt to decrease the amount of risk involved in shares

investing on the Johannesburg Stock Exchange by assisting in selecting those shares that has the highest likelihood of meeting the two fundamental criteria mentioned above.

A recent dissertation by a PBS MBA student, Me. Judy Cilliers evaluated the investment strategies of Warren Buffet. The culmination of her studies was a quantitative investment model that can be used to predict the performance of shares. In short, fourteen **investment criteria** have been identified, from which a model was constructed using six (6) of these criteria in a five- (5) step model:

- a. Evaluate the book value and book value per share.
- b. Calculation of the intrinsic value per share.
- c. Determine the margin of safety.
- d. Evaluate the profit margin of the company.
- e. Assess the usage of debt within the company.

The model constructed¹ from these five investment criteria is believed to have a high predictive value for correctly identifying shares with the potential to outperform other shares. The focus of this dissertation will be to implement a similar methodology used in constructing the current model on Technology driven sectors of the Johannesburg Stock Exchange to determine if the predictive value can be enhanced when projected on shares within these specific sectors.

1.2 Problem statement

A quantitative analysis model to assess the potential of investments on the Johannesburg Stock Exchange has been proposed and evaluated in the presentation of a previous dissertation. Applied to the All Share index of the Johannesburg Stock Exchange the current model achieved a high success rate when comparing average share prices of the chosen companies for 2003 and 2004 with the performance of other companies on the Johannesburg Stock

¹ The model constructed from the work of Me. Judy Cilliers will be called "**current model / current analysis model**" hence forward in this study.

Exchange. Much of the fundamental work has thus been done to create a model that can assist the private investor to choose the appropriate companies to invest in. The questions arising from the initial work are –

- a) Can the current model be applied for sector specific analysis?; and
- b) Would the sector specific application enhance the predictive value of the current model?

This dissertation will however not merely apply the current analysis model proposed by the previous study but will use all the investment criteria identified in the previous study as basis for application to technology driven companies on the Johannesburg Stock Exchange. ** See Objectives.

1.3 Objectives

The broad objective of this dissertation is to apply the fundamental research done in a previous dissertation to the **technology driven sectors** represented on the Johannesburg Stock Exchange. Again the underlying objective to focus on the investment needs of private investors will be important.

The **primary objective** of the study is to evaluate the identified investment criteria as to their application to the technology driven sectors on the Johannesburg Stock Exchange. It is important to note that because of the uniqueness of different business sectors (and certainly technology driven sectors) it was decided that all fourteen previously identified investment criteria needs to be re-evaluated as to their influence on changes in share price. In essence the assumption is that regression analysis will produce a “new” model that will have specific application for the technology driven sectors on the Johannesburg Stock Exchange.

Because the same statistical analysis process would be followed, the approach to re-evaluate all fourteen investment criteria would be beneficial to this study. The premise of this decision is based in the fact that the regression analysis that will be used will only produce the same results (five investment criteria of

current model) if these five criteria will have the same predictive value for the technology driven shares. If regression analysis identifies other criteria that influences changes in share price to a larger extent than the current model the primary objective will still be met.

The **secondary objective** is to apply the new model to the technology driven sectors in a step wise fashion to test its predictive value. The performance of the share prices of the companies evaluated will be tested over different time periods in order to establish whether the model has the ability to identify the better performing shares from those evaluated. The ability to correctly identify the better performing shares by at least 80% would be considered successful.

The end result expected would be a comprehensive, well balanced method for evaluating technology driven shares on the Johannesburg Stock Exchange.

1.4 Scope/Boundaries of the assignment

The all share index of the Johannesburg Stock Exchange will form the basis of this study. The sector application of the investment model will be done on the technology driven sectors on the Johannesburg Stock Exchange (JSE). The sub-sectors include: 1) Electronic and Electrical equipment, 2) Information Technology hardware, 3) Software and Computer services and 4) Telecommunication services. Thirty-four (34) companies are included in the sectors. Companies will be evaluated against the All Share index of The JSE. A comparison will also be made to evaluate the performance of the individual shares against companies in the same sub-sector. The financial statements of the organizations studied will be utilized to incorporate into the analysis model. The following boundaries need to be applied in order for the study to be applicable:

- i. Focus will be on investment from a private investor's perspective investing in individual shares within a portfolio of shares and not from the perspective of corporate investing and or fund investing.

- ii. The study will focus on investment in terms of purchasing shares of companies listed on the All Share index of the Johannesburg Stock Exchange. Therefore the AltX listed shares will not be included in this study.
- iii. The sector specific focus that will be employed throughout the study is based on companies listed in **technology driven sectors** on the Johannesburg Stock Exchange.
- iv. The period from 1996 to 2005 (a ten-year period) will be used for analysis of financial data.
- v. The financial data for 1996 – 2005 will form the basis for the statistical process from which the new analysis model will be constructed.
- vi. The Investment Criteria that will be evaluated will be the same criteria investigated by Me. Judy Cilliers for her dissertation in 2004.

1.5 Limitations of the Study

- This is a quantitative based study.
- Attention is given to qualitative aspects of organizational management in the theoretical research but these features are not researched or tested in the empirical part of the study.
- Because this dissertation analyses the same investment criteria used in the dissertation of Me. Judy Cilliers it is possible that other criteria, not evaluated here, could also be influential in predicting the performance of shares in the studied sector.

- As with any sample based study the statistical limitations inherent to the process needs to be kept in mind. All efforts were made to keep to statistical protocol in an effort to deliver a reliable end result.

1.6 Research Methodology

Research will start with a thorough literature study of investment theory and practical applications of these theories. A study of technology driven sectors of the JSE and International stock exchanges will be done to understand the intricacies of these sectors. Financial management will form the axis around which this study will rotate and as such much literature research will be done on this subject and particular as it pertains to shares as an asset class, portfolio management, diversification and risk management. Data from the JSE will be captured with software already available through the BFA McGregor database. This database will be the source of share price analysis.

Once the theoretical foundation has been established, analysis of the companies within the technology driven sectors will be done. The fourteen identified investment criteria will be analyzed using multiple regression and other statistical analysis methods in an effort to identify the criteria that most fundamentally are associated with changes in share price.

1.7 Layout of the assignment

- **CHAPTER 1: INTRODUCTION**

- Background
- Problem statement
- Objectives
- Scope and Boundaries
- Limitations of the Study
- Research Methodology
- Layout of the assignment

- CHAPTER 2: THEORETICAL ASPECTS OF INVESTING

GENERAL THEORY REGARDING INVESTMENTS AND THE ROLE OF FINANCIAL MARKETS ARE DISCUSSED. TIME IS SPENT DISCUSSING THE CAPM IN DETAIL AS WELL AS THE APPLICATION OF THE CAPM TO INVESTMENTS AND PRICING OF SHARES.

- CHAPTER 3: SHARES INVESTMENT

MORE ATTENTION IS GIVEN TO SHARES AS AN INVESTMENT VEHICLE IN THIS CHAPTER. THE PROCESS OF VALUING SHARES GETS PARTICULAR ATTENTION. VALUATION OF COMPANIES IS ADDRESSED AS AN IMPORTANT ASPECT OF UNDERSTANDING THE BUSINESS AND THE ORGANIZATION THAT AN INVESTMENT IS CONSIDERED IN.

- CHAPTER 4: RISK AND THE MANAGEMENT OF RISK

THE TOPIC OF RISK IS EVALUATED AND DISCUSSED EXTENSIVELY IN THIS CHAPTER. ATTENTION IS GIVEN TO THE MANAGEMENT OF RISK AS IT PERTAINS TO INVESTMENTS IN SHARES.

- CHAPTER 5: TECHNOLOGY DRIVEN ORGANIZATIONS

BECAUSE THIS DISSERTATION CONCENTRATES ON THE INVESTMENT IN THE SHARES OF TECHNOLOGY DRIVEN COMPANIES THIS CHAPTER ATTEMPTS TO INTRODUCE THE READER TO THE ENVIRONMENT THAT TECHNOLOGY DRIVEN COMPANIES OPERATE IN. A SOUTH AFRICAN PERSPECTIVE IS GIVEN AS WELL AS SOME INSIGHTS INTO THE INTERNATIONAL SCENE. VOLATILITY AS A TOPIC GETS SPECIFIC ATTENTION IN THIS CHAPTER.

- CHAPTER 6 EMPIRICAL STUDY

THE EMPIRICAL PART OF THIS STUDY STARTS IN CHAPTER SIX WITH COLLECTION AND ANALYSIS OF THE FINANCIAL DATA FOR THE COMPANIES EVALUATED. THE STATISTICAL PROCESS IS DISCUSSED AND THE RESULTS OF THIS IMPORTANT PROCESS IS PRESENTED IN GRAPHICAL AND TABULAR FORMAT. AN ANALYSIS MODEL IS PROPOSED BASED ON THE FINDINGS FROM THE STATISTICAL PROCESS.

- CHAPTER 7 TESTING OF THE NEW ANALYSIS MODEL

CHAPTER SEVEN IS TO A LARGE EXTENT THE ACID TEST OF THIS STUDY. THE MODEL PROPOSED IN CHAPTER SIX IS EVALUATED OVER DIFFERENT TIME PERIODS AND TESTED AS TO ITS ABILITY TO CORRECTLY PREDICT THOSE SHARES THAT WILL OUTPERFORM OTHER SHARES IN THE SECTOR. THE TESTING OF THE MODEL IS PRESENTED IN GRAPHICAL AND TABULAR FORMAT FOR THREE (3) PORTFOLIOS BASED ON THE NUMBER OF INVESTMENT CRITERIA MET.

- CHAPTER 8

THE STUDY IS CONCLUDED THROUGH A DISCUSSION OF FINDINGS AND RECOMMENDATIONS ARE MADE FOR FUTURE STUDY.

CHAPTER 2

THEORETICAL ASPECTS OF INVESTING

According to Luenberger (1998:xiii) investment theory currently commands a high level of intellectual attention – fuelled in part by some extraordinary theoretical developments in finance, by explosive growth of information and computing technology, and by the global expansion of investment activity. The focus of this chapter is to address some aspects of investment theory. Chapter 2 will concentrate more on the specifics and the theories surrounding shares investment.

2.1 The Marginal Investor

According to Anonymous (Anon), a marginal investor is a representative investor whose actions reflect the beliefs of those people who are currently trading a stock. It is the marginal investor who determines a stock's price.

An attempt was made to represent the actions of the marginal investor throughout this dissertation.

2.2 The role of Financial Markets

Hawawini et al (2002:14) states that financial markets play a key role in the process of business growth and value creation by performing two fundamental functions.

As primary markets, financial markets provide the financing required to fund new business ventures and sustain business growth. Financial markets perform this function by acting as intermediaries between individuals and companies that have a cash surplus that these individuals or companies wish to invest and

companies that have a cash deficit the company wish to eliminate by raising new capital through the issuance of *securities*.

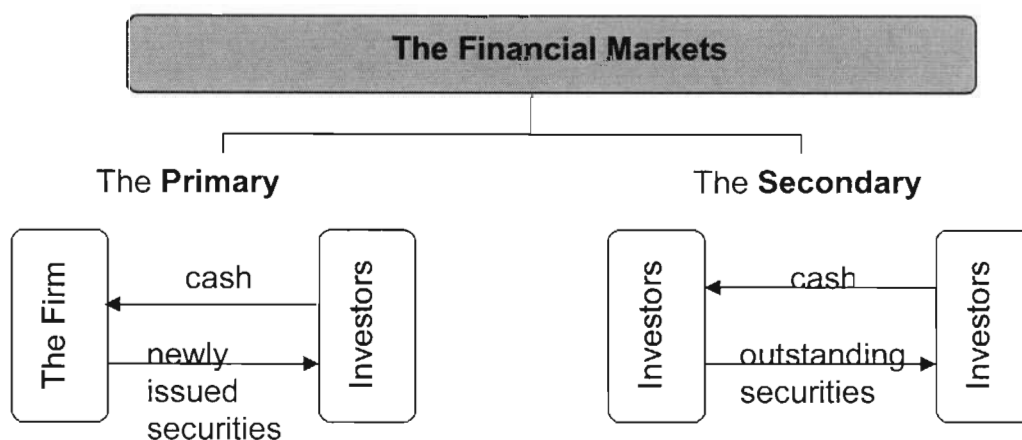
As secondary markets, financial markets provide an efficient mechanism for trading outstanding (already issued) shares and translating the value creating (value destroying) decisions of firms into increases (or decreases) in shareholders' wealth via higher (or lower) share prices.

Hawawini (2002:15) states that these two functions are not independent of each other. The price of shares in the secondary market is determined by the buying and selling carried out by traders in these markets. Investment bankers then use the price observed in the secondary market as a benchmark against which the investment bankers can set the price of newly issued shares in the primary market.

Thus, a well functioning secondary market facilitates the pricing of new securities issued in the primary market. As a consequence the two markets are closely related.

Diagrammatic representation of the functioning of financial markets, illustrating the role of primary and secondary markets follows in Figure 2.1.

Figure 2.1: The Financial Markets



Source: Hawanini (2002:16)

2.3 The Capital Asset Pricing Model (CAPM)

According to Luenberger (1998:173) the CAPM deals with the second of two fundamental questions during investment decision making – that of the correct, arbitrage-free, fair or equilibrium price of an asset. The first of these fundamental questions deals more with the strategic issues surrounding investment decisions. These are issues such as how to devise the best portfolio, how to devise the optimal strategy for managing an investment and how to select from a group of potential investments as well as several other issues.

Lovemore et al (2003:160) states that the CAPM is designed to calculate the cost of ordinary share capital, specifically taking risk into account. The formula is as follows: $k_E = r_f + \beta (r_m - r_f)$

The **risk-free rate** (r_f) is described as the rate that one can expect on a safe investment such as a Treasury bond or savings account and Brigham et al (2005:155) states that it is generally measured by the return on the long-term U.S. Treasury bonds. In the South African context the returns on the R153 is often used for this purpose. Lovemore et al (2003:160) states that this is the minimum rate that an investor would expect on an investment. As the risk in an investment increases, so a risk premium must be added to the risk-free rate in order to provide adequate compensation for the risk being taken.

Arnold (2005:224) describes the **beta coefficient** (β) as the measure of the covariance between the returns on a particular share with the returns of the market as a whole – usually measured as a market index. For the purpose of this dissertation the market index that was used was that of the Johannesburg Stock Exchange All Share Index. According to Brigham et al (2005:150) the market has by definition a beta equal to one (1).

Lovemore et al (2003:160) states that assets are considered risky if the returns of an asset fluctuate more than the fluctuations of returns in the market. Arnold (2005:225) gives the following summary of the basic features of beta:

$\beta = 1$ -----	A 1% change in the market index return leads to a 1% change in the return on a specific share.
$0 < \beta < 1$ -----	A 1% change in the market index return leads to a less than 1% change in the returns on a specific share.
$\beta > 1$ -----	A 1% change in the market index return leads to a greater change than 1% on the specific share.

This basically suggests that a share with a beta greater than 1.0 tends to exhibit amplified return movements compared to the index and conversely shares with a beta of less than 1.0 will vary less than the market as a whole.

According to Lovemore et al (2003:161) the **market rate of return** (r_m) is the average required rate of return on all assets in the market.

2.3.1 CAPM as a Pricing Formula

According to Leunberger (1998:187) the CAPM is a pricing model. However, the standard CAPM formula does not contain prices explicitly – only expected rates of return. To see why the CAPM is called a pricing model we must go back to the definition of return.

Suppose that an asset is purchased at price P and later sold at price \bar{Q} . The rate of return is then $r = (\bar{Q} - P) / P$. Here P is known and \bar{Q} is random. Putting this in the CAPM formula we have

$$\frac{\bar{Q} - P}{P} = r_f + \beta (\bar{r}_M - r_f)$$

Solving for P one obtains

$$P = \frac{\bar{Q}}{1 + r_f + \beta(r_M - r_f)}$$

2.3.2 Investment implications of the CAPM

Can the CAPM help with investment decisions? According to Leunberger (1998:183) there is no simple answer to the question.

The CAPM states (or assumes), based on an equilibrium argument, that the market portfolio is the one fund of risky assets that anyone should hold. This fund is only supplemented by the risk-free asset. The investment recommendation that follows this argument is that the investor should simply purchase the market portfolio. That is, ideally, an investor should purchase a little bit of every asset that is available, with the proportions determined by the relative amounts that are issued in the market as a whole. It is not necessary to analyse each individual asset – just buy the market portfolio.

Since it would be rather cumbersome for an individual to assemble the market portfolio, mutual funds have been designed to match the market portfolio closely. These funds are called index funds, since they usually attempt to duplicate the portfolio of a major stock market index.

Some people believe that one can do better than blindly purchasing the market portfolio. The CAPM, after all, assumes that everyone has identical information about the uncertain returns of all assets. Clearly this is not the case as according to Leunberger (1998:218) it is fundamentally impossible to obtain accurate estimates of expected returns of common stocks using historical data. The standard deviation (or volatility) is just too great. Better estimates can only be obtained if there is information regarding the future prospects of the stock available that supplements the information contained in the historical records.

Such information can be obtained in a variety of ways, including:

- ⇒ From detailed fundamental analysis of the firm, including an analysis of its future projects, its management, its financial condition, its competition, and the projected market for its products or services.
- ⇒ As a composite of other analysts' conclusions; and
- ⇒ From institution and hunches based on news reports and personal experience.

Such information can be systemically combined with the estimates derived from historical data to develop superior estimates. In the end one deal again with estimates and the issue of risk management always stays paramount to any investment decision.

2.4 Intrinsic Value

According to Bernstein et al (1998:186) in intrinsic valuation, the value of any asset is viewed as a function of the cash flows generated by that asset, the expected growth in the cash flows, and the riskiness associated with the cash flows. Three inputs are required to value any asset:

1. The expected cash flow.
2. The timing of the cash flow; and
3. The discount rate that is appropriate.

Vick (2001:108) states that the intrinsic value of a company is the total of its future expected earnings discounted by the time value of money.

The formula for calculating intrinsic value (on a per share basis), according to Vick (2001:117), is as follows:

$$\text{Intrinsic value per share} = \frac{\text{Estimated earnings per share for the following year}}{\text{Discount rate}}$$

Intrinsic value has a variety of applications for the marginal investor – the basic premise being that an asset has value when the calculated intrinsic value is greater than the current market value of the asset.

2.5 Margin of Safety

According to Simmons (1999:75-77) when an investor invests in a publicly quoted security the investor brings nothing to the table but the right to sell. The purchase adds no value to the company. There is therefore no point in paying \$1 for \$1.

Simmons explains this important concept by means of an example:

-- An investor finds an average company returning 10% to its equity. In this example it retains all its earnings and continues to grow at 10% per year.

Historic Earnings			Current Earnings	Future Earnings	
11.3	12.4	13.6	15	16.5	18.2

We estimate the intrinsic value² to be:

$$IV = \frac{15 \times 0.1}{(0.1)^2} = 150 \text{ or a P/E of } 10$$

This is also the market price, which in this case one pays. Since future earnings continue to rise 10% per year on an equity base rising at the same rate, ROE will remain at 10%. It is quite likely that IV and market price will keep step and also increase at 10% per year.

However, rises in future market price needs to be discounted by 10% per year (the long term discount rate) to get the present value. One paid 150 in the current year and in two years time the price will be 182, also worth 150 today ($182/(1.1)^2 = 150$). In summary, paying intrinsic value means one can expect no increase in real terms in the value of the investment. Margin of safety simply

² Note that Simmons uses a formula for IV incorporating ROE which is different to the formula used by Vick – refer Simmons (1999:174)

means that one should buy shares at a discount as big as possible to a security's intrinsic value.

By using this approach three advantages are achieved. More straightforwardly one should profit over time:

- ⇒ Either the market, that is other investors, will recognize the underlying value and the market price will rise or one sits tight and benefit from the company's underlying cash flow as earnings and dividends increase.
- ⇒ One does not have to worry about overall direction of the market. A security possesses a good margin of safety or it doesn't. The market as a whole may be crashing but over time the well chosen security will appreciate; and
- ⇒ A margin of safety is an insurance policy against our own ability and the pitfalls of the world. Management may stumble, products may be recalled, our forecast cockeyed – a good investor will have left enough room in the purchase price such that even a poor investment will at worst not lose money.

One more comfort of a good margin of safety, according to Simmons (1999:76) is that you would have bought a security that is well below its true value. If the price were to fall, the investor need not to worry and can actually use the opportunity to buy the security at an even more discounted price.

2.6 Stock Market Equilibrium

According to Brigham et al (2005:268) at equilibrium two conditions must hold:

1. A stock's expected rate of return as seen by the marginal investor must equal its *required rate of return*; and

2. The actual market price of the stock must equal its intrinsic value as estimated by the marginal investor.

Brigham et al (2005:266) states that the *required rate of return* can be found using the Security Market Line (SML) equation:

$$r_i = r_{RF} + (RP_M)\beta_i$$

The marginal investor will want to buy the stock if the expected rate of return is more than r_i , will want to sell it if the expected rate of return is less than r_i , and will be indifferent, hence will hold and not buy or sell, if the expected rate of return is equal to r_i .

Brigham et al (2005:267) states that by using the following equation the marginal investor can calculate the share's *expected rate of return*:

$$\hat{r}_i = \frac{D_1}{P_0} + g$$

If the *expected rate of return* was less than the *required rate of return* the holders of the share would want to sell the share. However one would expect that few buyers would be willing to pay the current share price for the share. Thus, the price would decline continuously until the equilibrium price is reached – the price where the *expected rate of return* equals the *required rate of return*. The opposite obviously holds true when the *expected rate of return* is higher than the *required rate of return* and buyer demand for the share will drive the price of the share upwards until the equilibrium price is reached.

Brigham et al (2005:268) alludes to the fact that different points of view of investors exist and that the *expected rate of return* as well as the *expected price* of the share differs between investors.

However, it is the marginal investor who establishes the actual market price of the share where $\hat{r}_i = r_i$ and $P_0 = \hat{P}_0$. Trading will continue until these conditions hold true.

Changes in the equilibrium share prices occur when the variables used to obtain the share price changes. Changes in the Risk-free rate, Market risk premium, the Beta of the share as well as the expected growth rate of the share will influence the equilibrium price of the share. At the new price the expected rate of return and the required rate of return will again be equal. Changes in share prices are thus a reflection of changes in expectations and conditions.

2.7 Efficient Market Hypothesis (EMH)

According to Hawawini (2002:15) in an efficient equity market, the share prices of firms adjust instantly to new and relevant information as soon as it becomes available to market participants. Brigham et al (2005:269) states that this hypothesis holds:

1. Stocks are always in equilibrium; and
2. It is impossible for an investor to consistently "beat the market".

The hypothesis is basically founded in the notion that the same information becomes available to all analysts evaluating the same shares and that the price of the share will adjust immediately to the new developments. Libby et al (2004:723) states that markets react very quickly to new information in an unbiased manner – that is the market does not systematically overreact or under-react to new information. Thus in an efficient market the price of securities fully reflect all available information. Different levels of Market Efficiency exist in theory according to Brigham et al (2005:270-271) –

- a) Weak-form Efficiency: Implies that any information coming from *past stock prices* is rapidly incorporated into the current stock price.

- b) Semi strong-form Efficiency: This form of the EMH states that current market prices reflect all *publicly available* information. The suggestion is that investors should expect returns predicted by the SML unless they have access to additional information that is not publicly available. This also implies that share prices will only respond if the information that becomes available differs from what have been expected; and
- c) Strong-form Efficiency: Strong-form efficiency states that the current market price of a share reflects *all pertinent* information and that even insiders would unlikely earn consistently abnormal returns.

The importance of this hypothesis, from the perspective of the marginal investor, is according to Libby et al (2004:723) that it is probably not beneficial to study old information for instance an annual report released six months earlier in an effort to identify undervalued stocks. The reason for this is that in an efficient market the price of the stock would reflect the new information very shortly after the release of the information.

2.8 Challenging the Efficient Market Hypothesis

Warneryd (2001:19) indicates that challenges to the Efficient Market Hypothesis on the basis of empirical data exist. He quotes the findings of Shefrin et al (2004) that cite a number of such incongruous findings:

- a) Abnormal returns due to firm size.
- b) Variability in earnings-to-price ratios.
- c) The performance of past winners and losers.
- d) Turn-of-year effects.
- e) Excessive volatility.
- f) The so called Equity-Premium puzzle; and
- g) Emergence of bubbles and crashes.

While followers of the Efficient Market Hypothesis admit that there are deviations from efficiency, it is maintained that over time it will balance out. For

example, if every investor does not use all the information, there will always be other investors making a profit on the basis of the information. Markets will be brought back towards efficiency through the trading of arbitrageurs who exploit favourable price differences.

CHAPTER 3

SHARES INVESTMENT

Common stock represents an ownership interest in a corporation. According to Brigham et al (2005:254-255) two features characterize this ownership of common stock:

- i. It entitles the owner to *dividends*; and

Dividends, however, will only be paid out to owners of stock at the discretion of company management when sufficient retained earnings have been realized through operations of the organization. According to Arnold (2005:352) two important fundamentals regarding the dividend policy of organizations are:

- ⇒ If cash flow is retained and invested within the firm at less than the required return on equity capital, shareholder wealth is destroyed: therefore it is better to raise the dividend payout rate.
 - ⇒ If retained earnings are insufficient to fund all positive NPV (Net Present Value) projects shareholder value is lost, and it would be beneficial to lower the dividend. Silbiger (2002:156) simply describes NPV by stating that investments need to be evaluated in today's dollars (rands).
- ii. Stock can be sold at some future date, hopefully at a price greater than the purchase price to realize *capital gains*.

Capitals gains will be realized if the stock is sold at a price above its purchase price. Capital losses are made when the stock has to be sold at a price below the original purchase price.

It is important to note that both these aspects of owning shares carry certain risks. The payment of and the size of dividend payments cannot be guaranteed. At the same time, no assurance exists for capital gains either.

Both these aspects of shares are utilized in valuation of shares. According to Brealey et al (2000:63) common stocks provide an expected future cash flow stream in the form of dividends, and a stock's value is found in the same manner as other financial assets – namely, as the present value of the expected future cash flow stream. The cash flow payoff to owners of common stocks comes in two ways:

- a) Cash dividends expected in each year; and
- b) The price investors expect to receive for the stock when the investor sells the stock. This will include the return of the original investment plus expected capital gains.

3.1 Valuation of shares

According to Kahn et al. (1999:59) the successful investor needs to understand:

- a) Factors that make stocks rise and fall.
- b) How to value stocks; and
- c) Characteristics of good stocks.

One of the most difficult questions that an investor has to answer is: What is the stock worth? If this can be answered prior to a stock purchase, significant gains can be realised. The basic premise is that stocks are just like any other commodity that can be bought or sold. Kahn et al (1999:59-62) states that one needs to understand the following factors that determine what other investors are willing to pay for a stock.

3.1.1 Factors determining share prices

3.1.1.1 Supply and Demand:

Investors need to understand a stock's supply and demand as well as the factors that affect the supply and demand. Any change in demand and supply, both of which can change at different rates, makes share prices fluctuate. In general, increase in demand for a share will lead to an increase in the price. An increased supply will depress the price of the share.

Supply

Stock supply is determined by two factors: the total number of shares issued by the company and its trading volume on a particular day. The number of outstanding shares remains fairly steady unless there is stock split or share buybacks from the company. The company usually publicly announces changes in stock supply due to these factors. According to Kahn et al (1999:60), over the years, the best price performers have been companies with relatively small numbers of available shares. In 1998, the average float (the number of shares available for trading) of the 10 top-performing shares on NASDAQ (the technology heavy bourse in USA) was only 16.64 million shares. According to Nursaw (1974:43) in settled equity markets the supply of shares is seldom adequate and prices are forced up. In boom times (as seen in South Africa over the last few years) too much money is chasing too little stock and prices can become unrealistic.

Demand

The demand for a company's shares can be steady or can fluctuate significantly and at frequent intervals. Stock demand is influenced by many factors and these factors are in constant flux. These include factors that affect the fundamentals (earnings, dividends, economy etc.), market or group behaviour, investor psychology, politics and other external factors. The example mentioned of Intel that saw an increase of \$7.75 in its share price on double its average

daily trade volume on December 11, 1996 after a positive public announcement by the company places this aspect of share valuation in perspective.

3.1.1.2 Trading factors

Liquidity

This is an important factor in stock ownership according to Kahn et al. (1999:62) because investors want to be in a position to sell a stock immediately if required. For this reason the general rule of thumb is that it is preferable to buy stocks with relatively high trade volumes. Shares with low trade volumes can become a liability during times of market decline because of the relatively low number of buyers available for the share. This situation can become compounded if a large amount of shares need to be unloaded.

Change in trading volume

Any increase or decrease in the daily trading volume of a share can affect its price.

Role of institutions

The role of institutional investors on the value of a share needs to be taken into account. Because these investors typically own large numbers of shares, institutional investors buy and or sell shares in relatively large numbers that can influence the price of a share significantly. This is in particular so if the share is traded in low daily trading volumes.

Company size

Price moves of widely held and heavily traded companies with large amounts of outstanding shares are small. Small stocks however can make big moves in share price in a short period of time especially if demand for the company's shares exists from the institutional investors.

Spread factor

The difference between the asking price and the bid price of a share can heavily influence the liquidity, price and trading pattern of a share. The difference between the asking price and the bid price (spread) is typically large for small capitalization and low trading volume stocks.

3.1.1.3 Fundamental factors:

In general four fundamental factors influence the price of a stock.

- Earnings Outlook.
- Dividend Prospects.
- Financial Condition
- Comparison to other investment alternatives

In the short-term (i.e. days or months) stock prices fluctuate in tandem with investor expectations of earnings and growth. These expectations are very volatile and sensitive to news items (directly or indirectly affecting the company), business conditions, market behaviour, and a number of other factors.

The long-term stock price rise (or fall) depends on a company's actual rising (or falling) of earnings and dividends, as well as its financial condition. Price/earnings ratios, dividend yields, and price/book value relationships have little short-term relevance to the price trend. However, in the final analysis, these financial parameters provide the basis of value upon which stock prices rest.

3.2 Dividends

Brealey et al (2000:63) suggest that the rate of return that investors expect from a share over the next year is defined as the expected dividend per share plus

the expected price appreciation per share (P_1 minus P_0), all divided by the original price, P_0 .

The following equation is used to calculate the expected return:

$$\text{Expected return} = \frac{\text{Div}_1 + P_1 - P_0}{P_0}$$

Brealey et al calls this return that is expected by investors the *market capitalization rate*.

This follows that if given investors' forecasts of dividend and price and the expected return offered by other equally risky stocks, the share price for today (P_0) can be predicted:

$$P_0 = \frac{\text{Div}_1 + P_1}{1 + r}$$

This formula can be expanded to include the dividends and the price of the stock in year 2:

$$P_0 = \frac{\text{Div}_1}{1 + r} + \frac{\text{Div}_2 + P_2}{(1 + r)^2}$$

3.3 Calculating the price of stocks

Because one succeeds with the preceding formulas to relate today's stock price to the forecasted dividends for two years (Div_1 and Div_2) and the forecasted price of the stock at the end of the second year (P_2) one gets to the following general stock price formula as per Brealey et al (2000:63):

The General Stock price Formula:

$$P_0 = \sum_{t=1}^H \frac{DIV_t}{(1+r)^t} + \frac{P_H}{(1+r)^H}$$

Brealey et al (2000:65) give an important insight in the calculations for constant growth stocks - constant growth stocks are stocks of which the dividends are expected to increase at a steady rate and the price to increase at the same rate each year.

As the horizon recedes, the dividend stream accounts for an increasing proportion of the present value, but the total present value of dividends plus the terminal price of the stock will always equal P_0 .

This leads to the following equation that according to Brigham et al (2005:257) suggests that the value of a stock at any given time is the *present value* of an infinite stream of dividends:

Value of stock = \hat{P}_0 = PV of expected future dividends

$$\begin{aligned} &= \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \dots + \frac{D_\infty}{(1+r_s)^\infty} \\ &= \sum_{t=1}^{\infty} \frac{D_t}{(1+r_s)^t} \end{aligned}$$

The notion is that the current price of the stock, when compared to the future price of the stock will always depend on the expected future dividends because the sale price the current investor receives will depend on the dividends some future investor expects.

3.3.1 Constant Growth stocks

Brigham et al (2005:258) suggests that for mature companies with a stable history of growth, the constant growth model can be used to determine the value of the stock. The following equation can be used:

$$\begin{aligned}\hat{P}_0 &= \frac{D_0(1+g)}{r_s - g} \\ &= \frac{D_1}{r_s - g}\end{aligned}$$

An important aspect of stock prices has been deduced from this equation. According to Brigham et al. (2005:261) more than 80% of a typical company's stock price is due to cash flows expected more than five years in the future. Another aspect that needs to be kept in mind is that one should not be tempted to think that the *total* value of the firm's outstanding common stock is equal to the discounted stream of *all* future dividends.

Brealey et al (2000:77 - 78) warns that one should only include dividends to be paid to *existing* stock. The company may at some future date decide to issue /sell more stock, which will then be entitled to its share of the dividend stream. The total value of the company's existing stock is equal to the discounted value of that *portion* of the total dividend stream that will be paid to the stock outstanding today. However, if the assumption were made that existing shareholders buy any new shares that the company issues, shareholders would bear *all* the cost of future investments and receive *all* the rewards. This net cash flow to shareholders after paying for future investments is also called *free cash flow*. The free cash flow can thus be considered to be the present value of (earnings minus investments).

3.3.2 Non-constant Growth stocks

Brigham et al (2005:263) suggests that the dividends of most companies do not grow at constant rates but rather at *non-constant* rates or *supernormal* rates. This depends on the success of the organization and the *stage* in *the life cycle* of the particular firm. Typically firms will grow faster than the economy during the early part of their lives, match economic growth during their mature years and tend to grow slower than the economy during years of decline.

Even for organizations with supernormal dividend growth rates, the value of such a firm is still the present value of expected future dividends as determined by the General Stock price Formula. Brigham et al (2005:263) describes the concept of *terminal date*, or *horizon date* to describe the number of periods (N) that the dividend will grow at a non-constant or supernormal rate. The constant growth formula can be used to determine the stock's horizon, or terminal value N periods from today. This is the present value of the stock at the start of the constant growth period – after the final dividend payment at the end of the supernormal growth stage. To establish the actual present value of the share the present value of the horizon value needs to be added to the present values of the dividends during the non-constant growth period. Brigham et al (2005:265) describes the following steps³:

- ⇒ Step 1: Calculate the dividends expected at the end of each year during the supernormal growth period. Calculate the first dividend, $D_1 = D_0(1 + g_s)$. Here g_s is the growth rate during the period of supernormal growth. Then calculate D_2 , based on D_1 . Continue with the dividend calculations for each year for the period of supernormal growth with the dividend of year N calculated as:

$$D_N = D_{(N-1)}(1 + g_s)$$

³ Adjusted to reflect generic application of formulas as used by Brigham et al.

- ⇒ Step 2: Calculate the first dividend payment during the period of normal growth, $D(N+1)$ by using the last dividend paid out during the last period of supernormal growth, $D_N = D_{(N-1)}(1 + g_s)$. Thus $D(N+1) = D_N(1 + g_n)$. Here g_n is the *normal* growth rate. The present value of the stock can now be calculated with the following formula:

$$\hat{P}_{(N-1)} = \frac{D_{(N+1)}}{r_s - g_n}$$

$\hat{P}_{(N-1)}$ is the price that the owner could sell the stock for at time N .

The *total cash flow* at time N consists of the sum of $D_N + \hat{P}_{(N-1)}$.

- ⇒ Step 3: All cash flows as calculated in steps 1 and 2 must now be discounted at the required rate of return to get the present values of these cash flows. The present values are totaled to get the present value of the supernormal growth stock.

3.4 Stock price forecast using estimates of earnings:

The following is an adoption from Kahn et al (1999:301-303) to illustrate a method to determine share prices in the future by using a simple method based on earning forecasts.

The basis of this method is earnings forecasts for the organization that is available through financial institutions. Using averages of different analysts an estimate of future earnings is made by estimating earnings per share (EPS) growth.

As illustration, the following data is available for Company A in Table 3.1:

Table3.1 Estimating Earnings per Share

Fiscal year end:May 31	1996(actual)	1997(estimated)	1998(estimated)
Mean Estimate (EPS):	R 0.9	R 1.28	R 1.69
No. of analysts making estimate:		25	20
Estimate range:		R 1.22 – R 1.34	R 1.55 – R 1.79

Forecast Calculations for the following year:

- ⇒ EPS growth in the last fiscal year: 35% (This is a known percentage based on actual earnings growth for 1995 to 1996)
- ⇒ Estimated EPS : R 1.28
- ⇒ Earnings growth estimates (short term: one year): Use financial analysts' estimates for earnings growth for the following year.

3.5 Company specific analysis – Focusing on the firm

Understanding all aspects of the company that is being investigated is a trademark of dedicated analysts and investors that outperform the market. According to Arnold (2005:322) examination of the numerous aspects of a firm, and its management, helps to develop an informed estimate of the growth potential of a firm.

According to Arnold (2005:322 – 323) these aspects will include the following:

3.5.1 Strategy Analysis:

The most important factor in assessing the value of a firm is its strategic position. The analyst needs to consider the attractiveness of the industry, the competitive position of the firm within the industry and the firm's position on the life cycle of value creation to appreciate the potential for increased dividends. During research for this dissertation it has become clear that understanding the *strategic aspects* of a company is very important in the analysis of technology driven companies. Evaluation of business strategy is a subject matter that does

not form part of the scope of this dissertation. It needs to be emphasized though, that *strategic analysis* needs to form part of the evaluation process of all organizations that are considered for investment. This holds especially true for organizations competing in technology driven sectors.

3.5.2 Evaluation of Management:

Running a close second in importance for the determination of a firms' value is the quality of its management. A starting point for analysis might be to collect factual information such as the level of experience and education. But this has to be combined with far more important evaluation variables that are unquantifiable, such as judgment and even gut feeling about issues such as competence, integrity, intelligence etc. Having honest managers with a focus on increasing the wealth of shareholders is at least as important for valuing shares as the factor of managerial competence. Investors downgrade the shares of companies run by the most brilliant managers if there is any doubt about the integrity of management – highly competent “crooks” can destroy shareholder wealth far quicker than any competitive action. Noted are the spectacles at Enron, WorldCom and Parmalat.

3.5.3 Using the Historical Growth Rate of Dividends:

For some firms the past growth may be extrapolated to estimate future dividends. If a company demonstrated a growth rate of 6 percent over the past ten years it might be reasonable to use this as a starting point for evaluating its future potential. This figure may have to be adjusted for new information such as new strategies, management or products.

3.5.4 Financial Statement evaluation and Ratio analysis⁴

An assessment of the firm's profitability, efficiency and risk through an analysis of accounting data can be enlightening. However, adjustments to the published figures are likely to be necessary to view the past clearly, let alone provide a guide to the future.

Armed with a questioning frame of mind the analyst can adjust accounts to provide a truer and fairer view of the company. This is part of the reason why standardized financial statements have been used during the empiric study of this dissertation. The other reason is the benefit of being able to compare different companies using the same yardstick.

The analyst may wish to calculate three groups of ratios to enable comparisons:

- Internal liquidity ratios permit some judgment about the ability of the firm to cope with short-term financial obligations – quick ratios, current ratios etc.
- Operating performance ratios may indicate the efficiency of the management in the operations of the business – asset turnover ratio, profit margins, debtor turnover etc.
- Risk analysis concerns the uncertainty of income flows – sales variability over the economic cycle, operational gearing (fixed cost as a proportion of total), and financial gearing ratio (ratio of debt to equity), cash flow and other factors.

3.6 Common Stock Valuation – Application to technology driven companies:

This insert has specifically been chosen because of the important influences that the mentioned topics and concepts have on particularly technology driven

⁴ Financial statement and Ratio analysis are dealt with in detail in Chapter 4.

organizations and technology driven sectors on stock exchanges. The examples used by the authors particularly ring true for technology driven companies.

3.6.1 Factors influencing share prices

According to Kahn et al (1999:46 - 52) the following aspects of the business environment are important influences on organizations and thus will influence the prices of these company's shares.

3.6.1.1 Internal factors

Products

According to Kahn et al (1999:46) the ability of a company to sell products determines its revenues, profits, and growth rate. Although this statement holds true for all companies, it is particularly true in the sectors driven by technology. Companies that produce innovative products and can do so consistently are generally very profitable and as a consequence the share prices of such companies reflect this through share price appreciation. Kahn et al points out the issue of a diverse product range versus a focused company controlling a niche market.

Product cycle

Kahn et al (1999:46) suggest that companies need to innovate and introduce new products regularly in order to stay ahead of competition. If the product cycle is very strong, with a number of products slated for release in the near future, it can be expected that revenues will grow in line with the products' release. The affect on revenue growth will often be reflected in the share price.

Competition

The authors stress the importance of the influence that competition can have on the price of a share. An important international example is given that pertains to

technology driven companies and technology driven sectors on stock exchanges – In 1995, Intel decided to enter the chipset market. As a result, Opti, the leading maker of chipsets at the time, almost overnight lost its market to a new but very powerful competitor. Within a few months, its stock price dropped from \$29 to \$4.62. Even if a competitor is not as formidable as Intel, share prices can be influenced by the products, and product cycles of competing companies.

Markets – Presence in growth areas

The presence, or absence, of a company from growth areas can affect its sales and earnings, as well as stock price. This absence of products can be from either sectors or markets (countries, regions) experiencing fast growth. C-Cube Microsystems experienced phenomenal growth, and profits, in the mid-1990's because C-Cube Microsystems' products were introduced to China that was experiencing significant growth.

Niche/Monopoly

The ability to corner a niche area can be very profitable for a company and its stock price. A company controlling a market through either a monopoly or a large market share can generate hefty profits consistently. These profits are reflected in share price growth. Again the example of Intel is used that dominates the IBM-compatible computer market with its high-end microprocessors.

Institutional presence

A shift in ownership of outstanding stock from individual investors to institutional investors has taken place over the last few decades in the USA. The massive buying power of institutional investors, those investors investing for large pension funds, insurance companies, banks etc. can significantly influence the share price of a small company that has been identified by institutional investors as having good growth potential.

Management

Without good management, a company cannot thrive. When analyzing a company, investors need to note if the following important management characteristics are present:

- ⇒ Integrity.
- ⇒ Ability to execute the company's plans.
- ⇒ Willingness to invest for the future.
- ⇒ Main focus on making correct business decisions rather than pleasing stock markets for temporary gains.
- ⇒ Open communications; and
- ⇒ Record of success

3.6.1.2 External Factors

Kahn et al also describes several external factors that can influence the price of shares. These factors are similar to those discussed under Risk and the Management of Risk and are dealt with extensively in Chapter 4.

CHAPTER 4

RISK AND THE MANAGEMENT OF RISK

It has been mentioned that both aspects of common stock investments' cash flow prospects (dividend growth and payments as well as capital gains) are subject to risk. The following is a synopsis of risk from the perspective of the private investor.

4.1 What is a Risky Asset?

Brigham et al (2005:130) gives the best description of risky assets. Risky assets rarely produce their *expected rate of return* – generally, risky assets earn either more or less than what was originally expected. Investment risk, is then related to the *probability* of actually earning a low or negative return – the greater the chance of a low or negative return, the riskier the investment.

4.2 Risk Aversion

Lovemore et al (2003:40) states that the phenomenon of demanding *adequate compensation* for bearing risk is known as risk aversion. Lovemore et al (2003:141) describes further that this *compensation* required for high risk is the correspondingly high required rates of return.

Luenberger (1998:5) describes the *principle* of risk aversion which describes the notion that individuals seeking investment rather than outright speculation will elect an investment with certain returns over an investment with uncertain returns. In general, one will accept more risk only if you expect to get greater expected returns from an investment. Formalization of the principle is through mean-variance analysis. In this approach, the uncertainty of the return on an asset is characterized by just two quantities: the *mean value* of the return and

the *variance* of the return. The risk aversion principle says that if several investment opportunities have the same mean but different variances, a rational (risk-averse) investor will select the one that has the smallest variance. The mean-variance method of formalizing risk is the basis for the most well known method of quantitative portfolio analysis, pioneered by Nobel Prize winner Harry Markowitz.

According to Brigham et al (2005:138) the implication of risk aversion for security prices and rates of return is that, other things held constant, the higher a security's risk, the lower its price and the higher its required return.

4.3 Types of Risk

Kahn et al (1999:317) states that an investor who desires to maximize return must generally be prepared to assume higher risk. Conversely, if one desires to reduce risk, then one must be prepared to accept a lower return. While the nature of risk varies with the type of investment, the most common types of risk are identifiable.

Two main components of risk exist and are commonly known as market risk and diversifiable risk. As can be seen in the following discussion market risk has different components but the common theme is that it affects all companies to some extent and that it cannot be diversified away.

4.3.1 Market Risk

According to Kahn et al (1999:317) stock prices always fluctuate up or down. The risk of a loss caused by a declining stock price over a short or extended period is called market risk. The frequency and amplitude of these price fluctuations are affected by many factors including:

- Economic factors (inflation rate, unemployment rate, changes in interest rate, etc.).

- External factors and events (political, international, trade issues, wars, national disasters).
- Changing investor expectations for the economy and the individual companies.
- Profitability of the company (performance in term of profit and loss).
- Emotional factors (hope, fear and greed); and
- Speculation.

Kahn et al (1999:318) suggest that overall market behaviour is also a major factor causing price fluctuations in individual stocks. If the market declines, the risk increases that the individual stock or the portfolio will follow the market that may result in a loss. According to Brigham et al (2005:146) market risk stems from factors that systematically affect most firms.

4.3.1.1 Inflation Risk

Kahn et al (1999:318) describe inflation as an increase in the price level of goods and services, which reduces the purchasing power of consumers. It has a corrosive effect on investments. If annual inflation is 4%:

- The real rate of return is approximately only 3% if an investment grows at a 7% rate; and
- Purchasing power will half every 18 years

Every investor is faced with the risk that the return from investments will not match, or exceed, the inflation rate. In order to beat inflation risk, it becomes imperative that investments grow faster than the inflation rate.

4.3.1.2 Interest rate Risk

Interest rates significantly influence the stock market both as to the absolute value as well as the direction of interest rates. Kahn et al (1999:319) suggest that when interest rates go up, alternative investment options, such as bonds and cash deposits, become more attractive when compared to stocks. Additionally higher interest rates affect the profitability of organizations because

borrowing cost increases, which can have a negative effect on profitability which in turn drag down stock prices. It is important though to note that changes in interest rates affect different stocks differently. Banking stocks, for instance, are much more sensitive to changes in interest rates due to heavy dependence for borrowed capital. As a consequence, increases in interest rates generally lead to declines in the stock prices of banks and utilities.

In an effort to limit the effect of interest rate risk, investors try to predict the level of interest rates 6 to 12 months ahead even though it is quite difficult to do this with any amount of consistency.

4.3.1.3 Business Risk

Because of the dynamic environment that organizations operate in, the business conditions are changing constantly. Risks like the business of a company becoming obsolete, decimation by competition, poor or unresponsiveness to the changing needs of customers or poor management always exist. These risks cannot be eliminated completely but by investing in solid companies that the investor understands well, can reduce business risk.

4.3.1.4 Liquidity Risk

Kahn et al (1999:319) describes this type of risk by stating that the demand for the shares of different companies varies significantly. The difference in daily volume can vary between a few hundred to several million shares traded for different shares. If only small numbers of a company's shares are traded daily, it can become difficult to sell shares in these companies due to the low demand for the shares. The result, according to Kahn et al (1999:319) is that – under the same conditions – a seller of stock in a low trade volume company might receive a lower price than a stock in a more heavily traded stock. This can be compounded during a declining market. To reduce this type of risk investors can consider trading only in companies that have a pre set daily trading volume. For instance some investors do not buy shares if the trading volume is below 100 000 shares per day. For institutional investors this trading volume might be even higher in an effort to reduce the liquidity risk of the stock.

4.3.1.5 Currency Risk

According to Kahn et al (1999:320) a change in the value of a local currency relative to foreign currencies can have a significant effect on the profitability of companies that have foreign operations. The magnitude of this effect depends on the extent of foreign operations and the percentage change in currency value. Brigham and Houston (1998:134) states that the effective rate of return on a foreign investment depends on both the performance of the foreign investment as well as on what happens to the exchange rate over the life of the investment. This type of risk is often difficult to manage and is often impossible to eliminate.

The mentioned types of risk (2.1.1 – 2.1.5) are also commonly referred to as *Non-diversifiable risk* or *systematic risk* and can thus not be eliminated through diversification.

The point about systematic risk is well made by Arnold (2004:223) stating that no matter how many shares are held, there will always be an element of risk that cannot be cancelled out by broadening the portfolio. All shares respond to the system-wide risk factors but do not respond equally. Some shares will exhibit a greater sensitivity to these systematic risk elements than others will.

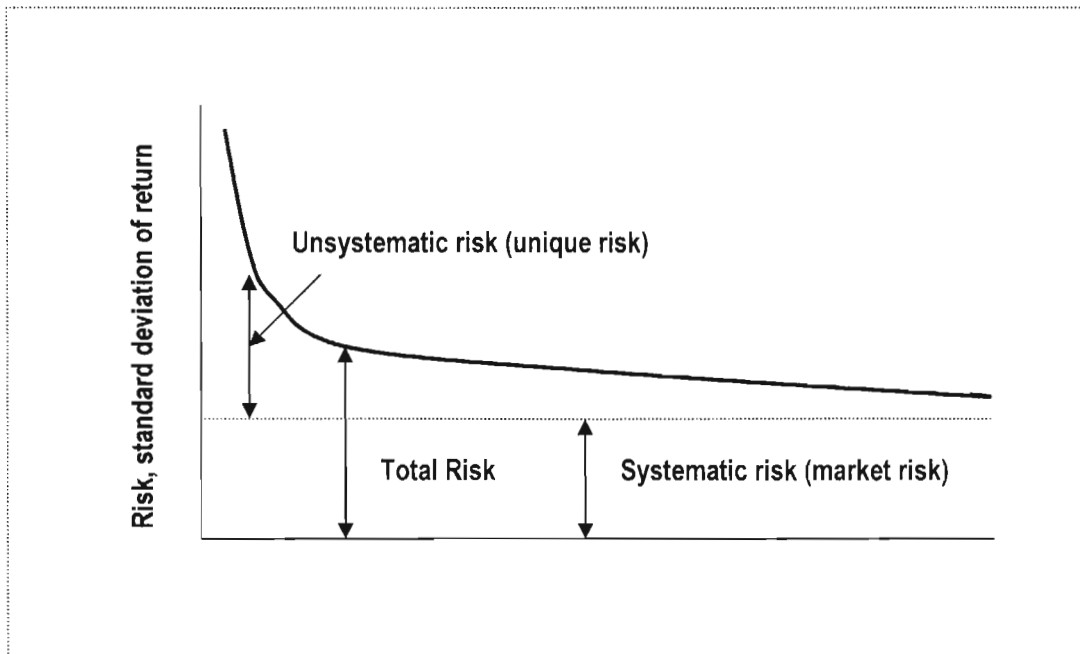
4.3.2 Diversifiable Risk

The portion of a stock's risk that can be eliminated is called diversifiable risk. According to Brigham and Houston (1998:176) the fact that a large part of the risk of any individual stock can be eliminated is vitally important. Diversifiable risk is caused by such random events as lawsuits, strikes, successful and unsuccessful marketing programs, winning or losing major contracts and other events that are unique to a particular company.

According to Brigham et al (2005:146) because these events are random, the effect on a portfolio can be eliminated by diversification – bad events in one firm will be offset by good events in another.

A graphic illustration of the types of risk that has been discussed is presented in Figure 4.1 below.

Figure 4.1 Systematic and unsystematic risk



Source: Arnold (2005:223)

4.4 Measurement of Risk

Although little doubt exist about the need for diversification of investments into an investment portfolio or portfolios it is necessary to discuss the concept of *stand-alone risk*. Brigham et al (2005:129) describes stand-alone risk as the risk an investor would face if the investor held only one particular asset.

- 4.4.1 Stand-Alone Risk

The basic concept of risk as it pertains to investments in essence is the difference that exists between the *expected* rate of return and the *actual* rate of return of an investment. If there were no difference, there would be no risk. This situation unfortunately only exists in relatively low return investments like government bonds and cash deposits. Brigham et al (2005:129) state an

important general investment truth when suggesting that no investment should be undertaken unless the expected rate of return is high enough to compensate the investor for the perceived risk of the investment.

- **4.4.2 Probability Distributions**

According to Brigham et al (2005:130) an event's probability is defined as the chance that the event will occur. If all possible events, or outcomes are listed, and if a probability is assigned to each event, the listing is called a probability distribution. The following is an example of a probability distribution for the rate-of-return for two companies: - Adapted from Brigham et al (2005:131)

Table 4.1 Probability Distribution

Rate of Return on Stocks if this Demand occurs			
Demand for the Company's Products	Probability of this Demand occurring	Company A	Company B
Strong	0.3	100%	20%
Normal	0.4	15	15
Weak	0.3	(70)	10
Total:	1.0		

- **4.4.3 Expected Rate of Return**

Brigham et al (2005:131) gives the following equation to determine the expected rate of return:

$$\begin{aligned} \text{Expected rate of return} &= \hat{r} = P_1r_1 + P_2r_2 + \dots + P_n r_n \\ &= \sum_{i=1}^n P_i r_i \end{aligned}$$

In our example above the expected rate of return for Company A would thus be:

$$\begin{aligned}\hat{r} &= P_1(r_1) + P_2(r_2) + P_3(r_3) \\ &= 0.3(100\%) + 0.4(15\%) + 0.3(-70\%) \\ &= 15\%\end{aligned}$$

Assigning a measure of risk to a particular company the variability (or the *tightness* of the probability distribution) of the possible outcomes need to be taken into account. Brigham et al (2005:133) suggest that the tighter the probability distribution, the more likely it is that the actual outcome will be close to the expected value, and, consequently, the less likely it is that the actual return will end up far below the expected return.

- 4.4.1.3 Measuring Stand-Alone Risk: Standard Deviation

In order to measure the *tightness* of any probability distribution the concept of standard deviation is used. According to Brigham et al (2005:134) the smaller the standard deviation, the tighter the probability distribution will be, and accordingly, the less risky the stock. Calculation of the standard deviation is done as follows:

- i. Calculate the expected rate of return:

$$\text{Expected rate of return} = \hat{r} = \sum_{i=1}^n P_i r_i$$

- ii. Subtract the expected rate of return (\hat{r}) from each possible outcome (r_i) to obtain a set of deviations about the expected rate of return.

$$\text{E.g.: Deviation} = r_i - \hat{r}$$

- iii. Square each deviation, then multiply the result by the probability of occurrence for its related outcome, and then sum these products to obtain the *variance* of the probability distribution.

$$\text{Variance} = \sigma^2 = \sum_{i=1}^n (r_i - \hat{r})^2 P_i$$

- iv. Finally, find the square root of the variance to obtain the standard deviation:

$$\text{Standard Deviation} = \sigma = \sqrt{\sum_{i=1}^n (r_i - \hat{r})^2 P_i}$$

Thus, the standard deviation is essentially a weighted average of the deviations from the expected value, and it provides an idea of how far above or below the expected value the actual value is likely to be. In Table 4.2 the calculation of the standard deviation of Company A as per example is illustrated.

Table 4.2 Standard Deviation for Company A

$r_i - \hat{r}$	$(r_i - \hat{r})^2$	$(r_i - \hat{r})^2 P_i$
100 - 15 = 85	7.225	(7.225)(0.3) = 2.167
15 - 15 = 0	0	(0)(0.40) = 0
-70 - 15 = -85	7.225	(7.225)(0.3) = 2.167
		Variance = $\sigma^2 = 4.335$
		Standard deviation = $\sigma = \sqrt{\sigma^2} = \sqrt{4.335} = 65.84\%$

Source: Brigham et al (2005:134)

The importance of these calculations and the associated assumptions is that the *actual* return will be within ± 1 standard deviation of the *expected* return 68.26% of the time.

Thus for Company A, in our example, the actual return would be in the range of $15 \pm 65.84\%$ or from -50.84 to 80.84% .

Because the distribution is quite large, the assumption can be made that shares of Company A can be considered risky from the perspective of its stand-alone risk or if it is held as the only share in an investment.

4.4.1.4 Using Historical data to measure risk

If sample returns data is available over some past period, Brigham et al (2005:135) suggest that the standard of returns can be estimated by using the following formula:

$$\text{Estimated } \sigma = S = \sqrt{\frac{\sum_{t=1}^n (\bar{r}_t - \bar{r}_{avg})^2}{n-1}}$$

4.4.1.5 Coefficient of Variation

When discrepancies between the standard deviation and expected returns of two investments exist the use of the coefficient of variation (CV) can be used. According to Brigham et al (2005:136) the coefficient of variation is the standard deviation divided by the expected return. The following formula describes the coefficient of variation:

$$\text{Coefficient of variation} = CV = \frac{\sigma}{\hat{r}}$$

Brigham et al (2005:136) states that the coefficient of variation shows the risk per unit of return, and it provides a more meaningful basis for comparison when the expected returns on two alternatives are not the same.

4.5 Management of Risk

Arnold (2005:510) states that running a business naturally entails taking risks – it is what business activity is about. Satisfactory profits rarely emerge from risk-eliminating strategy: some risk is therefore inevitable. This is a very important statement because from a risk management perspective as it pertains to the private investor it becomes therefore vital to choose companies to buy stock in that has a good track record of managing business risk effectively. Thus, the question can be asked: How effective is the management of a firm in selecting the risks to take and the risks to avoid?

Thus, how can the private investor manage his/her investment risk? From the literature studied it is clear that basically three methods exist.

4.5.1 Understanding the businesses that you invest in

This statement holds many valuable truths in that it encompasses the essence of doing business as stated above – taking risks. Understanding the business/organization that one invests in allows the investor to analyze the effectiveness of management dealing with the risks that the organization encounters in the business environment. Arnold (2005:511-514) describes the types of risk that businesses have to deal with:

a) Business risk

Many of the risks of operating in a competitive business environment have to be accepted by management to a greater or lesser extent. Sales may decrease because of a recession or innovative breakthrough by competitors. Cost may rise because of government imposed tariffs. A good example of managing business risk unique to a certain organization is a car production line that may be more expensive if it is to be capable of being used for the assembly of a number of different models. The option to use the facility for more than one type of car reduces the firm's risk by making it less dependent on one model. By understanding the business and the options available to management to manage business risk, the investor can decrease the risk associated with investing in a particular company.

b) Insurable risk

Many risks encountered by business can be transferred, through the payment of a premium to insurance companies. Examples include fires, pollution damage and accidents. Specialized

insurance firms are better able to bear the risk than ordinary commercial firms because these companies have:

- Experience in estimating probabilities of events and therefore are able to 'price' the risk more efficiently.
- Knowledge of methods of reducing risk. The knowledge can be passed on to the commercial firms, which may obtain lower premiums, if the appropriate precautionary measures are taken; and
- The ability to pool risk, or to *diversify* risk. The chance of an accident occurring at one firm is highly uncertain, but the probability of a particular proportion of a portfolio of insurance policies making a claim is fairly predictable.

Because insurance can be an expensive option it is important to understand the impact this management decision can have on the profitability of an organization as well as the risk that might have to be absorbed by the organization.

c) Currency risk

The management of this type of risk is of particular importance to South African firms. It is naturally also important to any firm that trades internationally. Changes in exchange rates can dramatically influence the profitability of firms that has international clients. The successful management of currency risk is vital for the profitability of these firms. Thus, from the perspective of the private investor, it is important to understand the decisions of management regarding managing the company's currency risk. The use of options to safeguard against detrimental currency changes and the cost of these options need to be taken into account by the investor.

d) Interest-rate risk

Interest rates cannot be predicted with any amount of certainty and accuracy. Companies with large amounts of floating-rate debt could be vulnerable if interest rates rise while companies with fixed rate debt could be at a disadvantage during interest rate cuts. Certain management options exist to reduce the risks involved with interest rates. Again, understanding the business and the way management of a firm deals with this type of risk can reduce the risk that an investor takes when investing in a company.

4.5.2 Diversification

According to Winger et al (1993:413) the advice, "Don't put all your eggs in one basket," is particularly applicable in the area of investments. By holding a portfolio, which is simply a group of assets held at the same time, certain risks can be avoided. The aim of the diversification process is to eliminate (or decrease to the largest possible extent) the portion of a stock's risk that can be eliminated – called diversifiable risk.

Lovemore et al (2003:10) describe diversification as the process whereby one can add other, less risky projects to the risky one in order to reduce the overall risk. The application to an investment portfolio is to have a portfolio of different kinds of shares, some less risky than others.

Wärneryd (2001:242) suggest that diversification may be used in several senses: 1) it refers to the proportion of riskless assets compared to risky assets, 2) it may be the spread within an asset category, for example, how many firms are represented in the portfolio of stocks, and 3) the bond/stock ratio.

Swart (1996:167) states that the investor's attitude towards risk plays an important role during investment and consequently during diversification.

Thus the process of spreading of risk over a number of investments with the purpose of lowering the total level of risk – diversification – is investor specific and relates to the investor’s attitude towards risk. There is therefore not a generic application of a diversification model available that will suite all investors. Unquestionably though, an important part of a sound investment program is adequate diversification.

According to Nursaw (1974:44-45) at first flush an equal amount invested in each of the equities available on the chosen stock exchange would achieve complete diversification. But this would ignore the facts that:

- a) One or more groups may be going through a difficult trading experience and the time is not ripe to purchase a share in the particular group.
- b) Some companies may not have a good history of growth – pedestrian in fact – and should not be invested in.
- c) Some companies are in the giant class and others mere pigmies and the investor ought by comparison to invest, say, three times as much in the former as in the latter; and
- d) Some equities, although excellent, appear to be currently over-valued.

4.5.3 Timing the market

According to Kahn et al (1999:11) the recognition of the *moderating effect of time* is an important aspect in the management of investment risk. The risk of investments in shares is typically higher in the short term.. However as the period for which a stock is held increases, the chances of losing money are lowered, and the odds of earning a return close to the long term average increases.

Therefore, both risk and return should be judged over a period of years – not months or days. The two critical variables involved in stock market investing are selection of shares and timing of the actual investment. For long term investors, selection would be the more important criterion, while day traders will be more concerned with the timing of buy and sell orders.

However, no matter what the investment horizon, every investor must choose a satisfactory combination of these two key variables. Khan et al (1999:11) states that insofar as long term investing is concerned, “ any time is appropriate to invest”, regardless of the short term trend of the market. The authors do however state that care should be taken to invest in quality companies with strong long-term prospects.

Kahn et al (1999:12) suggest the popular Dollar Cost Averaging technique to manage the risks associated with timing the market. This strategy involves buying a fixed currency amount of shares at periodic intervals, such as monthly or quarterly, regardless of the current price. In this strategy, whether the price of the share is low or high, the same amount of money is used to purchase the share periodically. Thus, more shares are accumulated at lower prices and less at higher prices.

According to Kahn et al (1999:12-13) this technique works well for investors who are:

- Investing for the long term.
- Investing in a company with long term favourable growth prospects; and
- Are able to invest relatively large amounts of money.

Disadvantages of dollar cost averaging according to Kahn et al are the following:

- During bull markets, when money needs to be invested right away, an investor ends up investing rather slowly.
- Investors can have relatively fewer funds invested in a growth company when it starts its price appreciation, unless one gets

in very early. This point illustrates again the interaction between selection and timing of investments.

- If a wrong selection is made to start with, the original mistake can be compounded; and
- Due to more transactions taking place, more commissions need to be paid.

The application of these risk management methods by the private investor does not hold any guarantees but it is the most sensible way of managing the inherent risk associated with stock market investment.

4.6 Portfolio Theory

The history and eventual birth of Portfolio theory is an interesting one and the importance of Harry Markowitz dates back to an article that was written in 1952. According to Brealey et al (2003:187) Markowitz drew attention to the common practice of portfolio diversification and showed exactly how an investor can reduce the standard deviation of portfolio returns by choosing stocks of which the rates of return do not move exactly together. Markowitz also worked out the basic principles of portfolio construction. The discussion of risk and its inter-relationship with return forms the basis of risk management for assets held in isolation as well as assets held in a portfolio. The question here is in essence – how does the risk of individual asset affect the risk of the portfolio in which these assets are held? According to Brigham et al (2005:139) an asset held as part of a portfolio is less risky than the same asset held in isolation.

4.6.1 Portfolio Returns

Brigham and Houston (1998:169) states that the expected return on a portfolio is simply the weighted average of the expected returns on the individual assets in the portfolio, with the weights being the fraction of the total portfolio invested in each asset.

The following formula describes expected return of a portfolio with n assets held in the portfolio:

$$\begin{aligned}\hat{k}_p &= w_1 \hat{k}_1 + w_2 \hat{k}_2 + \dots + w_n \hat{k}_n \\ &= \sum_{i=1}^n w_i \hat{k}_i\end{aligned}$$

Where:

k is the expected returns for each stock,

w is the weight, measured as the fraction of the portfolio's currency value, invested in the share; the total of the weights must sum to 1.0: and

n is the number of stocks in the portfolio.

If Company A is held in a portfolio with 3 other shares, the expected rate of return for the portfolio can be calculated as illustrated in table 4.3 below:

Table 4.3 Expected rate of return for a Portfolio

	Expected Return, \hat{k}
Company A	15%
Company B	25%
Company C	10%
Company D	8%

If a portfolio of R100 000 is formed and R25 000 is invested in the shares of each company, the expected portfolio return would be:

$$\begin{aligned}\hat{k}_p &= w_1 \hat{k}_1 + w_2 \hat{k}_2 + w_3 \hat{k}_3 + w_4 \hat{k}_4 \\ &= 0.25(15\%) + 0.25(25\%) + 0.25(10\%) + 0.25(8) \\ &= 14.5\%\end{aligned}$$

Adapted from Brigham and Houston (1998:170)

4.6.2 Portfolio Risk

Unlike portfolio returns that are the weighted average of the expected returns on the individual assets in the portfolio, the riskiness of a portfolio is generally not the weighted average of the standard deviations of the individual assets in the portfolio. According to Brealey et al (2003:188) portfolio risk is less than the average of the risks of the separate stocks.

The following example by Brealey et al (189) as in table 4.4 illustrates the point clearly.

Table 4.4 Standard Deviation for a Portfolio

<p>A portfolio consisting of shares in Company A and Company B:</p> <p>Company A –</p> <ul style="list-style-type: none">- Expected return: 10 percent- Standard Deviation (σ): 31.5 percent- Percentage of portfolio (x): 65 percent <p>Company B –</p> <ul style="list-style-type: none">- Expected return: 20 percent- Standard Deviation (σ): 58.5 percent- Percentage of portfolio (x): 35 percent <p>Correlation between returns of Company A and Company B (ρ): 0.2</p> <p>The variance and standard deviation of this portfolio would be:</p> <p>Variance = $x^2_1\sigma^2_1 + x^2_2\sigma^2_2 + 2x_1x_2\rho_{12}\sigma_1\sigma_2$</p> <p style="padding-left: 40px;">= $[(.65)^2 \times (31.5)^2] + [(.35)^2 \times (58.5)^2 + 2(.65 \times .35 \times 0.2 \times 31.5 \times 58.5)$</p> <p style="padding-left: 40px;">= 1006.1</p> <p>Standard deviation = $\sqrt{1006.1}$</p> <p style="padding-left: 40px;">= 31.7 percent</p>
--

Source: Adapted from Brealey et al (2003:188-189)

The question now is – How does diversification reduce risk?

Brealy et al (2003:165-168) provides interesting insights into this question by discussion of prominent companies listed on the New York Stock Exchange and NASDAQ exchanges in the United States of America.

Table 4.5 below gives the standard deviations of the shares of 10 well-known companies for a particular five year period.

Table 4.5 Illustration of Standard Deviation – NYSE and NASDAQ

Stock	Standard Deviation
Amazon.com	110.6
Boeing	30.9
Coca-Cola	31.5
Dell Computer	62.7
Exxon Mobil	17.4
General Electric	26.8
General Motors	33.4
McDonald's	27.4
Pfizer	29.3
Reebok	58.5

Source: Brealy et al (2003:165)

All the mentioned companies are well established organizations. When viewed against the illustration of table 4.4 above, one realises that investment risk can be reduced by owning shares in a portfolio of companies. Of note are the significantly higher standard deviations of technology driven companies. The exception is Pfizer – a pharmaceutical company that also has a high technology driven component. Another exception noted is that high standard deviations are not only seen with technology shares as is illustrated by Reebok, an apparel company.

4.7 Evaluation of Organizations

Arnold quotes Warren Buffet – Arnold (2005:323): “When managers want to get across the facts of the business to you, it can be done within the rules of accounting. Unfortunately when they want to play games, at least in some industries, it can also be done within the rules of accounting. If you can’t recognize the differences, you shouldn’t be in the equity-picking business.”

4.7.1 Financial Statement Analysis

According to Arnold (2005:323) accounts are a valuable source of information, but it has three drawbacks:

- It is based in the past when it is the future which is of interest.
- The fundamental value-creating processes within the firm are not identified and measured in conventional accounts; and
- It is frequently based on guesses, estimates and judgements, and are open to arbitrary method and manipulation.

Libby et al (2004:706) states that analyzing financial data without a basis for comparison is impossible and that financial results cannot be evaluated in isolation. Appropriate comparisons needs to be developed. Walton (2000:152) states that stockbrokers and investment analysts examine financial statements in order to advise on investments in the shares of commercial companies. Users are primarily interested in answering two questions:

- i. How well did the company perform?; and
- ii. How strong is the company financially?

From the perspective of investing in the shares of an organization, the analysis is focused on the prediction of potential future performance. The information about what the company did last year has no value of itself: its only relevance is as to whether it will do better or worse next year, and whether the expected return is adequate for the expected level of risk.

Walton (2000:154) suggests that there are two methods for making financial comparisons:

- a) Time series analysis: Libby et al (2004:706) states that time series analysis is the evaluation and comparison of the information on a single company over time. For example the measurement of changes in sales volume can be an important measure of performance. Walton (2000:154) suggests that at a simple level, time series analysis would compare the figures for one year with those of the preceding year. This would obviously not be of significant statistical value because such a short period may not reveal trends or may have been distorted by individual events. Analysts therefore, and particularly when making predictions, use at least a five year base, and often prefer a ten year base. Walton raises an important issue regarding time series analysis in the impact of inflation on time series analysis. He states that even a 5% inflation rate will lead to a 40% loss of value in the measuring unit over ten years. The impact of inflation on the numbers must therefore be considered in time series analysis.

- b) Cross-sectional analysis/Comparison with similar companies: Libby et al states that by comparing a company with another one in the same line of business, better insight into the performance of the company can be gained. Finding comparable companies can often be difficult. Walton (2000:154) states that potentially this type of comparison may yield insights if the companies have very similar products. Differences between companies will be the result of different management strategies in the face of the same problems. It is important when cross-sectional analysis is done that the interpretation of results should take into account the differences between the companies. The other possibility in cross-sectional analysis is the use of industry averages, available through industry specific trade associations or specialized financial data companies. Again the interpretation of results needs to be done with understanding of the 'average' as this

can be distorted by several factors. For instance if comparison is made with industry average where one major company dominates the industry, the average will be more a reflection of the major company rather than actual industry average.

4.7.2 Ratio and Percentage analysis

Libby et al (2004:707) suggests that to allow for easy comparison of two different amounts, *ratio analysis* or *percentage analysis* can be used. This expresses the proportionate relationship between the different amounts.

- Component percentages are described as a form of percentage analysis, which express each item on a financial statement as a percentage of a single base amount (the ratios denominator). Income statement component percentages are based on *net sales* and for the balance sheet the base amount is total assets. Significant stability in all income statement relationships is an indication of a well-managed company.

Libby et al (2004:705) suggest the following important aspect of analyzing organizations -- The best place to start financial analysis is with a solid understanding of a company's business strategy.

4.7.3 Market Tests

Although many ratios are calculated during the ratio analysis of organizations the *market tests* or *market value ratios* are indications of investor's perception of past performance of the company as well as expectations of the company's future performance. According to Libby et al (2004:719) these ratios or tests relate the current market price per share to the return that accrues to investors. Brigham et al (2005:454) suggests that the market ratios are generally a reflection of all other ratios. If liquidity, assets, debt and profitability are managed well, one can expect that the market ratios will be high and accordingly the stock price.

The following ratios are considered in the market tests:

a) Price/Earnings Ratio

Arnold (2005:324) states that a popular approach to valuing a share is to use the price-to-earnings ratio (PER). The historic PER compares a firm's share price with its latest earnings (profits) per share. Investors estimate a share's value as the amount investors are willing to pay for each unit of earnings. The historic PER is calculated as follows:

$$\text{Historic PER} = \frac{\text{Current Market price of Share}}{\text{Last year's earnings per share}}$$

The essence of price-to-earnings ratio is that for instance if the PER of Company A is 20, this suggests that investors are willing to buy shares of Company A at 20 times last years earnings per share. It also means that investors are prepared to accept a rate of return of 1 on 20 which means a 5% return.

Warneryd (2001:48) describes this ratio as the price of a stock, divided by the earnings per stock. In general *growth stocks* have high price/earnings ratios whereas *value stocks* have low price/earnings ratios. Kahn et al (1999:16) states that it is usually difficult to determine the appropriate price/earnings ratio for a growth company.

Brealey et al (2000:76) adds that a high price/earnings ratio shows that investors think that the firm has good growth opportunities, that its earnings are relatively save and deserve a low capitalization rate, or both. However the price/earnings ratio can also be high because of low earnings and not necessarily because of a high stock price. An important aspect of the denominator of the equation – the earnings per share – deserves more discussion.

According to Brealey et al (2000:77) earnings per share can mean different things to different firms and for some it means more than for others. The earnings that a firm reports are book, or accounting figures, and as such reflects a series of more or less arbitrary choices of accounting methods. A change in depreciation method can have a substantial effect on the earnings per share. Yet the depreciation method will not have any effect on the cash flow of the company since it is a non-cash charge.

Arnold (2005:325) states that if the price/earnings ratio is high investors expect profits to rise and that these companies are expected to show faster growth in earnings in the future.

b) Dividend Yield

Libby et al (2004:719) states that this ratio measures the relationship between the dividends per share paid to stockholders and the current market price of the stock. An important compromise often exists when evaluating dividend yields. It is not uncommon for the dividend yields to be low - even less than 1% - for shares that have high capital growth potential. In contrast, shares with lower growth potential often have higher dividend yields.

This ratio is calculated as follows:

$$\text{Dividend Yield ratio} = \frac{\text{Dividends per Share}}{\text{Market Price per share}}$$

c) Price/Cash Flow ratio

This ratio is often used in some industries where stock price is more closely tied to cash flow rather than net income. This ratio is calculated as follows:

$$\text{Price/Cash flow} = \frac{\text{Price per Share}}{\text{Cash flow per share}}$$

The cash flow per share is calculated as follows:

$$\text{Cash flow per share (CFPS)} = \frac{\text{Net income} + \text{Depreciation} + \text{Amortization}}{\text{Common shares outstanding}}$$

According to Brigham et al (2005:455) many variations of this ratio exist, but the basic notion that ultimately, the value of an organization depends on free cash flows and unless the intention of these ratios are to forecast free cash flows in the future these forecasts can be misleading.

d) Market/Book Value

Brigham et al (2005:455) suggests that this ratio gives an indication of how investors regard a company. Companies with relatively high rates of return on equity generally sell at higher multiples of book value than those with low returns.

The Book Value per share is calculated as follows:

$$\text{Book Value per share} = \frac{\text{Common Equity}}{\text{Shares outstanding}}$$

The Market/Book value is then calculated as follows:

$$\text{Market/Book ratio} = \frac{\text{Market Price per share}}{\text{Book value per share}}$$

This ratio is further discussed by Brigham et al (2005:455) and state that typically this ratio is more than 1, which means that investors are willing to pay more for stocks than the company's accounting book value.

The book value really gives a record of past performance of the company where as the market price is forward looking, reflecting investors' expectations of future cash flows.

4.8 Corporate Valuation

The size, timing, and risk of its expected future free cash flows determine the value of a firm – Brigham et al (2005:508).

Brigham et al (2005:507) quotes Warren Buffet, CEO of Berkshire Hathaway by stating that Berkshire Hathaway seek to own businesses that consistently earn above average returns on capital. When evaluating a potential acquisition, Buffet says:” He compares its purchase price with its *intrinsic value* which he defines as *the discounted value of the cash that can be taken out of a business during its remaining life.*” This is therefore based on the principles of value based management.

The Corporate Valuation Model

This model suggests the present value of expected future free cash flows, discounted at the weighted average cost of capital.

Brigham at al (2005:509) states that two types of corporate assets exist: Operating assets and non-operating assets.

- ✓ Operating assets take two forms: *assets in place* (tangible assets such as land, buildings, inventory etc as well as intangible assets such as patents, reputation and general know how) and *growth options* (opportunities to expand that arise from the firm” current operating knowledge, experience, and other resources). Operating assets provide an expected stream of cash flows.
- ✓ Non operating assets also come in two forms: *Marketable securities* and *investments in other companies*.

It is important to note that for most companies operating assets are more important than non-operating assets. Companies can influence the values of their operating assets while influence over the non-operating assets is limited.

4.8.1 Estimating the Value of Operations⁵

Actual financial statements as well as projections are used to create a set of financial statements for the organization for the following ± 5 years. Income statements and balance sheets are required for the estimation of the value of operations.

The free cash flow for a firm is the cash from operations that is actually available for distribution to investors, including stockholders, bondholders, and preferred stockholders. The value of operations is the present value of the free cash flows the firm is expected to generate in the future. Thus the value of a firm can be calculated as the present value of its expected future free cash flows from operations, discounted at its weighted average cost of capital plus the value of its non-operating assets.

The following equation states the value of operations in a mathematical formula according to Brigham et al (2005:510):

Value of operations = PV of expected future free cash flow

$$\begin{aligned} &= \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \dots + \frac{WCF_\infty}{(1+WACC)^\infty} \\ &= \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t} \end{aligned}$$

A similar approach is followed to the non-constant dividend growth model

To find the value of operations as a going concern.

- i. Assume that the firm will experience non-constant growth for N years, after which it will grow at some constant rate.

⁵ Adapted from Brigham et al (2005:509-513)

- ii. Calculate the expected free cash flow for each of the N non-constant growth years.
- iii. Recognize that after year N growth will be constant, so one can use the constant growth formula to find the firm's value at year N . This is the sum of the PV 's for year $N + 1$ and all the subsequent years, discounted back at the weighted average cost of capital (WACC) to year N .
- iv. Find the PV of the free cash flows for each of the N non-constant growth years. Also, find the PV of the firm's value at year N .
- v. Now sum all the PV 's, those of the annual free cash flows during the non-constant period plus the PV of the year N value, to find the firm's value of operations.

Calculations of the free cash flows needed for the calculations above are done as follows:

- i. Calculate the *Required Net Operating Working Capital (RNOWC)*–

$$\text{RNOWC} = (\text{Cash} + \text{Accounts Receivable} + \text{Inventories})$$

$$\text{minus } (\text{Accounts Payable} + \text{Accruals}).$$
- ii. Calculate/Estimate the *Required net Plant and Equipment*.
- iii. Sum the totals of i. and ii. above to get the *Required Total net Operating Capital* or simply called *Operating Capital*.
- iv. By using the projection for the following years the difference or change in total net operating capital is calculated between following years to get the *Required net New investment in Operating capital*
Thus: Required Total net Operating Capital of (year $X + 1$) minus Required Total net Operating Capital of (year X).

- v. Calculate Net Operating Profit after Taxes (NOPAT) from the Income statement and income statement projections where $NOPAT = EBIT (1 - T)$.
- vi. Subtract the required net new investment in operating capital (see iv. above) from NOPAT to get the Free Cash Flow (FCF) for that period.

A variation of the constant growth dividend model can be used to find the value of operations at the time that free cash flows stabilize and begin to grow at a constant rate. This is the value of all FCF 's beyond time N , discounted back to time N . The equation looks as follows:

$$\begin{aligned}
 V_{op(at\ time\ N)} &= \sum_{t=N+1}^{\infty} \frac{FCF_t}{(1+WACC)^{t-N}} \\
 &= \frac{FCF_N(1+g)}{WACC-g} = \frac{FCF_{N+1}}{WACC-g}
 \end{aligned}$$

Calculation of this value gives a figure that is called the company's *Terminal* or *Horizon* value that is in essence the value of the operations at the end of the supernormal growth period or the start of the constant growth period.

The FCF 's for the period of non-constant growth can now be placed on a time line and discounted at the WACC back to the present time. Also, the value of $V_{op(at\ time\ N)}$ plus the FCF at time N (the start of constant growth) must be discounted at WACC to the present time to find the PV of the operations at time N . All PV's are then added to find the value of operations of the non-constant growth company.

According to Gabehart et al (2002:44-45) there is no single best approach to value an organization. The purpose of valuation is to help determine the relevant standard of value and the relevant premise of value, which in turn helps determine the most relevant and important valuation approach and techniques:

4.8.2 Estimating the Price per Share

According to Brigham et al (2005:514) the total value of any company is the value of its operations plus the value of its non-operating assets. Unlike operating assets, one does not have to calculate a present value for marketable securities because these short-term financial assets are reported on the balance sheet at, or near market value. The sum of these values (PV of operations plus value of non-operating assets) is the total value of the company.

To determine the value of the common equity of the company, the sum of notes payable and long term debt needs to be subtracted. The reason for this subtraction is because creditors have priority claim on the assets and income of the company before common shareholders. If any preferred stock is outstanding, preferred stock holders also rank above the common shareholders. The value of preferred stock needs therefore to be subtracted as well.

Using the illustration on this page (Figure 4.6), it is clear that the portion available for common shareholders is the Book Value of Equity + Market Value Added. The *book value of equity* is the actual investment that stockholders have made in the company, while the Market Value Added (MVA) represents the additional market value added by management.

An important aspect of the valuation of organizations and the valuation of common stock as previously described (the dividend growth model) is that both these methods should reveal similar results for the eventual calculated value of an organization's shares.

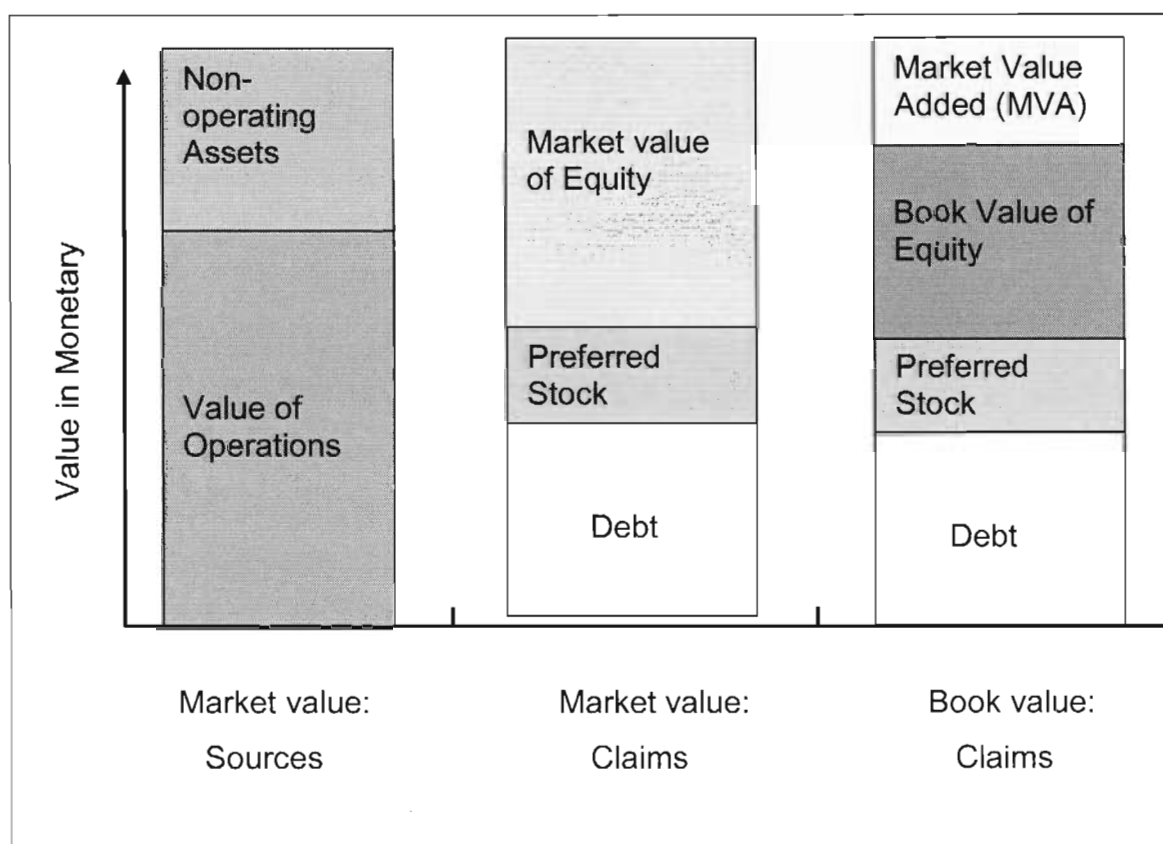
The question thus arises as to which model to use when. According to Brigham et al (2005:516) the basic premise is that the dividend growth model would probably evaluate a mature firm with a steady expected dividend growth rate more efficiently. Both models would likely evaluate high growth firms equally efficiently because estimation of future dividends would depend on the forecast of future financial returns. The use of the corporate valuation model really stands out as the preferred method of evaluation in situations where a company

does not pay dividends, new firms planning to go public or when a firm plans to sell one of its divisions. These situations require from the analyst to estimate future financial statements and thus will require the use of the corporate valuation method.

The use of the corporate valuation model by management to increase the company's value is called *value-based management*.

Fig. 4.6 illustrates the breakdown of the value of organizations:

Fig. 4.2 The Value of Organizations



Source: Brigham et al (2005:514)

4.9 Value based management

Here the notion that increasing sales of profitable divisions to increase value of firms are placed under the spotlight. Understanding the concepts underpinning

value based management gives the analysis of organization from an investor perspective new dimension.

According to Brigham et al (2005:517) the wealth of a firm can be expressed in terms of the following four fundamental wealth drivers:

- a) Growth in sales.
- b) Operating profitability = NOPAT/Sales.
- c) Capital requirements = Operating capital/Sales; and
- d) Weighted Average Cost of Capital

Discussing these drivers further Brigham et al (2005:518-521) elaborates on the ways these drivers affects organizational value.

- **Growth in sales (g):** Generally growth in sales will add value provided the company is profitable enough. The effect of sales growth can however be negative if growth requires large amounts of capital at a high cost of capital.
- **Operating profitability (OP):** A constant effect - the higher the better. This measures the after-tax profit per dollar of sales.
- **Capital requirements (CR):** This measures how much operating capital is needed to generate a dollar of sales. A low CR means that the company can generate new sales using relative small amounts of new capital. Thus also a constant effect – the lower the better.
- **WACC:** Again a constant effect – the lower the WACC of a firm, the higher the value of the firm will be.

Another important metric used in the corporation valuation model is the *Expected return on Invested capital* (EROIC). This is defined as the expected NOPAT (NOPAT (year x)) for the coming year divided by the amount of operating capital (Capital (year x-1)) at the beginning of the year (end of the previous year). Thus it represents the expected return on the capital that has already been invested.

The following equation (adapted from Brigham et al) is used:

$$\text{EROIC (year } x-1) = \frac{\text{NOPAT (year } x)}{\text{Capital (year } x-1)}$$

Rewriting the equation for the value of operations of a constant growth firm in terms of the value drivers gives the following important equation:

$$V_{op(at \ time \ N)} = Capital_N + \left[\frac{Sales_N(1+g)}{WACC-g} \right] \left[OP - WACC \left(\frac{CR}{1+g} \right) \right]$$

This equation shows that the value of operations can be divided into two components: (1) the dollars of *operating capital* that investors have provided and (2) the *additional value* that management has added or destroyed, which is the market value added (MVA).

The first bracket of the above mentioned equation shows the present value of growing sales, discounted at the WACC. According to Lambrechts et al (1986:306) the use of WACC appreciates the fact that organizations use a variety of financing forms and that a different cost is linked to each. Lambrechts et al (1986:306-307) describes three difficulties with the use of WACC in practice that one needs to be aware of:

- 1) For what term must calculations be done? It is generally accepted that a long term is required and that yearly recalculation is required.
- 2) For future projects where future cost is the issue, it is often difficult to predict the cost of capital into the future; and
- 3) It must be kept in mind that the cost of capital for an organization is often a combination of financing sources. Changes in the structure of these sources result in changes in the cost of capital.

To account for the costs and capital requirements the aspects in the second bracket is used. Thus, holding g constant, MVA will improve if operating

profitability (OP) increases, capital requirements (CR) decrease or WACC decreases.

An important alternate method of writing this equation in terms of *expected return on invested capital* (EROIC) is as follows:

$$V_{op(at\ time\ N)} = Capital_N + \frac{Capital_N(EROIC - WACC)}{WACC - g}$$

The second part of this equation is the MVA and that value depends on the spread between the expected return on invested capital, EROIC, and WACC. Simply put, if EROIC is greater than WACC, then the return on capital is greater than the return investors expect and the assumption can be made that management is adding value. The importance of this is also that if EROIC is less than WACC, management is actually destroying value and the faster the growth rate is, the lower the firm's value becomes. It must also be noted that the equations only applies to relatively stable firms that have relatively constant growth rates although the principles applicable to these equations can be applied to all firms.

The application of the principles underlying these equations as well as the application of the equations (in stable organizations) by management of companies will allow management to make better operational decisions. Understanding the influence of capital requirements and the cost of this capital requirements as well the interaction with the other value drivers (growth and profitability) on the value being added (or eroded) by the company is the essence of value-based management.

Brigham et al (2005:524) states that value-based management explicitly includes the effects of all the value drivers because it uses the corporate valuation model, and these drivers are all embodied in the model.

Why are these financial management concepts important for the private investor?

- It is important for the investor to understand the business by gaining broader insight into the decision-making processes of management.
- If the investor feels that management is successfully employing the concepts that have been discussed, the investor can add this into the equation as a qualitative measure to assist decision making regarding share investment choices.

4.10 Profitability

The question can be asked: How profitable is a firm?

According to Hawawini et al (2002:25) information provided in a firm's balance sheet and income statement can be combined to evaluate its financial performance, in particular the *profitability of its equity capital* and the *profitability of its invested capital*.

4.10.1 Profitability of equity capital

How profitable is a firm to its owners? Since the earnings after tax represents the shareholders' claim on the firm's profit, the return on investment is equal to earnings after tax divided by the equity capital. This is called Return on Equity (ROE).

$$\text{ROE} = \frac{\text{Net Income}^6}{\text{Shareholders' Equity}^7}$$

⁶ Net Income = Earnings after Tax

⁷ Shareholders' equity = Common stock + Preferred stock + Retained earnings

How are shares affected by Return on Equity?

According to Kahn et al (1999:6) the return obtained on the *book value* of a company's shares is called the *Return on Equity* (ROE). It is a measure of the return that a company's management is able to earn on the money entrusted to it by its shareholders.

Libby et al (2004:705) describes the DuPont model to illustrate ROE:

$$\frac{\text{Net Income}}{\text{Average Stockholders' Equity}} = \frac{\text{Net Income}}{\text{Net Sales}} \times \frac{\text{Net Sales}}{\text{Average Total Assets}} \times \frac{\text{Average Total Assets}}{\text{Average Stockholders' Equity}}$$

Or stated differently:

$$\text{ROE} = \text{Net Profit Margin} \times \text{Asset Turnover} \times \text{Financial Leverage}$$

According to Libby et al (2004:705), this model suggests that one needs to understand a number of business strategies as these strategies affect the profitability of the business.

In simple terms, according to Kahn et al (1999:6), ROE measures the return generated for each invested unit of currency. For example, a 12% ROE means that for every 100 rand invested in the company, the return was R12. ROE is also a measure of how fast a company can grow without having to seek additional sources of capital. A high ROE causes the net worth of a business to expand rapidly. In general, a ROE less than 10% is considered unsatisfactory. For small, growing companies, the ROE can be as high as 40% to 50% for a few high growth years.

4.10.1.1 The relation of ROE to a share's price performance

When a company earns a profit, most of it goes into its retained earnings. These ploughed-back profits increase the book value which, being related to the

share price causes the share price to be raised and rewards shareholders. Usually, a company's share price is higher than its book value. The book value is the amount that would be generated if all the company's tangible assets were liquidated. The ROE's of organizations in general has increased over the last few decades and this rise is attributed, according to Kahn et al (1999:7) to the heavy use of technology for reducing costs, profit margin improvement, and increased productivity. These thoughts compliments the concepts of value drivers discussed earlier during value based management.

Hagstrom (1997: 58) also stated that according to Warren Buffett there are only five ways for companies to increase return on equity:

1. Increase asset turnover (ratio between sales and assets).
2. Widen operating margins.
3. Pay lower taxes.
4. Increase leverage; and
5. Use cheaper leverage.

4.10.2 Profitability of invested capital

According to Hawawini (2002:25) to measure the after-tax profitability of a company's invested capital, one must use the after-tax profits generated by that investment. This is the *after-tax operating profit* that is equal to EBIT (1-Tax rate). The tax rate is applied before interest expenses are deducted from earnings because one wants to measure the profitability of the firms' total capital that is provided by both shareholders and debtors. Dividing the after-tax profit by the amount of capital that was used to generate that profit gives a measure of the firm's *return on invested capital* (ROIC).

$$\text{Return on Invested Capital (ROIC)} = \frac{\text{After-tax Operating profit}}{\text{Invested capital}}$$

This last equation is important in the calculation of the economic value added (EVA) of the firm.

$$\text{EVA} = \text{After-tax profits} - (\text{Capital employed} \times \text{WACC})$$

Restating the equation using ROIC one gets:

$$\text{EVA} = (\text{ROIC} - \text{WACC}) \times \text{Invested capital}$$

According to Hawawini (2002:31) this alternative way of expressing EVA says that EVA will be positive if the firm's return on invested capital is higher than the cost of capital, measured by the firm's WACC.

According to Brigham et al (2005:508) a key aspect of value based management is making sure that managers focus on the goal of stockholder wealth maximization.

4.11 Screening and Selection of Shares

The stock market has always been a dynamic environment and shares in the technology driven sectors are characterized by even higher volatility than other investment vehicles. According to Kahn et al (1999:250) stock markets have become even more challenging in recent years due to:

- Massive corporate structural changes forced by an increasingly competitive environment (global and domestic); and
- Availability of instant information to investors.

The basic objective for achieving long term success in the stock market is to buy shares of a company in which financial success is expected. According to Kahn et al (1999:251) revenues and profit margins that are currently increasing at a healthy pace or expected to do so in the near future characterize such a company. Typically, a winner will have some positive fundamentals such as

new products (or services), is riding a recently established trend, has an improved business outlook for its industry, or has new management.

4.11.1 Investment Strategies

The process of screening and evaluation of shares are directly dependent on the investment strategy that the investor is following. According to Kahn et al (252 and 266) four basic investment strategies exist.

- Growth.
- Momentum.
- Value; and
- Combination (based on criteria picked from the other approaches).

These strategies are affected by the investors' individual approach to investment as well as risk tolerance levels. According to Kahn et al (1999:266) the screening indicators differ as to the application of these indicators to the different investment strategies.

4.11.2 Investment Indicators for the different Investment Strategies

Growth Strategy

Objective: According to Kahn et al (1999:266 – 267) the objective of this search is to pick companies with superior growth prospects. In general, the following requirements are desired for selecting winning growth stocks:

- Strong earnings growth and momentum.
- Insider buying with no insider selling.
- Strongly performing industry group.
- Small capitalization company; and
- Low level of institutional ownership (ownership by large pension funds, insurance companies, etc.)

The following are the most commonly used screening criteria used by growth investors:

- Earnings growth rate (the higher, the better).
- Earnings that are rising (higher than a specified rate).
- Upward change in earnings estimates by analysts (the higher the upward revision, the better).
- Positive annual earnings history for the prior five years.
- Absolute P/E (should be in line with its industry/group range).
- Relative P/E ⁸ (preferred below 50% - must not be near the high end of its range).
- Insider buying (the greater, the better).
- Stock price range (between \$5 and \$75).
- Market capitalization (preference for small caps); and
- Bullish technical situation: Preferably above 200-day moving average line. Not more than 5% to 10% below its 200-day moving average line.

Kahn et al (1999:268) also suggest that by adding indicator weighting (each indicator is assigned a different weight) the search for a particular goal can be achieved. For example an investor that wants to favour projected earnings can apply a higher weight to this indicator compared the other indicators thereby giving this indicator a higher influence on the overall decision regarding the share.

Momentum Strategy

Objective: Kahn et al (1999:268) states that the objectives of this strategy are to pick companies with good price and earnings momentum. The overriding criterion is momentum and not indicators like high P/E ratios and other fundamental yardsticks.

⁸ Relative PE: This is a measure of a stock's current P/E ratio compared to its historical P/E ratio – Kahn et al (1999:65)

Indicators commonly used by momentum investors:

- Price momentum (RS rank)⁹
- Earnings momentum (EPS rank).¹⁰
- Industry group momentum (group rank); and
- Accumulation/distribution.¹¹

Value Strategy

Objective: According to Kahn et al (1999:269) the objective of a search for undervalued growth companies is to pick stocks that:

- Are trading below their true value.
- Have had high historical growth; and
- Have good projected growth.

Indicators commonly used by value investors:

- Lowest P/E ratio.
- Very low price-to-book ratio (stock price currently trading below book value).
- Yield above an absolute value or high compared to its historical yield.
- Minimum 10-year growth rate (the higher, the better).
- Low price compared to its long-term price trend (the lower, the better).
- High long-term price trend (the higher, the better).
- High projected EPS growth rate for the next five years (the higher, the better); and
- Projected earnings comparable to the historical growth rate.

⁹ RS Rank: Relative Strength rank is a technical indicator that measures a stock's price performance relative to all other stocks – Kahn et al (1999:144)

¹⁰ EPS Rank: A yardstick for comparing a company's profit growth with all other companies in the stock market. It Measures a company's earnings growth and the stability of that growth over the past five years with emphasis being placed on the last two quarters – Kahn et al (1999:118)

¹¹ Accumulation/Distribution: Accumulation indicates professional buying by institutions or that buyers outnumber sellers. Distribution indicates the opposite. – Kahn et al (1999:149)

Combination Strategy

Aspects of the strategies that are based on criteria picked from the other approaches are used during the combination investment strategy.

It goes without saying that the ability to identify superior stocks / other investments will lead to above-average returns on portfolios. According to Kahn et al (1999:271) these superior portfolios consist of unique stocks, which have distinct characteristics pertaining to earnings growth rate, historical earnings, P/E ratios, and other indicators. When the selection criteria used by professional and successful investors are compiled, a vast array of indicators gets listed. The combination of indicators used by each investor is somewhat distinctive.

4.11.3 Investment Criteria

According to Kahn et al (1999:272-273) stock market professionals commonly use the following screening/selection criteria.

Table 4.6 Screening/Selection Criteria used by Stock Market Professionals

No	Indicators
1.	<ul style="list-style-type: none">✓ Earnings outperforming the S&P 500 by 10%✓ Volatility within 20% of the S&P 500✓ Relative strength greater than 80 – Kahn et al (1999:144); and✓ EPS greater than 80
2.	<ul style="list-style-type: none">✓ P/E ratio less than the five-year earnings growth rate✓ P/E ratio below the latest ROE✓ Five straight years of profitability✓ Price greater than \$5 but less than \$25; and✓ Price at least 20% below the stock's 52-week high.
3.	<ul style="list-style-type: none">✓ Price above \$5.

- ✓ Market capitalization greater than \$150 million..
 - ✓ Three years annual earnings growth exceeding 12%.
 - ✓ Three years revenue growth over 8%.
 - ✓ ROE greater than 11%; and
 - ✓ Long-term debt to capitalization ratio less than 55%.
- 4.
- ✓ Market cap between \$100 million and \$15 million.
 - ✓ Profits growing at least 15% per year; and
 - ✓ P/E ratio less than the growth rate.
- 5.
- ✓ Growth rate (sales and earnings) at least 20%.
 - ✓ Growth rate at least twice that of the S&P 500.
 - ✓ High ROE (three to ten times the money market rates).
 - ✓ Low debt (below industry average).
 - ✓ Good cash flow; and
 - ✓ Price momentum especially in the past few quarters (high RS).
- 6.
- ✓ Revenues growing at least 30% a year.
 - ✓ Earnings growth keeping up with sales (greater than 30%).
 - ✓ P/E ratio no more than half the growth rate.
 - ✓ Earnings acceleration.
 - ✓ High sales-to-price ratio; and
 - ✓ RS 75 or higher (preferably 90 – 95).
- 7.
- ✓ Earnings growth at least 30%; and
 - ✓ P/E ratio (based on current years' estimated earnings) less than the growth rate.
- 8.
- ✓ Earnings growth greater than 25%.
 - ✓ Earnings growing at a faster rate than the P/E ratio.
 - ✓ Sales growth greater than 25%.
 - ✓ Historical growth greater than 10%.
 - ✓ Low debt.

- ✓ High ROE (16% or higher).
- ✓ Management ownership over 20%; and
- ✓ Institutional ownership.

9.

- ✓ Accelerating quarterly revenue growth.
- ✓ Earnings estimates being raised; and
- ✓ Earnings growth rate (for the next year) to be greater than the P/E ratio.

10.

- ✓ Sales \$200 million or less.
- ✓ Daily trading dollar value: \$3 million or less (ideally between \$50 000 and \$ 3 million).
- ✓ Price between \$5 and \$ 20.
- ✓ Net profit margin 10% or more.
- ✓ RS 90 or higher.
- ✓ Earnings and sales growth 25% or greater.
- ✓ Insider holdings at least 25%; and
- ✓ Cash flow from operations: a positive number.

11.

- ✓ EPS rank 90 or higher; and
- ✓ RS rank less than 20.

12.

- ✓ Sales growth greater than 15%.
- ✓ Pretax margin greater than 15%.
- ✓ ROE greater than 15%; and
- ✓ R&D expenditure greater than 7% of sales.

Additional factors that are listed as being important:

- ✓ Sustainable growth.
- ✓ Growth from existing operations – not any acquisitions.
- ✓ Among top two companies in niche market.
- ✓ High industry ranking (in top three).
- ✓ Barriers preventing new competition.
- ✓ Superior product line – no dependence on a single product.

- ✓ Strong upcoming product cycle.
- ✓ Excellent management team; and
- ✓ Conservative accounting, with a minimum of deferred expenses.

As can be seen the criteria are based on NYSE / NASDAQ exchanges but the principles have been applied to other stock markets. From this list it is clear that investors use a wide range of selection criteria as well as the preferred values for the different criteria. Preferred values for the different criteria are listed by Kahn et al (1999: 277)

4.11.4 Preferred values for investment criteria

Table 4.8 is an illustration of the preferred values of the different investment criteria. As can be seen the criteria are based on NYSE / NASDAQ exchanges but the principles can be applied to other stock markets. From this list it is clear that investors use a wide range of selection criteria as well as the preferred values for the different criteria.

It can be argued that using a diverse range of investment criteria will enhance the prospects of finding those shares that will have superior performance. Using all the criteria listed will however be cumbersome and unduly time consuming. Changes in the values of the investment criteria will be associated with a change in the price of the share to a larger or lesser extent. The assumption is that certain investment criteria (as well as changes in the values of these criteria) are more closely related to a change in share price. By using only those criteria that are most associated with a change in the price of a particular share, the process of choosing shares for investment can be simplified. This might also improve the performance of the investment portfolio based on these criteria. This study attempts to find those investment criteria that are most associated with a change in the share prices of companies in the technology driven sectors of the South African economy.

Table 4.7 Preferred Values – Investment Criteria

NO.	INDICATOR	PREFERRED VALUE
1	Projected long-term earnings growth rate	>20%
2	Annual and quarterly earnings increase	>25%
3	Revision in earnings estimates (one-month change)	Positive
4	P/E ratio	< growth rate
5	Relative P/E ratio (ignore for young companies)	70% for established companies
6	P/E-to-projected growth (PEG ratio)	<0.75: not more than 1.0
7	Insider buying	At least one buyer
8	Number of analysts following company	Four or more
9	Stock price	Between \$5 and \$75
10	Market capitalization	Small cap
11	Institutional ownership	>20% and <50%
12	EPS rank	>80%
13	RS rank	>80%
14	200-day moving average	Within +/- 10% of stock price – trend up
15	Accumulation/Distribution	-----
16	Return on Equity (ROE)	15% (minimum);prefer >20%
17	Debt/equity ratio	Below industry average
18	Cash flow growth rate (historical)	> earnings growth rate
19	Profitability	3+ years

CHAPTER 5

TECHNOLOGY DRIVEN ORGANIZATIONS

Chapter 5 is devoted to a literature study of the technology driven sectors. International sectors as well as the South African technology sectors are analyzed and the essence of this chapter is to understand the sector better as well as to understand the dynamics that influence the performance of shares in this sector.

5.1 Competition

McLeod (2002) suggested that South Africa's competitive IT services sector is set to consolidate dramatically, with mergers and acquisitions becoming the order of the day. That's the view of industry executives, who say intense competition, which has cut margins razor-thin, is not sustainable. McLeod quotes Deputy CEO Benjamin Mophatlane of Business Connexion stating that "There are just too many players in this space". This coupled with convergence between IT and telecommunications will drive the consolidation. Mophatlane's colleague, BCX outsourcing group executive Mike Sewell, adds: "The market is extremely competitive."

The article by McLeod continues to quote John Miller, CEO of GijimaAST, who states that consolidation is inevitable. "It's overtraded. There are lots of smaller companies bidding for business at prices at which they cannot [afford to] deliver. They are muddying the water."

"There are too many companies chasing too few contracts", he says. As a result, it's a buyers' market. These buyers - themselves under pressure to become more efficient in a low-inflation environment - are exerting enormous pressure on the IT suppliers of organizations to cut costs. In the past, services

companies such as GijimaAST and BCX enjoyed annual escalations in the value of annuity contracts. Now, these companies are often expected to cut costs every year instead.

The phenomenon is a global one, but Miller feels it's more acute in SA than it is, for example, in the UK. These statements suggest that the business environment that companies in the technological sectors operate in is highly competitive and thus very volatile. Basic assumptions of earnings projections into the future that are often the norm when evaluating companies in other sectors seems to have limited application when evaluating technology shares. Extrapolations of data and projections into the future need to be made with added caution and the time frame looking forward will likely have to be short as the volatility makes projections less accurate.

5.2 Social Responsibility

According to Jose et al (2003: 63) companies in the technology sectors also need to change current practices on valuating the company's social performance. Companies usually talk about social responsibility and measure it in terms of investments or donations and so on, but not in terms of the impacts in the larger context. Jose et al (2003:63) states that a report by PriceWaterhouseCoopers points out the currently measured value is limited basically to looking at financial assets and investors and probably at customers. Competing on price and corporate citizenship is what is going to be advantageous in the long term. These statements suggest that corporate responsibility by technology companies needs to become a higher priority in the future. There seems to be little doubt that, in general, shareholders value positive investments by companies insofar as the social commitment of these organizations is concerned. The assumption from this is that those organisations that realise that commitment to social responsibilities can add shareholder value and this aspect of corporate governance can be utilised in the decision making process when evaluating the shares of companies in the

technology sector. Although this aspect of corporate valuating seems to be more of a *qualitative* nature and the exact impact it will have on corporate valuation and eventual share price is difficult to determine. The general conclusion is that socially responsible organisations are valued higher by shareholders compared to those companies that turn a blind eye towards this.

5.3 Technological Innovation

Hobijn et al (2001:1203) argues that a major technological innovation causes the stock market to be temporarily undervalued until the claims to future dividends enter the stock market via initial public offerings (IPO's). In other words, that aggregate capitalization fell below the present value of dividends because a chunk of the dividend yielding capital stock was temporarily missing from the stock market. Capital is likely to "disappear" during epochs of major technological change – especially at the beginning of such epochs, because this is when new capital forms in small, private companies. Only when a private company promises to be successful, an initial public offering is possible and only then does its capital stock becomes part of stock market capitalization. Hobijn et al (2001:1203) believes that this statement explains why the American stock market (NYSE) declined so much in the 1970's and remained low until the early 1980's. The authors argue that it was because information technology arrived on the scene and the stock market incumbents of the day were not ready to implement it. Instead, new firms would bring in the new technology after the mid 1980's. Investors foresaw this in the early 1970's and the stock market fell right away.

5.4 Growth through acquisitions – A South African perspective

One gets the impression, reading through articles in the popular press, that revenue growth is often achieved through the acquisitions of smaller firms operating in international markets. Examples of this are numerous and none is

more telling than the acquisitions made by Datatec. In the case of Datatec, acquisitions in the United Kingdom and USA has positively impacted shareholder value according to Enslin (2003:4). Comparing this international exposure of Datatec to that of Bytes Technology who has holdings in the United Kingdom, one realizes that globalization (or the diversification of projects into international markets) alone does not necessarily guarantee additional shareholder value according to Masango (2005:3).

It is my opinion that the international operations need to be evaluated from a value creation perspective on an individual basis company by company. Assuming that international exposure through acquisitions and mergers will automatically unlock value, it could potentially lead to poor buying and selling decisions. Datacentrix, an ITC company that focuses operations in Africa – mainly Southern Africa, have not really performed particularly well. The volatility in performance is illustrated by Datacentrix's relatively good financial results published at the end of their financial year in February 2004 as discussed by Marais (2005:19). This was followed less than six months later with a set of poor interim results as discussed by Mochinko (2005:3). This is an illustration of the importance to evaluate projects of ITC companies as to the longevity and sustainability of the projects in creation of shareholder value. Projections of recent results into the future can be greatly misleading as illustrated by the Datacentrix example. Diversification alone does not seem to be the answer either. The relative success, according to Anon (2005:22), of Altron seems to lie in the diversification of products that is offered (cellular products, vehicle tracking and smart cards) as well as international exposure (Africa, United Kingdom and United States of America). The combination seems to add benefit.

5.5 An International view

A more international view of technological driven companies, specifically in the European Union is discussed by Barry et al (2004:919-920). The authors state that the following four interacting long-term processes will determine the location of the IT sector within the EU.

5.5.1 Technological change and its impact on industrial organisation.

The industry was highly vertically integrated during the mainframe phase, under IBM dominance, with the vast bulk of components produced in-house and in the US. Fragmentation began with the emergence of the integrated circuit which opened up the market for much lower-cost minicomputers and allowed a number of new firms to capture market share. Technological leadership in the industry shifted upstream to components producers such as Microsoft and Intel. These developments, as we will see, had important implications for the global geography of the sector.

5.5.2 The process of globalisation.

In essence this means the decreased importance of distance. This needs however to be viewed, not as an absolute determinant because distance remains of importance in some segments and could possibly even increase in importance in the future, given the taste for customised personal computers for example. The importance of this statement from a South African perspective is that globalization will likely exclude South African firms from significantly impacting on the assembly of IT components and other hardware unless the skills can be acquired to compete on the global stage. Delivery of services in the sector and distribution of assembled products still allows for business opportunities.

5.5.3 Policy-driven and endogenous changes in the characteristics of national economies.

From a South African perspective this view suggests that economic policies could potentially influence the advancement of the sector – and thus companies competing in the sector – as South African firms try to impact on the potential available on the African continent.

5.5.4 The current eastwards enlargement of the European Union.

The distinction between hardware and software is clearly important. Even within hardware, however, it is necessary to distinguish between computer assembly operations and the production of components such as semiconductors. Within software also it is necessary to distinguish between mass market packaged software on the one hand and custom and niche software and software services on the other. R&D in both hardware and software, furthermore, must be treated separately from production. The above statements by the authors have applications for South African IT companies. IT companies need to determine, not only whether to enter the African market but also where the synergies lie between the company's strengths and opportunities available in Africa. For instance the production of electronic components such as microchips is more highly skilled than computer assembly, and represents a growing share of activity in most EU locations, but the key issue seems to be the availability of the required skills.

5.6 Information Technology Research and Development alliances

Neill et al (2001:236) states that a significant abnormal positive return surrounds the announcement of information technology alliances. This abnormal return is concentrated during a 2-day window consisting of the announcement day and the day immediately prior to the announcement. This supports the hypothesis that the market expects that these alliances will create value for the participants beyond that which each could create individually. Further analysis reveals that the abnormal returns were not related to the relative size of the partners in the alliance. This finding is in contrast with previous research that suggests that strategic alliances results in asymmetric gains that are correlated with the size of the participating firm, and in the extreme, a wealth transfer from the larger to the smaller partner. Neill et al (2001:236) states that the announcement appears to have a positive impact on both partners. Neill et al (2001:236) also states that the abnormal returns from the smaller firms in these alliances were not significantly different from the returns realised by the larger partners.

5.7 Volatility

Krainer (2003:4) states that evidence uncovered by researchers in financial economics points to some important implications for economic forecasters and investors. In particular it suggests that the degree of stock market volatility can help forecasters predict the path of the economy's growth: furthermore, changes in the structure of volatility imply that investors now need to hold more stocks in their portfolios to achieve diversification.

Krainer (2003:4) continues to suggest that stock market volatility tends to be persistent: that is, periods of high volatility as well as low volatility tend to last for months. In particular, periods of high volatility tend to occur when stock prices are falling and during recessions. Stock market volatility also is positively related to volatility in economic variables, such as inflation, industrial production, and debt levels in the corporate sector.

5.7.1 Components of Volatility

Researchers have sought to analyze the relative importance of economy-wide factors, industry-specific factors, and firm-specific factors on a stock's volatility. This approach borrows from modern asset-pricing theory and its emphasis on so-called factor models, or models that assume that a firm's stock return is governed by factors such as the overall market return, the return on a portfolio of firms sampled from the same industry, or even changes in economic factors such as inflation, changes in oil prices, or growth in industrial production. According to Krainer (2003:5) although volatility moves considerably over time, there is no distinct trend upward or downward. More interestingly, since 1962, there has been a steady decline in stock market volatility attributed to the overall market factor: that is, the common volatility shared across returns on different stocks has diminished over that period. The variation ascribed to firm-specific sources, by contrast, has risen. The implication for investors, then, is that they need to hold more stocks in their portfolios in order to achieve diversification.

According to Gerlach (2005:173) imperfect information about the growth rate of an asset can produce excess volatility in which market returns are more volatile than the corresponding full-information asset returns. If investors do not know the asset's mean growth rate, a gap will arise between the market price and the full-information price. The arrival of relatively high quality information can reduce or eliminate that gap.

Using data sampled at 15-minute intervals from 1983 to 2002, the empirical evidence shows that S&P 500 quarterly volatility is closely linked to the number of large jumps in the index level per quarter. Over 70% of the variation in market volatility is explained by variation in the number of jumps per quarter. Further, both the number of jumps per quarter and quarterly stock market volatility are positively related to quarterly economic volatility, which is defined as the square of the difference between actual growth of GDP during a quarter and its long-run mean. In the post-1987 data, economic volatility explains about half of the variation in S&P 500 quarterly realized volatility.

Gerlach (2005:183) further states that squared percentage changes in the rate of growth of the full-information asset value and the volatility of the simulated market returns are positively related. When the growth rate is above or below the trend, there are more large jumps in price and, consequently, a higher variance.

It can be argued that technological advances have revolutionized data communication, voice communication and the delivery of information. With the help of the Internet, useful information can be disseminated around the world in a matter of a few seconds. This new method of delivering information has had an enormous effect on business activities in general and on the financial sector and stock investors in particular. These days, the Internet is making stock information of high quality available almost instantly to individual investors everywhere. Armed with such information, these investors can make more informed financial decisions regarding buying and selling stocks.

Furthermore, there are lower commissions charged for executing orders through the Internet compared to the traditional broker's commissions. Due to these two factors, a new group of investors has emerged. As a direct result of this phenomenon, the volume of trading and the volatility of stock prices are expected to increase substantially

5.7.2 Estimation of Volatility

According to Koorts et al (2002:32) the volatility of an asset price is a measure of uncertainty about the returns provided from an investment in the asset and is measured by the variability in its price over time (usually over one year). For a share it is usually the standard deviation of the continuously compounded returns provided by an investment in the share.

One estimate of future volatility of the asset underlying an option is by using historical prices and assuming that the realized level of volatility will continue into the future. Estimating volatility from historical data depends on the time frame of volatility interested in. Usually a standard deviation of the daily percentage changes in the share price is calculated for a period equal to that which the investor intends to hold the option. Koorts et al (2002:32) suggest that the following formula is often used to calculate the volatility of investment returns. The asset price is observed at fixed intervals (i.e. daily at close) and the natural logarithms of daily price ratios are calculated:

$$u_i = \ln \left(\frac{S_i}{S_{i-1}} \right) \text{ where } S_i \text{ is the spot price in period } i$$

The standard deviation of these values:

$$s = \sqrt{\frac{\sum u_i^2 - (\sum u_i)^2}{(n-1)}} \text{ for } n \text{ days}$$

Divided by the square root of the number of trading days per year (t), produces the estimate of yearly volatility $\hat{\sigma}$:

$$\hat{\sigma} = \frac{s}{\sqrt{t}} \text{ where } t \text{ usually is } 250 \text{ days.}$$

The question however remains whether historic volatility can be used to predict volatility in the future.

5.8 Evidence of increased volatility

Important research by Schwert (2002:15) suggests that it is apparent that the volatility of technology heavy portfolios has increased dramatically since mid-1998 (See Fig. 5.1). It is interesting that the biotechnology portfolio behaves in much the same way as the computer and telecommunications portfolios, since it is hard to think of similarities in the demand for the products of these firms. Moreover, it is clear that it is not just "Internet fever" that has raised the volatility of these firms. Indeed, there is a period in mid-2000 when the volatility of the biotechnology portfolio is noticeably higher than for the computer and telecommunications portfolios. Schwert also states that volatility and prices moved in opposite directions. When prices fell, the implied volatility of the NASDAQ 100 portfolio rose dramatically.

5.9 Conclusion

The information and technology sectors in South Africa, as has been the case in other parts of the world, have been a battleground where only the strongest survive. Clear and easy to follow generic strategies for success does not exist. A particular strategy working for one firm might be the cause for poor performance in another.

Volatility as a concept is well recognized and the existence of volatility has been clearly documented. The ability to predict and quantify volatility has however not

yet been mastered. As a single factor volatility still stays one of the most important investment aspects that investors have to be aware of. Measures to allow for volatility need always to be part of the planning process for every investment. The basic premise for allowing for volatility in investments as it pertains to technology driven companies seems to be the diligent evaluation of the companies that investments are considered in as well as appropriate diversification within the sector.

Figure 5.1 Evidence of Increased Volatility

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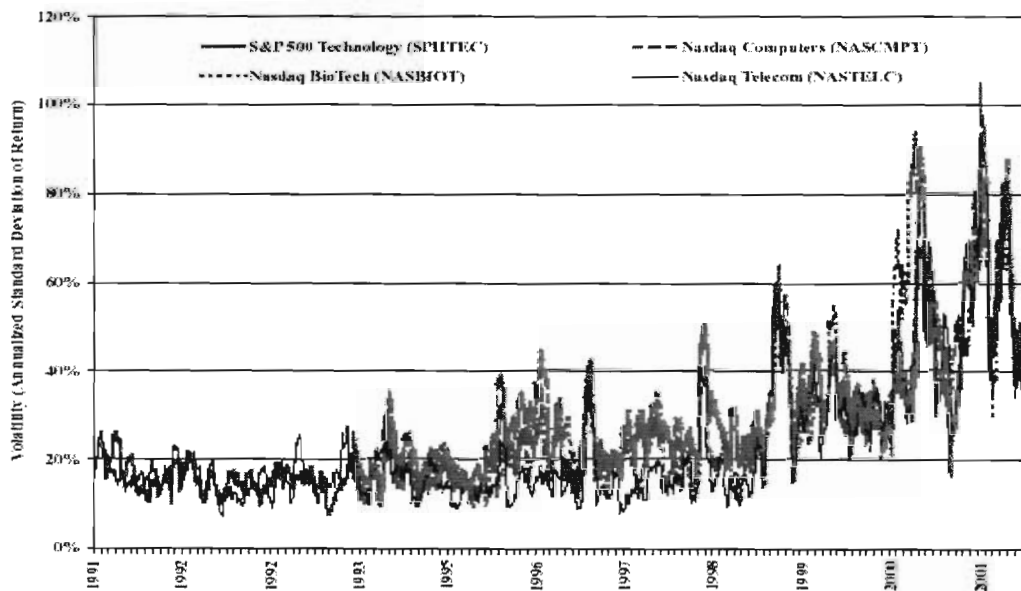


Fig. 8. Historical volatility of the S&P Technology portfolio (SPHTEC), Nasdaq Computer (NASCMPT), Biotechnology (NASBIOT), and Telecommunications (NASTELC) portfolios, January 1991 through July 25, 2001.

Source: Schwert (2005:15)

CHAPTER 6

EMPIRICAL STUDY

6.1 Introduction

Chapter six discusses the background of the investment criteria that will be analyzed during the empirical study for this dissertation. This chapter also introduces the raw data (see Annexure) and more importantly the digestion of raw data and the statistical process. The chapter ends with the introduction of the new analysis model that will be used in the following chapter as basis for testing the predictive ability of the new model. It is important to create the appropriate background and understanding for the investment criteria. These criteria were the basis for the current analysis model and will also be instrumental in establishment of the new analysis model.

6.2 Standardized vs. Published Financials

According to Hanlie van der Westhuizen from McGregor BFA, in order to make meaningful comparisons between the results of different companies, it was necessary to devise a standardized system of analysis and capturing of the financial statements of companies listed on the JSE Securities Exchange. The data bank containing this "Standardized" Financial Statements must, however, be viewed and used differently from their second data bank of financial statements, namely the so called "as published" financial statement data bank. The reason being that in the process of standardization the accounting figures within the income statement and the balance sheet are actually changed during the analysis process according to some fixed rules. This will naturally result in the fact that the profit of a company, as per this standardized version of the financial statements, will differ from that published by a company in its annual report.

The reason for standardizing the financial statements, of companies listed on the JSE, is purely due to the fact that companies apply accounting conventions, and therefore General Accepted Accounting Practices, in different ways and according to different interpretations. This fact makes it impossible for any analyst to analyze, interpret and compare the financial results and financial position of different companies.

The reason for standardizing financial statements is then to make the financial results of companies, listed on the JSE Securities Exchange, comparable with each other.

The term standardization is used as items in the balance sheet, income statement, cash flow statement and other quantitative information obtained from published financial statements are analyzed and categorized in a consistent manner.

6.3 Investment Criteria

The investment criteria that was identified and evaluated for the current analysis model have been re-evaluated for this dissertation. Two additional criteria have been added as it is the opinion of the author that these two criteria would be important in evaluation of the sector under investigation due to the unique character of the sector. The additional criteria are: Economic Value Added (EVA) and Beta. The decision to use the same investment criteria has been discussed previously.

i. Return on Equity:

ROE is defined as profits after tax (or net income) divided by the average of shareholder's funds employed during the year. Please refer to 4.10.1 where ROE has been extensively discussed. In summary according to Simmons (1999:54) every business has a history of reinvestments and a history of returns

which are summarized in the ROE. For the purpose of this dissertation ROE was calculated using the formula by Libby et al (2004:248):

$$\text{Return on Equity} = \frac{\text{Net Income}}{\text{Average Stockholders' Equity}^{12}}$$

ii. Number of years to payoff Debt:

A variety of formulas exist to evaluate the management of debt within organizations. For the purpose of this dissertation the management of debt will be evaluated by the number of years to payoff debt using the following formula:

$$\text{Number of Years to payoff Debt} = \frac{\text{Long Term Debt}}{\text{Current Annual Profit}}$$

iii. Debt/Equity Ratio:

According to Lovemore et al (2003:96) this ratio may be defined as the proportion between total interest bearing debt and shareholders' equity.

It is expressed by the following formula:

$$\text{Debt/Equity ratio} = \text{Total interest bearing Debt} / \text{Shareholders' Equity}$$

iv. Profit Margin:

According to Libby et al (2004:713) the profit margin measures the percentage of each sales dollar (rand), on average that represents profit. The following formula is used to calculate the profit margin of the companies studied:

$$\text{Profit Margin} = \text{Net Income (before Extraordinary Items)} / \text{Net Sales Revenue}$$

¹² Average Stockholders' Equity = (Beginning Stockholders' Equity + Ending Stockholders' Equity) / 2

v. Intrinsic value per share:

According to Simmons (1999:28) the intrinsic value for an investment is the discounted present value of its future cash flows. For the purpose of this dissertation intrinsic value has been calculated as the actual realized earnings per share for the particular year divided by the average of the R153 for the same year. Simmons (1999:76) states that paying intrinsic value for an asset means one can expect no increase in real terms in the value of the investment as the investor needs to discount the future earnings from the investment to the present value of the investment.

The formula for calculating Intrinsic Value:

$$\text{Intrinsic value} = \frac{\text{Earnings per Share}}{\text{Average rate of return for R153}}$$

vi. Margin of Safety:

Simmons (1999:76) suggests that margin of safety simply means that we should pay as big a discount as possible to a security's intrinsic value. The advantages of this approach, according to Simmons (1999:76) are that the investor should profit over time because:

- a) Either the market, that is other investors, will recognize the underlying value and the market price will rise or the investor can benefit from the company's underlying cash-flow as earnings and dividends increase.
- b) The investor does not have to worry about the overall direction of the stock market. As security possesses a good margin of safety or it doesn't. The market as a whole may be crashing but over time the well chosen security will appreciate; and
- c) A margin of safety is an insurance policy against our own ability and the pitfalls of the world. Management may stumble, products may be recalled, or our forecasting may be wrong – a good investor will have

left enough room in the purchase price such that even poor investment will in the worst not lose the investor any money.

A well-chosen share, with a good margin of safety has an additional advantage in that when the price of the share decreases in the market, it actually gives the investor the opportunity to buy shares at an even more discounted price. For the purpose of this dissertation the margin of safety has been calculated as follows:

Margin of Safety = Share Price – Intrinsic value of Share

vii. Earnings per share growth rate:

Earnings per Share are, according to Lovemore et al (2003:103), a measure of the profitability of a company. EPS may be defined as the return earned by each issued ordinary share. Lovemore states that it is important to note that the earnings used are the profit that accrues to ordinary shareholders (i.e. earnings after payment of preference dividends). The higher the EPS, the greater the earning power of each share and the greater the profitability of the firm.

According to Kahn et al (1999:267) earnings growth rate can be used to search for growth companies with winning characteristics. The higher the EPS growth rate, the better.

For the purpose of this dissertation the Earnings per Share Growth rate was determined by calculating the percentage change in the EPS for the organization from year x to year (x+1).

viii. Average share price:

The price of shares fluctuates on a daily basis and in the technology driven sectors these fluctuations can be considerable. For the purpose of this dissertation the average share price has been calculated using the Volume Weighted Average Price (VWAP) as calculated by the BFA McGregor database.

This calculation gives a better estimate of the average share price as the volume of shares traded gets incorporated into the equation and gives a truer reflection of the average share price for the given period. A simple explanation of this method:

Day 1 - Volume of shares trade: 10 000 (ten thousand) at an average price of R5-00 (five rand).

Day 2 – Volume of shares traded: 100 000 (one hundred thousand) at an average price of R5-20 (five rand and twenty cents).

A simple average of the two days average prices would be R5-10 (five rand and ten cents). The VWAP of R5-18 (five rand and eighteen cents) gives a much more accurate reflection of the average share price taking the different volumes traded at different average prices into account.

ix. Book value:

According to Gabehart et al (2002:24) book value is the difference between a company's assets and liabilities, as evidenced by the so-called accounting equation:

$$\text{Assets (A)} - \text{Liabilities (L)} = \text{Owner's Equity (OE)} = \text{Book Value (BV)}$$

Book value refers to the relationship between a company's assets and liabilities. Book value is an accounting measure as opposed to a market-based measure of value.

x. Book value per share:

According to Kahn et al (1999:77) book value per share is a valuation tool commonly used by investors. It is defined as the total of all assets, minus all liabilities (i.e., shareholders' equity) divided by the total number of outstanding shares and share equivalents. Book value per share is based on the premise that if a company's stock price is below its book value per share, the stock is

under valued. According to Garrison (2003:776) book value per share measures the amount that would be distributed to holders of each common stock if all assets were sold at their balance sheet carrying amounts and if all creditors are paid off.

The formula for calculating book value per share according to Garrison et al (2003:777) is:

$$\text{Book Value per Share} = \frac{\text{Common Stockholders' Equity}^{13}}{\text{Number of Common Shares Outstanding}}$$

xi. Growth in per share book value:

The year on year change in book value per share was calculated and this is expressed as a percentage. These calculations are presented in annexure 1 - 10.

A final calculation was done to determine the average growth in per share book value of the companies evaluated over the periods that data was available. These values are illustrated in graph 6.4 in this chapter.

xii. Share repurchases:

According to Libby et al (2004:557-558) a company may want to repurchase its stock from existing stockholders for a number of reasons. One common reason is the existence of an employee bonus plan that provides workers with shares of the company's stock as part of compensation. Because of regulation concerning newly issued shares, most companies find it less costly to give employees repurchased shares than to issue new ones. Stock that has been reacquired and held by the issuing corporation is called treasury stock. These shares have no voting, dividend or other stockholder rights while held as treasury stock.

According to Arnold (2005:360-361) share buy-backs is an alternative way to return money, held within the company, to the owners. Buy-backs may also be

¹³ Common Stockholders' equity = Total stockholders' equity – Preferred Stock.

a useful alternative when the company is unsure about the sustainability of a possible increase in the normal cash dividend. A stable policy may be pursued on dividends, then, as and when surplus cash arises, shares are repurchased. This two-track approach avoids sending an over-optimistic signal about future growth through underlying dividend levels. Share buy-backs are often subject to permission from shareholders as well as warrant and option holders. Rules of the particular stock exchange need also to be adhered to.

Share repurchases can be accomplished in one of three ways:

1. Purchasing shares in the stock market.
2. All shareholders are invited to tender some or all of their shares; and
3. An arrangement with particular share holders.

Share repurchases for the purpose of this dissertation has been calculated by subtracting the number of shares outstanding in Year X from the shares outstanding in Year (X-1). A positive value to this calculation suggests that the company has issued additional shares while a negative value suggests actual share repurchase/s into the treasury stock of the company.

xiii. Price/Earnings Ratio:

According to Brigham et al (2005:455) the Price/Earnings (P/E) ratio shows how much investors are willing to pay per dollar (rand) of reported profits. P/E ratios are higher for firms with strong growth prospects, other things held constant, but they are lower for riskier firms.

For the purpose of this dissertation the P/E ratios for the companies being studied, are the P/E ratios as calculated by the McGregor BFA database for the period studied.

xiv. Dividend/Share:

According to Arnold (2005:349) dividends may only be paid out of accumulated profits and not out of capital. This means that companies which have loss-making years may still pay dividends, but only up to the point that they have retained profits from previous years. This rule is designed to provide some protection to creditors by putting a barrier in the way of shareholders looking to remove funds from the firm and thereby withdrawing the cushion of capital originally provided by shareholders.

xv. Earnings retained per share:

Arnold (2005:353) quotes an extract from the Berkshire Hathaway Annual report from 1984 (Buffet on Dividends) stating that earnings should be retained only when there is a reasonable prospect – backed preferably by historical evidence or, when appropriate by a thoughtful analysis of the future – *that for every dollar (rand) retained by the corporation, at least one dollar of market value will be created for owners.* This will happen only if the capital retained produces incremental earnings equal to, or above, those generally available to investors.

xvi. Beta:

The concept of Beta has been extensively discussed in Chapter 2. The beta analysis was based on the BFA McGregor data bases calculations of beta for the different companies. The portfolio comparison was done with Johannesburg Stock Exchange All Share Index.

xvii. Economic Value Added:

This interesting concept has been developed and trademarked by the US consultants Stern Stewart and Co. According to Arnold (2005:189) EVA is probably the most widely talked about value metric.

$EVA = \text{Adjusted invested capital} \times (\text{Adjusted return on capital} - WACC)$

or

$EVA = \text{Adjusted operating profits after tax} - (\text{Adjusted invested capital} \times WACC)$

Arnold (2005:189) states that according to the originators of the formula, up to 164 adjustments may be needed to the accounting data of the firm being evaluated. For example, spending on marketing and research and development helps build value and so these are added back to the balance sheet as assets (and amortized over the period expected to benefit from these expenditures). There are some difficulties with the adjustments – for example, over what period should these reconstituted ‘assets’ be amortized? Arnold (2005:189) suggests that EVA has the virtue of being based on familiar accounting concepts and it is arguably more accurate than taking ordinary accounting figures.

However, critics have pointed out that the adjustments can be time-consuming and costly, and many are based on decisions as subjective as the original accountant’s numbers.

As with other value measuring formulas, EVA needs to be used as an operational tool by organizations, taking into account the shortcomings of the process as well as taking into account the operational value that it might add to the organization.

xviii. Change in share price:

The change in share price is the dependant variable which means that changes in the other variables (the investment criteria evaluated) influences the share price. Determining the change in share price was done by subtracting the end of year share price from the beginning of year share price.

6.4 Statistical process

According to Wisniewski (2002:198) if one takes random samples of size n from a population, the distribution of sample means will approach that of the normal probability distribution. The approximation will become closer, the larger n is.

The text below describes the process that was used to analyze the data.

6.4.1 Evaluation of normality

Evaluation of normality based on the research data suggested a skew distribution of variables with mainly book value causing skewness. Because this criterion is essentially evaluated in book value per share it was decided in discussion with an expert financial management consultant that this variable can be excluded from further analysis. Variables that created distortion by being more than three (3) standard deviations from the mean were also excluded. The latter was necessary given that standard deviation is a measure of the variability around the average: typically how much do the items in the data set differ from the mean value? Standard deviation for a sample is calculated using the following formula - Wisniewski (2002:100-101):

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Where x refers to the individual data items, \bar{x} is the sample mean and n the number of data items in the data sheet.

6.4.2 Multiple regression

A specific form of Multiple regression was used to find the best predictors of the dependant variable – change in share price. According to the authors at www.duke.edu stepwise regression is a semi-automated process of building a model by successively adding or removing variables based solely on the t -statistics of estimated coefficients. Properly used, the stepwise regression option in statistic packages puts more power and information at the fingertips of

the statistician than does the ordinary multiple regression option, and it is especially useful for sifting through large numbers of potential independent variables and/or fine-tuning a model by poking variables in or out.

Wisniewski (2002:347-348) describes the role of multiple regression where one expects a number of explanatory variables to affect the Y variable (dependent variable). Statisticians use multiple regression thus to explain some Y variable with several explanatory variables and not just one. Such is the case with the model that will be proposed where the change in share price of different shares is explained with the different investment criteria (or explanatory variables). Wisniewski (2002:347) warns that on the surface, such a model may appear appropriate for forecasting in some business situation, whereas in reality it has some fundamental statistical flaw apparent only to the statistical expert. Hasty use of such models may lead to serious forecasting error with major – and adverse – business consequences.

In general we can develop a multiple regression model of the form:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots + b_m X_m$$

with some number, m , of explanatory variables.

Wisniewski (2002:356-359) describes four (4) assumptions that need to be checked when working with multiple regression which are:

- Assumption 1: There is a linear relationship between Y and X variables

- Assumption 2: The regression errors have a constant variance

The errors are simply the difference between each actual Y value and the Y value predicted by the regression equation. This assumption effectively means that the errors remain relatively constant over the entire range of data.

- Assumption 3: The regression errors are independent of each other

This assumption implies that each error is independent of the errors before it and the errors after it. If this assumption is not met then it is often said that autocorrelation exists or that errors are strongly correlated with each other.

- Assumption 4: The X variables are independent of each other

The final assumption behind multiple regression is that the X variables included are each strongly correlated with Y but are independent of each other.

6.5 Determination of the regression models

Using statistical software the various regression models were determined. The various regression coefficients are represented by b_1 to b_{10} .

A summary of the regression models are represented in Table 6.1 below.

6.6 Multiple regression analysis results

The value of the various coefficients for the different years studied was determined using multiple regression analysis. The relevance of the models and the determination of the proportion of the total variation in the observed values of the change in average share price that is explained by the overall regression model are illustrated by the multiple-coefficients for the different models.

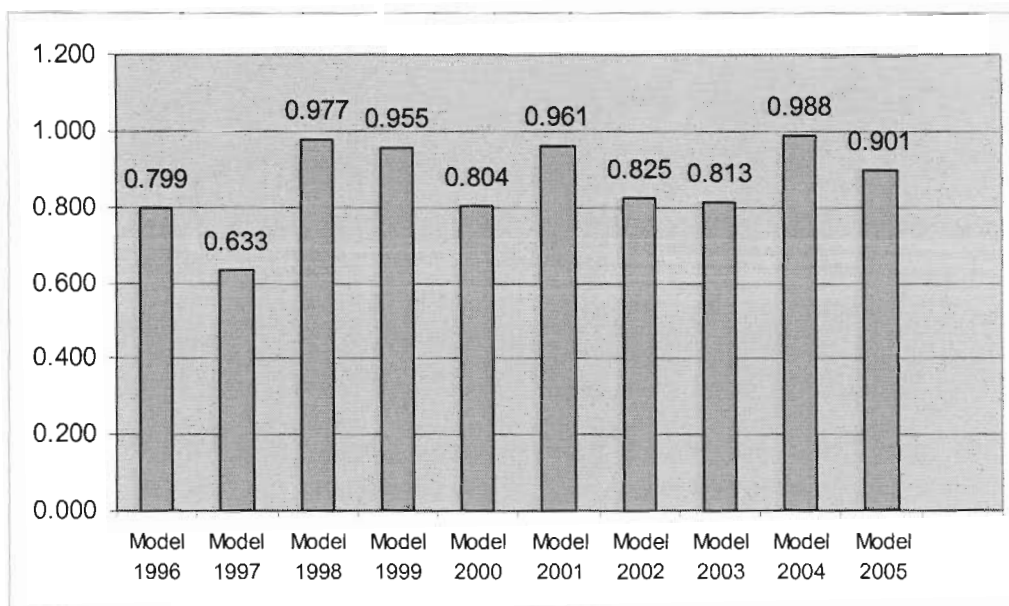
Graph 6.1 indicates the values of the multiple coefficient of determination of the various models. It is clear that a relatively high proportion of the variability is explained by the model for each year. On average approximately 87% of variability is explained by the models for the different years. The model for 1997 showed the lowest relevance but still explained approximately 63% of the total variation of the change in average share price. The model for 2004 explains almost 99% of the total variation of the change in share price.

Table 6.1 Summary of the multiple regression models

Model	Formula
Model 1996	Average change in share price per year = $b_0 + b_1 \times$ growth in per share book value + $b_2 \times$ earnings retained per share + $b_3 \times$ EVA + $b_4 \times$ beta
Model 1997	Average change in share price per year = $b_0 + b_1 \times$ growth in per share book value + $b_2 \times$ share repurchases + $b_3 \times$ book value per share
Model 1998	Average change in share price per year = $b_0 + b_1 \times$ dividends per share + $b_2 \times$ growth in per share book value + $b_3 \times$ earnings retained per share
Model 1999	Average change in share price per year = $b_0 + b_1 \times$ share repurchases + $b_2 \times$ debt/equity ratio + $b_3 \times$ earnings per share growth rate
Model 2000	Average change in share price per year = $b_0 + b_1 \times$ share repurchases + $b_2 \times$ dividends per share + $b_3 \times$ P/E ratio + $b_4 \times$ growth in per share book value + $b_5 \times$ beta
Model 2001	Average change in share price per year = $b_0 + b_1 \times$ dividends per share + $b_2 \times$ EVA + $b_3 \times$ earnings per share growth rate + $b_4 \times$ earnings retained per share + $b_5 \times$ ROE + $b_6 \times$ growth in per share book value + $b_7 \times$ P/E ratio + $b_8 \times$ beta + $b_9 \times$ number of years to payoff debt + $b_{10} \times$ book value per share
Model 2002	Average change in share price per year = $b_0 + b_1 \times$ debt/equity ratio + $b_2 \times$ book value per share + $b_3 \times$ beta + $b_4 \times$ number of years to payoff debt + $b_5 \times$ earnings per share growth rate + $b_6 \times$ earnings retained per share
Model 2003	Average change in share price per year = $b_0 + b_1 \times$ EVA + $b_2 \times$ earnings retained per share + $b_3 \times$ dividends per share + $b_4 \times$ share repurchases + $b_5 \times$ book value per share + $b_6 \times$ beta
Model 2004	Average change in share price per year = $b_0 + b_1 \times$ EVA + $b_2 \times$ earnings retained per share + $b_3 \times$ growth in per share book value + $b_4 \times$ P/E ratio + $b_5 \times$ book value per share + $b_6 \times$ earnings per share growth rate + $b_7 \times$ profit margin + $b_8 \times$ number of years to payoff debt + $b_9 \times$ beta + $b_{10} \times$ ROE
Model 2005	Average change in share price per year = $b_0 + b_1 \times$ dividends per share + $b_2 \times$ book value per share + $b_3 \times$ EVA + $b_4 \times$ earnings retained per share

Source: Own

Graph 6.1: The multiple coefficient of determination of the various models



Source: Own

Summaries of the statistical process are attached in the annexure of this study. Please see: **Annexure 17**.

6.7 Summary of the findings of the Statistical Process

The culmination from the statistical analysis process was the identification of those investment criteria that are most closely correlated to a change in share price. Table 6.2 is a summary of the complete statistical process and shows the frequency that the different criteria were identified as being related to a change in share price. Criteria with a frequency of five (5) or more were considered for inclusion into the new analysis model.

Table 6.2 Summary – Statistical Process

Investment Criteria	Model 1996	Model 1997	Model 1998	Model 1999	Model 2000	Model 2001	Model 2002	Model 2003	Model 2004	Model 2005	Frequency
R Squared (R ²)	0.799	0.633	0.977	0.955	0.804	0.961	0.825	0.813	0.988	0.901	
Correlation Coefficient (R)	0.894	0.796	0.988	0.977	0.897	0.980	0.908	0.902	0.994	0.949	
Return on Equity						x			x		2
Debt/Equity ratio				x			x				2
Profit Margin									x		1
Price/Earnings Ratio					x	x			x		3
Book value/Share		x				x	x	x	x	x	6
Dividend/Share			x		x	x		x		x	5
Earnings per Share Growth rate				x		x	x		x		4
Share Repurchases		x		x	x			x			4
Earnings Retained/Share	x		x			x	x	x	x	x	7
Number of Years to payoff Debt						x	x				2
Growth in per share book value	x	x	x		x	x			x		6
Economic Value Added	x					x		x	x	x	5
Beta	x				x	x	x	x	x		6

Source: Own

The investment criteria mostly associated with a change in share price are those criteria that were more frequently identified by the multiple regression and factor analysis. The frequency is noted in the last column of Table 6.1. These criteria are:

- a. Book Value per Share
- b. Dividends per Share
- c. Earnings Retained per Share
- d. Growth in per Share Book Value
- e. Economic value Added
- f. Beta

The six (6) investment criteria mentioned above will form the basis of the **new analysis model**.

6.8 Comparison of the current and the new analysis models

At this stage it is important to compare these findings with the findings that underpinned the establishment of the **current analysis model**. The different criteria are presented in Table 6.3 to compare the criteria identified for the current analysis model with that of the new analysis model.

Table 6.3 Comparison of Current and New Analysis Models

Current Analysis Model	New Analysis Model
Intrinsic Value per Share	Book Value per Share
Book value per share	Dividends per Share
Number of years to pay off debt	Earnings Retained per Share
Profit Margin	Growth in per Share Book Value
Margin of safety	Economic value Added
--	Beta

It is clear that the difference in identified investment criteria for the current versus the new analysis model concludes the **primary objective** of this dissertation. Only Book value per Share was identified as an important investment criterion that predicts change in share price for both analysis models. It can thus be stated that based on the data analyzed and the statistical process completed a new analysis model, using different investment criteria, is proposed for evaluating the performance of shares of technology driven companies. The current model was tested to confirm the findings as identified by the statistical process and these findings are summarized in annexure 12 – 17. It is clear from the application of the current model to the sector that was analyzed that the value of the current model is limited.

6.9 Analysis of Company specific Performance for identified Investment Criteria

A comparative analysis to evaluate the performance of each company against the identified investment criteria is required. These steps allow for comparing the relative performance of each company against the other companies in the sector for a particular investment criterion. Graphical representation of this process gives the additional insight into this process.

A graphical representation of the steps that will be followed in the practical application of the new model for each investment criterion and the relative performance of the companies evaluated follows the step-wise discussion of the model application. Superior performance by a company in relation to a particular investment criterion is considered when better than average performance is delivered for the particular criterion in the context of this study.

Step 1: Comparison of Average book Value per Share.

The average Book Value per Share over the ten (10) years evaluated for all companies was \pm 388 cents per share. The graph clearly identifies the companies performing better than average for this criterion. See graph 6.2.

Step 2: Comparison of Dividends per Share

As can be seen from the graph below as well as the tables in the annexures many companies pay no or little dividends. This tendency seems to be common for technology driven companies. When evaluating this criterion it is important to view it against the value created by the company when it re-invests the capital into company specific projects.

Step 3: Comparison of Earnings Retained per Share

An even distribution was seen for this criterion with only one company, GIJIMA AST showing a much higher than average value of retained earnings per share.

Step 4: Comparison of Growth in per Share Book Value

A very small average (for all companies) was seen in the growth of the per share book value. It is interesting to note that the companies doing well in this criterion were included by the current analysis model at a high percentage. As can be seen from the graph a certain amount of skewness exists for this criterion within the sample data. This criterion needs to be viewed as to its interaction with actual share price as well. The model views the criterion from the perspective of its interaction with the change in share price. When compared to the current share price an estimate of value can be gained similar to the concept of margin of safety.

Step 5: Comparison of Economic Value Added

Interestingly the average EVA for the sector analyzed is a negative value. This seems to be an indication of the volatility in the sector.

Step 6: Comparison of Beta

The performance of the companies as it pertains to this criterion was surprisingly evenly spread with minimal skewness of distribution. It was

insightful realizing that only two (2) of the companies identified by the current analysis model qualified for this criterion.

Graph 6.2 to Graph 6.7 depicts the steps suggested by the current analysis model. The graphs clearly identify those companies that perform better than their counterparts when companies are directly compared as to their performance for the particular investment criterion.

6.8 Summary of company specific performance

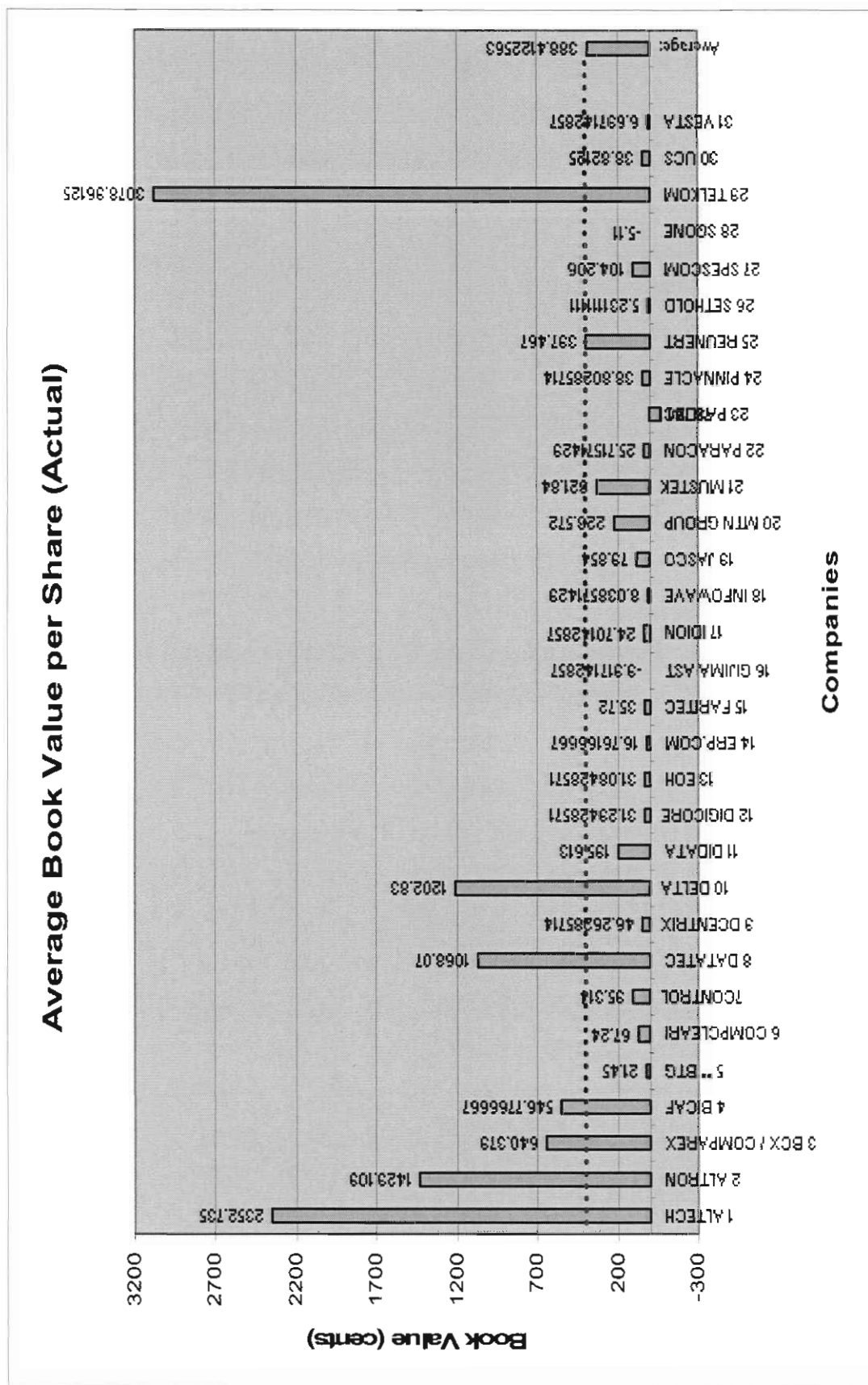
The goal of the new analysis model is to identify those companies whose shares will have the highest probability of realising positive returns. After step wise application of the new analysis model, the companies were evaluated as to the number of investment criteria they met. The verdict essentially being that the more investment criteria a particular company meets, the higher the likelihood that the shares of the particular company will realise a positive return. The information gathered from the application of the new analysis model is summarised in Table 6.4.

6.9 Summary of Findings

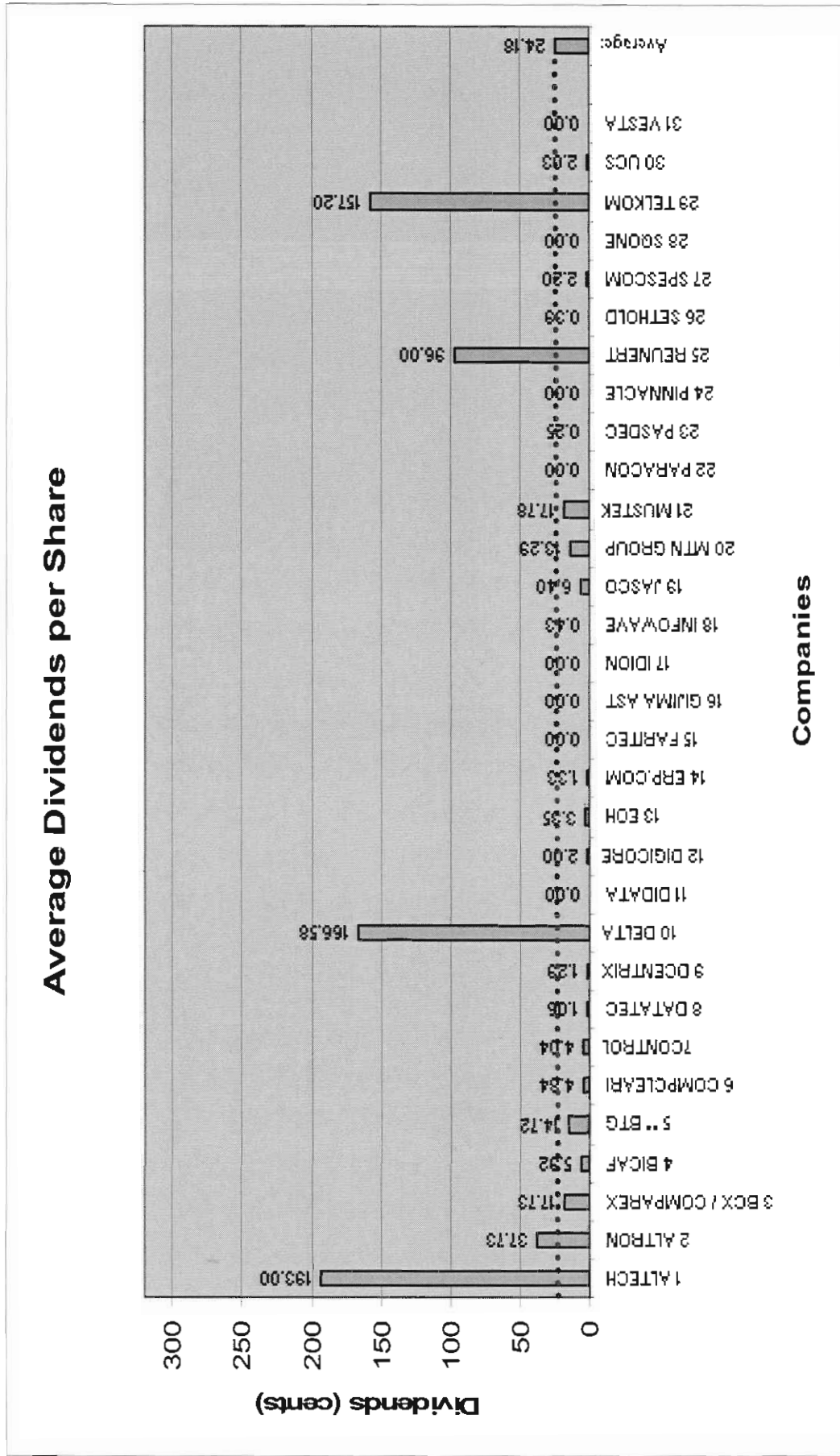
After collection of the necessary financial data an extensive statistical process followed. In the final analysis six (6) investment criteria was identified that most closely was associated with a change in share price of the evaluated companies.

The performance of each company was measured relative to the performance of the other companies to identify the best performing companies for each criterion.

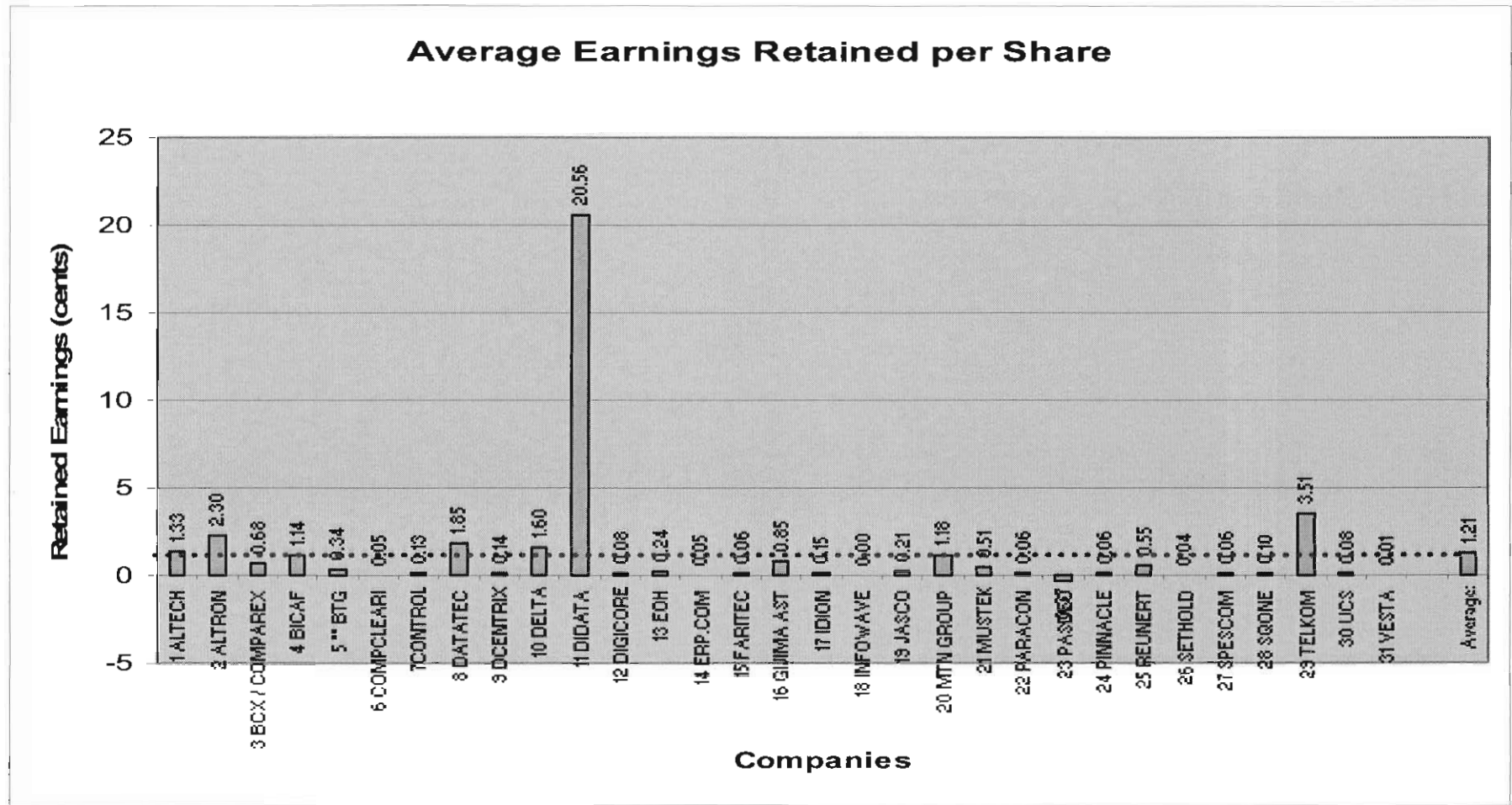
Graph 6.2 Average Book Value per Share



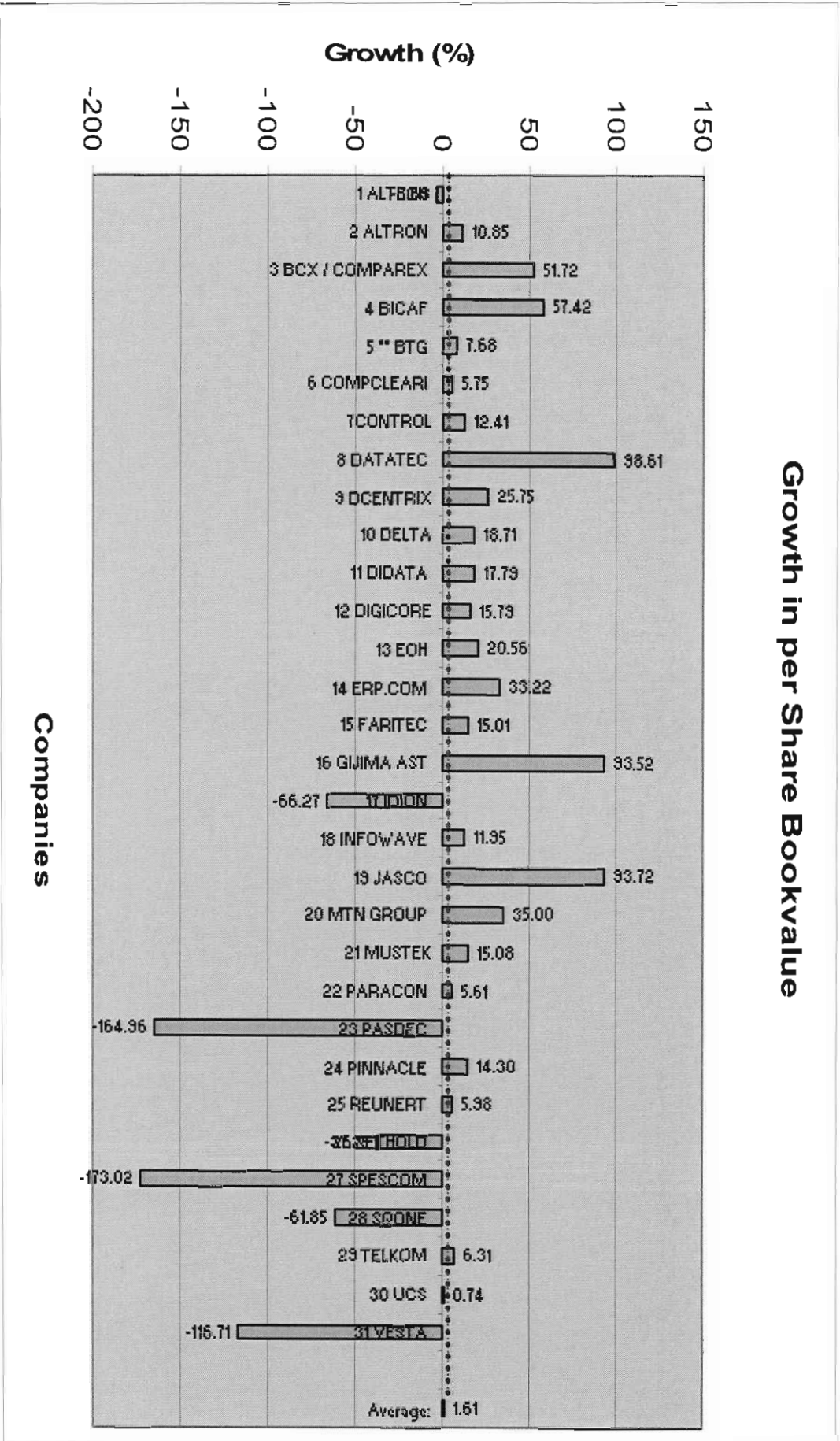
Graph 6.3 Average Dividends per Share



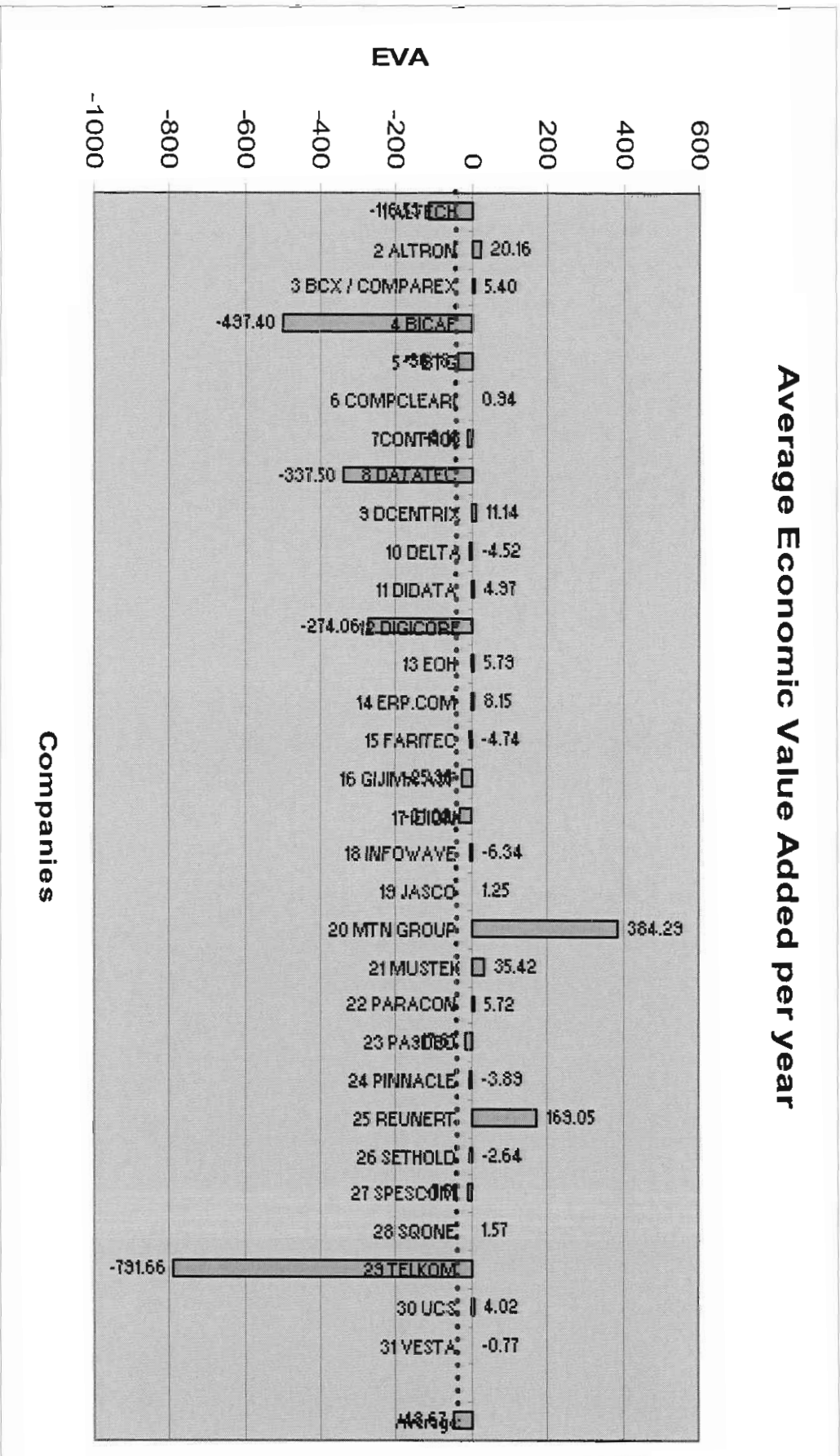
Graph 6.4 Average Earnings Retained per Share



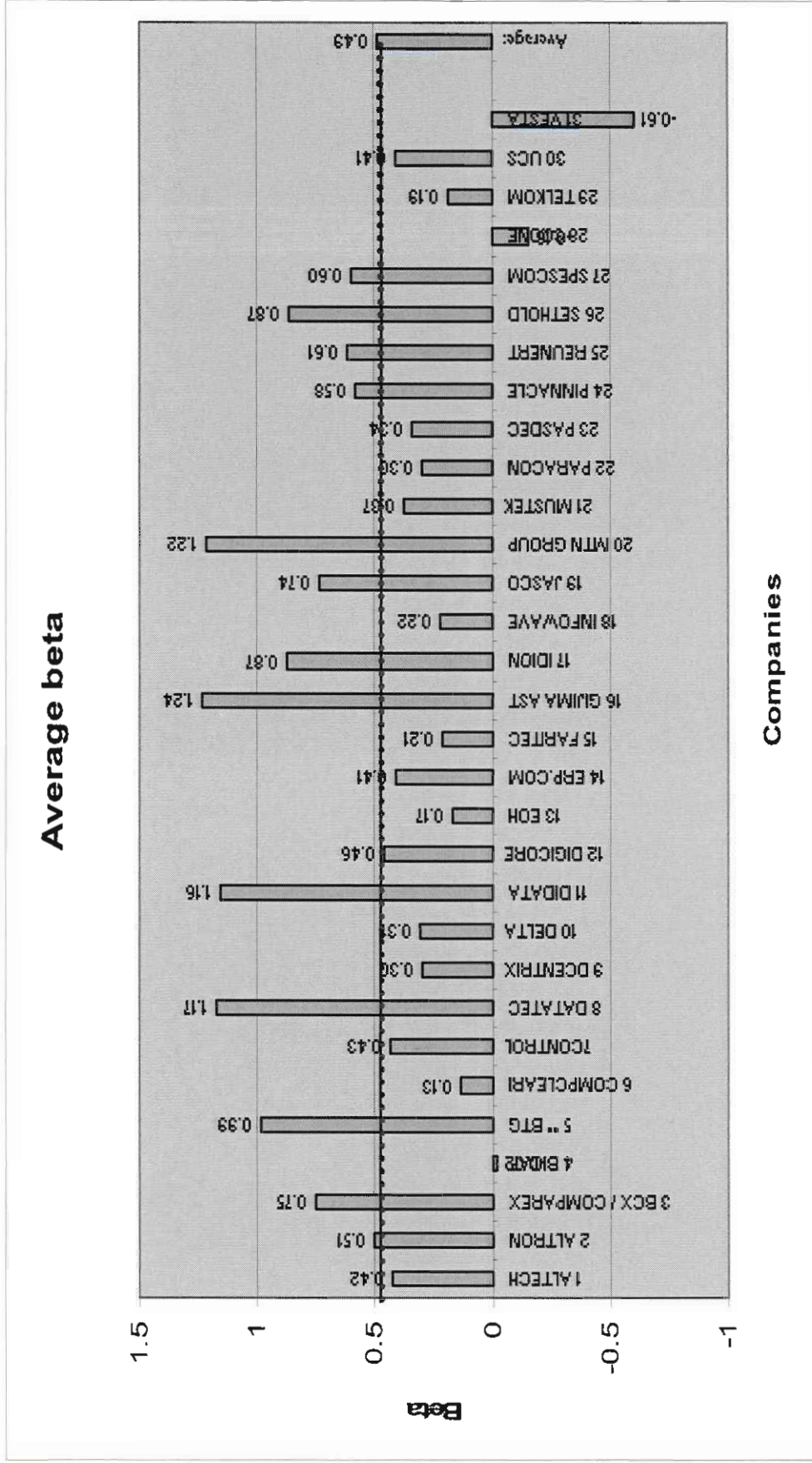
Graph 6.5 Growth in per Share Book value



Graph 6.6 Average Economic Value Added per year



Graph 6.7 Average Beta



Source (Graph 6.2 – 6.7): Own

Table 6.4 New analysis model application: Company specific performance

Company	Book Value per Share	Dividends Per Share	Earnings Retained Per Share	Growth in Per Share Book value	Economic Value Added	Beta
1 ALTECH	x	x	x			
2 ALTRON	x	x	x	x	x	x
3 BCX / COMPAREX	x			x	x	x
4 BICAF	x		x	x		
5 BTG				x	x	x
6 COMPCLEARI				x	x	
7 CONTROL				x	x	
8 DATATEC	x		x	x		x
9 DCENTRIX				x	x	
10 DELTA	x	x	x	x	x	
11 DIDATA			x	x	x	x
12 DIGICORE				x		
13 EOH				x	x	
14 ERP.COM				x	x	
15 FARITEC				x	x	
16 GIJIMA AST				x	x	x
17 IDION					x	x
18 INFOWAVE				x	x	
19 JASCO				x	x	x
20 MTN GROUP			x	x	x	x
21 MUSTEK				x	x	
22 PARACON				x	x	
23 PASDEC					x	
24 PINNACLE				x	x	x
25 REUNERT	x	x		x	x	x
26 SETHOLD					x	x
27 SPESCOM					x	x
28 SQONE					x	
29 TELKOM	x	x	x	x		
30 UCS					x	
31 VESTA					x	

Source: Own

CHAPTER 7

TESTING OF THE NEW ANALYSIS MODEL

The new analysis model was tested over four different time periods to determine the ability of the model to successfully predict shares that has positive growth over the periods tested. The periods tested were:

- 1) Percentage change in share price between **2003** and **2004**
- 2) Percentage change in share price between **2004** and **2005**
- 3) Percentage change in share price between **2005** and **22 August 2006** – this was the last date of data collection for the purpose of this dissertation
- 4) A final, longer period, was evaluated from **2004** until **22 August 2006**

Model testing results

The forthcoming discussion regarding the results of the testing process will be done using three (3) so called portfolios. Depending on the number of investment criteria that the companies identified qualified for the portfolios will be called either:

- The 4+ Criteria Portfolio when four (4) or more investment criteria are met
 - The 3 Criteria Portfolio when three (3) investment criteria are met
- and
- The 2- Criteria Portfolio when two (2) or less investment criteria are met

7.1 The 4+ Criteria Portfolio

The results of the testing when four (4) or more of the criteria were met are illustrated in Table 7.1 below.

The average share price per year of each company was used for the comparative study as illustrated in table 7.1. The reason average share price was used is because it represents the best broad application of investor behaviour as it is unlikely that an investor would buy shares at the beginning of the year and sell the shares at the end of the same year. The ability to buy low and sell high can also not be evaluated. The change in share price was calculated and is expressed as a percentage change in share price for the different periods that the model was tested.

As illustration of the process the data for ALTRON will be used. Average share price for 2003 was 911 cents. The average share price increased to 1292 cents for 2004, to 1910 cents for 2005 and to 2638 cents for the period tested in 2006. The percentage change in share price was calculated using the average share price for the particular years.

Finally a percentage change for the portfolio was calculated

The success of the model is clearly illustrated over all the time periods tested. The worst performance of the model was for the period 2003 to 2004 where the successful prediction value for the model was 75% while successful prediction was achieved in 87.5% of the other periods including the longer period of 2004 until 22 August 2006. If a portfolio ("4+ Criteria Portfolio") were held with only these eight (8) technology shares, the average change in share price for the portfolio would have been 79.02% for the period 2004 until 22 August 2006.

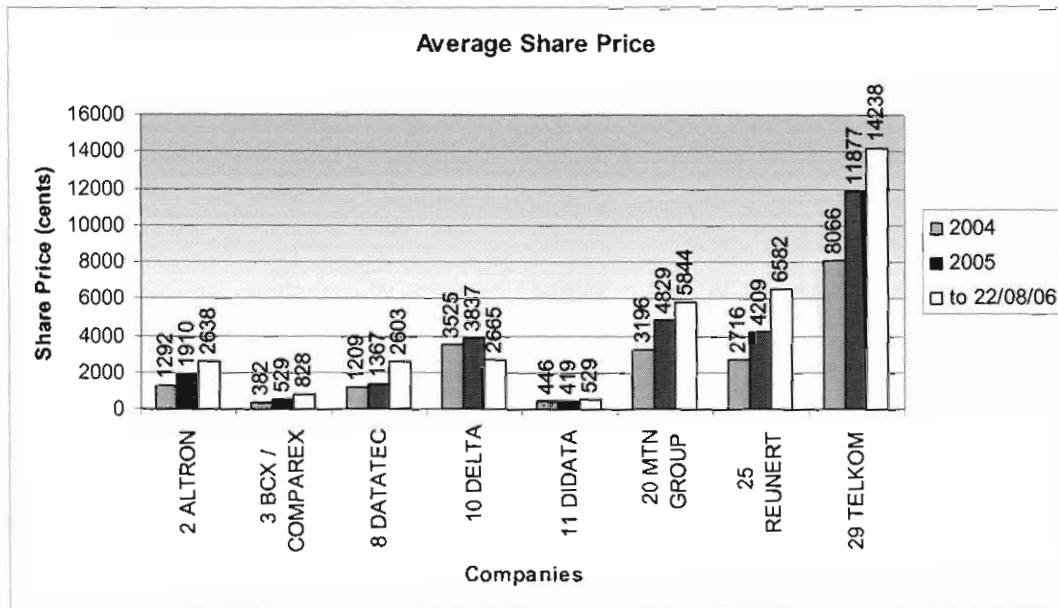
Table 7.1 4+ Criteria Performance

4+Criteria ¹⁴	Average share price per year				% Change in average share price			
	2003	2004	2005	2006 to 22/08	03-'04	04-'05	05-'06	04-'06
2 ALTRON	911	1292	1910	2638	0.42	0.48	0.38	104.18%
3 BCX / COMPAREX	715	382	529	828	0.47	0.38	0.57	116.75%
8 DATATEC	646	1209	1367	2603	0.87	0.13	0.90	115.30%
10 DELTA	4112	3525	3837	2665	0.14	0.09	0.31	-24.40%
11 DIDATA	330	446	419	529	0.35	0.06	0.26	18.61%
20 MTN GROUP	1746	3196	4829	5844	0.83	0.51	0.21	82.85%
25 REUNERT	1810	2716	4209	6582	0.50	0.55	0.56	142.34%
29 TELKOM	4097	8066	11877	14238	0.97	0.47	0.20	76.52%
Average Change								79.02%

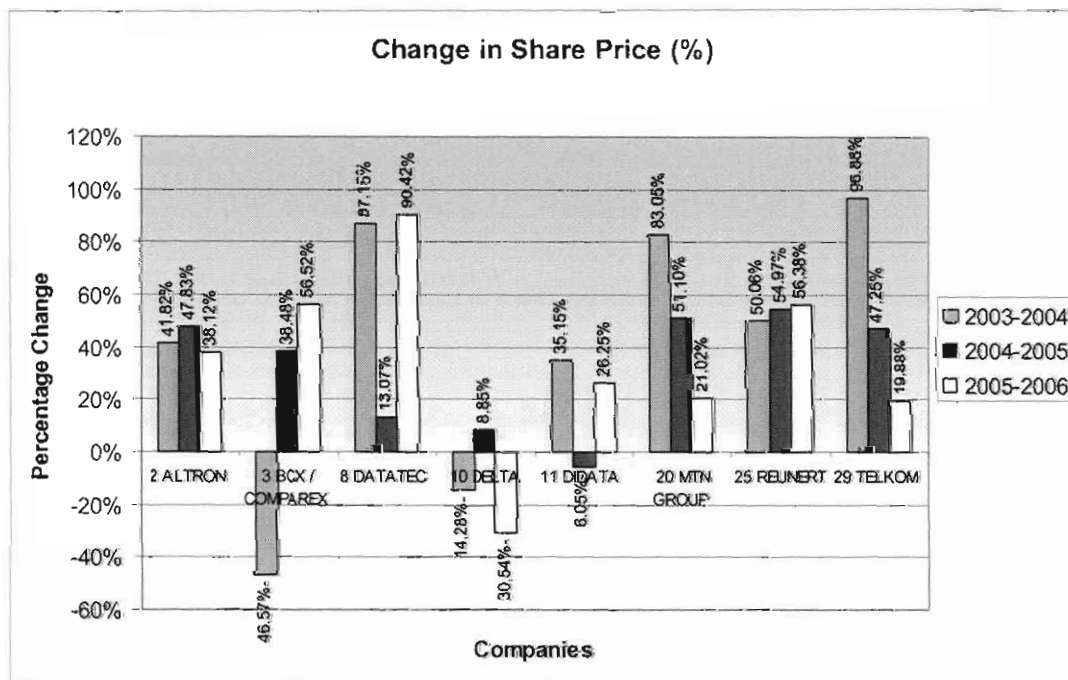
Source: Own

¹⁴ The companies represented in the table are those that obtained four (4) or more criteria as illustrated in table 6.4.

Graph 7.1: Average share-prices for companies meeting four (4) or more investment criteria:



Graph 7.2: Percentage change in Average Share Price for companies meeting four (4) or more investment criteria:



7.2 The 3 Criteria Portfolio

The results of the testing when three (3) of the criteria were met are illustrated in Table 7.2 below.

Testing of the model when three (3) criteria were met revealed interesting results for the companies evaluated. The performance of PINNACLE is clearly extra-ordinary and skews the performance of the 3 Criteria Portfolio. The entry for BICAF is also extraordinary as the share price for the company has virtually been fixed for the periods used for testing of the new model – See Annexures 1 - 10. The model had a 75% successful prediction for three (3) of the four (4) periods tested and a 100% success for one period. The question that comes to mind is why did the model not identify PINNACLE in the “4+ Criteria Portfolio”? Because PINNACLE does not pay dividends it was effectively excluded from this criterion and could well have been included in the “4+ Criteria Portfolio”. The share price of PINNACLE also started from a very low base where relatively small rand (or cent) value changes can result in large percentage gains.

Graph 7.3 Average share-prices for companies meeting three (3) investment criteria:

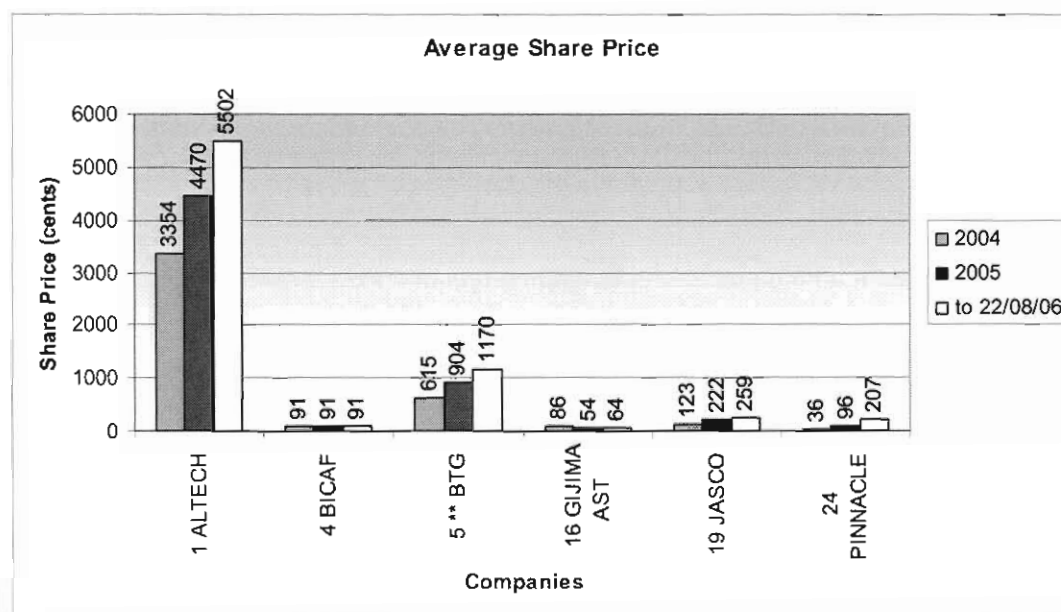


Table 7.2 3 Criteria Performance

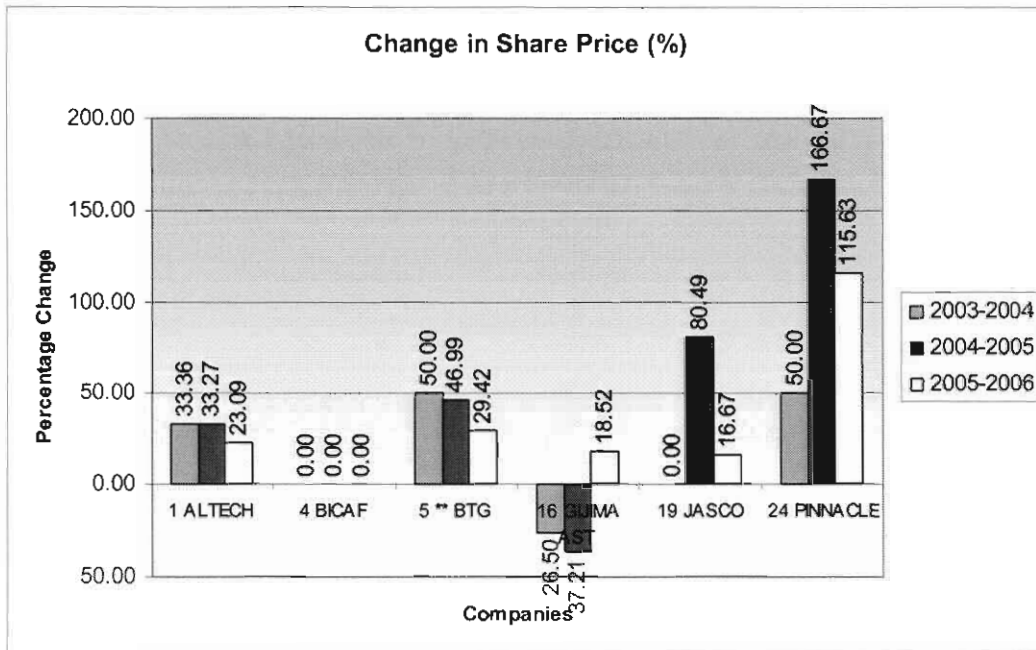
3 Criteria ¹⁵	Average share price per year				% Change in average share price			
	2003	2004	2005	2006 - to 22/08	03-'04	04-'05	05-'06	04-'06
1 ALTECH	2515	3354	4470	5502	33.36	33.27	23.09	64.04%
4 BICAF	91	91	91	91	0.00	0.00	0.00	0.00%
5 BTG	410	615	904	1170	50.00	46.99	29.42	90.24%
16 GIJIMA AST	117	86	54	64	26.50	37.21	18.52	-25.58%
19 JASCO	123	123	222	259	0.00	80.49	16.67	110.57%
24 PINNACLE	24	36	96	207	50.00	166.67	115.63	475.00%
Average Change								59.82% ¹⁶

Source:Own

¹⁵ The companies represented in the table are those that obtained three (3) criteria as illustrated in table 6.4.

¹⁶ Calculation of Average Change in share price excluded extraordinary performances of BICAF and PINNACLE

Graph 7.4 Percentage change in Average Share Price for companies meeting three (3) investment criteria:



1.7 The 2- Criteria Portfolio

The results of the testing when two (2) or less of the criteria were met are illustrated in Table 7.3 below.

The predictive success for the new model when only two (2) or less criteria were met ranges between 64.71% and 88.24%. When evaluating the information in Table 7.3 the performance of several companies stands out that influences the average change in share price for this group. CONTROL, DIGICORE, FARITEC and SETHOLD showed extraordinary growth in their share price – again, these companies pay little or no dividends and this criterion could well have placed them in the “3 Criterion Portfolio”. The average change in share price for this ‘portfolio’ would have been 70.83% if the extra-ordinary performances of the mentioned companies were included. With these shares excluded, the average return on the portfolio was 29.05%. Another encouraging aspect of the model is that five (5) of the seven (7) worst performing shares was

Table 7.3 2- Criteria Performance

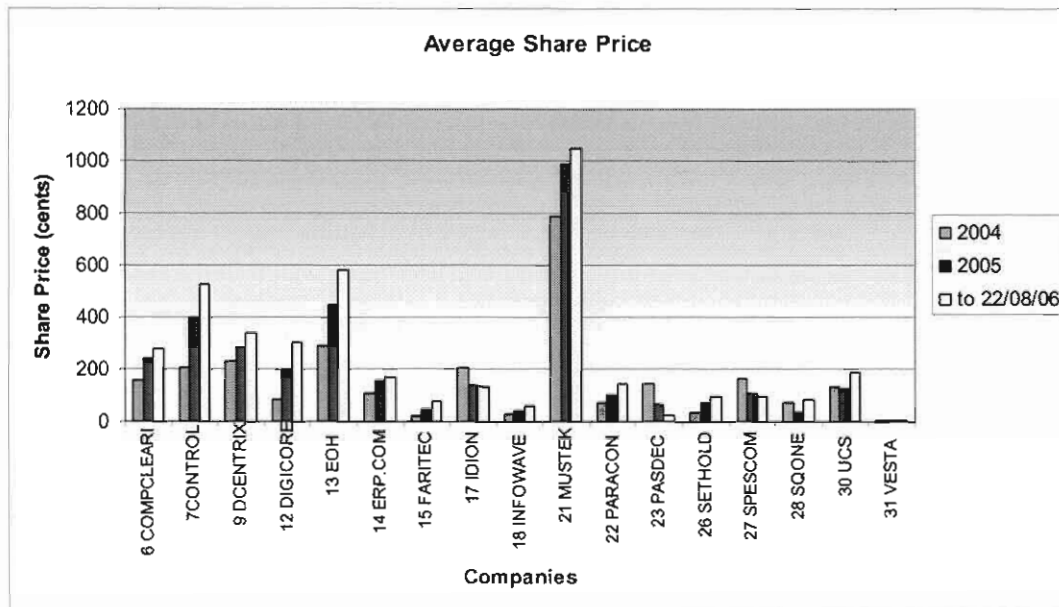
2-Criteria¹⁷:								
	Average share price per year				%Change in average share price			
	2003	2004	2005	2006to22/08	03-'04	04-'05	05-'06	04-'06
6 COMPCLEARI	125	155	243	276	24.00	56.77	13.58	78.06%
7CONTROL	104	204	400	529	96.15	96.08	32.25	159.31%
9 DCENTRIX	146	229	284	341	56.85	24.02	20.07	48.91%
12 DIGICORE	30	83	202	303	176.67	143.37	50.00	265.06%
13 EOH	170	293	449	579	72.35	53.24	28.95	97.61%
14 ERP.COM	63	111	159	171	76.19	43.24	7.55	54.05%
15 FARITEC	30	25	49	77	16.67	96.00	57.14	208.00%
17 IDION	205	209	137	136	1.95	34.45	0.73	-34.93%
18 INFOWAVE	25	33	45	59	32.00	36.36	31.11	78.79%
21 MUSTEK	568	789	989	1050	38.91	25.35	6.17	33.08%
22 PARACON	52	73	101	146	40.38	38.36	44.55	100.00%
23 PASDEC	103	147	64	27	42.72	56.46	57.81	-81.63%
26 SETHOLD	27	34	72	100	25.93	111.76	38.89	194.12%
27 SPESCOM	100	161	109	99	61.00	32.30	9.17	-38.51%
28 SQONE	120	75	39	82	37.50	48.00	110.26	9.33%
30 UCS	65	132	125	190	103.08	5.30	52.00	43.94%
31 VESTA	4	9	6	8	125.00	33.33	33.33	-11.11%
Average Change								29.05%¹⁸

¹⁷ The companies represented in the table are those that obtained two (2) or less criteria as illustrated in table 6.4.

¹⁸ Calculation of Average Change in share price excluded extraordinary performances of CONTROL, DIGICORE, FARITEC and SETHOLD.

successfully identified and excluded from the "4+ and 3 Criterion Portfolios". In essence this suggests a 71.4% negative exclusion ratio. These shares are IDION, PASDEC, SPESCOM, SQONE and VESTA.

Graph 7.5 Average share-prices for companies meeting two (2) or less investment criteria:

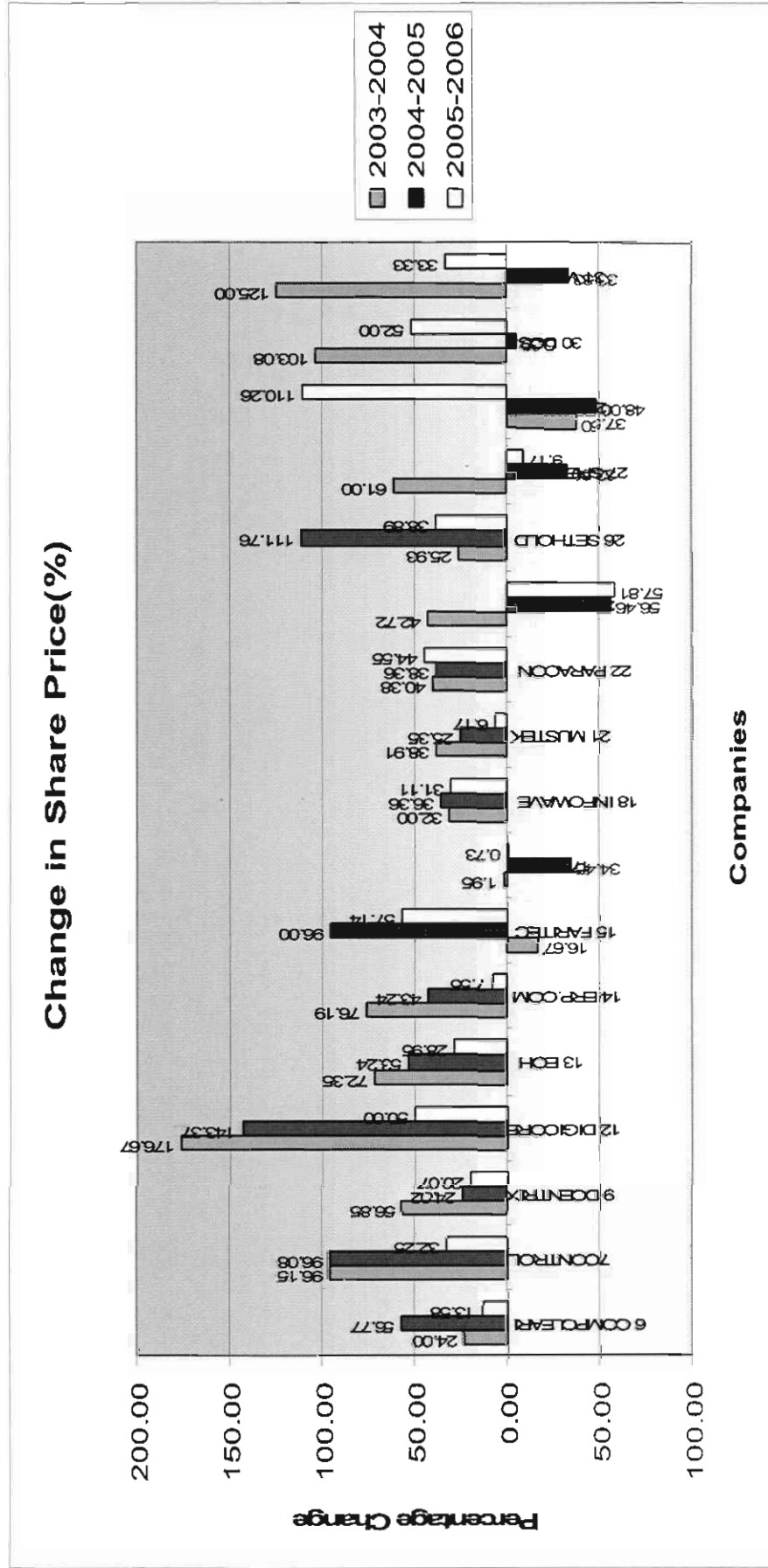


Summary

The model was tested using all the companies identified in order to establish whether the model would reliably and at a high success rate identify those companies whose share would out perform other shares.

The predictive value of the model was 79% when four (4) or more criteria were met. Secondly the ability of the new analysis model to identify the worst performing shares (71.4%) in the sector was very encouraging.

Graph 7.6 Percentage change in Average Share Price for companies meeting two (2) or less investment criteria:



CHAPTER 8

GENERAL CONCLUSIONS

The first five (5) chapters of this study dealt with the theoretical aspects of investments, shares investments and technology driven organizations. An effort was made to address the topics as thoroughly as possible without making the discussions overly technical. From the perspective of the private investor these topics can be considered essential and the fundamentals that have been dealt with are indispensable for success when buying and selling shares.

This study concludes that sector specific analysis of share performance results in a higher rate of successfully identifying the best performing shares in sectors driven by technology. Although this general assumption was made at the start of the study it was insightful to get confirmation by meeting the primary objective of the study. Meeting the stringent secondary objective of the study was always going to be difficult. The model has however been able meet this objective with a 87.5% successful prediction success rate when four (4) or more investment criteria was met.

The model proposed can thus be considered helpful when evaluating the shares of companies in technology driven sectors on the Johannesburg Stock Exchange.

Recommendation for further studies

- Due to the uniqueness of most sectors within the economy it is suggested that this process be followed for other sectors.
- This study was based on shares listed only on the Johannesburg Stock Exchange. Similar application to the technology driven sectors of companies listed on other international stock exchanges might be of

value for the investor interested in off-shore diversification of his portfolio. This can be of particular importance during a slow-down of the local economy and in view of decreases in monetary controls by the South African Reserve Bank.

- Addition of Qualitative based criteria might add value to this model and other available investment criteria based models
- Application of the model in the different sub-sectors of the technology driven sectors.

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2005

Annexure 1

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	ΔIn SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	40.11	1.53	9.49	12.78	767.86	174.00	4470.00	345.00	919000.00	12.25	7811.00	1.69	0.13	41.70	62.94	0.12	43.74	0.96
ALTRON	26.88	1.16	8.66	10.38	1644.88	63.00	1910.00	670.00	1781000.00	15.97	0.00	4.61	0.45	14.26	110.79	0.76	20.80	1.70
BCX	34.74	1.33	8.94	6.28	353.40	0.00	529.00	279.00	1025869.00	119.01	850.00	0.93	0.89	5.73	54.03	0.12	9.66	4.37
COMPAREX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BICAF	-	-	-	-	-	-	-	30.00	-	-	-	-	-	-	2564.16	0.46	-	-
BTG	545.68	32.45	8.05	8.85	13.72	32.00	904.00	285.00	110000.00	32.11	8544.00	0.73	0.92	142.53	96.98	0.63	11.57	2.53
COMPCLEAR	18.92	0.27	26.36	15.51	76.67	18.00	243.00	76.00	34225.00	2.50	344.00	0.06	0.16	8.17	1.96	0.19	2.01	0.42
CONTROL	25.64	1.69	10.26	18.27	144.20	6.00	400.00	238.00	107300.00	2.75	13956.00	0.30	2.13	17.37	3.43	0.44	3.65	0.35
DATATEC	22.31	1.63	1.38	40.61	1289.63	0.00	1367.00	985.00	1898613.00	152.50	446.00	3.10	0.02	1.66	51.53	0.76	2.98	10.69
DCENTRIX	30.31	0.93	8.86	10.74	85.63	9.00	284.00	9.00	197451.00	30.92	8471.00	0.17	0.00	28.34	30.35	0.01	3.50	0.66
DELTA	108.86	0.96	16.42	16.32	1952.24	639.00	3837.00	150.00	1617534.00	9.69	221.00	0.83	0.03	9.00	113.25	0.50	25.73	12.64
DIDATA	8.29	2.85	3.11	48.54	124.67	0.00	419.00	48.00	1696095.00	53.45	2614.00	0.09	3.46	9.72	12.48	0.19	1.15	3.04
DIGICORE	37.80	1.00	24.95	6.87	44.45	4.00	202.00	114.00	106375.00	72.95	16035.00	0.10	0.35	16.21	37.10	0.85	2.72	0.70
EOH	1098.49	60.64	9.73	7.72	5.29	11.50	449.00	50.00	12850.00	26.17	4156.00	0.47	0.09	93.19	13.71	0.38	6.97	37.93
ERP.COM	58.80	1.32	22.69	10.58	27.42	8.00	159.00	22.00	62125.00	9.15	734.00	0.08	-	25.43	17.12	0.51	2.00	0.41
FARITEC	15.21	2.43	1.18	18.85	31.03	0.00	49.00	40.00	29585.00	130.23	0.00	0.06	0.42	33.58	7.55	0.07	0.34	0.15
GUJIMA AST	70.12	16.65	4.42	2.93	0.93	0.00	54.00	1.00	137396.00	282.56	780376.00	0.01	1.03	100.88	10.98	0.01	2.03	1.49
IDION	44.95	9.18	3.03	30.53	10.31	0.00	137.00	32.00	37500.00	47.95	736.00	0.05	1.65	49.56	0.76	1.36	0.49	0.88
INFOWAVE	67.67	0.81	25.55	6.21	8.95	3.00	45.00	13.00	10230.00	5.45	6551.00	0.03	-	11.04	4.08	0.30	0.75	0.30
JASCO	41.13	1.13	8.55	13.44	57.39	6.00	222.00	42.00	55545.00	51.49	0.00	0.18	0.01	42.51	9.84	0.72	2.10	0.12
MTN GROUP	92.62	1.49	34.15	7.89	684.19	106.00	4829.00	1666.00	13009000.00	182.44	6515.00	5.87	0.48	40.48	4219.88	1.53	96.10	47.81
MUSTEK	22.71	2.16	8.20	11.22	423.08	85.00	989.00	4.00	489871.00	24.69	3077.00	0.46	1.02	0.34	60.02	0.80	11.66	1.77
PARACON	26.60	0.35	8.53	12.33	32.15	0.00	101.00	25.00	123604.00	45.76	4074.00	0.09	-	-	10.12	0.52	1.11	0.10
PASDEC	73.39	2.29	3.80	0.41	287.13	0.00	64.00	85.00	51925.00	15.71	0.00	1.03	1.38	56.32	28.69	0.02	14.75	15.39
PINNACLE	35.30	1.92	5.34	5.70	60.71	0.00	96.00	102.00	96778.00	-	7237.00	0.16	0.19	22.03	9.17	0.69	0.00	0.96
REUNERT	83.10	3.36	15.65	10.47	459.93	222.00	4209.00	1520.00	1123800.00	46.31	2608.00	1.88	0.13	62.03	313.62	0.38	52.39	10.30
SETHOLD	66.57	6.06	15.48	10.40	10.58	2.00	72.00	32.00	13096.00	44.23	35510.00	0.05	1.89	217.82	3.04	0.29	0.97	0.25
SPESCOM	81.04	2.58	1.63	2.96	53.22	0.00	109.00	63.00	51027.00	42.79	8.00	0.30	0.52	97.77	23.26	0.11	4.66	3.57
SQONE	44.61	13.23	3.38	6.91	22.27	0.00	39.00	29.00	1817.00	161.11	6101.00	0.09	2.90	61.72	1.69	0.05	1.21	0.82
TELKOM	32.04	1.52	27.69	8.82	4170.84	900.00	11877.00	3525.00	26324000.00	47.53	20380.00	4.34	1.06	8.52	2905.41	0.92	164.40	45.63
UCS	60.78	2.97	11.01	9.38	26.38	4.30	125.00	53.00	90548.00	21.85	2404.00	0.11	1.41	10.19	15.20	0.56	1.87	0.62
VESTA	34.84	1.31	10.12	8.57	1.70	0.00	6.00	3.00	1603.00	16.67	0.00	0.01	-	46.55	0.39	1.02	0.09	0.03

Annexure 2

2004

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ In SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	22.03	0.57	11.27	10.04	1317.19	125.00	3354.00	1535.00	1547000.00	11.72	7.00	1.48		11.45	122.81	0.42	32.90	0.64
ALTRON	18.56	0.78	8.64	8.05	1918.49	52.00	1292.00	560.00	2013000.00	6.96	0.00	2.92	0.10	12.85	57.29	0.03	15.14	2.22
BCX	40.75	1.27	6.59	10.64	334.24	0.00	382.00	341.00	812465.00	-	-	1.41	0.89	-	-	-	3.73	0.09
COMPAREX	-	-	-	-	-	-	-	490.00	-	-	-	-	-	-	-	-	-	-
BICAF	103.59	2.10	5.06	0.05	1291.92	0.00	-	0.00	416632.00	177.00	40.00	13.38	-	38.41	3302.20		144.18	144.18
BTG	223.83	18.01	8.09	8.38	32.26	22.00	615.00	300.00	33192.00	6.22	1156.00	0.39	0.94	412.06	71.51	0.50	7.40	1.25
COMPCLEARI	25.30	0.49	25.91	9.81	70.88	6.00	155.00	9.00	34638.00	0.62	190.00	0.01	0.18	1.53	2.80	1.11	1.74	0.19
CONTROL	27.44	1.39	10.45	9.76	122.86	4.50	204.00	125.00	63314.00	1.75	11979.00	0.27	1.04	49.56	8.28	0.51	3.17	1.13
DATATEC	6.56	2.11	0.68	35.07	1311.46	0.00	1209.00	365.00	1957220.00	35.29	234.00	0.94	0.11	15.18	663.22	0.47	4.79	16.88
DCENTRIX	30.17	1.03	8.02	10.58	66.72	0.00	229.00	81.00	161183.00	5.05	5909.00	0.13	0.04	14.98	21.34	0.31	2.25	0.04
DELTA	6.14	0.62	13.49	14.99	1791.04	88.50	3525.00	410.00	900038.00	40.24	413.00	0.18	0.14	2.39	62.18	0.35	24.05	11.20
DIDATA	3.18	2.10	2.00	63.45	138.10	0.00	446.00	35.00	1875812.00	130.05	445.00	0.06	8.75	9.66	21.18	1.42	0.63	3.83
DIGICORE	35.44	0.53	18.97	5.41	38.25	8.00	83.00	108.00	101335.00	62.67	7822.00	0.07	0.05	3.60	67.06	0.15	1.33	0.50
EOH	53.50	2.88	8.37	6.80	77.63	10.00	293.00	220.00	42306.00	35.87	3556.00	0.31	0.89	78.79	6.58	0.11	4.66	1.73
ERP.COM	60.12	1.63	26.55	7.68	21.86	0.00	111.00	66.00	53725.00	23.48	448.00	0.05	-	6.69	14.64	0.56	1.55	0.44
FARITEC	46.38	1.54	3.69	2.91	23.23	0.00	25.00	3.00	19540.00	272.00	3640.00	0.10	0.22	35.93	23.92	0.58	0.94	1.19
GIJIMA AST	59.12	3.84	3.00	7.91	106.19	0.00	86.00	41.00	7394.00	15.69	116980.00	0.62	35.76	286.71	94.19	0.11	0.94	1.80
IDION	58.81	4.25	9.38	22.19	20.44	0.00	209.00	29.00	43797.00	30.48	1756.00	0.12	0.67	108.57	6.95	0.73	0.80	1.29
INFOWAVE	73.33	0.71	25.90	5.27	8.06	0.00	33.00	6.00	10343.00	19.12	1510.00	0.00	-	41.40	2.99	0.19	0.60	0.27
JASCO	16.80	2.27	6.72	2.50	40.27	0.00	123.00	85.00	44824.00	42.07	20919.00	0.03	0.04	40.45	0.56	0.76	3.66	2.43
MTN GROUP	39.06	1.13	29.22	12.32	487.04	0.00	3196.00	1520.00	8449000.00	75.10	6744.00	1.46	0.65	56.66	1462.41	1.05	28.73	3.23
MUSTEK	10.69	1.85	11.53	10.28	421.64	50.00	789.00	223.00	455714.00	38.92	4133.00	0.04	1.25	2.61	136.94	0.67	7.90	0.01
PARACON	22.13	0.37	8.32	13.39	27.51	0.00	73.00	44.00	118752.00	40.48	4803.00	0.03	-	1.64	2.66	0.20	0.64	0.09
PASDEC	340.28	6.99	2.23	1.04	183.68	2.50	147.00	35.00	16772.00	212.62	0.00	1.30	1.23	238.46	34.69	0.05	14.77	16.24
PINNACLE	20.45	1.37	3.49	2.47	49.75	0.00	36.00	15.00	88076.00		450.00	0.08	0.38	17.97	5.20	0.43	0.00	0.36
REUNERT	89.93	4.31	14.09	10.00	283.86	160.00	2716.00	1559.00	611000.00	51.23	17080.00	0.87	-	34.77	558.19	0.10	30.23	3.07
SETHOLD	41.69	3.86	11.97	6.15	8.98	1.50	34.00	21.00	35451.00	44.44	6733.00	0.02	0.38	20.86	3.88	2.39	0.57	0.23
SPESCOM	220.55	6.62	14.17	2.46	26.91	0.00	161.00	6.00	30518.00	25.20	14479.00	0.62	0.74	158.32	65.09	0.26	6.87	5.26
SQONE	3.85	4.97	1.06	10.00	58.18	0.00	75.00	84.00	3617.00	53.85	0.00	0.01	9.91	80.57	1.89	1.02	0.39	0.36
TELKOM	24.45	1.41	24.53	8.37	3843.49	200.00	8066.00	2800.00	21478000.00	175.03	3186.00	7.35	1.71	20.66	1564.66	0.60	94.07	13.41
UCS	50.93	3.13	9.96	10.42	23.94	4.30	132.00	10.00	80523.00	15.53	17480.00	0.08	1.75	18.24	5.07	0.64	1.30	0.02
VESTA	120.04	2.15	7.70	20.00	1.16	0.00	9.00	1.00	1148.00	71.43	0.00	0.01	-	604.35	1.20	2.81	0.07	0.02

Annexure 3

2003

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ in SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	55.17	0.70	11.57	6.37	1181.87	150.00	2515.00	720.00	1377431.00	27.60	245.00	4.60	0.06	64.67	65.60	0.38	35.67	10.52
ALTRON	31.42	0.94	8.82	5.56	1699.99	43.00	911.00	225.00	1796044.00	15.37	26.00	4.01	0.30	6.18	65.48	0.15	15.58	6.47
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	5.73	0.40	3.36	9.47	757.21	0.00	715.00	435.00	2230324.19	4.10	0.00	0.40	4.09	6.92		0.24	64.96	6.50
BICAF	81.95	1.02	24.96	0.03	2097.61	0.00	91.00	30.00	672053.00	230.83	370.00	17.19	-	188.48	1480.15	0.27	179.25	178.34
BTG	133.33	8.31	6.24	5.54	6.30	16.00	410.00	105.00	75532.00	14.20	764.00	0.61	1.40	105.00	4.95	0.28	7.55	3.45
COMPCLEARI	18.48	0.30	28.61	9.32	71.98	3.00	125.00	25.00	31219.00	37.61	2414.00	0.07	0.20	5.73	0.36	0.25	1.68	0.43
CONTROL	34.55	1.43	7.76	5.17	82.15	2.50	104.00	73.00	67932.00	110.29	11508.00	0.25	0.79	0.23	4.07	0.79	2.98	1.94
DATATEC	44.55	1.87	0.86	5.99	1546.12	0.00	646.00	700.00	2286000.00	125.66	382.00	7.37	0.14	32.03	1051.89	1.24	7.09	13.55
DCENTRIX	36.50	1.43	8.52	5.92	58.03	0.00	146.00	48.00	126215.00	30.54	10782.00	0.21	0.31	22.30	16.15	0.10	2.27	0.81
DELTA	24.23	0.69	16.50	10.04	1749.24	195.00	4112.00	1060.00	904062.00	24.21	0.00	2.27	0.11	7.90	38.68	0.44	38.53	2.59
DIDATA	2.72	1.92	0.40	18.29	152.87	0.00	330.00	56.00	2218578.00	179.75	42515.00	0.08	4.48	32.10	8.48	2.29	2.01	5.31
DIGICORE	24.21	0.29	18.16	3.47	39.68	2.00	30.00	24.00	97801.00	4.17	10798.00	0.08	0.11	15.32	180.33	0.23	0.78	0.48
EOH	67.45	2.31	10.43	4.92	43.42	6.00	170.00	38.00	25188.00	20.23	0.00	0.22	0.33	112.63	6.43	0.31	3.28	1.58
ERP.COM	53.75	1.23	21.33	6.17	20.49	0.00	63.00	61.00	44652.00	59.72	4643.00	0.06	-	36.51	10.08	0.55	1.20	0.57
FARITEC	26.52	1.68	2.30	5.20	36.26	0.00	30.00	14.00	35088.00	61.54	1.00	0.10	0.10	47.01	8.21	0.10	0.52	0.22
GIJIMA AST	90.47	5.07	1.35	1.76	27.46	0.00	117.00	175.00	23571.00	150.75	9806.00	2.11	2.54	148.51	199.01	8.33	1.06	2.23
IDION	128.28	11.46	8.87	21.81	9.80	0.00	205.00	81.00	43633.00	650.00	100.00	0.13	1.97	488.89	5.91	0.66	1.09	0.96
INFOWAVE	107.21	1.50	25.45	3.24	5.70	0.00	25.00	7.00	8221.00	28.30	1640.00	0.07	0.01	54.73	9.01	0.92	0.71	0.46
JASCO	67.98	2.58	13.02	2.64	67.62	11.00	123.00	81.00	43664.00	110.14	300.00	0.35	0.02	88.51	37.25	0.30	6.05	4.82
MTN GROUP	32.25	1.56	24.38	8.19	310.88	0.00	1746.00	1625.00	4502000.00	111.22	11621.00	1.00	0.94	122.68	332.43	0.52	15.70	1.76
MUSTEK	26.12	1.85	10.37	4.37	432.92	25.00	568.00	218.00	445519.00	21.12	6522.00	0.62	0.86	12.75	107.40	0.64	12.38	6.70
PARACON	12.89	0.28	6.50	11.19	27.97	0.00	52.00	2.00	119777.00	57.14	14762.00	0.01	-	22.25	5.28	0.50	0.44	0.08
PASDEC	40.34	2.47	13.26	0.83	54.27	0.00	103.00	30.00	92920.00	487.32	0.00	0.37	2.37	46.00	11.53	0.03	12.55	11.52
PINNACLE	9.46	1.22	3.68	2.92	42.17	0.00	24.00	24.00	78025.00	-	0.00	0.03	0.71	19.63	8.30	1.41	0.00	0.24
REUNERT	49.25	2.61	18.27	9.41	435.16	120.00	1810.00	214.00	848900.00	20.04	1591.00	1.00	-	17.77	407.95	0.44	19.13	1.03
SETHOLD	40.11	4.89	10.73	7.50	7.43	0.00	27.00	4.00	30614.00	44.62	59996.00	0.02	0.96	44.59	1.02	0.13	0.38	0.11
SPESCOM	89.22	9.44	3.53	2.20	46.14	0.00	100.00	81.00	19364.00	145.20	0.00	0.48	1.66	57.56	17.98	0.97	5.26	4.26
SQONE	44.22	8.00	7.40	15.38	32.22	0.00	120.00	20.00	3461.00	79.37	0.00	0.13	3.33	310.86	1.78	0.06	0.81	0.39
TELKOM	11.51	1.89	20.65	9.09	3185.45	0.00	4097.00	4125.00	17984000.00	24.32	0.00	3.52	3.34	8.37	2294.42		32.74	8.23
UCS	12.09	3.10	8.99	7.96	29.28	3.80	65.00	65.00	81634.00	5.50	18120.00	0.00	3.80	41.68	14.55	0.24	1.07	0.42
VESTA	581.22	16.13	6.60	0.95	0.23	0.00	4.00	4.00	335.00	142.00	0.00	0.01	0.01	85.53	1.42	0.80	0.22	0.18

2002

Annexure 4

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ in SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	30.06	1.23	14.70	7.61	717.74	100.00	2202.00	170.00	874941.00	20.17	13.00	1.37	0.10	24.40	351.39	0.10	22.88	0.86
ALTRON	20.91	1.16	7.58	5.94	1601.07	37.00	803.00	65.00	1679946.00	27.59	3096.00	3.25	1.13	10.53	117.47	0.01	11.05	3.02
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	0.25	1.22	0.09	44.53	708.18	0.00	761.00	610.00	2085908.78	409.95	36608.00	0.29	2.83	26.50		0.00	17.15	7.78
BICAF	72.42	1.99	19.67	0.19	727.13	33.60	95.00	40.00	222832.00	740.78	322.00	5.27		285.36	25.03	0.19	44.33	43.38
BTG	33.21	3.22	5.08	5.87	123.83	12.00	403.00	18.00	273170.00	1319.23	450675464.00	0.31	1.25	3510.20	42.66	0.44	5.41	1.38
COMPCLEAR	18.91	0.20	25.35	11.28	68.08	2.50	128.00	5.00	29062.00	6.40	1111.00	0.10	0.25	0.12	0.74	0.30	1.00	0.28
CONTROL	13.17	1.21	6.78	7.21	81.96	2.00	68.00	42.00	64275.00	302.99	0.00	0.09	0.85	11.03	3.03	0.71	1.16	0.48
DATATEC	23.62	1.74	2.84	6.80	2274.68	0.00	1427.00	1325.00	3307000.00	18.51	8680.00	5.63	0.05	18.29	868.62	0.55	22.61	8.34
DCENTRIX	32.60	1.58	5.60	5.39	47.45	0.00	98.00	36.00	98070.00	47.79	25751.00	0.16	0.26	142.46	1.30	0.11	1.42	0.44
DELTA	32.53	0.61	27.95	10.75	1621.20	195.00	5045.00	700.00	857831.00	8.82	0.00	3.35	0.00	27.87	96.99	0.11	41.60	8.85
DIDATA	31.41	2.21	3.12	11.61	225.15	0.00	626.00	1039.00	3124990.00	79.01	665.00	0.91	2.75	25.00	2.50	0.82	2.06	4.20
DIGICORE	13.78	0.38	13.73	3.89	34.41	0.00	29.00	10.00	82138.00	33.33	2246.00	0.05	0.01	24.76	631.13	0.38	0.61	0.32
EOH	129.38	5.57	13.31	4.39	20.42	6.00	113.00	46.00	12278.00	27.80	0.00	0.20	0.40	24.87	3.94	0.12	2.24	1.11
ERP.COM	44.35	0.94	16.11	7.08	15.01	0.00	36.00	8.00	28088.00	53.19	2113.00	0.05	-	46.73	4.20	0.07	0.61	0.25
FARITEC	20.10	1.00	7.31	6.54	68.43	0.00	85.00	13.00	81249.00	44.44	10555.00	0.14	0.06	17.62	2.03	0.44	1.11	0.26
GLJIMA AST	3945.50	327.06	6.79	4.83	11.05	0.00	793.00	2030.00	54766.00	23.28	2093.00	1.67	1.33	416.36	29.12	0.60	1.72	6.21
IDION	2461.57	55.69	4.25	105.71	2.52	0.00	110.00	25.00	36687.00	104.40	685.00	0.62	0.25	306.56	20.24	0.69	0.12	0.98
INFOWAVE	43.17	0.36	25.12	3.77	12.59	0.00	24.00	5.00	11012.00	178.95	1300.00	0.05	0.05	74.62	1.64	0.44	0.45	0.21
JASCO	60.47	6.90	7.54	2.36	35.87	0.00	104.00	121.00	17507.00	163.89	1635.00	0.21	0.00	792.29	1.38	0.01	2.35	1.31
MTN GROUP	65.48	3.14	22.67	18.88	139.61	0.00	1228.00	85.00	1414100.00	4.30	20193.00	1.27	1.66	65.24	1704.49	0.39	6.08	6.20
MUSTEK	16.33	1.99	8.71	3.55	383.98	0.00	384.00	185.00	352042.00	75.00	9203.00	0.57	0.82	28.44	32.46	0.23	8.36	4.52
PARACON	30.17	0.39	9.38	5.41	22.88	0.00	61.00	2.00	95686.00	3.16	10065.00	0.04	-	5.15	13.53	0.39	0.84	0.23
PASDEC	42.86	5.76	8.79	6.34	100.50	0.00	144.00	40.00	25556.00	159.77	0.00	0.20	3.95	16.30	0.72	0.07	1.75	0.31
PINNACLE	13.47	2.04	3.09	2.27	35.25	0.00	13.00	1.00	69310.00	-	537.00	0.05	0.91	17.03	7.82	0.01	0.00	0.13
REUNERT	50.81	2.83	11.09	8.37	369.49	118.00	1922.00	40.00	710400.00	30.40	375.00	0.87	-	8.53	94.02	0.13	19.58	0.36
SETHOLD	93.57	2.74	10.81	3.38	13.41	0.00	25.00	5.00	34122.00	309.68	7040.00	0.13	0.50	504.05	8.78	0.36	0.55	0.30
SPESCOM	105.72	4.55	11.03	0.46	108.73	0.00	81.00	111.00	57623.00	449.53	3061.00	1.15	0.02	1521.31	80.31	0.01	9.51	10.32
SQONE	161.59	13.58	7.43	3.97	15.28	0.00	150.00	10.00	4119.00	617.81	0.00	0.26	0.27	17.58	7.39	0.05	3.23	1.73
TELKOM	17.93	2.19	16.98	0.00	2939.33	0.00	-	-	16796000.00	32.77	0.00	5.28	3.59	13.73	4155.05		35.40	35.40
UCS	14.46	0.66	18.45	5.78	50.21	1.80	72.00	20.00	131365.00	3.54	23162.00	0.03	1.45	13.13	0.76	0.28	0.93	0.21
VESTA	146.54	3.24	9.54	1.40	1.59	0.00	21.00	7.00	1343.00	1150.00	0.00	0.02	0.11	120.60	32.27	1.26	0.43	0.64

Annexure 5

2001

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	ΔIn SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	32.32	1.35	12.39	9.52	576.98	100.00	2312.00	20.00	614784.00	45.53	511.00	1.12	0.11	0.33	193.84	0.56	19.64	3.48
ALTRON	24.21	1.12	7.55	7.68	1448.51	31.00	801.00	150.00	1434321.00	18.57	25.00	3.09	0.85	11.53	117.19	0.36	8.93	0.92
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	11.37	0.85	7.13	12.93	963.49	0.00	1066.00	335.00	3190626.04	123.40	0.00	0.89	3.01	8.58		0.35	0.76	9.90
BICAF	60.86	1.23	13.77	0.81	188.69	0.00	48.00	2.00	54228.00	1036.36	0.00	1.15	-	156.79	43.04	0.02	5.44	4.96
BTG	39.60	2.90	5.01	3.08	3.43	0.00	377.00	50.00	185719.00	76.15	401202900.00	0.00	0.77	127.93	25.58	21.83	0.46	4.23
COMPCLEA	21.05	0.10	27.65	8.64	68.16	2.20	113.00	10.00	27950.00	10.62	4489.00	0.12	-	9.30	1.15	0.33	1.10	0.03
CONTROL	3.47	1.27	1.08	10.30	73.82	0.00	74.00	47.00	58901.00	198.53	0.00	0.03	12.48	22.73	27.28	0.13	0.59	1.33
DATATEC	49.43	2.30	5.82	6.22	1923.05	0.00	1844.00	1510.00	2634000.00	7.51	9752.00	10.06	0.04	65.40	272.70	2.47	28.63	10.19
DCENTRIX	41.51	3.63	6.35	7.96	19.57	0.00	90.00	11.00	38420.00	2.73	2543.00	0.10	1.03	11.07	3.16	0.51	0.99	0.09
DELTA	35.58	0.85	26.27	11.42	1267.87	169.00	4347.00	1710.00	700332.00	37.34	0.00	2.86	0.00	26.34	3.18	0.33	39.44	4.03
DIDATA	25.05	2.57	8.66	9.25	300.18	0.00	2542.00	3490.00	3880910.00	1.20	140722.00	0.79	2.21	49.15	16.51	2.26	10.15	15.27
DIGICORE	45.24	0.55	14.52	3.33	27.58	0.00	33.00	4.00	65813.00	2060.00	0.00	0.12	0.05	69.20	644.88	0.06	0.95	0.62
EOH	82.74	2.33	16.19	4.05	27.18	0.00	96.00	12.00	13012.00	27.33	460.00	0.22	0.00	1.56	6.09	0.20	1.80	0.84
ERP.COM	48.30	0.89	15.36	3.83	10.23	0.00	21.00	11.00	17007.00	4.44	0.00	0.05	-	83.99	2.86	0.65	0.41	0.20
FARITEC	15.83	1.07	5.67	4.44	58.18	0.00	42.00	33.00	79442.00	4.65	3428.00	0.09	0.04	21.59		1.02	0.79	0.37
GIJIMA AST	350.08	15.79	12.89	9.16	2.14	0.00	2535.00	550.00	110107.00	37.17	780.00	2.76	0.92	105.36	37.47	0.36	2.31	23.04
IDION	4789.70	135.28	24.27	2.89	1.22	0.00	203.00	665.00	41406.00	168.09	0.00	0.58	0.09	98.89	207.02	2.73	2.80	4.83
INFOWAVE	38.73	0.82	12.34	9.47	7.21	0.00	11.00	0.00	6389.00	120.88	0.00	0.03	0.23	64.61	1.01	1.10	0.17	0.06
JASCO	762.78	34.23	0.82	0.81	4.02	0.00	32.00	3.00	1897.00	305.71	0.00	0.80	0.07	98.03	42.79	0.83	3.80	4.12
MTNGROUP	96.49	4.40	26.21	25.53	84.49	10.00	1818.00	1160.00	700400.00	46.94	371112.00	0.76	1.77	44.67	334.83	1.08	6.56	11.62
MUSTEK	9.56	1.86	6.51	3.02	298.95	0.00	201.00	195.00	308300.00	21.57	0.00	0.23	0.08	3.75	8.18	0.13	4.93	2.92
PARACON	39.51	0.52	11.46	5.37	21.76	0.00	56.00	69.00	86832.00	41.79	23307.00	0.10	-	12.75	14.22	1.01	0.84	0.28
PASDEC	126.91	7.63	10.51	4.96	120.07	0.00	126.00	110.00	14602.00	55.91	0.00	0.33	4.71	38.07	22.21	0.11	3.02	4.28
PINNACLE	2.25	1.67	2.09	20.00	30.12	0.00	5.00	5.00	63720.00	-	3104.00	0.01	1.76	2.69	10.49	0.82	0.00	0.05
REUNERT	33.64	1.87	10.67	9.34	403.94	91.00	1629.00	630.00	748300.00	25.09	17138.00	0.45	0.01	4.07	87.49	0.28	15.49	0.80
SETHOLD	746.02	28.08	3.66	4.84	2.22	0.00	15.00	4.00	19828.00	153.45	9180.00	0.17	2.56	87.44	37.96	3.07	0.27	0.42
SPESCOM	778.44	48.25	9.67	8.34	7.65	0.00	228.00	85.00	9883.00	206.73	1132.00	0.74	0.02	72.79	9.78		2.81	0.53
SQONE	27.12	10.56	3.09	17.95	18.54	0.00	202.00	89.00	4078.00	142.94	0.00	0.07	1.39	61.53	0.43	0.00	0.64	2.66
TELKOM	2.10	2.46	17.09	0.00	2584.41	0.00			15022000.00	1.92	0.00	0.43	5.58	1.65	1980.74		27.51	27.51
UCS	20.23	0.44	25.43	7.52	57.80	0.00	80.00	2.00	153442.00	10.32	9445.00	0.12	0.96	15.07	7.33	0.01	0.99	0.19
VESTA	239.28	1.25	8.72	25.00	7.72	0.00	15.00	122.00	7362.00	102.92	217.00	0.18	0.03	60.99	3.29	0.18	0.04	0.19

Annexure 6

2000

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δln SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	19.38	0.98	11.88	9.98	578.89	66.00	1686.00	845.00	576159.00	33.19	466.00	0.54	0.13	25.09	154.62	0.59	11.12	5.74
ALTRON	12.98	0.75	9.55	8.67	1637.35	28.00	660.00	20.00	1430617.00	13.01	142.00	0.43	0.84	6.14	20.60	0.81	6.21	0.39
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	384.31	0.54	189.33	9.92	1053.94	2950.00	1784.00	3545.00	3490153.93	15.62	0.00	1.56	1.44	33.95	-	0.56	0.74	17.10
BICAF	11.40	1.79	3.00	5.30	73.48	5.50	55.00	15.00	20165.00	126.40	125.00	0.14	14.19	33.04	23.76	0.83	0.48	1.03
BTG	259.86	5.70	5.66	2.20	12.28	0.00	964.00	1110.00	61041.00	-	1006500.00	0.00	0.01	-	326.00	0.03	1.58	11.22
COMPCLEARI	19.02	0.11	31.27	10.44	62.36	2.20	131.00	60.00	28823.00	9.71	1564.00	0.11	-	18.67	1.04	0.45	0.82	0.49
CONTROL	18.28	1.04	3.67	13.82	95.54	0.00	113.00	28.00	66028.00	54.36	0.00	0.17	0.93	12.80	13.80	0.63	0.49	0.64
DATATEC	20.54	3.42	5.98	37.46	1162.67	0.00	6732.00	7500.00	1437000.00	31.93	19047.00	2.54	1.43	35.08	303.21	1.76	25.52	41.80
DCENTRIX	62.94	3.67	9.55	26.73	17.62	0.00	124.00	224.00	32766.00	22.22	4832.00	0.11	1.08	38.86	8.29	0.88	0.80	0.44
DELTA	32.29	0.70	22.73	11.62	1003.57	130.00	2922.00	1100.00	466932.00	40.24	0.00	1.97	0.00	10.51	36.61	0.42	23.67	5.55
DIDATA	3.39	0.99	13.27	59.73	590.33	0.00	5749.00	1090.00	6836855.00	42.84	471278.00	0.07	0.64	293.76	6.45	0.99	8.47	49.02
DIGICORE	6.75	0.98	6.40	44.00	16.30	0.00	28.00	34.00	38459.00	95.05	24256.00	0.01	0.80	11.36	446.51	0.79	0.04	0.24
EOH	57.34	1.47	20.05	10.19	27.61	0.00	228.00	134.00	13934.00	31.97	1007.00	0.16	0.40	72.13	3.80	0.01	1.17	1.11
ERP.COM	54.95	1.26	16.53	8.44	5.56	0.00	43.00	76.00	9880.00	-	161399.00	0.03	-	-	-	0.24	0.33	0.10
FARITEC	13.31	0.63	7.36	15.81	47.85	0.00	106.00	285.00	68975.00	45.91	1966.00	0.06	0.19	130.27	0.26	0.67	0.62	0.44
GIJIMA AST	80.97	1.50	12.67	15.39	39.94	0.00	2557.00	990.00	347427.00	267.31	564.00	3.23	0.19	9.27	55.87	0.67	1.39	24.18
IDION	87.17	0.41	23.48	17.47	110.27	0.00	1272.00	575.00	41466.00	407.61	46348.00	0.96	0.01	371.44	1.99	1.62	3.39	9.33
INFOWAVE	241.28	1.37	31.02	1.76	4.38	0.00	12.00	3.00	4976.00	282.00	1955.00	0.11	0.09	53.30	63.13	0.65	0.66	0.78
JASCO	48.45	1.57	6.37	8.90	204.19	0.00	124.00	172.00	96329.00	66.29	1297.00	0.97	0.04	88.89	5.51	0.67	1.52	0.28
MTN GROUP	52.03	1.34	26.36	82.80	152.71	7.90	3199.00	205.00	1399700.00	101.99	585202.00	0.78	0.95	25.46	199.34	1.58	3.68	28.31
MUSTEK	16.72	1.81	6.77	4.96	288.14	0.00	316.00	642.00	292889.00	17.36	43.00	0.48	0.25	7.26	12.84	-	5.18	2.02
PARACON	26.09	0.63	14.94	24.03	24.94	0.00	154.00	5.00	105834.00	10.67	2400.00	0.07	-	9.39	4.82	0.14	0.49	1.05
PASDEC	25.33	3.13	4.01	2.64	86.96	0.00	36.00	30.00	48667.00	57.20	0.00	0.22	16.87	54.54	12.61	0.91	1.60	1.96
PINNACLE	17.52	2.25	4.31	3.24	29.33	0.00	18.00	11.00	61702.00	-	24084.00	0.05	0.91	20.75	4.60	1.53	0.00	0.18
REUNERT	37.13	1.28	12.75	8.41	388.15	76.00	1021.00	425.00	810000.00	1.54	3520.00	0.83	0.01	21.87	116.79	0.44	10.21	0.00
SETHOLD	11.70	8.85	13.54	4.48	17.68	0.00	46.00	124.00	37752.00	72.64	890.00	0.02	4.23	76.98	5.01	0.28	0.42	0.04
SPESCOM	456.03	15.14	6.25	32.02	28.11	0.00	445.00	762.00	21189.00	87.06	192.00	1.43	0.12	92.51	9.47	1.34	0.75	3.70
SQONE	35.16	5.09	5.12	12.94	48.19	0.00	220.00	119.00	10601.00	-	22000.00	0.17	0.21	-	-	-	1.23	0.97
TELKOM	5.10	2.02	17.93	0.00	2627.68	0.00	-	-	15027000.00	26.79	0.00	1.32	4.57	1.71	1331.07	-	22.25	22.25
UCS	25.50	0.54	36.22	11.98	50.23	0.00	234.00	223.00	136975.00	3.08	49110.00	0.13	0.88	21.18	5.93	0.79	0.91	1.43
VESTA	67.51	0.67	51.42	13.80	19.79	0.00	189.00	50.00	16777.00	44.21	2621.00	0.13	0.03	7.97	20.57	0.37	0.99	0.90

Annexure 7

1999

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ in SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	32.05	0.89	14.87	10.81	772.79	55.00	1387.00	165.00	742469.00	86.95	512.00	1.23	0.10	88.55	91.30	0.21	7.72	6.15
ALTRON	22.11	0.72	13.12	6.17	1744.42	33.00	697.00	125.00	1510420.00	25.67	36.00	2.12	0.28	72.71	52.14	0.71	6.60	0.37
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	18.55	0.95	6.30	23.96	786.84	52.50	4190.00	480.00	2605644.27	35.41	0.00	0.51	0.12	8.51	-	1.12	105.70	63.80
BICAF	21.70	1.02	11.54	3.00	109.74	9.70	37.00	3.00	29140.00	123.21	90.00	0.14	0.00	25.36	3.27	0.32	1.68	1.31
BTG	-	-	-	-	-	-	3766.00	5670.00	-	-	0.00	-	-	-	17.61	0.54	-	-
COMPCLEARI	15.85	0.16	31.11	31.46	52.55	0.00	262.00	29.00	23953.00	-	47885.00	0.06	0.03	-	-	0.52	0.69	1.93
CONTROL	10.08	0.97	7.44	5.37	84.70	8.00	77.00	5.00	66252.00	1.36	0.00	0.01	0.60	8.91	13.45	0.39	1.00	0.23
DATATEC	21.70	3.95	7.11	37.70	860.75	0.00	8351.00	3410.00	897440.00	207.03	41715.00	1.81	2.48	273.93	105.53	1.68	17.87	65.64
DCENTRIX	29.07	1.04	11.37	22.44	28.82	0.00	212.00	260.00	49351.00	-	154455.00	0.08	0.12	-	-	0.39	0.60	1.52
DELTA	25.14	0.67	21.28	10.82	908.11	91.00	2557.00	660.00	407002.00	27.87	0.00	1.36	0.00	19.72	10.51	0.09	15.60	9.97
DIDATA	40.32	1.67	13.12	30.39	149.92	0.00	2827.00	1350.00	1049943.00	58.03	119330.00	0.89	0.89	20.10	-	1.17	5.48	22.79
DIGICORE	54.10	0.84	35.08	5.54	18.39	0.00	61.00	35.00	38669.00	-	215000.00	0.10	0.14	-	56.30	0.73	0.68	0.07
EOH	75.33	1.70	25.84	25.00	16.04	0.00	276.00	90.00	7839.00	-	49200.00	0.12	0.87	-	-	0.08	0.82	1.94
ERP.COM	-	-	-	-	-	-	98.00	0.00	-	-	0.00	-	-	-	-	-	-	-
FARITEC	71.29	2.27	11.41	26.42	20.78	0.00	411.00	199.00	28672.00	-	138005.00	0.15	1.36	-	-	1.03	1.07	3.04
GIJIMA AST	27.76	0.60	26.97	74.42	36.55	0.00	1371.00	1590.00	171074.00	-	54068.00	1.01	0.01	-	-	-	0.35	13.36
IDION	33.63	0.42	38.41	31.41	23.39	0.00	582.00	1260.00	15713.00	-	66237.00	0.08	-	-	-	1.00	0.62	5.20
INFOWAVE	50.49	1.26	37.95	23.00	9.38	0.00	65.00	45.00	7900.00	-	84200.00	0.05	0.87	-	-	0.21	0.34	0.31
JASCO	52.45	2.25	11.43	11.40	108.10	15.00	433.00	470.00	49597.00	40.95	4592.00	0.41	0.06	4.57	7.10	0.70	4.18	0.15
MTN GROUP	27.92	1.13	20.99	37.37	121.72	4.00	1250.00	1622.00	725242.00	76.76	169873.00	0.31	1.54	25.82	3.03	0.79	1.68	10.82
MUSTEK	26.65	0.71	8.23	10.94	310.69	0.00	814.00	62.00	310780.00	40.72	2010.00	0.82	0.03	46.84	7.06	0.35	5.79	2.35
PARACON	28.40	0.72	24.33	16.53	22.80	0.00	142.00	70.00	88074.00	-	361783.00	0.07	-	-	-	-	0.50	0.92
PASDEC	105.13	3.96	9.47	0.58	56.27	0.00	28.00	8.00	31493.00	33.51	0.00	0.59	2.06	1815.55	29.69	0.23	3.45	3.73
PINNACLE	32.41	2.52	5.61	0.00	24.29	0.00	26.00	19.00	29335.00	-	120882.00	0.07	0.87	-	-	-	0.00	0.26
REUNERT	46.63	2.07	11.59	5.42	318.50	58.00	809.00	50.00	632000.00	35.32	100.00	1.44	0.01	32.36	190.88	0.75	9.58	1.49
SETHOLD	216.88	13.75	15.39	9.34	9.99	0.00	327.00	260.00	17054.00	31.68	31480.00	0.22	1.74	587.32	4.50	0.44	1.42	1.85
SPESCOM	19.75	0.66	12.57	10.91	375.35	0.00	1143.00	275.00	203322.00	25.23	6768.00	0.74	0.20	41.32	3.00	0.40	5.39	6.04
SQONE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
TELKOM	10.62	1.47	21.08	0.00	2673.28	59.50	-	-	14919000.00	7.37	0.00	2.16	2.66	2.53	1042.09	-	28.09	28.09
UCS	38.88	0.38	47.39	21.46	41.45	0.00	270.00	160.00	92629.00	113.11	0.00	0.16	0.24	32.51	12.40	0.77	0.87	1.83
VESTA	52.28	0.80	43.25	15.37	18.33	0.00	140.00	60.00	14733.00	-	82196.00	0.10	0.04	-	-	0.16	0.64	0.76

Annexure 8

1998

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ in SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	26.60	0.99	13.10	14.24	6748.12	450.00	2355.00	125.00	651524.00	26.05	1540.00	1.08	0.24	20.35	91.73	0.61	58.29	34.74
ALTRON	21.20	0.90	11.57	11.30	1010.04	27.50	895.00	405.00	831849.00	22.73	192.00	1.30	0.34	17.58	39.27	0.32	5.18	3.77
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	89.12	0.64	61.47	51.57	859.99	32.20	4870.00	2150.00	2847882.68	49.53	68307.00	0.23	1.67	148.24	-	1.37	69.66	20.96
BICAF	20.21	0.81	8.03	5.36	87.54	4.50	56.00	0.00	23979.00	330.77	36.00	0.13	0.05	34.32	1.64	0.00	0.74	0.18
BTG	238.27	18.11	7.90	19.62	5.76	2.20	10442.00	3390.00	28161.00	35.06	5626600.00	0.00	1.94	127.57	6.61	2.14	0.69	103.73
COMPCLEARI	-	-	-	-	-	-	187.00	43.00	-	-	0.00	-	-	-	-	-	-	-
CONTROL	15.89	0.77	1.98	4.35	92.98	6.00	127.00	10.00	82276.00	27.83	728.00	0.09	0.30	2.65	23.68	1.29	0.97	0.30
DATATEC	51.32	5.23	6.19	78.15	230.19	0.00	8100.00	3540.00	132297.00	76.42	20931.00	1.29	2.02	229.93	47.35	1.45	5.74	75.28
DCENTRIX	-	-	-	-	-	-	92.00	0.00	-	-	0.00	-	-	-	-	-	-	-
DELTA	26.26	0.77	20.13	11.00	758.55	72.00	2133.00	115.00	332213.00	45.64	4213.00	1.28	0.00	41.84	12.62	0.42	12.02	9.31
DIDATA	40.27	1.48	11.10	42.05	124.83	0.00	2738.00	370.00	687211.00	53.41	93260.00	0.65	0.38	47.62	-	1.29	3.42	23.96
DIGICORE	-	-	-	-	-	-	99.00	3.00	-	-	0.00	-	-	-	61.86	-	-	-
EOH	-	-	-	-	-	-	221.00	100.00	-	-	0.00	-	-	-	-	-	-	-
ERP.COM	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
FARITEC	-	-	-	-	-	-	410.00	98.00	-	-	0.00	-	-	-	-	-	-	-
GIJIMA AST	-	-	-	-	-	-	-	660.00	-	-	0.00	-	-	-	-	-	-	-
IDION	-	-	-	-	-	-	248.00	63.00	-	-	0.00	-	-	-	-	-	-	-
INFOWAVE	-	-	-	-	-	-	64.00	6.00	-	-	0.00	-	-	-	-	-	-	-
JASCO	48.55	1.71	16.43	6.40	103.38	12.00	628.00	430.00	41313.00	50.34	3754.00	0.37	0.47	2.88	4.43	1.54	2.92	3.36
MTN GROUP	27.97	0.99	21.27	58.31	96.74	3.00	770.00	125.00	443339.00	69.05	0.00	0.24	1.43	20.50	2.67	1.33	0.94	6.76
MUSTEK	41.65	0.90	9.46	16.24	211.59	0.00	880.00	34.00	205736.00	34.35	1786.00	0.88	0.07	68.50	31.31	0.89	4.06	4.74
PARACON	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
PASDEC	1154.50	52.93	6.42	1.32	3.28	0.00	57.00	6.00	1835.00	178.99	0.00	0.38	0.79	93.28	30.21	0.36	2.54	3.11
PINNACLE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
REUNERT	22.27	1.08	9.11	4.30	470.91	43.00	771.00	30.00	938000.00	58.80	1600.00	0.60	0.01	14.81	43.55	0.92	6.98	0.73
SETHOLD	750.79	39.32	16.23	39.57	2.05	0.00	366.00	305.00	829.00	-	140870.00	0.11	1.37	#N/A	-	1.40	1.06	2.60
SPESCOM	24.76	1.17	13.86	12.63	265.61	0.00	1143.00	610.00	124493.00	42.35	9088.00	0.65	0.28	10.19	2.77	1.41	4.24	7.19
SQONE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
TELKOM	18.01	0.90	26.41	0.00	2607.21	98.10	-	-	14394000.00	-	557032.00	3.70	1.13	-	-	-	29.88	29.88
UCS	17.04	0.37	40.85	22.62	31.28	2.00	138.00	5.00	69902.00	-	223590.00	0.04	0.69	-	-	-	0.40	0.98
VESTA	-	-	-	-	-	-	126.00	1.00	-	-	0.00	-	-	-	-	-	-	-

1997

Annexure 9

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ in SP	BV	EPS GR	Share Rep.	ER/Share	NY P O D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	18.10	0.62	9.69	7.33	5607.30	380.00	9909.00	820.00	536113.00	10.26	130.00	0.52	0.07	6.63	50.57	1.03	47.63	51.46
ALTRON	16.36	0.83	9.43	8.89	858.99	23.00	629.00	435.00	700062.00	14.75	137.00	0.91	0.60	18.10	110.54	0.98	4.34	1.95
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	16.37	0.67	9.02	42.59	346.44	25.70	3042.00	860.00	910603.68	63.16	76605.00	1.01	1.52	44.31	-	0.56	-	-
BICAF	2.04	0.41	3.41	23.08	133.29	0.00	82.00	50.00	41700.00	119.40	0.00	0.03	0.79	37.01	17.85	0.49	0.18	0.64
BTG	69.69	1.21	9.36	16.62	26.70	1.90	2768.00	1980.00	114537.00	6.94	253700.00	0.00	0.16	51.53	0.49	1.28	0.52	27.16
COMPLEARI	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
CONTROL	10.91	0.80	7.01	14.52	95.51	5.70	181.00	250.00	85193.00	42.21	7214.00	0.05	0.35	20.26	8.37	0.34	0.78	1.03
DATATEC	33.10	7.19	5.13	47.03	69.77	10.60	2715.00	2480.00	25485.00	137.68	15332.00	0.34	3.22	463.57	7.69	0.58	3.35	23.80
DCENTRIX	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
DELTA	27.28	0.48	16.22	15.12	534.81	46.80	1692.00	535.00	217080.00	25.78	221.00	0.98	0.00	21.09	12.12	0.38	8.50	8.42
DIDATA	36.74	1.18	14.88	57.95	84.56	0.00	1698.00	710.00	376695.00	64.39	473833.00	0.32	0.26	29.06	-	0.84	2.29	14.69
DIGICORE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	9.64	-	-	-
EOH	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
ERP.COM	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
FARITEC	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
GUJIMA AST	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
IDION	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
INFOWAVE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
JASCO	33.09	1.73	10.13	7.82	100.49	10.00	264.00	54.00	28145.00	17.13	183.00	0.23	0.52	30.15	2.35	0.44	2.00	0.64
MTN GROUP	12.10	0.78	11.79	64.64	80.28	2.00	537.00	235.00	389997.00	380.00	0.00	0.08	2.08	2.84	51.23	1.10	0.57	4.80
MUSTEK	40.26	1.54	6.47	32.30	125.57	0.00	1183.00	455.00	124012.00	-	99848.00	0.53	0.07	-	-	-	3.11	8.72
PARACON	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
PASDEC	40.48	2.72	1.36	2.75	48.81	0.00	64.00	5.00	27317.00	74.77	0.00	0.20	0.61	1.15	8.94	0.54	0.94	1.58
PINNACLE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
REUNERT	4.65	1.22	5.82	21.17	410.16	36.00	1294.00	710.00	807800.00	36.12	1133.00	0.15	0.03	5.62	47.81	1.48	4.53	8.41
SETHOLD	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
SPESCOM	15.13	1.00	10.47	16.19	241.04	13.00	700.00	40.00	92392.00	43.17	6688.00	0.50	0.27	21.10	7.81	1.18	3.07	3.93
SQONE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
TELKOM	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
UCS	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
VESTA	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-

Annexure 10

1996

	ROE	D/E ratio	PM	P/E Ratio	BV/Share	D/Share	Av. SP	Δ In SP	BV	EPS GR	Share Rep.	ER/Share	NY PO D	Gr./s BV	EVA	Beta	IV	MOS
ALTECH	1.09	0.63	7.87	17.08	5258.61	330.00	6900.00	520.00	522810.00	10.26	960.00	0.30	0.29	8.11	106.42	0.39	41.02	27.98
ALTRON	7.84	0.78	7.03	20.85	727.35	39.80	608.00	490.00	615497.00	14.75	324.00	0.32	0.06	2.53	189.54	0.93	3.59	2.49
BCX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COMPAREX	14.26	0.81	5.92	34.55	240.06	19.00	1790.00	2825.00	447090.14	39.83	31140.00	0.18	0.02	321.68		3.18	29.86	11.96
BICAF	6.28	0.34	1.57	8.21	211.59	0.00	220.00	190.00	66196.00	119.40	115.00	0.13	4.27	3.56	32.37	0.43	0.87	3.07
BTG	46.81	1.01	8.46	7.08	17.62	2.20	2040.00	870.00	75080.00	6.94	0.00	0.00	0.00	50.73	2.15	0.46	0.47	19.93
COMPCLEARI	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
CONTROL	25.08	0.83	7.98	19.60	79.42	5.70	369.00	40.00	65121.00	42.21	10306.00	0.14	0.11	47.18	1.08	0.13	1.29	2.40
DATATEC	26.17	4.36	11.42	44.64	12.38	0.00	1228.00	795.00	2714.00	137.68	1925.00	0.11	1.64	51.18	3.28	0.77	1.34	10.94
DCENTRIX											0.00	-	-	-	-	-	-	-
DELTA	30.16	0.76	14.49	14.71	441.67	39.50	1639.00	35.00	180530.00	25.78	0.00	0.96	0.03	20.41	3.15	0.03	6.42	9.97
DIDATA	30.66	0.84	13.84	44.10	65.52	0.00	1085.00	920.00	264201.00	64.39	43.00	203.70		86.96		0.29	1.33	9.52
DIGICORE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
EOH	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
ERP.COM	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
FARITEC	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
GIJIMA AST	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
IDION	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
INFOWAVE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
JASCO	29.63	1.83	11.15	14.06	77.21	10.00	280.00	24.00	27779.00	17.13	8032.00	0.13	0.43	25.89	1.00	1.45	1.62	1.18
MTN GROUP	0.42	0.48	0.23	123.00	78.06	0.00	383.00	95.00	464792.00	380.00	494057.00	0.02	3.85	-		1.62	0.19	4.02
MUSTEK	0.00	0.00	0.00		0.00	0.00	-	-	89865.00	-	0.00	-	-	-	-	-	-	-
PARACON	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
PASDEC	43.36	0.92	4.65	0.69	49.38	0.00	45.00	8.00	27633.00	74.77	27982.00	0.21	0.42	64.73	21.94	2.11	3.54	3.99
PINNACLE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	0.00	0.00
REUNERT	17.68	1.27	6.92	15.08	434.57	36.00	1915.00	1020.00	849000.00	36.12	4890.00	0.55	0.04	20.50	74.22	1.40	6.73	12.42
SETHOLD	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
SPESCOM	14.69	0.90	10.62	11.75	199.04	9.00	450.00	265.00	63083.00	43.17	11486.00	0.21	0.18	1.86	5.95	0.56	2.04	2.46
SQONE	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
TELKOM	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
UCS	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-
VESTA	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-

Annexure 11: Abbreviations for annexure 1 – 10

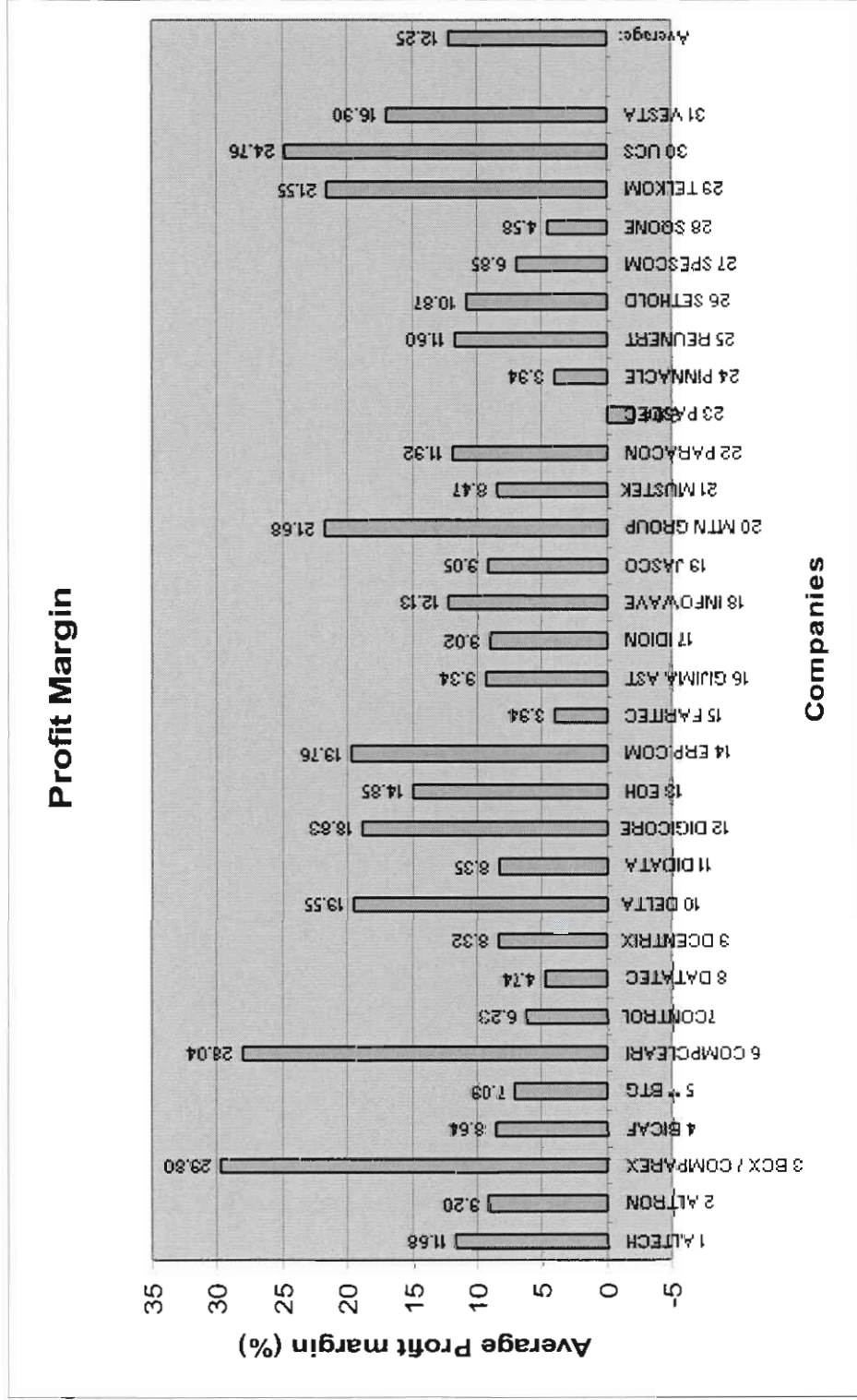
ROE	Return on Equity
D/E ratio	Debt to Equity ratio
PM	Profit Margin
P/E Ratio	Price/Earnings Ratio
BV/Share	Book value per Share
EPS GR	Earnings per Share Growth Rate
Share Rep.	Shares Repurchases
ER/Share	Earnings Retained per Share
NY PO D	Number of Years to Payoff Debt
Gr./s BV	Growth in per Share Book Value
Av. SP	Average Share Price
Δ in SP	Change in Share Price
BV	Book Value
Beta	Beta
IV	Intrinsic value
D/Share	Dividends per Share
MOS	Margin of Safety
EVA	Economic value Added

Annexure 12: Summary of Current Model Testing

COMPANY	INVESTMENT CRITERIA ¹⁹	TIMES CRITERION QUALIFIED	COMPANY	INVESTMENT CRITERIA	TIMES CRITERION QUALIFIED
1 ALTECH	D,IV,MS	3	24 PINNACLE	BV	1
2 ALTRON	IV,BV	2	25 REUNERT	D,IV,BV	3
3 BCX / COMPAREX	PM,IV,BV	3	26 SETHOLD		0
4 BICAF	IV,BV	2	27 SPESCOM	D	1
5 ** BTG	MS,BV	2	28 SQONE		0
6 COMPCLEARI	PM,D,BV	3	29 TELKOM	PM,IV,BV	3
7CONTROL	BV	1	30 UCS	PM,	1
8 DATATEC	IV,BV	2	31 VESTA	PM,D	2
9 DCENTRIX	D,MS,BV	3			
10 DELTA	PM,D,IV,MS,BV	5			
11 DIDATA	MS,BV	2			
12 DIGICORE	PM,D,BV	3			
13 EOH	PM,D,MS,BV	4			
14 ERP.COM	PM,D,BV	3			
15 FARITEC	D,BV	2			
16 GIJIMA AST	D,MS,BV	3			
17 IDION	D,MS,	2			
18 INFOWAVE	D,BV	2			
19 JASCO	D,BV	2			
20 MTN GROUP	PM,IV,MS,BV	4			
21 MUSTEK	D,BV	2			
22 PARACON	D,BV	2			
23 PASDEC	D,MS,	2			

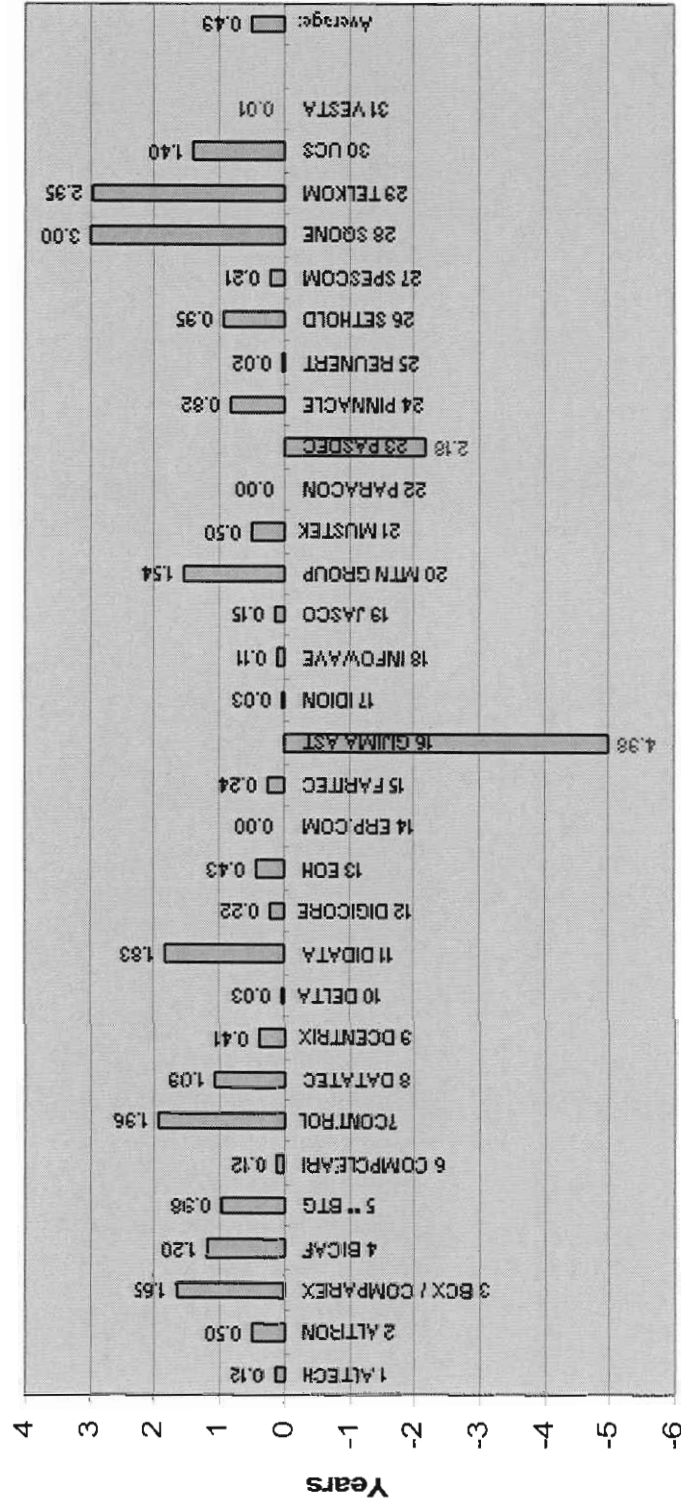
¹⁹ D = Dividends; IV = Intrinsic Value; MS = Margin of Safety; BV = Book value; PM = Profit Margin:

Annexure 13: Current Model – Step 1 Testing

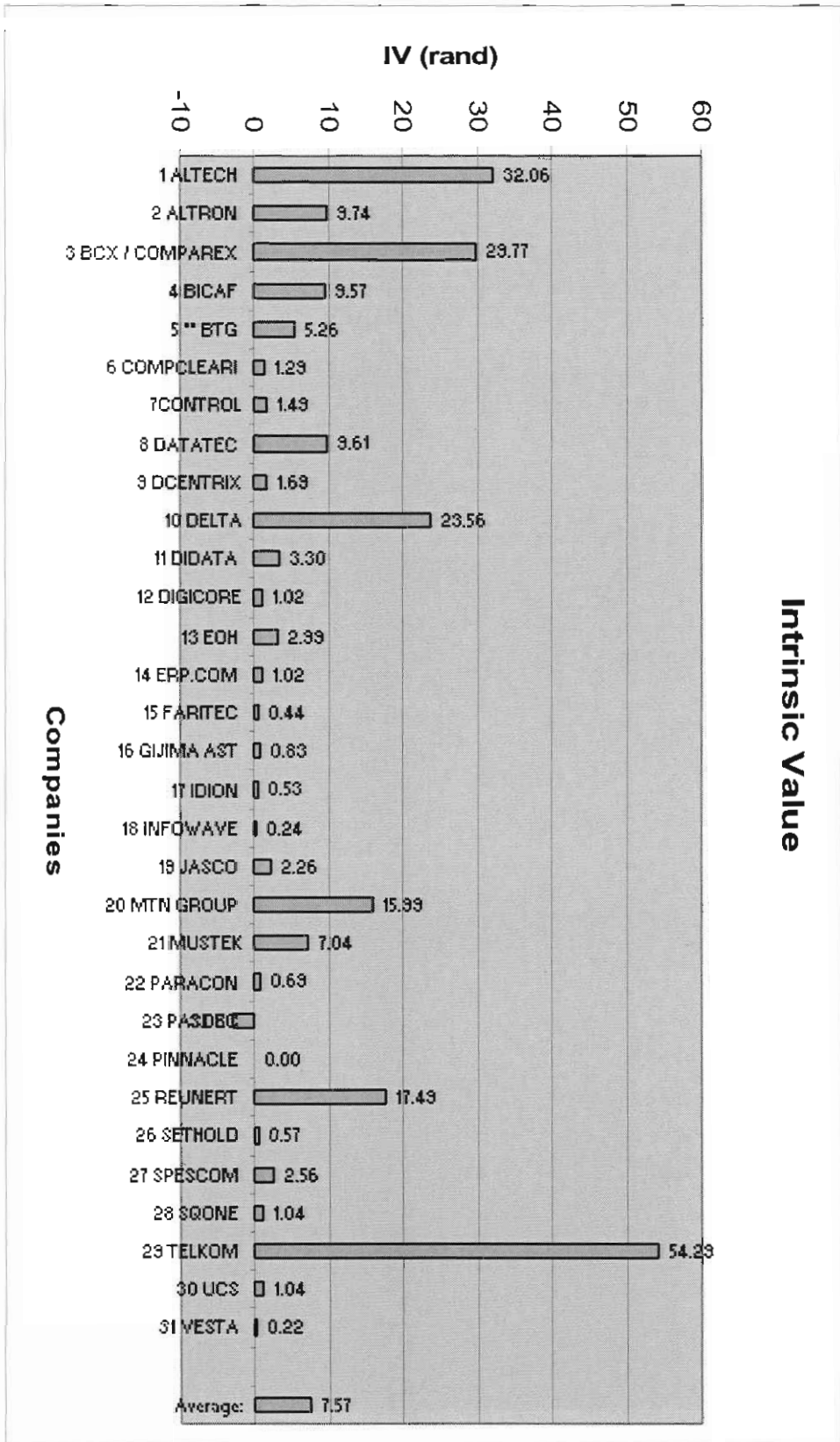


Annexure 14: Current Model – Step 2 Testing

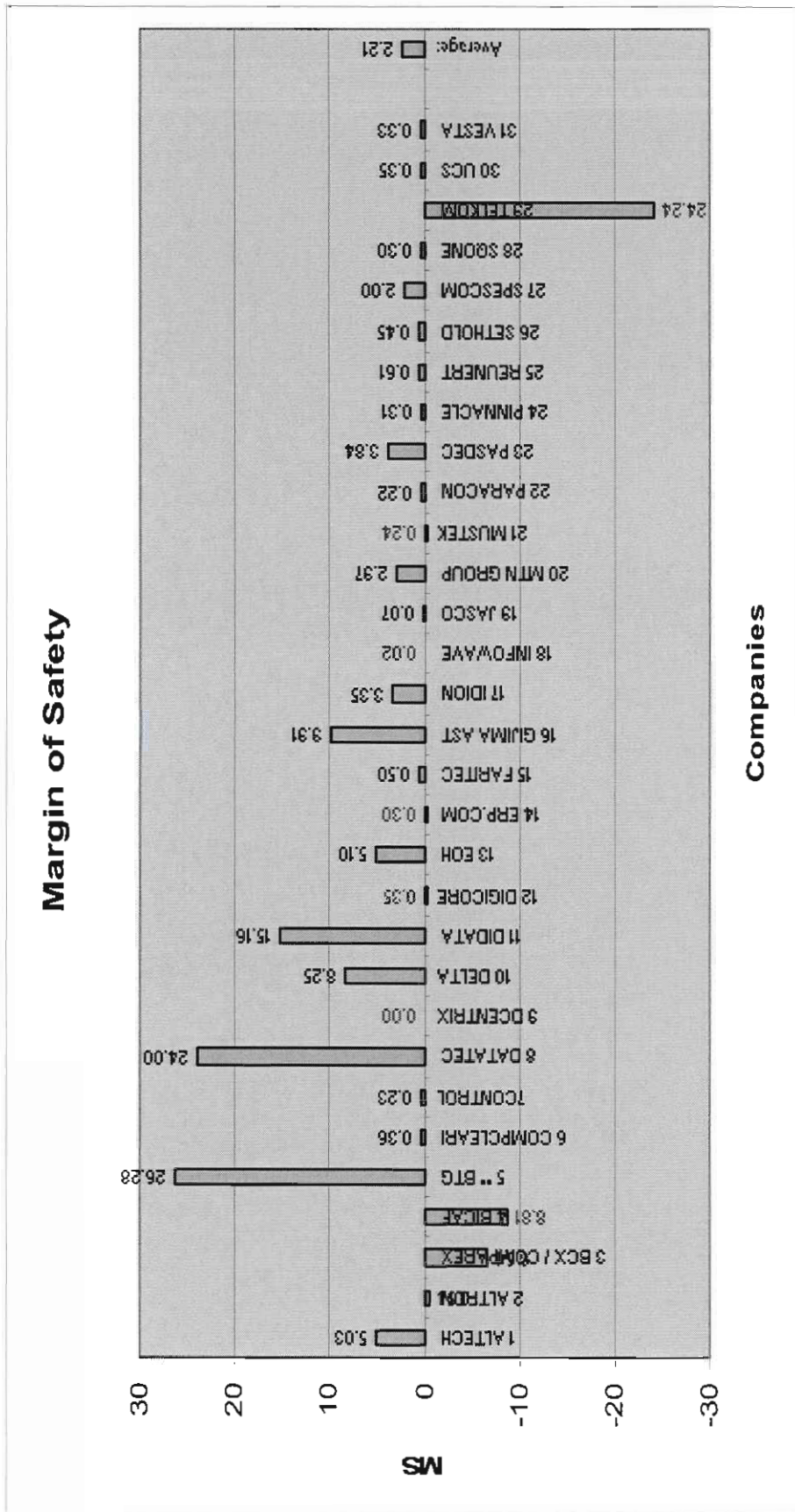
No. Years pay off Debt

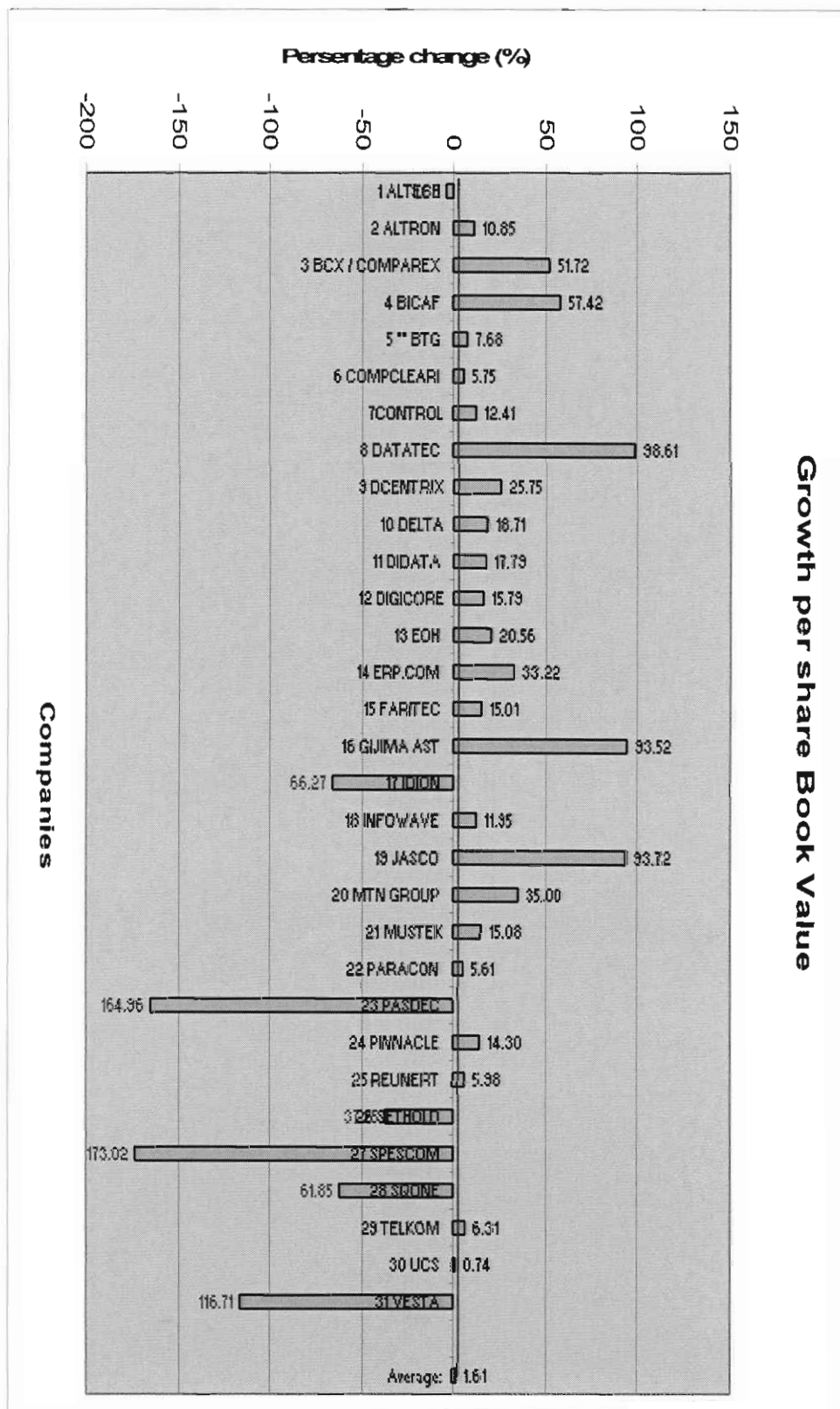


Companies



Annexure16: Current Model – Step 4 Testing





Annexure 18: Summaries of Statistical Process

Regression Summary for Dependent Variable: Change in Share Price (VanNiekercTop3							
R= .89400653 R ² = .79924767 Adjusted R ² = .66541278							
F(4,6)=5.9719 p<.02749 Std.Error of estimate: 553.19							
	Beta	Std.Err. of Beta	B	Std.Err. of B	t(6)	p-level	Valid N
N=11							
Intercept			-233.051	292.4930	-0.796776	0.455943	
Growth in per share book value	0.444325	0.244884	4.251	2.3431	1.814434	0.119539	13
Earnings Retained/Share	0.468875	0.194058	8.156	3.3755	2.416156	0.052135	14
EVA	0.451912	0.188954	7.385	3.0877	2.391653	0.053905	12
Beta	0.412815	0.237347	441.522	253.8513	1.739293	0.132640	14

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop308.sta)							
R= .98821024 R ² = .97655948 Adjusted R ² = .96483922							
F(4,8)=83.322 p<.00000 Std.Error of estimate: 189.47							
	Beta	Std.Err. of Beta	B	Std.Err. of B	t(8)	p-level	Valid N
N=13							
Intercept			51.522	72.59465	0.70972	0.498036	
Average Share price	0.922279	0.055512	0.356	0.02140	16.61406	0.000000	26
Dividend/Share	-0.118020	0.058397	-1.116	0.55222	-2.02099	0.077939	18
Growth in per share book value	0.277523	0.069326	3.291	0.82208	4.00318	0.003932	15
Earnings Retained/Share	-0.257236	0.072128	-284.115	79.66489	-3.56637	0.007332	18

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop309.sta)							
R= .97737863 R ² = .95526898 Adjusted R ² = .93538853							
F(4,9)=48.051 p<.00000 Std.Error of estimate: 256.69							
	Beta	Std.Err. of Beta	B	Std.Err. of B	t(9)	p-level	
N=14							
Intercept			-267.273	89.36808	-2.99070	0.015184	
Average Share price	0.778703	0.086254	0.367	0.04067	9.02801	0.000008	
Share Repurchases	-0.355908	0.073830	-0.008	0.00164	-4.82066	0.000946	
Debt/Equity ratio	-0.135173	0.072266	-35.669	19.06910	-1.87050	0.094224	
Earnings per Share Growth rate	0.118056	0.088677	1.688	1.26780	1.33131	0.215823	

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop300.sta R= .89683700 R ² = .80431661 Adjusted R ² = .73093534 F(6,16)=10.961 p<.00007 Std.Error of estimate: 851.91						
N=23	Beta	Std.Err. of Beta	B	Std.Err. of B	t(16)	p-level
Intercept			320.423	318.8501	1.00493	0.329887
Average Share price	-0.897973	0.154347	-0.790	0.1358	-5.81790	0.000026
Share Repurchases	-0.844671	0.216864	-0.009	0.0024	-3.89494	0.001287
Dividend/Share	0.492865	0.120396	24.694	6.0322	4.09371	0.000848
Price/Earnings Ratio	-0.177046	0.250686	-14.054	19.8992	-0.70625	0.490192
Growth in per share book value	0.151251	0.121849	1.867	1.5042	1.24130	0.232386
Beta	-0.155111	0.154385	-437.735	435.6860	-1.00470	0.329993

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop301.sta)						
R= .98039427 R ² = .96117292 Adjusted R ² = .90778570						
F(11,8)=18.004 p<.00019 Std.Error of estimate: 188.49						
	Beta	Std.Err. of Beta	B	Std.Err. of B	t(8)	p-level
N=20						
Intercept			-111.592	70.82884	-1.57552	0.153785
Dividend/Share	-0.140016	0.340937	-1.897	4.62003	-0.41068	0.692088
Average Share price	0.953974	0.372832	0.496	0.19377	2.55872	0.033714
EVA	0.905150	0.150774	3.222	0.53665	6.00334	0.000322
Earnings per Share Growth rate	0.693344	0.144127	0.899	0.18693	4.81064	0.001337
Earnings Retained/Share	-0.925176	0.338423	-239.856	87.73788	-2.73378	0.025695
Return on Equity	-0.505381	0.143591	-1.196	0.33993	-3.51958	0.007851
Growth in per share book value	0.571053	0.171555	6.043	1.81532	3.32869	0.010405
Price/Earnings Ratio	-0.204459	0.100487	-11.321	5.56404	-2.03468	0.076301
Beta	-0.224546	0.099832	-27.430	12.19505	-2.24924	0.054632
Number of Years to payoff Debt	0.121680	0.084951	24.081	16.81212	1.43235	0.189936
Book value/Share	0.366587	0.272577	0.400	0.29755	1.34489	0.215540

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop302.sta)						
R= .90841034 R ² = .82520934 Adjusted R ² = .75966284						
F(6,16)=12.590 p<.00003 Std.Error of estimate: 268.71						
N=23	Beta	Std.Err. of Beta	B	Std.Err. of B	t(16)	p-level
Intercept			-74.859	75.6276	-0.98983	0.336989
Debt/Equity ratio	0.799871	0.138676	6.333	1.0979	5.76793	0.000029
Book value/Share	0.118275	0.422711	0.102	0.3643	0.27980	0.783216
Beta	-0.360917	0.131528	-416.605	151.8219	-2.74404	0.014410
Number of Years to payoff Debt	0.290112	0.137621	138.939	65.9089	2.10805	0.051148
Earnings per Share Growth rate	0.188713	0.123756	0.327	0.2143	1.52487	0.146812
Earnings Retained/Share	-0.482899	0.422402	-172.563	150.9444	-1.14322	0.269765

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop303.sta)						
R= .90210898 R ² = .81380062 Adjusted R ² = .73932087						
F(6,15)=10.926 p<.00009 Std.Error of estimate: 239.65						
N=22	Beta	Std.Err. of Beta	B	Std.Err. of B	t(15)	p-level
Intercept			44.3630	67.59051	0.65635	0.521542
EVA	-1.59020	0.246392	-3.1357	0.48586	-6.45395	0.000011
Earnings Retained/Share	1.45802	0.247002	310.4570	52.59436	5.90286	0.000029
Dividend/Share	-0.68280	0.202683	-6.3238	1.87716	-3.36883	0.004219
Share Repurchases	-0.21592	0.119595	-0.0149	0.00823	-1.80540	0.091119
Book value/Share	-0.31575	0.216437	-0.2448	0.16779	-1.45887	0.165223
Beta	-0.13202	0.127362	-35.4982	34.24634	-1.03655	0.316366

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop304.sla)
R= .99396389 R²= .98796421 Adjusted R²= .97141499
F(11,8)=59.699 p<.00000 Std.Error of estimate: 65.859

	Beta	Std.Err. of Beta	B	Std.Err. of B	t(8)	p-level
N=20						
Intercept			419.849	85.03580	4.93732	0.001139
EVA	1.692657	0.178421	1.793	0.18899	9.48688	0.000013
Earnings Retained/Share	-0.267741	0.155663	-130.212	75.70456	-1.72001	0.123744
Average Share price	-0.904179	0.183485	-0.353	0.07159	-4.92780	0.001153
Growth in per share book value	0.150563	0.047111	0.506	0.15838	3.19592	0.012690
Price/Earnings Ratio	-0.202154	0.063103	-4.633	1.44614	-3.20354	0.012545
Book value/Share	0.886217	0.229704	0.564	0.14613	3.85808	0.004822
Earnings per Share Growth rate	0.486862	0.113945	2.094	0.49000	4.27277	0.002714
Profit Margin	-0.372254	0.103784	-17.349	4.83688	-3.58682	0.007117
Number of Years to payoff Debt	-0.253980	0.077391	-35.079	10.68906	-3.28179	0.011158
Beta	-0.164406	0.065963	-79.603	31.93799	-2.49241	0.037381
Return on Equity	-0.099607	0.052936	-0.370	0.19687	-1.88166	0.096659

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop304.sta)
R= .94502837 R²= .89307863 Adjusted R²= .87303087
F(3,16)=44.548 p<.00000 Std.Error of estimate: 138.80

	Beta	Std.Err. of Beta	B	Std.Err. of B	t(16)	p-level
N=20						
Intercept			96.31241	37.79875	2.54803	0.021489
Book value/Share	0.551404	0.161126	0.35079	0.10251	3.42219	0.003493
Average Share price	-0.613135	0.181112	-0.23923	0.07067	-3.38540	0.003775
EVA	1.237978	0.127501	1.31132	0.13505	9.70955	0.000000

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop305.sta)						
R= .94919372 R ² = .90096872 Adjusted R ² = .87184187						
F(5,17)=30.933 p<.00000 Std.Error of estimate: 298.58						
N=23	Beta	Std.Err. of Beta	B	Std.Err. of B	t(17)	p-level
Intercept			-34.522	79.54380	-0.43400	0.669744
Average Share price	1.131825	0.280518	0.345	0.08554	4.03477	0.000860
Dividend/Share	-0.860322	0.301170	-3.212	1.12451	-2.85660	0.010921
Book value/Share	0.574610	0.279093	0.491	0.23864	2.05885	0.055170
EVA	0.243499	0.151887	0.195	0.12163	1.60316	0.127316
Earnings Retained/Share	-0.218838	0.203555	-104.285	97.00221	-1.07508	0.297362

Regression Summary for Dependent Variable: Change in Share Price (VanNiekerkTop305.sta)						
R= .93197443 R ² = .86857634 Adjusted R ² = .85543397						
F(2,20)=66.090 p<.00000 Std.Error of estimate: 317.12						
N=23	Beta	Std.Err. of Beta	B	Std.Err. of B	t(20)	p-level
Intercept			-63.7586	78.30150	-0.81427	0.425080
Dividend/Share	-0.571304	0.175988	-2.1331	0.65710	-3.24627	0.004045
Average Share price	1.401140	0.175988	0.4273	0.05367	7.96157	0.000000