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Performance of Low Price-Earnings Companies on the Stock Exchange of Mauritius

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A research report submitted to the Faculty of Commerce, Law and Management, University of Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Mauritius
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ABSTRACT

Practitioners on the stock exchange have claimed that low price earnings (P/E) ratio stocks are generally bargains and do better than the stocks with high P/E ratios. This effect is usually known as the P/E ratio anomaly.

The purpose of this study has been to test empirically whether the investment performance of listed companies on the Stock Exchange of Mauritius (SEM) is related to the P/E ratios. An analysis of such a study can help fund managers and academics to contribute to the discussion of the existence of the P/E ratio anomaly in Mauritius and the market form efficiency in the SEM.

Results from a portfolio study showed that, between January 2001 and December 2003, below median P/E ratio portfolios earned, on average, higher absolute and risk-adjusted rates of return rather than above median P/E ratio portfolios. These results showed that investing on low P/E companies on the SEM was rewarding and could be used by investment professionals.

THE DECLARATION

I, Johnny Chong Chap Sin, declare that this research report is my own unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university

_____

Johnny Chong Chap Sin

05 February 2006

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GLOSSARY

Abnormal returns

Abnormal returns are also known as above-average returns and residuals. Abnormal returns are returns in excess of those predicted by the Single Index Model, which represents the Capital Asset Pricing Model (CAPM) in practice.

Analyst

An analyst is an investment-professional who studies the fundamentals and technicalities of a company and makes ‘buy or sell’ recommendations.

Bear market

A bear market occurs when there is a prolonged period of falling share prices, dominated by selling pressure in the marketplace, caused by investors, or adverse economic or political factors.

Benchmark

A benchmark is a standard against which a share’s return is measured or compared.

Bull market

A bull market is a market in which prices of a certain group of securities are rising or are expected to rise. A bull market is sustained by the buying pressures of actual investors, news of favourable economic growth, political developments, periods of optimism and other related factors.

Buy and hold

A ‘buy and hold’ strategy is a passive investment strategy with which an investor buys stocks and holds them for a long period, regardless of fluctuations in the market.

Capital Asset Pricing Model (CAPM)

The CAPM is a security valuation model that is based on the notion that investors demand extra returns for assuming additional risk. The model establishes the relationship between expected risk and expected return.

Closed-end fund

A closed-end fund, also known as closed-end mutual fund, is a fund, the shares of which are traded through brokers at market prices; the fund will not redeem shares at net asset value.

Efficiency market hypothesis

The efficient market hypothesis is an investment theory that states that it is impossible to beat the market because prices already incorporate and reflect all relevant information. It is also known as market efficiency.

Excess return

The excess return is the difference in any particular period between the actual rate of return on a risky asset and the risk-free rate.

Forward Price Earnings (P/E) ratio

The forward P/E ratio is a P/E ratio, which is usually calculated with future earnings estimates for the next four quarters of the company.

Jensen's measure

The Jensen's measure, also known as the alpha of an investment, is the abnormal rate of return on a security in excess of what would be predicted by an equilibrium model like the CAPM.

Market Capitalisation

The market capitalisation is the total value placed on a company on the share market. Market capitalisation is calculated by multiplying the share price of a company by its number of shares in use.

Market Model

The market model is an index model that breaks down return uncertainty into systematic and non-systematic components. It provides the relationship between the return of a common stock over a given time period and the return earned on a market index.

Outperformance

The outperformance for this study means to achieve a higher return than a selected benchmark.

P/E ratio effect or P/E ratio anomaly

The P/E ratio effect or P/E ratio anomaly is the characteristic observed on the stock market, which indicates that companies with low P/E ratios earn excess returns compared with companies with high P/E ratios.

Random walk model

The random walk model describes the notion that stock price changes are random and unpredictable.

Sharpe's measure

The Sharpe's measure is also known as the Sharpe ratio or the Sharpe index. It has also been termed as the reward to variability ratio. The Sharpe's measure is a ratio to measure the risk-adjusted performance. It is calculated by subtracting the risk free rate from the rate of return for a portfolio and by dividing the result by the standard deviation of the portfolio returns.

Standard & Poor's 500 index (S&P 500)

The Standard & Poor's 500 index is an index that measures the price index of 500 widely held equity shares, mostly of the New York Stock Exchange**.**

Survival Bias

The survival bias is a bias, which is introduced in the data. Individual firms, that become inactive during the test period, are systematically excluded. If these firms are not included in an index, the index is upwardly biased by lack of that data since it only includes companies that have survived. Data suffering from survivorship bias may overstate returns.

Stock Exchange of Mauritius Index (SEMDEX)

The SEMDEX is the main benchmark of the Stock Exchange of Mauritius. It is an index of prices of all listed shares. Each stock is weighted according to its share in the total market capitalisation. In its computation, the current value of SEMDEX is expressed in relation to a base period, which begins on the 5th of July 1989, with an index value of 100.

Stock Exchange of Mauritius Total Return Index (SEMTRI)

The SEMTRI is a Total Return Index, which measures the performance of the local market. The SEMTRI captures the price movements of listed stocks common to the already published all-share index SEMDEX. The index incorporates a good measurement of total return for investors as it combines both capital gains/losses on listed stocks and gross dividends obtained on these stocks since the inception of the local stock market on the 5th of July 1989. Gross dividends are assumed to be invested in the stocks underlying the capital index, SEMDEX.

Systematic risk

The systematic risk which is also known as the market risk, is the risk related to risk factors common to the whole economy or entire market.

Trailing P/E ratio

The trailing P/E ratio is a P/E ratio, which is usually calculated by using the most recently past accounting earnings of the company.

Treynor's measure

The Treynor's measure is also known as the Treynor ratio or the Treynor index. It has also been termed as the reward to volatility ratio. The Treynor's measure is a ratio that measures returns, earned in excess, which could have been earned on a riskless investment per unit of market risk. It is similar to the Sharpe ratio with the difference being that it uses beta as the measurement of volatility.

1 INTRODUCTION

1.1 Context of Study

The concept of efficiency is central to finance. In an efficient market, a set of information is fully and immediately reflected in market prices. Fama (1970) made a distinction between three forms of efficient market: (a) the weak form; (b) the semi-strong form, and (c) the strong form. It is the semi-strong efficient market that has formed the basis of most empirical research. To test market efficiency, specific investment strategies are examined to see whether they earn abnormal returns. An abnormal return is usually represented by the difference between the actual return and the expected return. The expected return is usually based on the CAPM.

Two common techniques, used to test market efficiency, are the event study and the portfolio study (Chandra, 2003). It is by using the portfolio study method that Basu (1977) found that risk-adjusted equity returns of low P/E ratio firms were significantly higher than those of high P/E ratio firms for stocks on New York Stock Exchange between 1957 and 1971. This P/E ratio "anomaly" or "effect" has given rise to much debate on market efficiency and risk return model.

Since the discovery of the P/E ratio anomaly, there have been many studies of the P/E ratio effect and its interrelationship with other factors affecting the market on various bourses in the world (Reinganum, 1981; Keim, 1990; Aggarwal, Rao & Hiraki, 1990; Fama & French, 1998; Rensburg & Roberston, 2003). However, no academic research has been made to investigate the existence of the P/E ratio anomaly on the SEM.

1.2 Purposes of this study

The objective of this research was to establish the existence of the P/E ratio anomaly in Mauritius. Using the accounting variable P/E ratio as the firm specific characteristic, a portfolio study based on the P/E ratio of companies listed in the SEM was carried out.

1.3 Problem statement

The research problem was to determine empirically whether the investment performance of listed companies on the SEM was related to their P/E ratios. For this study, there was no sub problem.

1.4 Assumptions

It was assumed that the data obtained from the SEM needed for this study was correct. The collected data fairly and truly represent the real financial figures and data of the listed companies.

For the purposes of this research, it was assumed that:

a) there were no transaction costs on share transactions;
b) there were no taxes or levies charged on share transactions;
c) the market remained liquid and the shares were available for purchase;
d) fractions of shares could be purchased and sold on the market without adversely affecting the return realised, and
e) the closing monthly share prices on which return calculations were based were recorded on the last day of the month.

The P/E ratio used for calculation in this study was assumed to represent the trailing P/E ratio of the company.

1.5 Delimitations and limitations

This research was limited to the dealings and performance of all listed companies on the SEM between January 1995 and January 2004. It did not include the investment companies listed in the investments sector as these were considered to be managed closed-end investment funds.

A closed-end fund consists of an actively managed portfolio of stocks, which are all individually traded on the stock exchange. In general, the pricing of closed-end funds is dictated by the market forces of demand and supply, which may not be directly linked to funds' fundamentals or net asset value.

The primary data information sources for the research were obtained from the SEM. It consisted of selected electronic data values and figures contained in the SEM database. The remaining information sources included the annual reports, bulletins and other official publications by the SEM.

Though the results of this study could be used to reach conclusions about the market form efficiency of the SEM, this was not the objective of the research.

This research did not attempt to investigate the P/E ratio as a valuation tool or a benchmark for comparing companies.

1.6 Significance of this study

The results presented in this study can be used to contribute to the debate on the form of market efficiency on the SEM. This study fills the gap in the limited academic literature available on the SEM. It has documented, for the first time, the investigation of performance of Mauritian companies in terms of their P/E ratio.

1.7 Subsequent chapters of the research report

This report is divided into seven chapters, Chapter 1 being the Introduction.

Chapter 2: LITERATURE REVIEW

This chapter covers the literature on P/E ratios, the efficient market hypothesis and asset pricing models.

Chapter 3: HYPOTHESES

The hypotheses that were tested in this research are stated here.

Chapter 4: RESEARCH METHODOLOGY

This chapter discusses the data used in this study and describes the methodology carried out in conducting the research. The various models and assumptions used are detailed.

Chapter 5: PRESENTATION OF RESULTS

The results of this study are presented in this chapter. These include results from the data integrity tests; the equity firms forming the portfolios used in each test period; the returns of the firms, and the outcome of the hypothesis tests. The results of the hypotheses are analysed here as well.

Chapter 6: INTERPRETATION OF RESULTS

The results of this study are analysed and compared with the findings of previous researchers.

Chapter 7: CONCLUSIONS AND RECOMMENDATIONS

In this final chapter, the main conclusions are drawn from the results discussed in the earlier chapters and recommendations are made concerning possible future research.

2 LITERATURE REVIEW

2.1 Prior studies on P/E ratios

The P/E ratio is one of the most frequently used financial ratios in the investment community (Chandra, 2002). There have been many studies of the P/E ratios that are of particular interest. In one study, Mc Williams (1966) showed that better investments might be obtained from a portfolio comprised of low P/E ratio stocks as contrasted with portfolios of high P/E ratio stocks. In another study, Basu (1977) attempted to determine empirically the relationship between investment performance of equity securities and their P/E ratios. The study showed that abnormal returns were earned with low P/E ratio portfolios on the New York Stock Exchange between 1957 and 1971. Agarwal, Rao & Hiraki (1990) documented the P/E ratio effect for the first time for a non-US market on the Tokyo Stock Exchange.

In Mauritius, studies on P/E ratio or tests of empirical evidence for P/E ratio effect on the SEM have not been undertaken.

2.2 P/E ratios

The P/E ratio is the ratio of the company share price to its latest reported per share earnings. Theoretically the P/E ratio tells how much investors are willing to pay per dollar (or rupees in Mauritius) of earnings. P/E ratio is one of the tools most widely used by analysts and forms the key variable in many value strategies. P/E ratios are indicators of the future investment performance of a security.

Many firms focus their strategic planning on maximising growth in earnings per share (EPS), which also maximise the company's P/E ratio and hence its share value. However, the connection between growth in EPS and high P/E ratios might be tenuous (Firer, 1993) and there were many pitfalls which needed to be considered during a P/E ratio analysis.

2.2.1 Pitfalls in P/E ratios analysis

There are several pitfalls encountered in P/E ratios analysis. First, the denominator in the P/E ratio is the accounting earnings, which are influenced by such arbitrary rules like historical costs in depreciation and inventory valuation. Earnings are accounting figures that include non-cash items. The rules for determining earnings are governed by accounting rules such as Generally Accepted Accounting Principles (GAAP) that change over time (Floquet, 1978).

During times of high inflation, historical cost depreciation and inventory costs tended to be understated because the replacement costs of goods and equipment rise with the general level of prices. Thus, the P/E ratios tended to be low during times of inflation compared with such ratios in normal times because the market sees earnings as artificially distorted upwards. As with most accounting ratios, it is more valuable to look at the P/E ratio over time in order to examine the trend.

Another pitfall is that “normal” P/E ratio is computed using today’s price as the trend value of future earnings. The P/E ratio estimated on the basis of expected or future earnings is known as the forward-looking P/E ratio. The P/E ratio reported in financial statements and newspapers is usually the ratio of price related to the most recent *past* accounting earnings. P/E ratio estimated on the basis of observed or past earnings is known as trailing P/E ratio. Current accounting earnings can differ considerably from future economic earnings. Since ownership of stock conveys the right to future as well as to current earnings, the ratio related to most recent earnings can vary substantially over business cycles as accounting earnings and the trend value of economic earnings diverge by different amounts (Bodie, Kane & Marcus, 2002).

Thus, analysts must be careful when making a P/E ratio analysis. It is difficult to compare the P/E ratios of two totally different companies to determine which has a better value. Comparing companies is useful only if they are in the same industry. Two factors, namely the company and the industry growth rates the company is in, must be taken into account. It is often seen that P/E ratios vary across industries and sectors in the market. For

example, on the one hand, utilities typically have low multiples because they are low growth, yet stable industries, whereas technological industries, on the other hand, are characterised by high growth rates, constant changes and have high P/E ratios.

For the purposes of this research, these pitfall factors, which affected P/E ratios analysis, were ignored, since the objective of this study was to seek whether there was any existence of P/E ratio anomaly on the SEM. It was not a comparative analysis of the P/E ratio values. The P/E ratios of companies used in the analysis were trailing P/E ratios.

2.3 Efficient market hypothesis

The efficient market hypothesis can be defined as a market where current prices reflect all available information. Fama (1970) described three forms of market efficiency:

(a) the weak form efficiency;
(b) the semi-strong efficiency, and
(c) the strong form efficiency.

In an efficient market, it is impossible to make above average returns, regardless of the information available, unless abnormal risk is taken. The implications of market efficiency are that neither technical analysis nor fundamental analysis is useful in helping an investor to earn above normal risk-adjusted returns. No group of investors can consistently beat the market using a common investment strategy.

2.3.1 Testing market efficiency

Tests of market efficiency are essentially tests of whether the three general types of information - past prices, other public information, and inside information - can be used to make above average returns. There are several ways to test market efficiency. Some of the methods are based on statistical tests while others are based on some scientific methodology such as the event studies and portfolio studies (Chandra, 2002).

An event study averages the cumulative performance of stocks over time from a specified number of time periods before an event to a specified number of periods afterwards. The event can be the release of information, such as, news or announcements pertaining to earnings and dividends, share repurchase programs, stock splits, bonus issues, stock listing, option listing, mergers and acquisitions, and other related matters. This area of academic research has become a virtual growth industry.

The portfolio study method is normally used for testing the semi-strong form efficient market. This is made by examining the returns earned by a portfolio of stocks having some observable characteristics, such as, low P/E ratio, book to market ratio or market capitalisation. In the eighties, a large number of these characteristics have been identified and have shown to earn abnormal returns. Those characteristics were labelled as "empirical regularities" or "market anomalies" (Bodie, Kane & Marcus, 2002).

2.3.2 Empirical evidence of market efficiency overseas and efficiency of the SEM

The efficient market hypothesis has provided the theoretical basis for many financial market researches undertaken during the seventies and eighties. In the past, most of the evidence seemed to be consistent with the efficient market hypothesis. Prices were seen to follow a random walk model and the predictable variations in equity returns, if any, were found to be statistically insignificant. With its flood of information and countless participants, the U.S stock is regarded by academicians as highly efficient (Jacobs & Levy, 1989). For the local market, Saraspatti (1997) provided some evidence of weak form efficiency on the SEM.

Most event studies in the seventies on earnings announcements and stock splits support the semi-strong form efficient market hypothesis (Fama, 1970). Event studies are the cleanest evidence on efficiency. With few exceptions (for anomalies), the evidence is supportive on the US markets (Fama, 1991). No academic event study on the SEM has been found in Mauritius.

As there are no laws concerning disclosure of directors' dealings in Mauritius, event studies on the returns earned by directors' dealings, such as those conducted by Mordant (2002),

which are a test of strong form of efficiency, are not possible. However, empirical evidence in international markets suggests that corporate insides and stock exchange specialists earn superior risk-adjusted rates of return (Chandra, 2002). Mutual fund managers, do not, on average earn superior rates of return (Sharpe, Alexander & Bailey, 2003). No studies on the semi-strong form of efficiency have been undertaken in Mauritius.

2.3.3 P/E ratios and interrelationship with other anomalies

During the early eighties, several anomalies were identified and their relationship with the P/E ratio effect investigated. Anomalies were situations that appeared to violate the traditional view of market efficiency. In a study with stocks from New York Stock Exchange and American Stock Exchange for the period 1975-1977, Reinganum (1981) showed that besides earnings to price (E/P) ratios, firm size could also bring in abnormal returns. The size effect was first discovered by Banz in 1981, when he revealed that excess returns could be earned by holding stocks of low capitalisation.

Using a long 1951-1986 sample period, Keim (1990) looked at the effects of firm size and E/P ratio on stock returns across all the months in the US market. It was found that both E/P and size effects were significant in January - the “January effect”, but only the E/P effect was significant during the rest of the year. The January effect is the market anomaly where security returns appear to be abnormally higher in the month of January than in other months (Robbins, Sandler & Durand, 1999). Besides finding that the P/E ratio effect was stronger for small companies than for large ones on the Japan Stock Exchange, Aggarwal, Rao & Hiraki (1990) also found that the size effect took place in January and June.

Other academic studies also revealed that there were other factors besides the P/E ratio accounting variable, which could capture the cross-sectional variation in average stocks returns (Jacobs & Levy, 1989). If stocks could be classified under two categories, that is, value and growth stocks, Fama and French (1992) showed that value stocks tended to outperform growth stocks. Value stocks are stocks which have relatively high E/P ratios

and low book to market ratios, whereas growth stocks are stocks with relatively low E/P ratios and high book to market ratios.

In general, most of the anomalies found in international studies seem to revolve around certain themes (Jacobs & Levy, 1989; Bhalla, 2004):

(a) Markets overreact to news, both good and bad.
(b) Value investing is contrarian in nature and is beneficial because markets overreact.
(c) The market consistently ignores certain stocks, especially small stocks.
(d) All things being equal, there are times when it is more advantageous to buy stocks whereas, at other times, it is better to avoid stocks.

2.3.4 Explanations for the existence of the P/E ratio anomaly

The traditional efficient market hypothesis and rational expectation asset pricing models had difficulty in explaining the empirical evidence of anomalies. Market overreaction might offer the best explanation for several of the anomalies such as P/E ratio effect (Dreman & Berry, 1995). In a study by De Bondt & Thaler (1985), it was found that markets tended to overreact to unexpected and dramatic news events. The study showed that, over the following year, a portfolio of “losers” earned more on average than a portfolio of “winners”. This meant that high returns in one time period tended to be followed by low returns in the next period and vice versa.

Low P/E ratio may be analogous to losers as there may be stocks that are out of favour with investors. However, high P/E ratio stocks may be the current investor favourites or winners. As the market demonstrates almost daily, today’s favourite stock can fall from grace and reverse direction very quickly.

2.4 Benchmark model

In testing the market efficiency, the researchers must normally posit some sort of benchmark for calculating the returns of the market. The benchmark model used to calculate the expected returns of the market is usually the market model or the CAPM.

2.4.1 The CAPM

The CAPM (Sharpe, 1964; Lintner, 1965; Black, 1972) is an economic model that describes how securities are priced in the market place. It is a centrepiece of modern financial economics. The CAPM is based on a specific set of assumptions about investor behaviour and the existence of perfect security markets (Sharpe, Alexander & Bailey, 2003). The model provides a precise prediction of the relationship between the risk of an asset and its expected return. The risk is represented by the asset's beta. The beta is defined as the covariance of the asset's return with the market. It is a standardised measure of systematic risk.

The traditional CAPM of Sharpe (1964) and Lintner (1965) is given by the equation 2.1.

$$E(R_{i,}) = R_f + [\, E(R_m) - R_f \,] * \beta_{iM} \quad , i= 1,\ldots,N. \qquad \text{(Equation 2.1)}$$

In words, the expected return on any asset is the risk free rate, $R_{f,}$ plus a risk premium, which is the asset's market beta, β_{iM}, times the premium per unit risk, $[E(R_m) - R_{f]}$

2.4.2 The market model and the single index model

The market model is a simple linear model that expresses the relationship between the return on a security and a return on a market index. Bodie, Kane & Marcus (2002) described the market model as a model which states that the return "surprise" of any security is proportional to the return surprise of the market, plus a firm specific surprise. This relationship is expressed by the equation 2.2.

$$r_{i,t} - E(r_{i,t}) = \beta_i * [r_{M,t} - E(r_{M,t})] + \varepsilon_{i,t} \quad \text{(Equation 2.2)}$$

where

$r_{i,t} - E(r_{i,t})$ = the return "surprise" on stock $_i$ in period $_t$

$r_{i,t}$ = the return on stock $_i$ for period $_t$

$E(r_{i,t})$ = the expected return on stock $_i$ for period $_t$

$r_{M,t} - E(r_{M,t})$ = the market return "surprise" in period $_t$

$r_{M,t}$ = the market return for period $_t$

$E(r_{M,t})$ = the expected market return for period $_t$

β_i = beta, the systematic risk of stock $_i$ relative to the market

$\varepsilon_{i,t}$ = the firm specific surprise

However, if the CAPM is valid, it can be shown that the market model relationship can be expressed by the equation 2.3, which is also known as the single index model (Bodie, Kane & Marcus, 2002).

$$R_{i,t} = \alpha_i + [\beta_i * R_{M,t}] + \varepsilon_{i,t} \quad \text{(Equation 2.3)}$$

where

$R_{i,t}$ = the excess return on stock $_i$ in period $_t$ given by $r_{i,t} - r_f$

$r_{i,t}$ = the return on stock $_i$ for period $_t$

r_f = the risk free rate

$R_{M,t}$ = the excess market return in period $_t$ given by $r_{M,t} - r_f$

$r_{M,t}$ = the market return for period $_t$

β_i = beta, the systematic risk of stock $_i$ relative to the market

α_i = alpha, the intercept of the linear relationship between the returns of stock $_i$ relative to the return of the market. It has a value of zero when the CAPM is valid.

$\varepsilon_{i,t}$ = the unpredictable component. It has an expected value of zero

The alpha, α, measures how much a share outperformed (alpha positive) or under performed (alpha negative), given a market movement of zero. When the CAPM is valid, α, is zero and the single index model is the same as the market model. The market model is also described as a factor model or to be more specific, a single factor model in which the factor is a market index (Sharpe, Alexander & Bailey, 2003).

2.4.3 Criticisms of the CAPM

The CAPM has been regarded as an elegant model and useful tool for analysts. However, the CAPM has its critics. It does not fully withstand empirical tests. The CAPM's empirical problem may be due to its simple assumptions which may not reflect reality. There are also difficulties in implementing valid tests of the model. For example, the ideal way to test the CAPM is to use *ex ante* or expected returns information on investor expectations. However, this is not practical and *ex post facto* or realised returns are used instead. Not withstanding its limitations, the CAPM is still used widely (Fama & French, 1992), because it is simple and intuitively appealing.

In the context of market efficiency, others have ascribed the existence of anomalies to misspecification of the risk parameter. What this means is that beta in the asset-pricing model does not capture all the systematic risk and other factors in combination with beta need to be included. Several researchers, for example, Fama & French (1992), argued that a single factor beta model provided little explanation, if any, for the cross-section on the returns on shares. Studies showed that certain characteristics such as company size or market capitalisation, P/E ratio, leverage and book to market equity ratios, past returns and dividend yield could predict returns (Fama & French, 1992, 1996, 1998; Daniel & Titman, 1997). This had launched the debate among academics of whether beta reflects risk and, therefore, the validity of using the CAPM to predict returns. A study by Rensburg & Robertson (2003) even showed that beta was inversely related to returns for stocks on the JSE Securities Exchange.

2.4.4 Estimation of beta

In the CAPM, beta is the only asset specific or portfolio-specific factor. Beta is the measure of the systematic risk or volatility of a security or portfolio in comparison to the market as a whole. The beta value can range from zero (no systematic risk, that is, risk free rate) to one (same amount of systematic risk as the market portfolio) and above one (more systematic risk than the market portfolio). Given that beta is such a crucial element in the CAPM, its estimation must be accurate.

The estimation of the beta coefficient has traditionally been achieved by running the ordinary least squares (OLS) regression on either the single index model equation or the CAPM model.

2.4.4.1 Finding beta using single index model

When the single index model is used, the beta of the stock is given by the slope of the regression line equation 2.4

$$R_{i,t} = \alpha_i + [\beta_i * R_{M,t}] + \varepsilon_{i,t} \qquad \text{(Equation 2.4)}$$

where

$R_{i,t}$ = the excess return on stock $_i$ in period $_t$ given by $r_{i,t} - r_f$

$r_{i,t}$ = the return on stock $_i$ for period $_t$

r_f = the risk free rate

$R_{M,t}$ = the excess market return in period $_t$ given by $r_{M,t} - r_f$

$r_{M,t}$ = the market return for period $_t$

β_i = beta, the systematic risk of stock $_i$ relative to the market

α_i = alpha, the intercept of the linear relationship between the returns of stock $_i$ relative to the return of the market

$\varepsilon_{i,t}$ = the unpredictable component. It has an expected value of zero

The slope of beta, β_i of the regression line also equals to:

$$\beta_i = \frac{\mathrm{cov}(R_{it}, R_{mt})}{Var(R_{mt})} \qquad \text{(Equation 2.5)}$$

It should be noted that the market model is not based on any assumptions about the investment behaviour but simply posits a linear relationship between stock returns and the market returns (Bradfield, 2003).

2.4.4.2 Finding beta using the CAPM model

Using the CAPM model, the beta values are estimated by regressing the monthly returns of a share in excess of the risk free rate on the monthly returns of the market in excess of the risk free rate. The regression equation is in the following form:

$$[Ri_{,t} - R_f] = \text{constant} + \beta_i * [Rm_{,t} - R_f] \qquad \text{(Equation 2.6)}$$

where

$R_{i,t}$ = monthly returns earned by the share in period t

β_i = Beta of the share i

$R_{m,t}$ = monthly returns of the market in period t

R_f = risk free rate

2.4.4.3 Other methods for the calculation of beta

The standard approach for estimating betas requires information on market prices. This method cannot be applied easily to companies which are not traded or to companies which have been traded only for a short period, or to stocks subject to a lot of manipulative trading (Chandra, 2003). In this case, other methods for calculating beta should be used. Betas can be calculated by using fundamental information or accounting earnings or cross-sectional regressions (Chandra, 2003).

3 HYPOTHESES

In an effort to determine whether or not the P/E ratio effect existed on the SEM during the period between January 2001 and December 2003, two hypotheses were formulated.

Hypothesis one:
The first hypothesis investigated whether there was a difference in returns from portfolios with different P/E ratios.

H_0: There was no difference in the return of a portfolio of shares with below median P/E ratios and the return of a portfolio of shares with above median P/E ratios on a risk adjusted basis.

H_a: There was a difference in the return of a portfolio of shares with below median P/E ratios and the return of a portfolio of shares with above median P/E ratios on a risk-adjusted basis.

A two-tailed test was used for testing the difference in return of two P/E ratio portfolios. One portfolio contained below median P/E ratio firms and the second portfolio contained above median P/E ratio firms.

Hypothesis two:
The second hypothesis investigated whether the return of a low P/E ratio portfolio was greater than the return of a high P/E ratio portfolio.

H_0: The risk-adjusted return of a portfolio of shares with below median P/E ratios was less than or equal to that of a portfolio of shares with above median P/E ratios.

H_a: The risk-adjusted return of a portfolio of shares with below median P/E ratios was greater than that of a portfolio of shares with above median P/E ratios.

A one-tailed test was used for testing that the portfolio of shares with low P/E ratios outperformed the portfolio of shares with high P/E ratios. One portfolio contained below median P/E ratio firms and the second portfolio contained above median P/E ratio firms

4 RESEARCH METHODOLOGY

This chapter describes the methodology that was used to answer the hypotheses posed in the previous section.

4.1 Population

The population under consideration for this study was all those companies meeting some criteria. It consisted of all equity companies excluding investment companies, which were listed on the SEM between December 1995 and December 2003. Investment companies are usually closed-end investment funds. These funds consisted of an actively managed portfolio of stocks, which are all individually traded on the stock exchange. The population also did not include debentures and preference shares. Only listed companies were considered as these were the ones used for the calculation of the market indices such as the SEMDEX and the SEMTRI. There were 42 listed equity companies at the end of period 1996 and 39 listed equity companies at the end of period 2003. There were also 12 investment companies at the year-end of 2003 (The Stock Exchange of Mauritius Ltd, 2004).

4.2 Sample

For the purposes of this study, the population - as defined for all equity companies excluding investment companies - and the sample were the same. Sampling of the population was not undertaken for this research as the population size was fairly small -an average of 30 companies in the research period.

4.2.1 Sample bias issues

Compared with international studies (Basu, 1977; Reinganum, 1981; Keim, 1990), the sample of the research was relatively tightly bound in time and the number of companies to form portfolios was small. However, this was unavoidable as the SEM is a small stock market which started its trading only in July 1989 with five companies and reached 42 companies in 1996.

A potential bias that could have been introduced in this study was the time-constricted sample as the time period under investigation was fairly small - three years. Thus, the business life cycle and impact of “bull” or “bear” market trends could impact across market returns. For the purposes of this study, P/E ratio portfolios were analysed for the period between January 2001 and December 2003 only. Data for companies between January 1996 and December 2000 was used to calculate historical beta values needed for the P/E ratio portfolio monthly returns between January 2001 and December 2003.

Given the small population of firms, the selection of firms with the same fiscal end period in the portfolios was not practical and the requirement that firms have the same fiscal year end was not considered.

As far as possible, the P/E ratio portfolios created were kept free of survivorship bias (Haugen, 2002; Bodie, Kane & Marcus, 2002). Thus, de-listed shares were included in the sample up to the day of de-listing. New listings were included from their first trading day.

4.3 Data Specifications

The data collected from the sample consisted of the daily listed values of companies on the SEM for the test period. Only transactions in ordinary shares were included. All transactions were conducted in Mauritian currency.

4.4 Data Collection

The primary data for this study was drawn from a CD Rom, which contained electronic Excel files of transactions of listed companies on the SEM. The raw data files were extracted from the database of the SEM. The data obtained included all transactions between December 1995 and December 2003, mainly:

- the individual company closing share price
- the closing SEMDEX indices
- the average number of shares in issue for the firms
- the dividend payout (dividend yield or dividend per share) of the firms
- the P/E ratios of the firms

Monthly closing share prices were used for this study, as the data was more readily available than weekly or daily share prices.

When data was not available, alternative sources such as financial reports, official bulletins from the SEM or the MCB Stock Brokers Ltd, a private stock broking company, were used.

It was not possible to find any companies, which provide services to calculate the alphas and betas of the companies. As for beta values, they were computed using the raw market and company data that were collected from SEM.

For the collection of treasury bills rate, the data was obtained from the annual reports of the Bank of Mauritius.

This study assumed that, for portfolio formation, an investor was able to purchase shares of whatever size at the closing price on the portfolio formation date. These were subsequently sold at the corresponding date twelve months later. Transaction costs and taxes were not taken into account.

4.5 Data Reliability and integrity

Data reliability is the consistency with which a measuring instrument yields a certain result when the characteristic being measured has not changed (Leedy & Ormrod, 2001). Since the data obtained came from the official database SEM, the data was considered to be reliable, at least, concerning the share prices and market indices.

However, several checks were made to verify the reliability of data collected. The data of the sample firms, needed for this research, was also obtained from the MCB Stock Brokers Ltd. Random checks on the accuracy of sample required data made from two different database sources. Discrepancies checks on share price were performed. Any data discrepancies obtained was re-checked. If no certainty could be found, the data value was excluded.

Internal checks were also made. The simulated market capitalisation index was construed from the collected share returns and market capitalisation data. If this simulated market capitalisation index closely tracked with the official SEMDEX, then it was assumed that the collected data was reliable. The results of this validity test are shown in chapter 5.1.

4.6 Data analysis: The portfolio study methodology

The portfolio study (Chandra, 2003), is a method that can be used for testing the abnormal returns of low P/E ratio firms. The general steps in making this portfolio study were as follows:

1. define the variable (characteristic) on which firms are classified;
2. classify firms into portfolios based on the magnitude of the variable;
3. compute the actual returns for each portfolio;
4. calculate the abnormal returns for each portfolio; and
5. assess whether the average returns are different across the portfolios.

4.6.1 Step 1: Define the variable on which firms are classified

The variable considered for the research was the P/E ratio.

4.6.2 Step 2: Classify firms into portfolios based on the magnitude of the variable

The research period for the creation of portfolios was arbitrarily selected as the last trading day of the month from December 2000 to December 2003. This resulted in three review periods namely year 2001, year 2002 and year 2003. Portfolio formation date is usually made on the last trading day of the month prior to the review period. Thus, for the review period 2001, the portfolio creation date was December 2000. Similarly, for review period 2002, the portfolio creation date was December 2001, and for the review period 2003, it was December 2002. Using data on P/E ratios, listed firms on the SEM were classified into two portfolios class groups namely, below median P/E ratio portfolio class and above median P/E ratio portfolio class.

To facilitate ranking, only shares with positive P/E ratios were used in this study. It was assumed that negative earnings could mean “distress”, for companies and investors would not buy the shares of those companies. For this study, all the P/E ratios for the companies were obtained from the data CD ROM available from the SEM. When the P/E ratio of companies were not available, the researcher computed the P/E ratio with the numerator defined as the market value of common stock (market price times number of shares outstanding) and the denominator as reported annual earnings (before extraordinary items) available for common stock holders. This was the approach used by Basu (1977) in his study of P/E ratio anomaly.

Given that the whole complete sample or population was used, the look-ahead bias (Banz, 1986; Haugen, 2002) was not eliminated in the research. For this study, the look-ahead bias occurred when the P/E ratio calculation was made using earnings data that was not known when the predictions were made at the portfolio creation date. One way of eliminating the look-ahead bias in calculating the P/E ratio of the firm, therefore, was to

select companies which all end their financial year in the same month (Basu, 1986). However, for this study, it was practically difficult to eliminate look-ahead bias as the size of population was small. For example, in 2003, there were only 17 companies with December fiscal year (Stock Exchange of Mauritius, 2004) and studies in creating portfolios with 17 companies would have introduced other biases such as normally distributed return issues due to small size.

The construction of two portfolios was arbitrary, though that number represented the best practical balance as the number of companies in the population was small. Usually, elimination of diversifiable risk is achieved by spreading the assets and at least 32 stocks must be in a portfolio for the returns of the portfolio to be normally distributed (Bodie, Kane & Marcus, 2003). For this study, the average number of companies in each portfolio was fifteen. However, since this research was about finding differential abnormal returns between the two P/E ratio portfolios, the methodology used was still valid.

The portfolio was reconstructed from the entire population at the beginning of each review period starting in January. This ensured that:

(a) the portfolios retained their character (either low P/E ratio or high P/E ratio portfolios), and
(b) the shares were evenly balanced in terms of value over the portfolios during each review.

4.6.3 Step 3: Compute the actual returns for each portfolio

For the calculation of the returns for each portfolio, the following assumptions were made:

(a) it was assumed that the stocks in each portfolio were equally weighted and Rs100 was invested in each stock at the portfolio formation date;

(b) a buy and hold policy was assumed for each portfolio during each review period.

The monthly actual returns of each portfolio for the next 12 months of the review period are the mean monthly returns of all the firms in each portfolio of the testing period. That is mathematically:

$$\text{Monthly return of portfolio} = \frac{\text{Sum of all the monthly returns for each firm in the portfolio}}{\text{No of firms in the portfolio}}$$

For this study, it was assumed that, at P/E ratio portfolio formation date, the closing share price of each company was used. Transaction costs, taxes and minimum shares requirements were not taken into consideration in the calculation.

The compounded monthly returns in percentage (including dividends) for a firm were calculated by using equation 4.1.

$$R_{it} = 100 * \ln_e (P_{it} + D_{it}) / P_{it-1} \qquad \text{(Equation 4.1)}$$

where

R_{it} = return on share $_i$ over period $_t$

P_{it} = share $_i$ closing price at the end of period $_t$

P_{it-1} = share $_i$ closing price at the end of period $_{t-1}$

D_{it} = cash dividend paid out on share $_i$ over period $_t$

As far as possible, the adjustments for share-split or bonus issues and rights issues on monthly returns for each firm (if any) were calculated.

Shares, which were suspended for any period, were reflected as having nil return for the period during which the shares were suspended. Shares, which were de-listed, were considered as written off.

4.6.3.1 Assumptions for cash dividend value D_{it}

Given that it was not easy to identify the exact payment dates for dividends, it was assumed that dividends were received evenly during the year. Thus, the monthly return was calculated by using equation 4.2.

$$R_{it} = 100 * \ln_e (P_{it} + D_{it}/12) / P_{it-1} \qquad \text{(Equation 4.2)}$$

For the purposes of this study, it was assumed that D_{it} was the dividend per share as listed by the SEM. This dividend was usually the dividend paid during the last financial year in the trailing twelve months.

4.6.4 Step 4: Calculate the abnormal returns for each portfolio

For the purposes of this study, the continuously compounded returns were calculated. The fourth step of the portfolio study was the calculation of the abnormal returns of each portfolio.

The abnormal return is the difference between the actual return and the expected return of the portfolio. This was mathematically computed by using equation 4.3.

$$A(R_{pt}) = R_{pt} - E(R_{pt}) \qquad \text{(Equation 4.3)}$$

where

$A(R_{pt})$ = abnormal returns earned by portfolio p in period t

R_{pt} = returns earned by portfolio p in period t

$E(R_{pt})$ = expected returns earned by portfolio p in period t

The expected return was calculated by the formula of equation 4.4.

$$E(R_{pt}) = R_f + [E(R_{Mt}) - R_f]\,\beta_p \qquad \text{(Equation 4.4)}$$

where

$E(R_{pt})$ = expected returns earned by portfolio p in period t

β_p = beta of portfolio p

$E(R_{Mt})$ = returns (compounded) earned by market portfolio in period t

R_f = monthly risk free rate. For the purposes of this study, the monthly 91-days Treasury Bills rate was used

4.6.4.1 Obtaining risk free rate R_f

The raw values which were collected for R_f were the annual 91-days Treasury Bills rate. Those values were obtained from the Bank of Mauritius. Given that monthly expected returns were calculated, the monthly 91-days Treasury Bills (TB) rate was obtained by using the equation 4.5.

$$\text{Monthly 91-days TB rate} = [(1+ \text{annual 91-days TB rate})^{(1/12)} - 1] \qquad \text{(Equation 4.5)}$$

4.6.4.2 Obtaining the beta of portfolio

The beta of each portfolio, β_p was estimated either by taking the average of the betas of the individual stocks in the portfolio or by regressing the portfolio's returns against market returns over a prior period (1996-2000).

For the purposes of this study, the beta portfolio was calculated using the average of the betas of the firms in the portfolio. The beta of each firm was computed using the regression equation 4.6.

$$[R_{i,t} - R_f] = \text{constant} + \beta_i * [R_{m,t} - R_f] \qquad \text{(Equation 4.6)}$$

where

- $R_{i,t}$ = monthly return earned by the share in period t. The return measures of the firm earned include dividends paid out during the period. The mathematical equation 4.1 is used to calculate the returns.
- β_i = beta of the share i
- $R_{m,t}$ = monthly return of the market in period t
- R_f = risk free rate; obtained by using equation 4.5

A portfolio beta was calculated for each of the review periods and for each portfolio.

4.6.4.3 Issues in regression methodology

In setting up the regression equation to calculate the historical beta, certain decisions needed to be taken. These included the length of the estimation period, the return interval and the choice of the market index.

Measurement period

The measurement period to be used should be long enough to have a statistically significant sample, but it should not be so long that it does not reflect the relationships likely to persist in the future. For this study, the beta value was calculated using 60 months of historical data between January 1996 and December 2000 prior to the start of the P/E ratio portfolio creation in January 2001. A 60-month estimation period was used in many international studies (Basu, 1977, Aggarwal, Rao & Hiraki, 1990).

Interval choice

The length of the intervals within the chosen holding period can affect the beta estimate. Intervals may be calculated on annual, monthly, weekly or daily basis. Using daily basis, the number of observations increases, but this introduces a bias of non-trading hence to reduce non-trading bias, monthly intervals have been used for this study.

The market proxy

The standard practice has been to estimate the beta of a stock in relation to the index of the market to which it belongs (Chandra, 2002). In Mauritius, the main market index benchmark used by investors is the SEMDEX. The SEMTRI is a relatively new index which was launched on 03 October 2002. The SEMTRI index includes price earning ratios, dividend earnings besides measurements of daily price changes on listed stocks. For this study, the market benchmark used was the SEMDEX.

4.6.4.4 Return measures in beta estimation

The first consideration in beta estimation is the construction of the return series for both the stock and the market index used. Either discrete or continuously compounded, returns can be used as long as the consistency between asset returns and the market index proxy is maintained (Bradfield, 2003). For this study, continuously compounded returns were used. The return measures also took into account dividends paid out by firms.

4.6.4.5 Stability of historical beta

Blume (1975) was the first to document that individual stock betas had a regression tendency towards the grand mean of all stocks on the exchange market, which has a value of one. The beta, estimated with the data set between January 1996 and December 2000, reflected a measure of historical alignment of the price of a stock with that of the market. To correct the regression bias to an appropriate estimate of "current" beta at portfolio creation date, different adjustment formulas can be used (Blume, 1975). A simple way was to use Merill Lynch's beta prediction, which assigned a weight of 0.66 to historical beta and a weight of 0.34 to average market wide value (Sharpe, Alexander & Bailey, 2003). More generally the formula used was:

$$\beta_a = (1/3 \times 1.0) + (2/3 \times \beta_h) \qquad \text{(Equation 4.7)}$$

where β_a and β_h are adjusted with the respective historical betas

For this study, the Merill Lynch beta correction was made to the historical beta values that were obtained from the OLS method.

4.6.5 Step 5: Assess whether the average returns are different across the portfolios

Each year's monthly returns were compared to create the data sets for statistical analysis. There were 36 monthly actual and abnormal returns (twelve months x three years) for the two P/E ratio portfolios. From the data sets, several statistical calculations were made. For example, the mean monthly abnormal return was obtained by equation 4.8.

$$\overline{R_{pt}} = \sum_{j=1}^{3}\sum_{t=1}^{12} R_{pt,\,j,t} \,/\, N \,, \qquad \text{(Equation 4.8)}$$

where

$\overline{R_{pt}}$ = mean monthly abnormal return for portfolio P (non risk-adjusted)

N = number of monthly observations (36)

Since the data sets, created for the two P/E ratio portfolios, were date-dependent and correlated, it was assumed that the returns for the two P/E ratio portfolios were not independent and could be paired.

In general, when the samples are naturally paired in some way and there is a reasonably large positive correlation between the pairs; a paired sample procedure can be used to analyse the data. Thus, to assess whether the average abnormal returns between the portfolios were different, the statistical test paired t-test was used.

Paired t-tests are based on the following assumptions:

1. the data is continuous (that is not discrete)
2. the data is not independent.
3. the distribution of the differences follows a normal distribution.

Paired t-tests are used when the samples are dependent or related (Lind, Marchal & Mason, 2000). T-test statistics are quite robust when the population is not normally distributed except in the case of outliers and strong skewness. The one-sample or paired t-test can be used safely when n is greater than or equal to fifteen, unless an outlier or clearly marked skewness is present (Moore & McCabe, 2003). For large samples when n is

greater than or equal to 40, the t statistic can be used even for clearly skewed distributions (Moore & McCabe, 2003).

In hypothesis testing, the null and alternative hypotheses are always the opposite of one another. Thus, in a two-tailed test on the difference between two paired means, the null and the alternate hypotheses were stated as follows:

H_0: $\mu_d = 0$ (The population distribution of differences has a mean of zero)
H_A: $\mu_d \neq 0$ (The population distribution of differences does not have a mean of zero)
where μ_d represents the mean of the population distribution of differences.

For the one-tailed test, the left tail alternate hypothesis is represented by H_A: $\mu_d < 0$ while the right tail alternate hypothesis is depicted by H_A: $\mu_d > 0$

The t-value is the test statistic for the t-test. It has n-1 degrees of freedom. It is identical for both one-tailed and two-tailed tests. The paired t-test statistics are given by the equation4.9.

$$t_{n-1} = \frac{\bar{d}}{S_d / \sqrt{n}} \qquad \textbf{(}\text{Equation 4.9)}$$

where

$$\bar{d} = \frac{\sum d}{n} \qquad \text{(Equation 4.10)}$$

$\bar{d}$ is the mean of the difference between the paired variables

$$S_d = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}} \qquad \text{(Equation 4.11)}$$

S_d is the standard deviation of the differences between the paired variables.

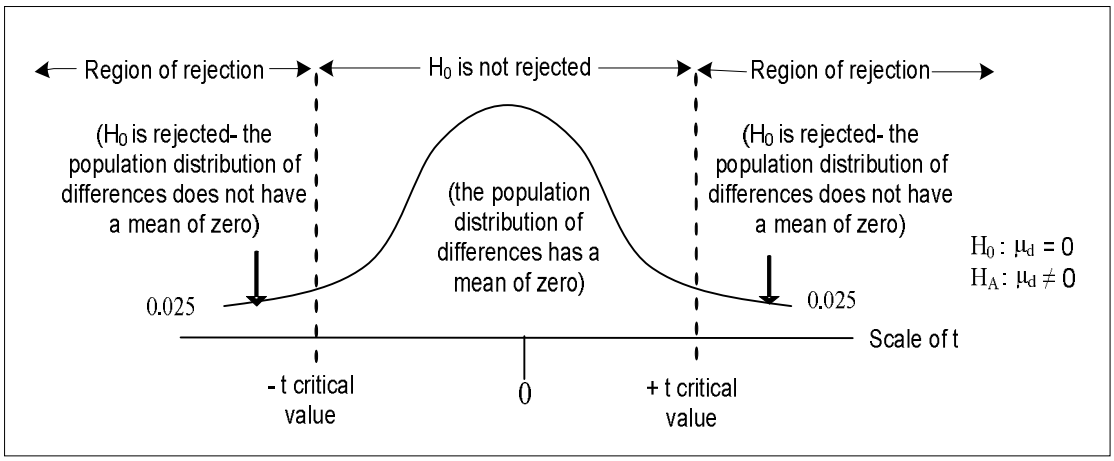
n is the number of paired variables.

For the testing of the hypothesis one, as stated in chapter three, a two-tailed test was used. A two-tailed test was appropriate in order to determine whether there was a difference in

the mean of the population distribution. The test involved determining whether the sample differences could have come from a population with a mean of zero.

The decision rule was to accept the null hypothesis if the computed t value fell within the ±critical t range. This decision rule for a two-tailed test of hypothesis at the 0.05 significance level (or alpha) for n-1 degrees of freedom is illustrated in figure 4.1. The critical t values were calculated using NCSS probability calculator with n-1 degrees of freedom. If the paired t-statistic value t_{n-1} is greater than the critical t value, then the null hypothesis that the population distribution of differences has a mean of zero is rejected and the alternative hypothesis is favoured; namely that the population distribution of differences does not have a mean of zero.

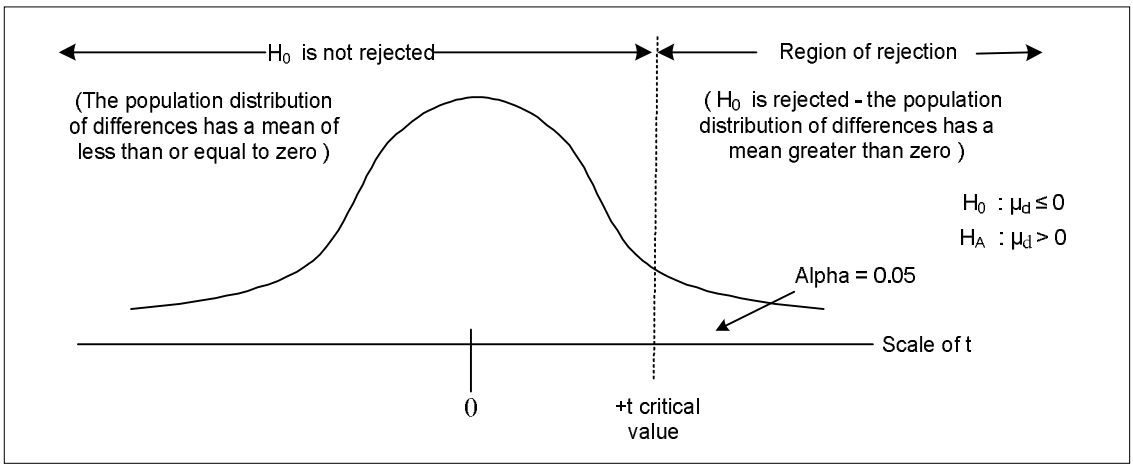
Figure 4.1: Decision rule for two-tailed test at the 0.05 significance level.



For the testing of the hypothesis two, as stated in chapter three, a one-tailed test was used. In the one-tailed hypothesis test, the rejection of the null hypothesis occurs in only one tail of sampling distribution of the test statistic.

The decision rule for a right tailed test at the 0.05 significance level for n-1 degrees of freedom is illustrated in figure 4.2. The positive critical t value was computed using NCSS probability calculator with n-1 degrees of freedom. If the paired t-statistic value t_{n-1} greater than the critical t value, then the null hypothesis that the population distribution of differences has a mean less than or equal to zero is rejected and the alternative hypothesis is favoured; namely the population distribution of differences has a mean greater than zero.

Figure 4.2: Decision rule for a right-tailed test at the 0.05 significance level.



4.6.5.2 Change of frequency of measured returns

Most of the values, observations and thus statistical returns, were based on monthly periods. Given that compounded returns were calculated to transform continuously compounded returns to annual returns, the following mathematical conversions given by equation 4.12 and equation 4.13 were used.

$$\text{Mean}_{(\text{annually})} = 12 \times \text{Mean}_{(\text{monthly})} \qquad \text{(Equation 4.12)}$$

$$\text{Standard deviation}_{(\text{annually})} = \sqrt{12} \times \text{Standard deviation}_{(\text{monthly})} \qquad \text{(Equation 4.13)}$$

4.6.5.3 Risk-adjusted performance measures

There are several risk-adjusted performance measures which are used by the academics and investors to evaluate performance of portfolios (Friend & Blume, 1970). They are the Sharpe's, Treynor's and Jensen's measures.

Sharpe's measure:

The Sharpe's measure is very useful in comparing two portfolios in terms of risk-adjusted returns. It is calculated by first subtracting the risk free rate from the return of the portfolio, and then by dividing the standard deviation of the portfolio. This is mathematically given by the equation 4.14.

$$S_p = (\overline{R_{pt}} - \overline{R_f}) / \sigma_p \qquad \text{(Equation 4.14)}$$

where

S_p = the Sharpe's measure for portfolio p

$\overline{R_{pt}}$ = the average rate of return on portfolio p

$\overline{R_f}$ = average rate of return on a risk free rate investment

σ_p = the standard deviation of the average monthly returns for portfolio p

The higher the Sharpe's measure the better as it implies that the portfolio is realising sufficient returns for each unit of risk.

Treynor's measure:

The Treynor's measure is a measurement of the returns earned in excess of what could have been earned on a risk-less investment (per unit of market risk assumed). It uses systematic risk instead of total risk. The Treynor index is obtained mathematically by the equation 4.15.

$$T_p = (\overline{R_{pt}} - \overline{R_f}) / \beta_p \qquad \text{(Equation 4.15)}$$

where

T_p = the Treynor's measure for portfolio p

$\overline{R_{pt}}$ = the average rate of return on portfolio p

$\overline{R_f}$ = average rate of return on a risk free rate investment

β_p = the beta for portfolio p

The beta of portfolio p was calculated over the three-year period (January 2001 to December 2003) using the OLS method, with the SEMDEX as the market proxy.

For the analysis of the risk adjustment performance of the portfolios during the review period 2001 to 2002, the beta for the Treynor's measure was computed using the regression of the market model equation given as:

Return of portfolio = constant + beta of portfolio x return of market

Jensen's measure:

Jensen's measure is the average return on the portfolio over and above the one predicted by the CAPM, given the portfolio's beta and the average market return. The Jensen's measure is obtained by using equation 4.16.

$$A_p = \overline{R_{pt}} - [\overline{R_f} + \beta_p * (\overline{R_{mt}} - \overline{R_f})] \qquad \text{(Equation 4.16)}$$

where

A_p = the Jensen's measure for portfolio p

$\overline{R_{pt}}$ = the average rate of return on portfolio p for time period t

$\overline{R_{mt}}$ = the average rate of return on the market

$\overline{R_f}$ = the average rate of return on a risk free rate investment

β_p = the beta for portfolio p

Jensen's measure is usually the alpha value of the regression equation 4.17.

$$(\overline{R_{pt}} - \overline{R_f}) = A_p + \beta_p * (\overline{R_{mt}} - \overline{R_f}) \qquad \text{(Equation 4.17)}$$

or

Excess Return = Jensen's measure + (Beta x Market excess return)

If alpha was positive on the one hand, the portfolio did better than the market on a risk-adjusted basis during the time period of study. On the other hand, if alpha was negative, then the portfolio did worse than the market on a risk-adjusted basis during the time period of study.

4.7 Validity and Reliability of study

The validity of a research refers to the “accuracy, meaningfulness, and credibility” of the study as a whole (Leedy & Ormrod, 2001).

4.7.1 Internal validity

According to Leedy & Ormrod (2001:103), internal validity refers to the extent to which the researcher is able to draw “accurate conclusions” from this study. This involves reducing the possibility of research results coming about due to reasons other than those concluded in this study. This study employed the portfolio study technique and the portfolio evaluation technique which are commonly used by professional investors and other academics. Many of the practical issues and problems for portfolio calculations were documented by others and care was taken to eliminate the remaining ones whenever possible.

4.7.2 External validity

External validity refers to the extent to which generalisations into other areas can be made from the results of a specific study (Leedy & Ormrod, 2001). One way to enhance the external validity is to use a representative sample. For practical purposes and because of the small number of companies in the SEM, no random sampling was made and the whole population of companies was used.

Another way of improving external validity is through replication in another context (Leedy & Ormrod, 2001). The present research was based on replicating and using similar methodology based from other international studies on the Mauritian market context.

5 PRESENTATION OF RESULTS

5.1 Data integrity tests

The first step was to ensure that the source data collected from the SEM for this study was sound. A monthly market capitalisation-weighted index was constructed from the monthly share returns from all the firms used for the portfolio study. This synthesised index was then compared for accuracy against the SEMDEX. If the two indices closely tracked each other, then it could be said that the data used in this study was reliable and accurate.

The starting date of the index was 31st January 2001, which, in fact, was the last trading day of the first research month. Figure 5.1 shows how closely the two indices tracked each other throughout the review period between 31st January 2001 and 31st December 2003. The indices diverted slightly during the review period year 2002 and slightly during the end of the review period year 2003.

Figure 5.1: Tracking of simulated index and SEMDEX based to 100 at January 2001

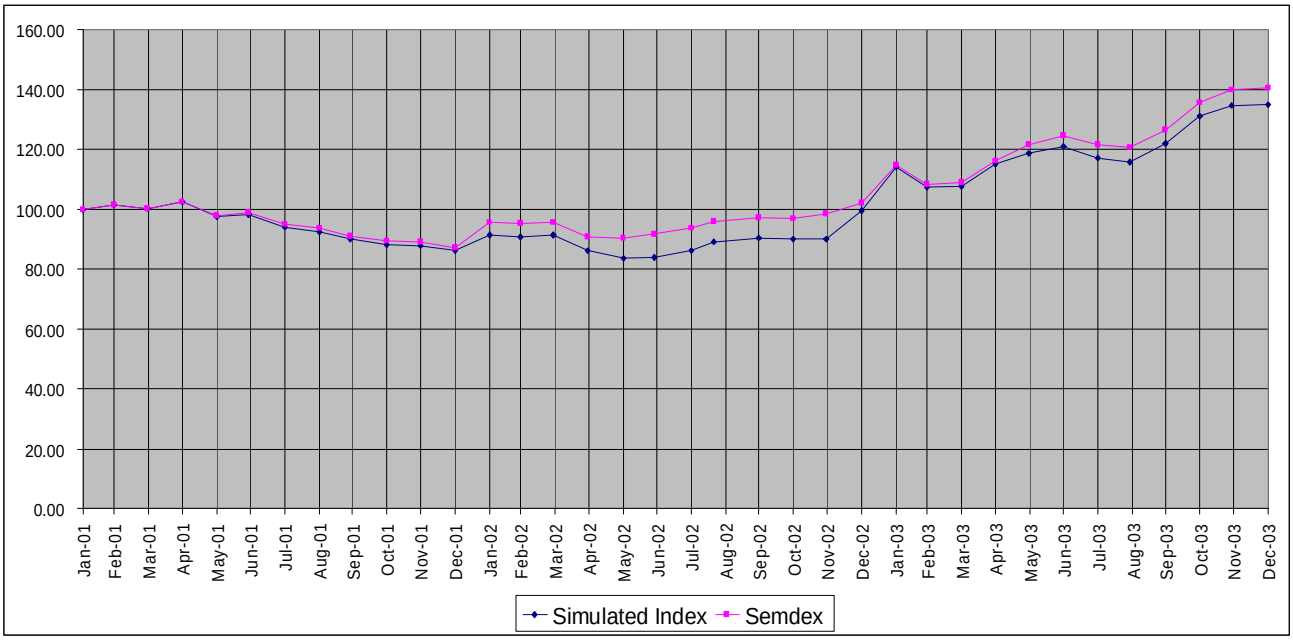


Figure 5.2 shows the returns of the simulated index relative to the returns of the SEMDEX. The graph was plotted by dividing each period's return of the SEMDEX together with that of the simulated index. The widest deviation of the simulated index from the SEMDEX was about 9% in November 2002. This deviation narrowed down to 4% at the end of the review period.

Figure 5.2: Relative returns SEMDEX vs. simulated index

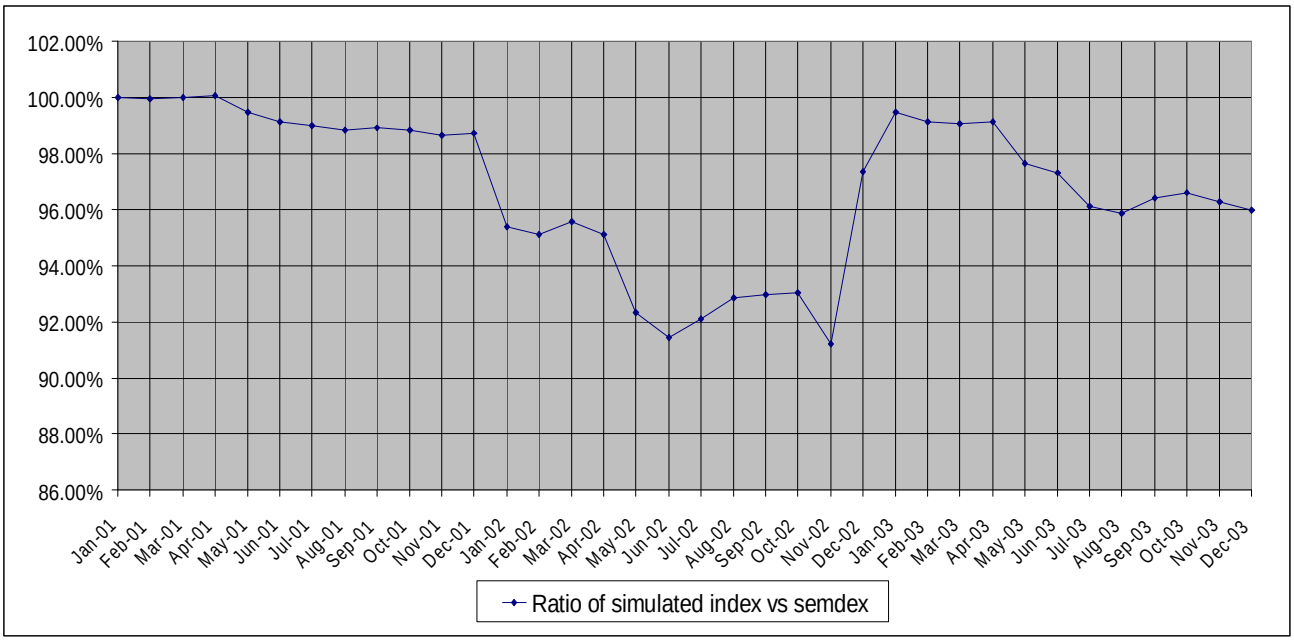


Figure 5.3 shows the scatter plot of SEMDEX as compared to the simulated index during the research period. The scatter plot illustrates that there was a positive relationship between the simulated index and the SEMDEX. This is shown by the regression equation, which has a high R-squared value of 0.9686. The output results of the regression equation analysis between the simulated index (Independent variable) and the SEMDEX (dependent variable) are outlined in table 5.1. The high value of correlation obtained between the simulated index and the SEMDEX, which is 0.9842, further indicated that there was a positive relationship between the simulated index and the SEMDEX.

5.1.1 Conclusion

It was concluded that the collected data, used for building portfolios, was reliable and in accordance with what actually happened in the market.

Table 5.1: Results of simple regression for simulated index vs. SEMDEX

Results of simple regression for Simulated Index

Summary measures

Multiple R	0.9842
R-Square	0.9686
StErr of Est	2.7026

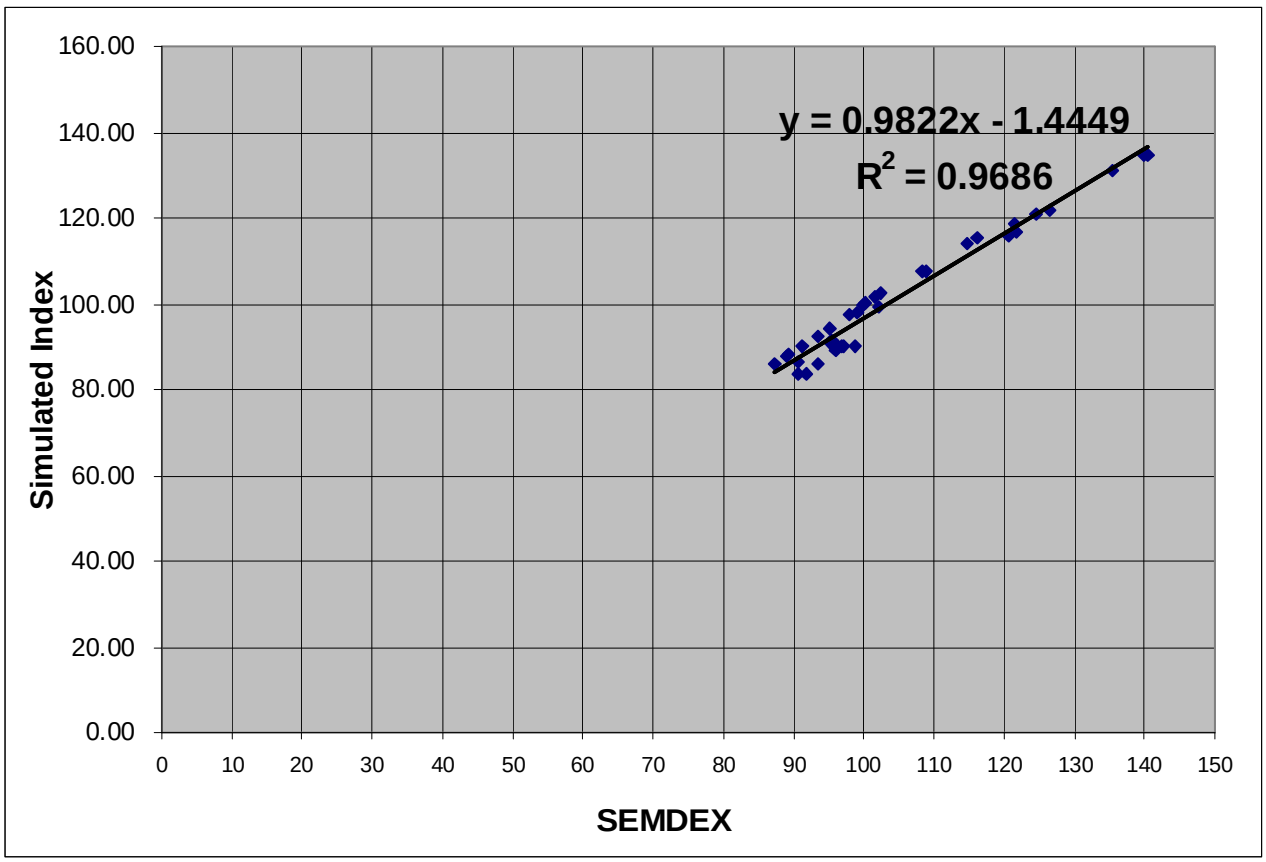
ANOVA table

Source	df	SS	MS	F	p-value
Explained	1	7660.6779	7660.6779	1048.8132	0.0000
Unexplained	34	248.3408	7.3041		

Regression coefficients

	Coefficient	Std Err	t-value	p-value	Lower limit	Upper limit
Constant	-1.4449	3.2072	-0.4505	0.6552	-7.9627	5.0728
Semdex	0.9822	0.0303	32.3854	0.0000	0.9206	1.0439

Figure 5.3: Scatter plot of simulated index vs. Semdex with regression equation



5.2 Classification of firms into portfolios in each review period

For each of the review periods from 2001 to 2003, firms, selected for the constitution of the P/E ratio portfolios, were the listed equity companies in the SEMDEX except for investment companies, debentures, preference shares companies and companies with negative earnings. The firms, constituting the below median P/E ratio portfolios and above median P/E ratio portfolios[1] in each review period, are given in Tables 5.2, 5.3 and 5.4.

Table 5.2: List of firms in above and low median P/E ratio portfolios for year 2001

Portfolio creation date: 29th December 2000					
	List of firms	Ranking of P/E ratios in ascending order		List of firms	Ranking of P/E ratios in ascending order
Below Median Low P/E ratio Portfolio	SAVA (O)	1.9	Above Median High P/E ratio Portfolio	SWAN	6.5
	M D A (O)	2.3		I B L	6.7
	AIR MAURITIUS	2.6		M B L	7.0
	P I M	3.2		H W F	7.1
	COURTS	3.6		SHELL	7.5
	M C F I	4.5		S B M	7.6
	GAMMA CIVIC	4.7		M T M D	8.0
	M C B	4.9		A S L	8.7
	M S M	4.9		M U A	9.2
	U B P	5.0		SUN RESORTS	9.4
	MEI	5.2		G B H	10.1
	HAREL. MALLAC	5.6		DELPHIS BANK	10.3
	M O R	5.8		N M H	10.7
	ROGERS	5.8		MOUNT	51.4
	B A I	6.0		C M P L	59.1

[1] For this study, given that only two P/E ratio portfolios were created for each review period, the same portfolio was used for both the below median and the low P/E ratio portfolio. For the above median P/E ratio portfolio and the high P/E ratio portfolio, it was the same portfolio.

Table 5.3: List of firms in above and low median P/E ratio portfolios for year 2002

Portfolio creation date: 31st December 2001					
	List of firms	Ranking of P/E ratios in ascending order		List of firms	Ranking of P/E ratios in ascending order
Below Median Low P/E ratio Portfolio	COURTS	2.14	Above Median High P/E ratio Portfolio	M B L	6.16
	I B L	3.14		H W F	6.23
	M C F I	3.78		SUN RESORTS	6.53
	HAREL MALLAC	3.97		M O R	6.64
	M S M	4.03		G B H	7.24
	M C B	4.25		SHELL	7.62
	S B M	4.38		N M H	7.87
	ROGERS	4.73		M U A	8.41
	MEI	4.81		HAREL FRERES	8.52
	P I M	4.86		A S L	8.70
	B A I	5.15		DELPHIS BANK	13.25
	C M P L	5.48		GAMMA CIVIC	18.75
	U B P	5.57		M T M D	20.28
	MOUNT	5.61		SAVA (O)	35.71
	SWAN	5.78			

Table 5.4: List of firms in above and low median P/E ratio portfolios for year 2003

Portfolio creation date 31st December 2002					
	List of firms	Ranking of P/E ratios in ascending order		List of firms	Ranking of P/E ratios in ascending order
Below Median Low P/E Portfolio	COURTS	2.14	Above Median High P/E Portfolio	M D A (O)	5.72
	M T M D	2.29		SWAN	5.78
	GAMMA CIVIC	2.32		ROGERS	5.87
	AIR MAURITIUS	2.54		B A I	6.06
	SAVA (O)	2.67		M U A	6.31
	HAREL FRERES	3.48		H W F	6.86
	P I M ^	3.57		MOUNT	7.02
	U B P	3.93		SUN RESORTS	7.51
	M C F I	4.37		SHELL	7.73
	S B M	4.43		M O R	7.76
	M S M	4.52		M B L	7.80
	HAREL MALLAC	4.53		I B L	8.50
	M C B	4.59		A S L	8.59
	MEI	5.14		N M H	8.81
	C M P L	5.32			

5.3 Beta of firms and beta of portfolios

For each of the review periods, the following values were computed, namely:

(a) the beta and adjusted beta of firms forming the below and above median P/E ratio portfolios;

(b) the beta and adjusted beta of portfolios.

Tables 5.6, 5.7 and 5.8 show the output of values beta estimates of firms and some of their statistics in below median P/E ratio portfolio and above median P/E ratio portfolio for different research periods. The beta of firms and beta of portfolios were calculated as described in section 4.6.4.2. The adjusted beta is the beta value representing an estimate of the future beta of the firm using the Merill Lynch method. It was adjusted as described in section 4.6.4.5.

A summary of the beta of portfolios, obtained and used for subsequent calculations of abnormal returns, is given in table 5.5. The lower the value of beta between zero and one, the lower is the volatility. From table 5.5, it is seen that, except for the adjusted beta computed for year 2001, the adjusted beta of the below median P/E ratio portfolio was higher than the adjusted beta of above median P/E ratio portfolio. For the years 2001 and 2002, the below median P/E ratio portfolio could be considered to be less volatile and, therefore, less risky than the above median P/E ratio portfolio. The adjusted beta values of both P/E ratio portfolios were also less than one and thus less volatile than the market.

Table 5.5: Summary of beta of portfolios computed

	Below median P/E ratio portfolio	**Above median P/E ratio portfolio**
Adjusted beta used for research period 2001	0.786	0.842
Adjusted beta used for research period 2002	0.777	0.708
Adjusted beta used for research period 2003	0.729	0.722

Table 5.6: Beta estimates for review period year 2001

		Annualised Monthly Return Premiums (from Jan96 to Dec00)		Beta	Adjusted Beta
		Mean	Mean Standard Deviation		
	Below median P/E ratio portfolio			**0.679**	**0.786**
Firms in below median P/E ratio portfolio	SAVA (O)	(4.785)	24.163	0.830	0.888
	M D A (O)	(17.982)	28.775	0.972	0.981
	AIR MAURITIUS	(12.314)	22.448	0.586	0.727
	P I M	(5.523)	36.426	1.042	1.027
	COURTS	(7.388)	46.962	1.341	1.225
	M C F I	(12.028)	22.060	0.338	0.563
	GAMMA CIVIC	(5.481)	22.904	0.080	0.393
	M C B	(5.230)	16.693	1.147	1.097
	M S M	(12.218)	20.683	0.623	0.751
	U B P	8.199	19.880	0.835	0.891
	M E I	(2.917)	15.648	0.460	0.644
	HAREL MALLAC	(11.781)	18.943	0.403	0.606
	M O R	10.631	19.145	0.066	0.383
	ROGERS	(9.861)	45.883	0.956	0.971
	B A I	(0.106)	15.895	0.511	0.677
	Above median P/E ratio portfolio			**0.762**	**0.842**
Firms in above median P/E ratio portfolio	SWAN	2.538	23.406	0.824	0.884
	IBL	(6.762)	24.151	1.235	1.155
	M B L	(7.540)	15.801	0.487	0.662
	HAPPY WORLD FOODS	(1.314)	17.041	0.584	0.725
	SHELL	4.045	24.281	0.756	0.839
	S B M	8.665	23.164	1.481	1.317
	M T M D	(9.857)	19.526	0.973	0.982
	A S L	(6.646)	25.697	0.617	0.747
	M U A	3.822	18.059	0.338	0.563
	SUN RESORTS	2.807	19.813	1.172	1.114
	G B H	3.431	17.927	0.777	0.853
	DELPHIS	(22.906)	17.714	(0.098)	0.275
	NEW MTIUS HOTELS	(1.344)	18.521	1.151	1.099
	MOUNT	(12.075)	28.677	0.838	0.893
	C M P L	(25.744)	24.200	0.300	0.538

Table 5.7: Beta estimates for review period year 2002

		Annualised Monthly Return Premiums (from Jan97 to Dec01)		Beta	Adjusted Beta
		Mean	Mean Std Dev		
	Below median P/E ratio portfolio			0.665	0.777
Firms in below median P/E ratio portfolio	COURTS	(21.648)	45.053	0.944	0.963
	I B L	(11.067)	23.848	1.329	1.217
	M C F I	(10.223)	24.141	0.326	0.555
	HAREL MALLAC	(7.559)	41.756	0.347	0.569
	M S M	(9.766)	15.751	0.310	0.544
	M C B	(5.718)	15.906	1.120	1.079
	S B M	(5.822)	23.462	1.665	1.439
	ROGERS	(11.963)	45.404	0.942	0.961
	MEI	(5.504)	16.802	0.412	0.612
	P I M	19.944	33.626	0.530	0.690
	B A I	(1.878)	14.608	0.336	0.562
	C M P L	(12.019)	20.807	0.071	0.387
	U B P	8.914	17.733	0.630	0.756
	MOUNT	(16.796)	23.824	0.570	0.716
	SWAN	(1.559)	18.144	0.447	0.635
	Above median P/E ratio portfolio			0.561	0.708
Firms in above median P/E ratio portfolio	M B L	(11.891)	16.516	0.364	0.580
	H W F	(2.775)	15.547	0.425	0.621
	SUN RESORTS	(4.600)	19.241	1.294	1.194
	M O R	(0.915)	17.383	0.087	0.398
	G B H	(4.344)	16.054	0.722	0.817
	SHELL	18.877	20.724	0.584	0.725
	N M H	(10.022)	18.653	1.187	1.123
	M U A	8.861	18.855	0.285	0.528
	HAREL FRERES	(18.188)	24.370	0.492	0.665
	A S L	(8.013)	23.124	0.470	0.650
	DELPHIS BANK	(26.636)	32.117	0.656	0.773
	GAMMA CIVIC	2.996	24.633	(0.222)	0.194
	M T M D	0.455	25.899	0.847	0.899
	SAVA (O)	(8.758)	28.310	0.668	0.781

Table 5.8: Beta estimates for review period year 2003

		Annualised Monthly Return Premiums (from Jan98 to Dec02)		Beta	Adjusted Beta
		Mean	Mean Std Dev		
	Below median P/E ratio portfolio			**0.594**	**0.729**
Firms in below median P/E ratio portfolio	**COURTS**	(25.090)	43.643	0.940	0.960
	M T M D	5.876	29.430	0.861	0.908
	GAMMA CIVIC	1.842	21.366	0.093	0.402
	AIR MAURITIUS	(5.434)	24.380	0.819	0.880
	SAVA (O)	(14.088)	29.012	0.403	0.606
	HAREL FRERES	(7.830)	26.540	0.023	0.355
	P I M	28.488	29.848	0.585	0.726
	U B P	9.115	14.903	0.515	0.680
	M C F I	(2.592)	26.796	0.607	0.741
	S B M	(6.592)	25.364	1.819	1.540
	M S M	(5.022)	16.419	0.316	0.549
	HAREL MALLAC	0.345	40.141	0.342	0.566
	M C B	(6.393)	16.818	1.104	1.069
	MEI	(2.564)	16.385	0.487	0.662
	C M P L	(5.444)	19.996	(0.001)	0.339
	Above median P/E ratio portfolio			**0.582**	**0.722**
Firms in above median P/E ratio portfolio	**M D A (O)**	4.316	32.465	0.915	0.944
	SWAN	(2.919)	12.888	0.257	0.510
	ROGERS	(9.547)	44.907	0.877	0.919
	B A I	(2.622)	14.815	0.425	0.621
	M U A	6.899	18.706	0.506	0.674
	H W F	(0.971)	14.211	0.363	0.580
	MOUNT	(10.362)	21.199	0.092	0.401
	SUN RESORTS	(3.221)	17.770	1.207	1.136
	SHELL	11.226	13.966	0.156	0.443
	M O R	(0.003)	16.586	0.075	0.389
	M B L	(15.363)	15.115	0.161	0.446
	I B L	(5.689)	24.854	1.289	1.190
	A S L	(10.167)	23.211	0.466	0.648
	N M H	(6.435)	21.073	1.364	1.240

5.4 Summary of results of returns for different portfolios

Table 5.9 shows the returns of portfolios for the different research periods from 31 January 2001 to 31 December 2003.

Table 5.9: Returns of below median and above median P/E ratio portfolios

				Below median P/E ratio portfolio				Above median P/E ratio portfolio			
	Date	Market return	Risk free rate	Adjusted Beta	Actual Monthly return	Expected Monthly return	Abnormal Monthly return	Adjusted Beta	Actual Monthly return	Expected Monthly return	Abnormal Monthly return
Research period Year 2001	31-Jan-01	0.22	0.80	0.786	(3.56)	0.34	(3.90)	0.842	0.97	0.31	0.66
	28-Feb-01	1.48	0.79	0.786	2.54	1.33	1.21	0.842	2.92	1.37	1.55
	30-Mar-01	(1.29)	0.79	0.786	0.83	(0.84)	1.68	0.842	0.20	(0.96)	1.16
	30-Apr-01	2.09	0.78	0.786	0.36	1.81	(1.46)	0.842	1.35	1.88	(0.53)
	31-May-01	(4.40)	0.78	0.786	1.79	(3.29)	5.07	0.842	(4.94)	(3.57)	(1.36)
	29-Jun-01	1.07	0.75	0.786	3.14	1.00	2.13	0.842	2.34	1.02	1.32
	31-Jul-01	(4.01)	0.76	0.786	0.99	(2.99)	3.98	0.842	(0.60)	(3.25)	2.65
	31-Aug-01	(1.62)	0.76	0.786	(0.68)	(1.11)	0.43	0.842	(0.82)	(1.24)	0.42
	28-Sep-01	(2.66)	0.75	0.786	(4.71)	(1.93)	(2.78)	0.842	0.93	(2.12)	3.05
	31-Oct-01	(1.97)	0.75	0.786	2.01	(1.39)	3.40	0.842	(1.50)	(1.54)	0.04
	30-Nov-01	0.00	0.73	0.786	5.18	0.16	5.02	0.842	0.71	0.12	0.59
	31-Dec-01	(2.39)	0.73	0.786	1.94	(1.72)	3.66	0.842	(0.51)	(1.90)	1.39
Research period year 2002	31-Jan-02	9.23	0.73	0.777	6.14	7.33	(1.19)	0.708	3.18	6.74	(3.57)
	28-Feb-02	(0.25)	0.72	0.777	0.86	(0.03)	0.89	0.708	1.60	0.04	1.56
	29-Mar-02	0.13	0.72	0.777	0.36	0.26	0.10	0.708	1.90	0.30	1.60
	30-Apr-02	(5.45)	0.72	0.777	(0.91)	(4.07)	3.16	0.708	(0.62)	(3.64)	3.02
	31-May-02	0.11	0.72	0.777	0.20	0.25	(0.05)	0.708	(6.09)	0.29	(6.38)
	28-Jun-02	1.30	0.72	0.777	3.53	1.17	2.37	0.708	(1.71)	1.13	(2.84)
	31-Jul-02	1.94	0.56	0.777	0.10	1.64	(1.54)	0.708	1.98	1.54	0.44
	30-Aug-02	2.58	0.56	0.777	3.01	2.13	0.89	0.708	5.18	1.99	3.19
	30-Sep-02	1.19	0.56	0.777	2.25	1.05	1.19	0.708	0.58	1.01	(0.42)
	31-Oct-02	(0.19)	0.56	0.777	0.51	(0.02)	0.53	0.708	(0.52)	0.03	(0.55)
	29-Nov-02	1.75	0.53	0.777	0.93	1.48	(0.55)	0.708	0.05	1.40	(1.35)
	31-Dec-02	3.45	0.50	0.777	2.45	2.79	(0.34)	0.708	1.85	2.59	(0.74)
Research period Year 2003	31-Jan-03	11.60	0.50	0.729	7.45	8.60	(1.14)	0.722	7.33	8.51	(1.18)
	28-Feb-03	(5.71)	0.61	0.729	1.08	(4.00)	5.08	0.722	(0.10)	(3.95)	3.85
	31-Mar-03	0.44	0.61	0.729	2.80	0.49	2.31	0.722	0.42	0.49	(0.06)
	30-Apr-03	6.62	0.61	0.729	6.10	5.00	1.10	0.722	4.39	4.95	(0.56)
	30-May-03	4.46	0.59	0.729	4.77	3.41	1.36	0.722	3.74	3.38	0.36
	30-Jun-03	2.36	0.59	0.729	6.35	1.88	4.46	0.722	4.70	1.87	2.83
	31-Jul-03	(2.29)	0.58	0.729	(1.67)	(1.51)	(0.16)	0.722	2.18	(1.49)	3.67
	29-Aug-03	(0.74)	0.58	0.729	2.32	(0.38)	2.70	0.722	0.57	(0.37)	0.94
	30-Sep-03	4.66	0.56	0.729	4.43	3.56	0.88	0.722	1.58	3.52	(1.95)
	31-Oct-03	6.92	0.55	0.729	7.45	5.20	2.25	0.722	(3.81)	5.15	(8.96)
	28-Nov-03	3.13	0.53	0.729	3.45	2.43	1.02	0.722	6.02	2.41	3.62
	31-Dec-03	0.49	0.51	0.729	1.58	0.50	1.09	0.722	3.41	0.50	2.92

Using the values of table 5.9, the returns of the below median P/E ratio portfolio and the above median P/E ratio portfolio were assessed. Several statistical measures were calculated. Table 5.10 shows the risk-adjusted returns of monthly returns and abnormal monthly returns of the two P/E ratio portfolios.

Table 5.10: Risk-adjusted performance measures of different P/E ratio portfolios

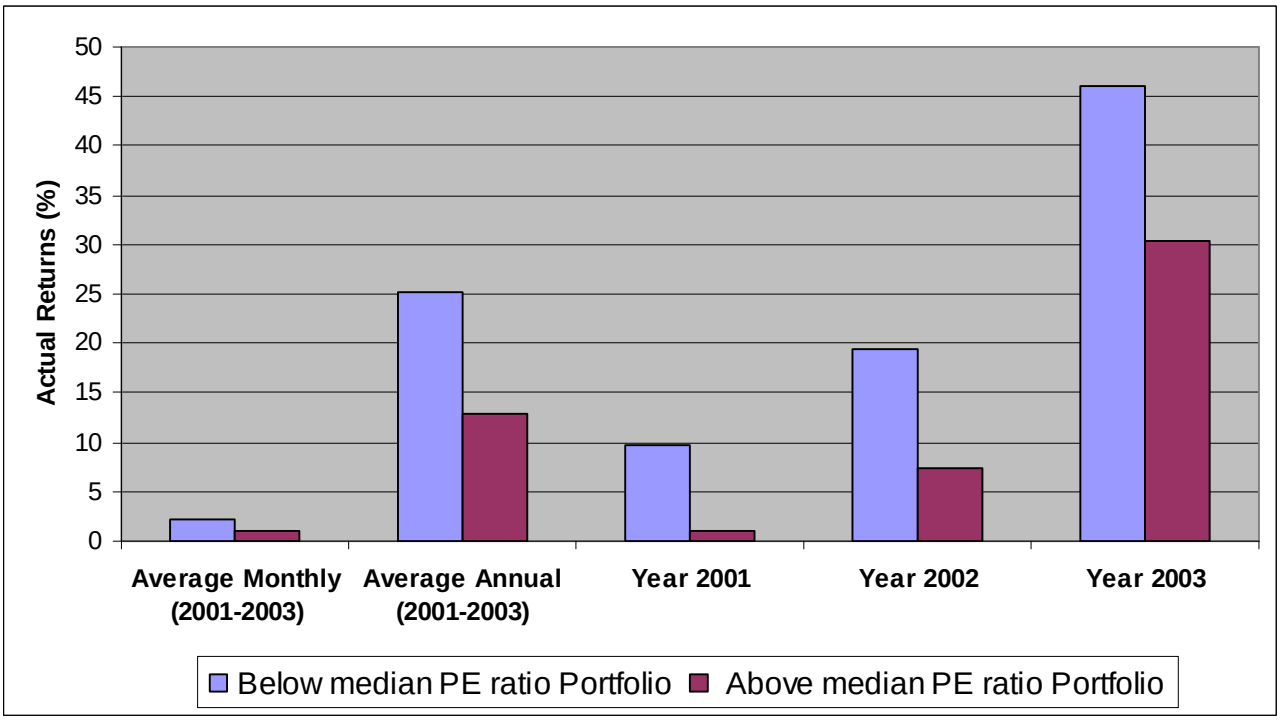
		Below median P/E ratio portfolio			Above median P/E ratio portfolio		
		Actual return	Expected return	Abnormal return	Actual return	Expected return	Abnormal return
Year 2001	Annual rate	9.81	(8.63)	18.45	1.06	(9.89)	10.94
	Std dev*	9.53	5.75	10.31	7.09	6.15	4.29
	Beta	0.21	0.79	(0.58)	0.77	0.84	(0.07)
	Sharpe's measure	0.07	(3.10)	0.90	(1.15)	(3.10)	0.41
	Treynor's measure	3.03	(22.64)	(16.05)	(10.49)	(22.64)	(26.23)
	Jensen's measure	5.38	0.01	(3.82)	9.43	0.01	0.24
Year 2002	Annual rate	19.44	13.97	5.47	7.38	13.41	(6.03)
	Std dev*	6.75	8.98	4.74	9.73	8.17	9.67
	Beta	0.50	0.78	(0.28)	0.36	0.71	(0.34)
	Sharpe's measure	1.75	0.71	(0.45)	(0.02)	0.71	(1.41)
	Treynor's measure	23.72	8.19	7.75	(0.67)	8.19	39.58
	Jensen's measure	7.74	0.01	0.12	(3.20)	0.01	(10.83)
Year 2003	Annual rate	46.12	25.16	20.96	30.43	24.96	5.47
	Std dev*	9.65	11.71	6.11	10.55	11.59	12.46
	Beta	0.51	0.73	(0.22)	0.24	0.72	(0.48)
	Sharpe's measure	4.07	1.56	2.31	2.24	1.56	(0.11)
	Treynor's measure	76.78	25.16	(65.16)	97.13	25.16	2.86
	Jensen's measure	26.43	0.03	19.57	17.49	0.03	10.63
Annualised (2001-2003)	Monthly rate	2.09	0.85	1.25	1.08	0.79	0.29
	Annual rate	25.12	10.17	14.96	12.95	9.49	3.46
	Std dev*	9.61	9.79	7.50	9.71	9.65	9.40
	Beta (yr 01-03)	0.52	0.75	(0.23)	0.39	0.74	(0.35)
	Sharpe' measure	1.80	0.23	0.94	0.52	0.17	(0.47)
	Treynor's measure	33.19	3.05	(30.82)	13.11	2.19	12.60
	Jensen measure	15.40	(0.37)	7.89	3.70	(1.00)	(3.17)

5.4.1 Analysis of the actual and abnormal returns of different P/E ratio portfolios

The following can be observed from table 5.10:

a) the annual (2001-2003) actual monthly return of below median P/E ratio portfolio (2.09%) was higher than the annualised actual return of above median P/E ratio portfolio (1.08%). In general, for each of the review periods, the below median P/E ratio portfolio had a higher return than that of the above median P/E ratio portfolio. This pattern is illustrated in figure 5.4.

Figure 5.4: Actual returns of below median and above median P/E ratio portfolios.

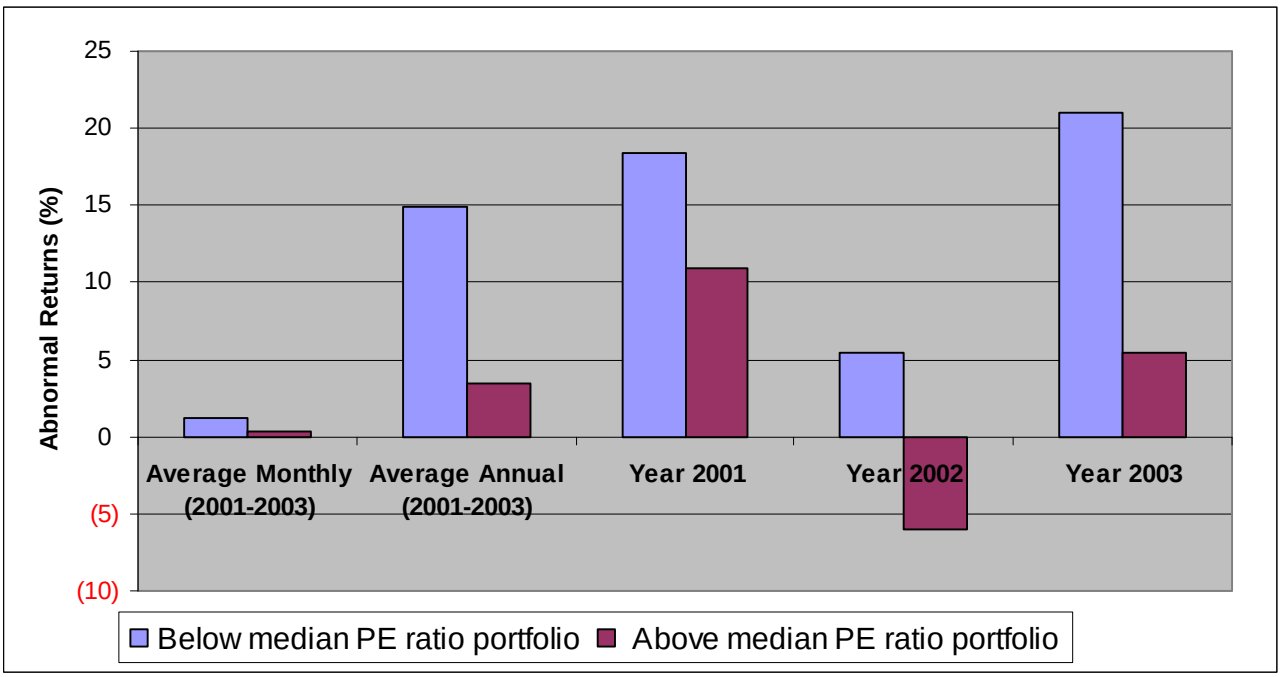


b) for each of the review periods, the abnormal return of the below median P/E ratio portfolio was also above the abnormal return of the above median P/E ratio portfolio. This is illustrated in figure 5.5.

5.4.1.1 Conclusion

For each year, between 2001 and 2003 and for the whole review period, the below median P/E ratio portfolio outperformed the above median P/E ratio portfolio both in both actual and abnormal returns.

Figure 5.5: Abnormal returns of below median and above median P/E ratio portfolios



5.4.2 Analysis of the performance measures of different P/E ratio portfolios

The performance measures for below median and above median P/E ratio portfolios are in terms of Sharpe's, Treynor's and Jensen's measures as they will be discussed in the coming sections.

5.4.2.1 Sharpe's measure analysis

The results of risk taking measures in terms of Sharpe's measure indicated that, in general, the actual returns of below median P/E ratio portfolio outperformed the actual returns of above median P/E ratio portfolio. This is illustrated from the charts of figure 5.6.

Figure 5.6: Sharpe's measure of the actual returns of the P/E ratio portfolios

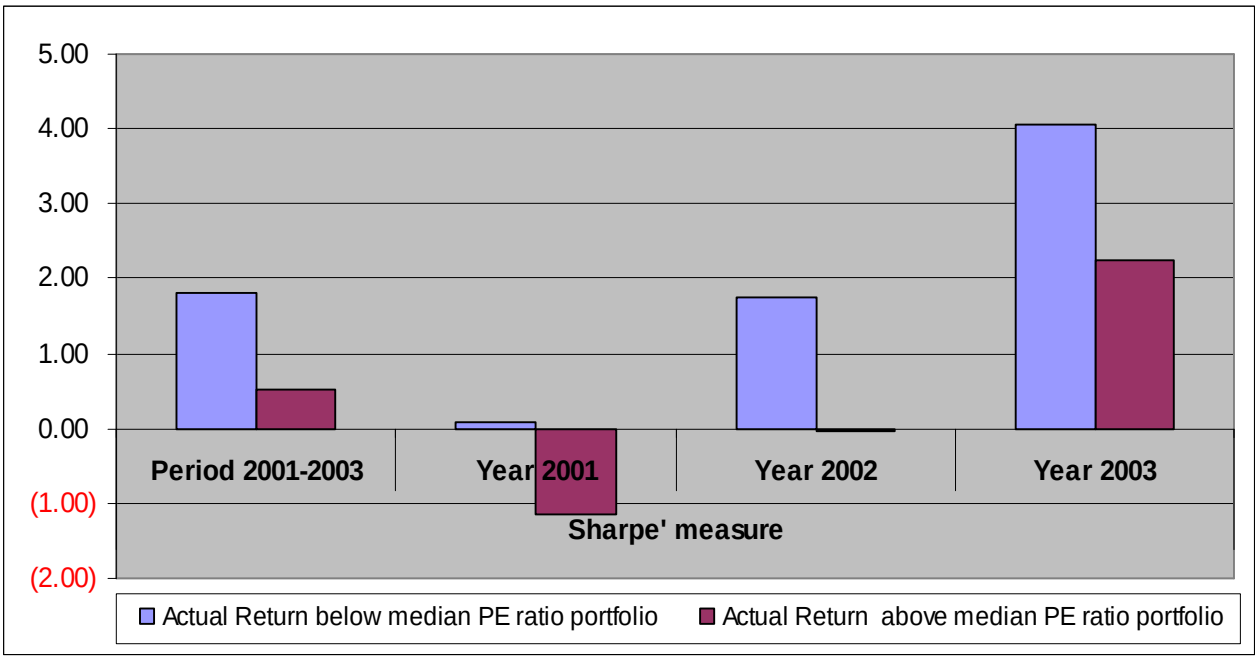
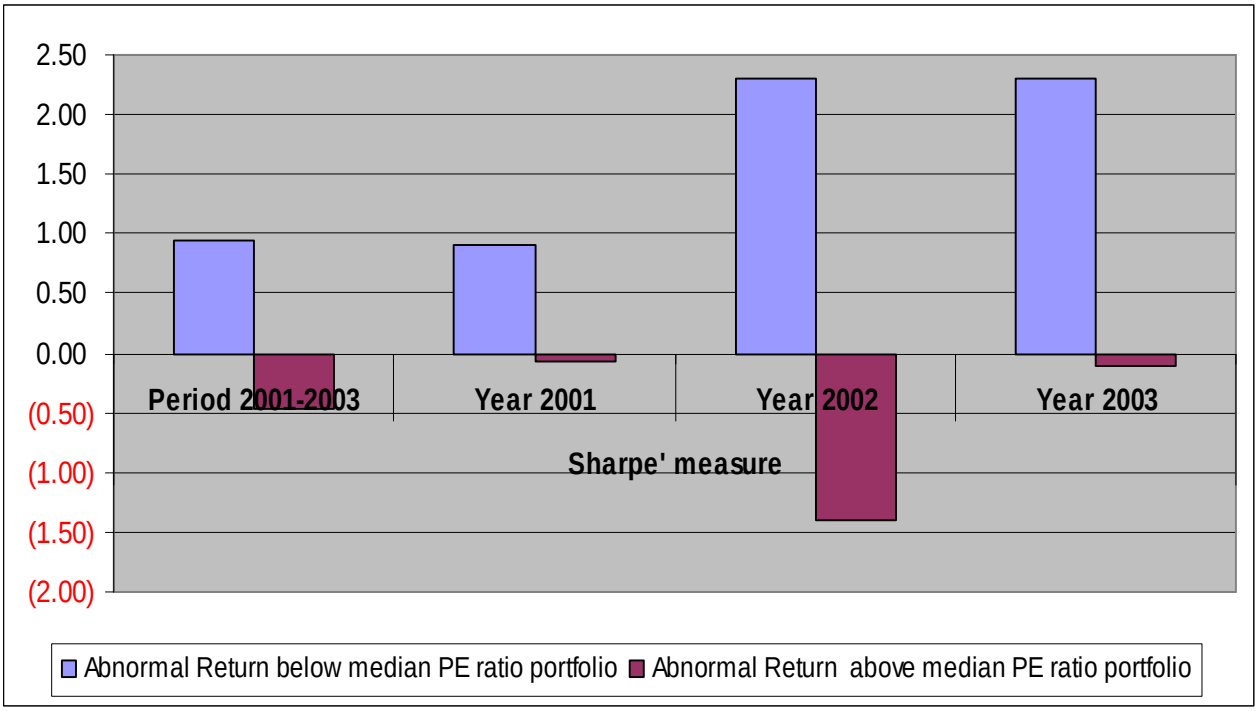


Figure 5.7 illustrates that the Sharpe's measure of abnormal returns of below median P/E ratio portfolios had higher returns than the above median P/E ratio portfolios for the period 2001-2003.

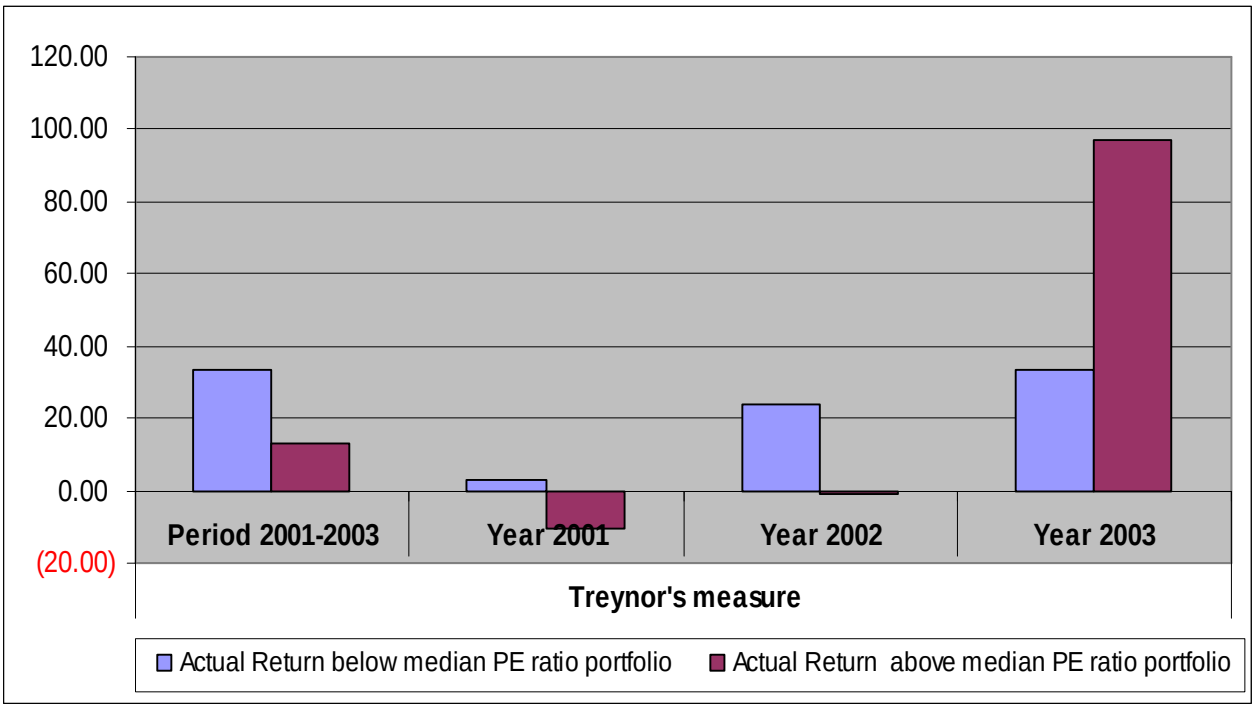
Figure 5.7: Sharpe's measure of the abnormal returns of the P/E ratio portfolios



5.4.2.2 Treynor's measure analysis

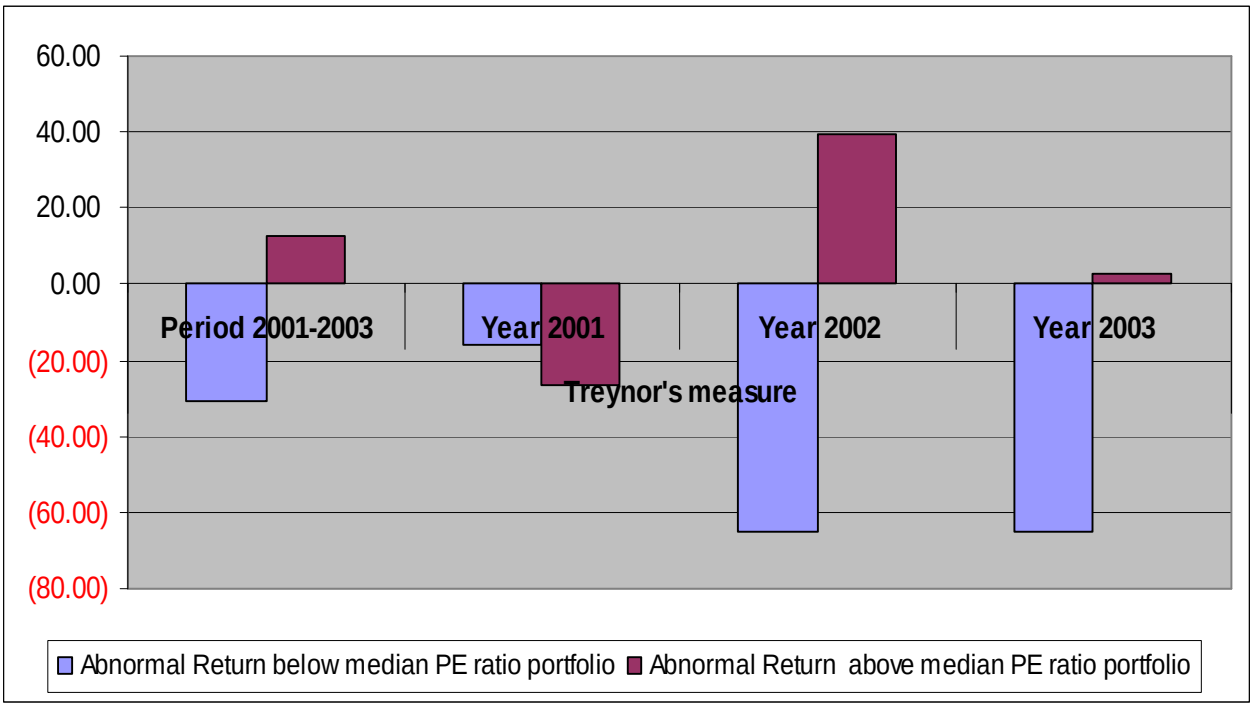
The Treynor's measure is a risk-adjusted measurement based on systematic risk. From the charts of figure 5.8, the actual returns performance of below median P/E ratio portfolio was better than the above median P/E ratio portfolio for the years 2001 and 2002 except for the year 2003 which was the reverse. The average performance of below median P/E ratio portfolio throughout the period of 2001-2003 was higher than the above median P/E ratio portfolio.

Figure 5.8: Treynor's measure of the actual returns of the P/E ratio portfolios



Usually a beta value of less than zero is unlikely and this means that the firm does better than the average market when the market declines. The beta computed for abnormal returns, using the regression equation of the market model, gave negative beta values. The entire beta obtained from the portfolios of abnormal returns was negative. Thus, this gave rise to abnormal Treynor's measures which could lead to an incorrect interpretation. The Treynor's measure obtained for the abnormal returns during the period 2001-2003 had, therefore, not been explored. The plot of the Treynor's measure obtained is given in figure 5.9

Figure 5.9: Treynor's measure of the abnormal returns of the P/E ratio portfolios

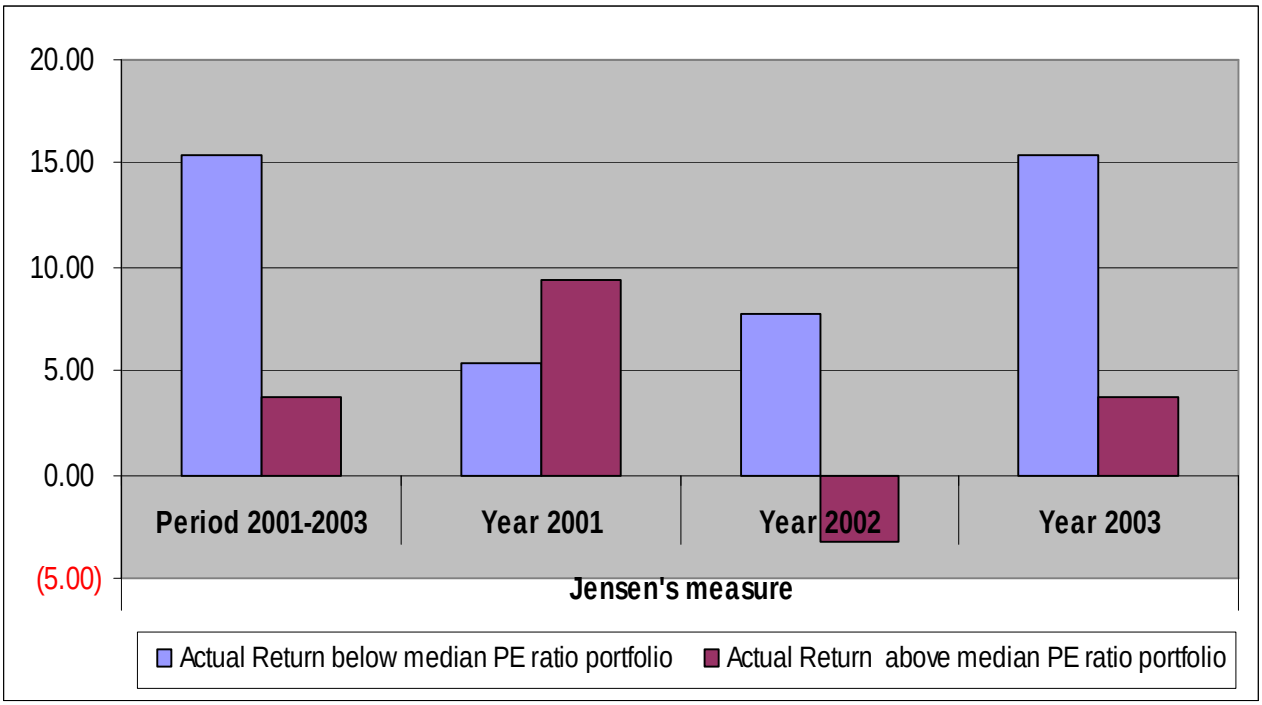


5.4.2.3 Jensen's measure analysis

The Jensen's measure performance of portfolios for actual returns for different research periods is illustrated in figure 5.10. The average Jensen's measure for below median P/E ratio portfolio was better than the above median P/E ratio portfolio for the period of 2001-2003.

The Jensen's measure for below median P/E ratio portfolios was higher than the above median P/E ratio portfolios for the years 2002 and 2003 except for the year 2001 when the Jensen's measure of the above median P/E ratio portfolio was higher than the value of below median P/E ratio portfolio.

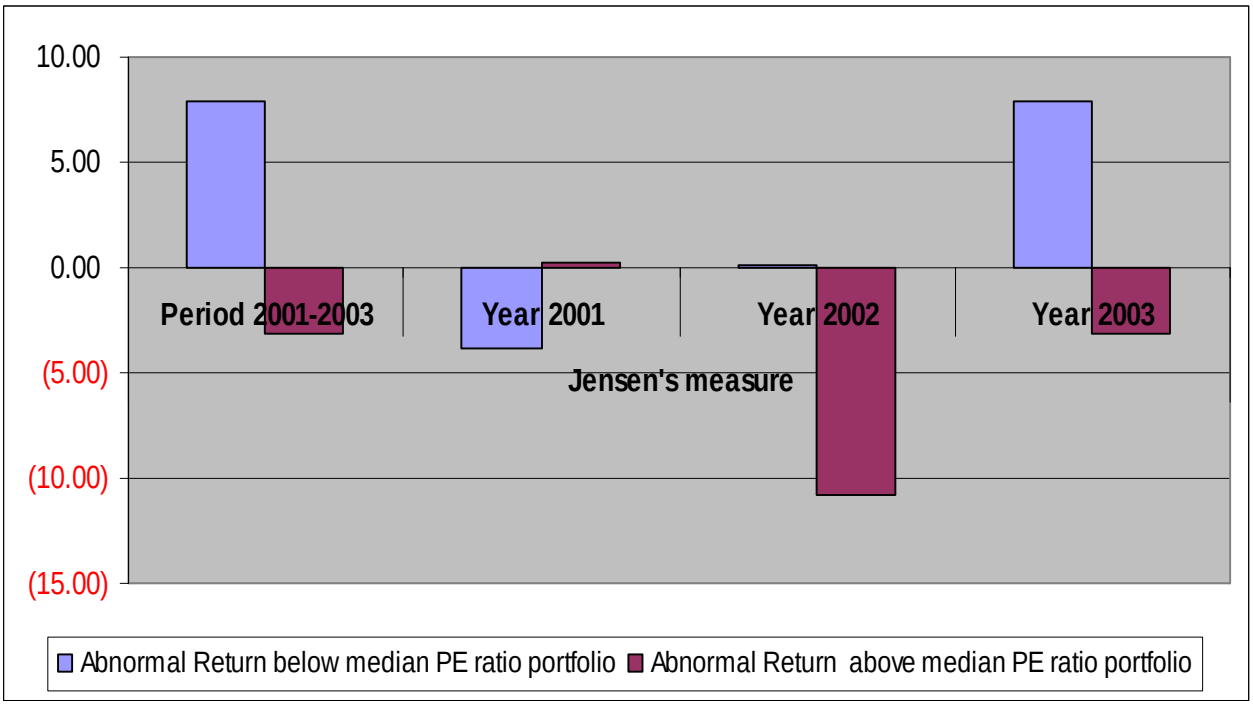
Figure 5.10: Jensen's measure of the actual returns of the P/E ratio portfolios



The Jensen's measure performance of portfolios for abnormal returns for different research periods is illustrated in figure 5.11. The average Jensen's measure for below median P/E ratio portfolio was better than the above median P/E ratio portfolio for the period of 2001-2003.

The Jensen's measure for below median P/E ratio portfolio was higher than the above median P/E ratio portfolio for the years 2002 and 2003 except for the year 2001 when the Jensen's measure of above median P/E ratio portfolio was higher than the value of below median P/E ratio portfolio.

Figure 5.11: Jensen's measure of the abnormal returns of the P/E ratio portfolios



5.5 Results of hypotheses

The hypotheses, which are to be tested, as underlined in chapter three, were:

Hypothesis one:
The first hypothesis investigated whether there was a difference in returns from portfolios with different P/E ratios.

H_0: There was no difference in the return of a portfolio of shares with below median P/E ratios and the return of a portfolio of shares with above median P/E ratios on a risk-adjusted basis.

H_a: There was a difference in the return of a portfolio of shares with below median P/E ratios and the return of a portfolio of shares with above median P/E ratios on a risk-adjusted basis.

Hypothesis two:
The second hypothesis investigated whether the return of a low P/E ratio portfolio was greater than the return of a high P/E ratio portfolio.

H_0: The risk-adjusted return of a portfolio of shares with below median P/E ratios was less than or equal to that of a portfolio of shares with above median P/E ratios.

H_a: The risk-adjusted return of a portfolio of shares with below median P/E ratios was greater than that of a portfolio of shares with above median P/E ratios.

The risk-adjusted performance measure used for hypothesis testing was the Sharpe's measure, which is the most common performance measure. Treynor's value was not used because for short period calculations, the beta obtained for portfolio performance measure might not be accurate.

5.5.1 Data sets used for hypothesis testing

As stated in section 4.6.5.1, one sample or paired t-test can be safely used when the number of data variables under test is greater or more than fifteen. Since Sharpe's measure was calculated at the end of each one year review period - there were only three one-year review periods as seen from table 5.10 - the original data set Sharpe's measure provided only a data set of three points. To obtain a larger data set of more than these three points, Sharpe's measure, for the last twelve months period, was calculated at the end of each month as from December 2001 till December 2003.

The Sharpe's measure -of a portfolio p- as at December 2001 was computed using the equation 5.1.

$$S_{p(Dec2001)} = S_{p(\text{calculated as at Dec2001})} = S_{p(\text{Jan 2001 to Dec2001})} = (\overline{R_{pt}} - \overline{R_f})/\sigma_p \qquad \text{(Equation 5.1)}$$

where

$S_{p(Dec01)}$ = the Sharpe's measure for portfolio p at December 2001 for the last twelve month period. Here, the portfolio p is the below median P/E ratio portfolio or the above median P/E ratio portfolio.

$\overline{R_{pt}}$ = the average rate of return on portfolio p for the last twelve month period

$\overline{R_f}$ = average rate of return on a risk free rate investment

σ_p = the standard deviation of the average monthly returns for portfolio p.

Similarly, the Sharpe's measure, as from January 2002 until December 2003, for below median low P/E ratio portfolio and above median high P/E ratio portfolio were calculated. In fact, the computations for the following Sharpe's measure were made:

$$S_{p(Jan2002)} = S_{p(\text{calculated as at Jan2002})} = S_{p(\text{Feb2001 to Jan2002})}$$
$$S_{p(Feb2002)} = S_{p(\text{calculated as at Feb2002})} = S_{p(\text{Mar2001 to Feb2002})}$$
$$S_{p(Mar2002)} = S_{p(\text{calculated as at Mar2002})} = S_{p(\text{Apr2001 to Mar2002})}$$
$$S_{p(Apr2002)} = S_{p(\text{calculated as at Apr2002})} = S_{p(\text{May2001 to Apr2002})}$$
$$S_{p(May2002)} = S_{p(\text{calculated as at May2002})} = S_{p(\text{Jun2001 to May2002})}$$
$$S_{p(Jun2002)} = S_{p(\text{calculated as at Jun2002})} = S_{p(\text{Jul2001 to Jun2002})}$$
$$S_{p(July2002)} = S_{p(\text{calculated as at Jul2002})} = S_{p(\text{Aug2001 to Jul2002})}$$
$$S_{p(Aug2002)} = S_{p(\text{calculated as at Aug2002})} = S_{p(\text{Sep2001 to Aug2002})}$$
$$S_{p(Sep2002)} = S_{p(\text{calculated as at Sep2002})} = S_{p(\text{Oct2001 to Sep2002})}$$
$$S_{p(Oct2002)} = S_{p(\text{calculated as at Oct2002})} = S_{p(\text{Nov2001 to Oct2002})}$$
$$S_{p(Nov2002)} = S_{p(\text{calculated as at Nov2002})} = S_{p(\text{Dec2001 to Nov2002})}$$
$$S_{p(Dec2002)} = S_{p(\text{calculated as at Dec2002})} = S_{p(\text{Jan2002 to Dec2002})}$$
$$S_{p(Jan2003)} = S_{p(\text{calculated as at Jan2003})} = S_{p(\text{Feb2002 to Jan2003})}$$
$$S_{p(Feb2003)} = S_{p(\text{calculated as at Feb2003})} = S_{p(\text{Mar2002 to Feb2003})}$$
$$S_{p(Mar2003)} = S_{p(\text{calculated as at Mar2003})} = S_{p(\text{Apr2002 to Mar2003})}$$
$$S_{p(Apr2003)} = S_{p(\text{calculated as at Apr2003})} = S_{p(\text{May2002 to Apr2003})}$$
$$S_{p(May2003)} = S_{p(\text{calculated as at May2003})} = S_{p(\text{Jun2002 to May2003})}$$
$$S_{p(Jun2003)} = S_{p(\text{calculated as at Jun2003})} = S_{p(\text{Jul2002 to Jun2003})}$$
$$S_{p(July2003)} = S_{p(\text{calculated as at Jul2003})} = S_{p(\text{Aug2002 to Jul2003})}$$
$$S_{p(Aug2003)} = S_{p(\text{calculated as at Aug2003})} = S_{p(\text{Sep2002 to Aug2003})}$$
$$S_{p(Sep2003)} = S_{p(\text{calculated as at Sep2003})} = S_{p(\text{Oct2002 to Sep2003})}$$
$$S_{p(Oct2003)} = S_{p(\text{calculated as at Oct2003})} = S_{p(\text{Nov2002 to Oct2003})}$$
$$S_{p(Nov2003)} = S_{p(\text{calculated as at Nov2003})} = S_{p(\text{Dec2002 to Nov2003})}$$
$$S_{p(Dec2003)} = S_{p(\text{calculated as at Dec2003})} = S_{p(\text{Jan2003-to Dec2003})}$$

Using this methodology, and after calculating the Sharpe's measure of (a) all the actual returns of below median and the actual returns of above median P/E ratio portfolios; and (b) all the abnormal returns of below median and the abnormal returns of above median P/E ratio portfolios, two data sets were obtained:

1) the first data set consisted of 25 data set points, as from Dec 2001 up to Dec 2003, for the actual returns on a risk-adjusted basis - using Sharpe's measure - for below median P/E ratio portfolios and above median P/E ratio portfolios. Table 5.11 shows the risk-adjusted returns using Sharpe's measure for below median low P/E ratio portfolios and above median high P/E ratio portfolios calculated on a monthly basis as from December 2001 to December 2003.
2) the second data set consisted of 25 data set points as from Dec 2001 up to Dec 2003) for the abnormal returns on risk-adjusted basis - using Sharpe's measure - for below median P/E ratio portfolios and above median P/E ratio portfolios. Table 5.12 shows the risk-adjusted abnormal returns using Sharpe's measure for below median low P/E ratio portfolios and above median high P/E ratio portfolios calculated monthly as from December 2001 to December 2003.

Given that the Sharpe's measure for both below median P/E ratio portfolio and above median P/E ratio portfolios were date-dependent and correlated, the Sharpe's measure of the two portfolios thus constituted the data set series of two dependent sets of data. Since two dependent sets of data were obtained, paired t-tests were used for analysis of whether the two sets differed from each other in a significant way.

The statistical software NCSS 2001 was used to analyse the paired t-tests on the data set of two 25 data set points each for below median low P/E ratio portfolios and above median high P/E ratio portfolios.

Table 5.11: Risk-adjusted actual returns for different P/E ratio portfolios

			Below median Low P/E ratio portfolio (annualised)			Above median High P/E ratio portfolio (annualised)		
Values as at	Period data used	Rf*	Std dev*	Actual Returns	Sharpe	Std dev*	Actual Returns	Sharpe
Dec-01	Jan01-Dec01	9.18	9.53	9.81	0.07	7.09	1.06	(1.15)
Jan-02	Feb01-Jan02	9.11	9.60	19.52	1.08	7.70	3.27	(0.76)
Feb-02	Mar01-Feb02	9.05	9.58	17.83	0.92	7.31	1.94	(0.97)
Mar-02	Apr01-Mar02	8.98	9.62	17.37	0.87	7.51	3.64	(0.71)
Apr-02	May01-Apr02	8.91	9.86	16.10	0.73	7.47	1.67	(0.97)
May-02	Jun01-May02	8.85	9.91	14.52	0.57	8.36	0.51	(1.00)
Jun-02	Jul01-Jun02	8.81	10.00	14.92	0.61	8.12	(3.54)	(1.52)
Jul-02	Aug01-Jul02	8.62	10.07	14.02	0.54	8.42	(0.96)	(1.14)
Aug-02	Sep01-Aug02	8.42	10.00	17.71	0.93	9.86	5.04	(0.34)
Sep-02	Oct01-Sep02	8.23	7.38	24.67	2.23	9.85	4.69	(0.36)
Oct-02	Nov01-Oct02	8.04	7.54	23.17	2.01	9.69	5.68	(0.24)
Nov-02	Dec01-Nov02	7.85	6.70	18.93	1.65	9.69	5.03	(0.29)
Dec-02	Jan02-Dec02	7.62	6.75	19.44	1.75	9.73	7.38	(0.02)
Jan-03	Feb02-Jan03	7.39	7.76	20.75	1.72	11.63	11.53	0.36
Feb-03	Mar02-Feb03	7.28	7.73	20.97	1.77	11.65	9.83	0.22
Mar-03	Apr02-Mar03	7.18	7.64	23.41	2.13	11.59	8.35	0.10
Apr-03	May02-Apr03	7.07	7.98	30.42	2.92	12.05	13.36	0.52
May-03	Jun02-May03	6.94	7.83	34.99	3.58	9.34	23.19	1.74
Jun-03	Jul02-Jun03	6.80	8.55	37.80	3.63	8.80	29.60	2.59
Jul-03	Aug02-Jul03	6.82	9.38	36.03	3.11	8.79	29.81	2.62
Aug-03	Sep02-Aug03	6.84	9.40	35.34	3.03	8.45	25.20	2.17
Sep-03	Oct02-Sep03	6.84	9.48	37.53	3.24	8.31	26.19	2.33
Oct-03	Nov02-Oct03	6.83	9.92	44.47	3.79	9.97	22.89	1.61
Nov-03	Dec02-Nov03	6.83	9.46	46.99	4.24	10.53	28.86	2.09
Dec-03	Jan03-Dec03	6.84	9.65	46.12	4.07	10.55	30.43	2.24

Table 5.12: Risk-adjusted abnormal returns for different P/E ratio portfolios

			Below median P/E ratio portfolio (annualised)			Above median P/E ratio portfolio (annualised)		
Values as at	Period data used	Rf*	Std dev*	Abnormal Returns	Sharpe	Std dev*	Abnormal Returns	Sharpe
Dec-01	Jan01-Dec01	9.18	10.31	18.45	0.90	4.29	10.94	0.41
Jan-02	Feb01-Jan02	9.11	9.03	21.16	1.33	6.21	6.72	(0.39)
Feb-02	Mar01-Feb02	9.05	9.06	20.84	1.30	6.22	6.73	(0.37)
Mar-02	Apr01-Mar02	8.98	9.20	19.27	1.12	6.28	7.16	(0.29)
Apr-02	May01-Apr02	8.91	8.67	23.89	1.73	6.58	10.72	0.27
May-02	Jun01-May02	8.85	8.18	18.77	1.21	9.65	5.70	(0.33)
Jun-02	Jul01-Jun02	8.81	8.20	19.00	1.24	10.14	1.55	(0.72)
Jul-02	Aug01-Jul02	8.62	8.30	13.48	0.59	9.77	(0.67)	(0.95)
Aug-02	Sep01-Aug02	8.42	8.27	13.93	0.67	10.30	2.10	(0.61)
Sep-02	Oct01-Sep02	8.23	7.07	17.91	1.37	9.81	(1.37)	(0.98)
Oct-02	Nov01-Oct02	8.04	6.81	15.04	1.03	9.82	(1.96)	(1.02)
Nov-02	Dec01-Nov02	7.85	5.62	9.47	0.29	9.85	(3.90)	(1.19)
Dec-02	Jan02-Dec02	7.62	4.74	5.47	(0.45)	9.67	(6.03)	(1.41)
Jan-03	Feb02-Jan03	7.39	4.72	5.51	(0.40)	9.13	(3.64)	(1.21)
Feb-03	Mar02-Feb03	7.28	6.62	9.70	0.37	9.89	(1.36)	(0.87)
Mar-03	Apr02-Mar03	7.18	6.73	11.92	0.70	9.72	(3.02)	(1.05)
Apr-03	May02-Apr03	7.07	6.31	9.86	0.44	9.04	(6.60)	(1.51)
May-03	Jun02-May03	6.94	6.26	11.26	0.69	6.43	0.13	(1.06)
Jun-03	Jul02-Jun03	6.80	7.08	13.36	0.93	6.19	5.80	(0.16)
Jul-03	Aug02-Jul03	6.82	6.63	14.74	1.19	6.96	9.04	0.32
Aug-03	Sep02-Aug03	6.84	6.78	16.55	1.43	6.44	6.79	(0.01)
Sep-03	Oct02-Sep03	6.84	6.79	16.24	1.38	6.86	5.26	(0.23)
Oct-03	Nov02-Oct03	6.83	6.78	17.96	1.64	11.66	(3.15)	(0.86)
Nov-03	Dec02-Nov03	6.83	6.44	19.53	1.97	12.21	1.81	(0.41)
Dec-03	Jan03-Dec03	6.84	6.11	20.96	2.31	12.46	5.47	(0.11)

5.5.2 Hypothesis testing the actual returns of different P/E ratio portfolios

From table 5.11, the Sharpe's measure for each portfolio calculated at different period dates represented the 25-paired data used for the paired t-tests for the actual returns of different P/E ratio portfolios on a risk-adjusted basis. The paired data values used for the t-tests have been highlighted in table 5.13.

Table 5.13: Paired values used for testing the actual returns of different P/E ratio portfolios

Values as at	Actual returns below median P/E ratio portfolio	Actual returns above median P/E ratio portfolio
Dec-01	0.07	(1.15)
Jan-02	1.08	(0.76)
Feb-02	0.92	(0.97)
Mar-02	0.87	(0.71)
Apr-02	0.73	(0.97)
May-02	0.57	(1.00)
Jun-02	0.61	(1.52)
Jul-02	0.54	(1.14)
Aug-02	0.93	(0.34)
Sep-02	2.23	(0.36)
Oct-02	2.01	(0.24)
Nov-02	1.65	(0.29)
Dec-02	1.75	(0.02)
Jan-03	1.72	0.36
Feb-03	1.77	0.22
Mar-03	2.13	0.10
Apr-03	2.92	0.52
May-03	3.58	1.74
Jun-03	3.63	2.59
Jul-03	3.11	2.62
Aug-03	3.03	2.17
Sep-03	3.24	2.33
Oct-03	3.79	1.61
Nov-03	4.24	2.09
Dec-03	4.07	2.24

Using the NCSS 2001 statistical software, the output results for the paired t-tests for the actual returns of below median low P/E ratio portfolio and above median high P/E ratio portfolio is given in Appendix 9.2.

5.5.2.1 Analysis of results of Appendix 9.2

The results of the tests of assumptions, extracted from Appendix 9.2 about the difference between the paired values, are given in table 5.14.

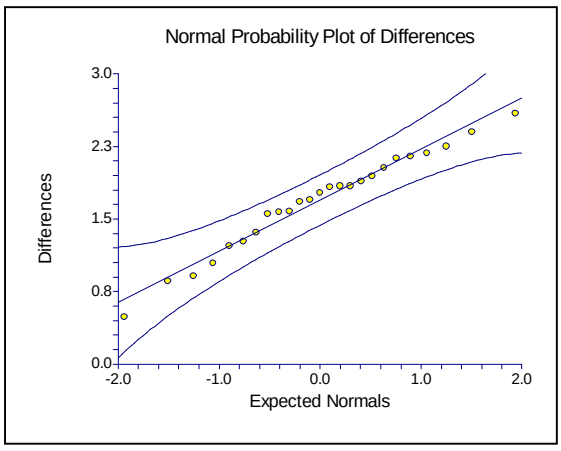
Table 5.14: Tests of assumptions about differences section (extracted from Appendix 9.2)

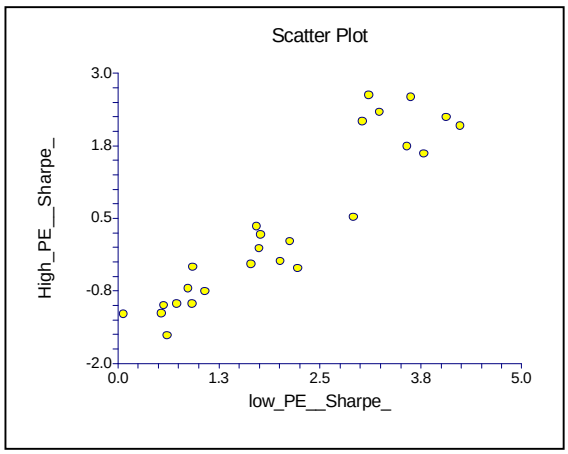
Assumption	Value	Probability	Decision(5%)
Skewness Normality	-1.1342	0.256729	Cannot reject normality
Kurtosis Normality	0.1901	0.849263	Cannot reject normality
Omnibus Normality	1.3224	0.516223	Cannot reject normality
Correlation Coefficient	0.927909		

At a 5% significance level, the p values for all the normality tests (skewness, kurtosis and omnibus) were much greater than 0.05. The "cannot reject normality" was the formal conclusion of the normality tests.

The normality probability plot on the differences as illustrated in figure 5.12, also indicates normality within the 95% confidence bands of the probability plot. The scatter plot of figure 5.12 also illustrates that there was a positive linear relationship between the two portfolios. This was confirmed by the Pearson correlation coefficient of 0.927909.

Figure 5.12: Normal probability plot of differences and scatter plot (from Appendix 9.2)





The results of the findings of these normality tests indicated that the data sets, under investigation, were normal and that parametric tests section could be used for further analysis. A modified and extracted section of Appendix 9.2 is given in table 5.15.

Table 5.15: Descriptive statistics and t-tests extracted & modified from Appendix 9.2

Descriptive Statistics Section (for actual returns of actual P/E ratio portfolios)

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Below median P/E	25	2.0476	1.267337	0.2534675	1.524469	2.570731
Above median P/E	25	0.3648	1.371289	0.2742579	-0.2012404	0.9308404
Difference	25	1.6828	0.5112527	0.1022505	1.471765	1.893835

T for Confidence Limits = 2.0639

T-Test For Difference Between Means Section

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
below P/E - above P/E <>0	16.4576	0.000000	Reject Ho	1.000000	1.000000
below P/E – above P/E < 0	16.4576	1.000000	Accept Ho	0.000000	0.000000
below P/E - above P/E > 0	16.4576	0.000000	Reject Ho	1.000000	1.000000

For hypothesis one, the elements to be tested were:

Alternative hypothesis, H_a: Below median P/E ratio portfolio – Above median P/E ratio portfolio ≠ 0

Null hypothesis, H_0: Below median P/E ratio portfolio – Above median P/E ratio portfolio = 0

From table 5.15, the p-value for alternative hypothesis of t-test for the difference between the means of 'below P/E – above P/E ≠ 0' was zero.

The prob level, as given in table 5.15, is the significance level or p-value of the statistical test. The p-value of a sample is the probability of seeing a sample with, at least, as much evidence in favour of the alternative hypothesis as the sample actually observed. The smaller the p-value, the more evidence there is in favour of the alternative hypothesis (Albright, Winston & Zappe, 2003). Thus, with a zero p-value, there was much evidence in favour of the alternative hypothesis, Ha, and the null hypothesis, H0, was rejected at 5% decision rule.

The conclusion obtained was that there was a difference in the actual return of a portfolio of shares with below median P/E ratio and the actual return of a portfolio of shares with above median P/E ratio on a risk-adjusted basis using the Sharpe's measure.

For hypothesis two, the elements to be tested were:

Alternative hypothesis, H_a: Below median P/E ratio portfolio – Above median P/E ratio portfolio > 0
Null hypothesis, H_0: Below median P/E ratio portfolio – Above median P/E ratio portfolio ≤ 0

From table 5.15, the p-value for alternative hypothesis of t-test for difference between the means of 'below P/E – above P/E > 0' is zero. Thus, there was sufficient evidence in favour of the alternative hypothesis, Ha, and the null hypothesis, H0, was rejected at the 5% decision rule.

The conclusion obtained was that the actual return of a portfolio of shares with below median P/E ratio was greater than the actual return of a portfolio of shares with above median P/E ratio on a risk-adjusted basis using the Sharpe's measure.

5.5.3 Hypothesis testing the abnormal returns of different P/E ratio portfolios

From table 5.12, the Sharpe's measure for each portfolio, calculated for different period dates, represented the 25-paired data used for the paired t-tests for the abnormal returns of different P/E ratio portfolios on a risk-adjusted basis.

The 25 paired data, used for the t-tests, are given in table 5.16.

Table 5.16: Paired values used for testing the abnormal returns of different portfolios

Values as at	Abnormal returns below median P/E ratio portfolio	Abnormal returns above median P/E ratio portfolio
Dec-01	0.90	0.41
Jan-02	1.33	(0.39)
Feb-02	1.30	(0.37)
Mar-02	1.12	(0.29)
Apr-02	1.73	0.27
May-02	1.21	(0.33)
Jun-02	1.24	(0.72)
Jul-02	0.59	(0.95)
Aug-02	0.67	(0.61)
Sep-02	1.37	(0.98)
Oct-02	1.03	(1.02)
Nov-02	0.29	(1.19)
Dec-02	(0.45)	(1.41)
Jan-03	(0.40)	(1.21)
Feb-03	0.37	(0.87)
Mar-03	0.70	(1.05)
Apr-03	0.44	(1.51)
May-03	0.69	(1.06)
Jun-03	0.93	(0.16)
Jul-03	1.19	0.32
Aug-03	1.43	(0.01)
Sep-03	1.38	(0.23)
Oct-03	1.64	(0.86)
Nov-03	1.97	(0.41)
Dec-03	2.31	(0.11)

The output results for the paired t-tests are given in Appendix 9.3.

5.5.3.1 Analysis of results of Appendix 9.3

The results of the tests of assumptions, which have been extracted from Appendix 9.3, about the difference between the paired values, are outlined in table 5.17.

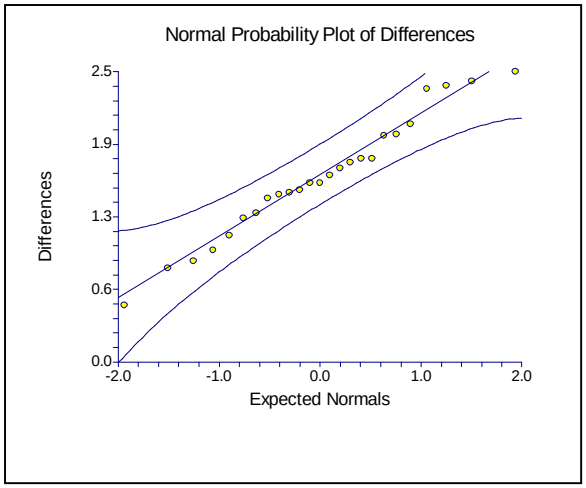
Table 5.17: Tests of assumptions about differences section (extracted from Appendix 9.3)

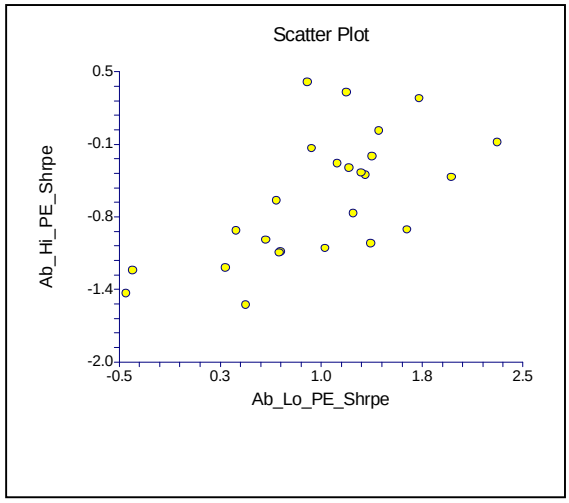
Tests of Assumptions about Differences Section			
Assumption	**Value**	**Probability**	**Decision(5%)**
Skewness Normality	-0.1110	0.911596	Cannot reject normality
Kurtosis Normality	-0.2014	0.840421	Cannot reject normality
Omnibus Normality	0.0529	0.973911	Cannot reject normality
Correlation Coefficient	0.629495		

At a 5% significance level, the p values for all the three normality tests used, namely skewness, kurtosis and omnibus, were much greater than 0.05. The conclusion of the tests indicated the difference between the paired values exhibited normality and there was no reason for the rejection of the"cannot reject normality".

The normality probability plot on the difference, as illustrated in figure 5.13, also indicated normality within the 95% confidence bands of the probability plot. From the scatter plot, in figure 5.13, the relationship between the two portfolios was seen to be positive though not very definite. This was confirmed by the positive Pearson correlation at 0.62945.

Figure 5.13: Normal probability plot of differences and scatter plot (from Appendix 9.3)





The results of the findings of normality tests indicated that the data sets under investigation were normal and that parametric tests section could be used for additional analysis. A modified and extracted section of Appendix 9.3 is given in table 5.18.

Table 5.18: Descriptive statistics and t-tests extracted & modified from Appendix 9.3

Descriptive Statistics Section (for abnormal returns of the P/E ratio portfolios)

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Below median P/E	25	0.9992	0.6510499	0.13021	0.7304598	1.26794
Above median P/E	25	-0.5896	0.5423059	0.1084612	-0.8134528	-0.3657471
Difference	25	1.5888	0.522927	0.1045854	1.372946	1.804654

T for Confidence Limits = 2.0639

T-Test For Difference Between Means Section

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Below P/E – Above P/E <>0	15.1914	0.000000	Reject Ho	1.000000	1.000000
Below P/E – Above P/E <0	15.1914	1.000000	Accept Ho	0.000000	0.000000
Ab_Lo_P/E -Ab_Hi_P/E >0	15.1914	0.000000	Reject Ho	1.000000	1.000000

For hypothesis one, the elements to be tested were:

Alternative hypothesis, H_a: Below median P/E ratio portfolio – Above median P/E ratio portfolio ≠ 0
Null hypothesis, H_0: Below median P/E ratio portfolio – Above median P/E ratio portfolio = 0

From the table 5.18, it is clearly shown that the p-value for alternative hypothesis of t-test for the difference between the means of 'below P/E – above P/E ≠ 0' was zero. There was sufficient evidence in favour of the alternative hypothesis, Ha, and the null hypothesis, H0, was rejected at the 5% decision rule.

The conclusion obtained was that there was a difference in the abnormal return of a portfolio of shares with below median P/E ratio and the abnormal return of a portfolio of shares with above median P/E ratio on a risk-adjusted basis using the Sharpe's measure.

For hypothesis two, the elements to be tested were:

Alternative hypothesis H_a: Below median P/E ratio portfolio – Above median P/E ratio portfolio > 0
Null hypothesis H_0: Below median P/E ratio portfolio – Above median P/E ratio portfolio ≤ 0

From the table 5.18, we can see that the p-value for alternative hypothesis of t-test for difference between the means of 'below P/E – above P/E > 0' is zero. Thus, there was sufficient evidence in favour of the alternative hypothesis, Ha, and the null hypothesis, H0, was rejected at the 5% decision rule.

The conclusion obtained was that the abnormal return of a portfolio of shares with below median P/E ratio was greater than the abnormal return of a portfolio of shares with above median P/E ratio on a risk-adjusted basis using the Sharpe's measure.

6 INTERPRETATION OF RESULTS

The SEM is only in its 16th year of operation in 2005. The SEM database of trading data is relatively small. Full replication of empirical research studies on investment performance of equity securities and their P/E ratios (Mc William, 1996; Basu, 1977) was not possible. As a result, the number of portfolios and the selection of companies comprising the portfolios for this study are different from those used in international studies.

Using the portfolio study methodology, the results, as presented in chapter four, indicated that the below median P/E ratios companies on the SEM tended to outperform the above median P/E ratios companies between the years 2001 and 2003. This was consistent with the findings at international research level on the anomaly of the P/E ratios (Mc Williams, 1966; Basu, 1977; Agarwal, Rao & Hiraki, 1990). This study showed that better performance could be obtained with a portfolio of low P/E ratio stocks as contrasted with a portfolio made up of high P/E ratio stocks.

In the light of the results of the hypotheses, there was evidence to suggest the existence of the P/E ratio effect on the SEM. This study has documented that the P/E ratio effect also exists on emerging markets on a small stock exchange like the SEM.

The importance of the results of this study can be significant for the investor's community of the SEM. The existence of the P/E ratio anomaly on the SEM means that the investor, adopting a simple trading strategy of holding companies with low P/E ratio portfolios, can earn higher returns than the one who holds the entire sample of stocks. Fund managers, investing in Mauritius stocks, may appreciate the fact that P/E ratios may impact on their portfolio performance.

The results of this study can be used to contribute to the body of research in Mauritius on the form of market efficiency on the SEM. It also adds to the discussion on the Efficiency Market Hypothesis (Fama, 1970). The existence of the P/E ratio anomaly on the SEM tended to indicate that the market is not efficient in the weak form.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

The purpose of this research was to determine whether the investment performance of listed companies on the SEM was related to their P/E ratio. The approach used in this study was to investigate whether low P/E ratio firms outperform high P/E ratio firms on a risk-adjusted basis.

The portfolio study methodology was used for testing the performance returns of the listed companies on the SEM. Thirty companies were classified into two portfolios and the returns of the portfolios were assessed. At the 5% significance level, it was found that during the period of 2001 to 2003 portfolios with low P/E ratios or in this study below median P/E ratio portfolios had higher actual and abnormal returns than those of portfolios with high P/E ratios or above median P/E ratio portfolios. The results of this study were consistent with those found in the international studies where market characteristics such as P/E ratios constituted an important variable that could be used to forecast stock returns (Basu, 1977; Reinganum, 1981; Keim, 1990; Aggarwal, Rao & Hiraki, 1990).

7.2 Limitations

The SEM is a relatively new and small market which started its operation in 1989. Given the small number of firms on the SEM, only two portfolios were constructed for analysis. The number of portfolios and size of firms as constructed and used in international studies cannot be replicated in the Mauritian context in that short period. The selection of firms with same fiscal end period in the portfolios was also not considered and this led to the existence of biased portfolios.

As the review period for this study was only three years, the results of the performance of portfolios might have been subject to the business life cycle and the elements of bull or bear market trends could impact across the market returns. During the last few years, the SEM was in a bull period and exhibited rapid growth in terms of market capitalisation. As most investment schemes make good returns when the market goes well, and most

schemes also do badly when the overall market performs poorly, it was crucial, therefore, to control market performance.

7.3 Suggestions for further research

Given that there are not many academic studies on the empirical evidence of market anomalies on the SEM, further investigation of the P/E ratio anomaly and its inter-relationship with other characteristics such as firm size, market capitalisation and risk (or beta) can be made in future. With time, the SEM database information on the P/E ratios of companies is improving and growing. The stock market also goes through its business cycle. A study of an analysis for testing the investment strategy of low P/E ratios while checking the market performance can be explored.

If firms in the SEM can be grouped into categories such as value and growth stocks, a study of the empirical evidence of the findings of international studies that value stocks tend to outperform growth stocks can also be investigated.

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9 APPENDICES

Appendix 9.1: Data values of simulated index and SEMDEX during the review period

Date	Ratio of simulated index vs semdex	Simulated Index	Semdex
31-Jan-01	100.00%	100.00	100.00
28-Feb-01	99.94%	101.43	101.49
30-Mar-01	100.01%	100.20	100.19
30-Apr-01	100.08%	102.39	102.31
31-May-01	99.49%	97.41	97.91
29-Jun-01	99.15%	98.12	98.96
31-Jul-01	98.97%	94.10	95.08
31-Aug-01	98.85%	92.47	93.55
28-Sep-01	98.90%	90.09	91.09
31-Oct-01	98.85%	88.28	89.31
30-Nov-01	98.65%	87.91	89.11
31-Dec-01	98.71%	86.08	87.20
31-Jan-02	95.39%	91.23	95.63
28-Feb-02	95.12%	90.74	95.40
29-Mar-02	95.57%	91.28	95.52
29-Apr-02	95.13%	86.23	90.64
31-May-02	92.33%	83.61	90.55
28-Jun-02	91.44%	83.88	91.74
31-Jul-02	92.11%	86.16	93.54
20-Aug-02	92.85%	89.11	95.98
30-Sep-02	92.95%	90.28	97.13
31-Oct-02	93.03%	90.19	96.95
29-Nov-02	91.22%	90.00	98.67
31-Dec-02	97.37%	99.44	102.13
31-Jan-03	99.46%	114.06	114.68
28-Feb-03	99.15%	107.39	108.32
31-Mar-03	99.06%	107.77	108.79
30-Apr-03	99.14%	115.25	116.24
30-May-03	97.65%	118.69	121.55
30-Jun-03	97.31%	121.11	124.45
31-Jul-03	96.12%	116.92	121.64
29-Aug-03	95.85%	115.72	120.74
30-Sep-03	96.42%	121.98	126.51
31-Oct-03	96.60%	130.97	135.58
28-Nov-03	96.25%	134.64	139.88
31-Dec-03	95.98%	134.92	140.57

Appendix 9.2: Paired t-test report for absolute returns of portfolios

Paired T-Test Report

Page/Date/Time 1 7/19/2005 12:57:45 PM
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Variable X1 = low_PE__Sharpe_, X2 = High_PE__Sharpe_

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Low_PE__Sharpe_	25	2.0476	1.267337	0.2534675	1.524469	2.570731
High_PE__Sharpe_	25	0.3648	1.371289	0.2742579	-0.2012404	0.9308404
Difference	25	1.6828	0.5112527	0.1022505	1.471765	1.893835

T for Confidence Limits = 2.0639

Tests of Assumptions about Differences Section

Assumption	Value	Probability	Decision(5%)
Skewness Normality	-1.1342	0.256729	Cannot reject normality
Kurtosis Normality	0.1901	0.849263	Cannot reject normality
Omnibus Normality	1.3224	0.516223	Cannot reject normality
Correlation Coefficient	0.927909		

T-Test For Difference Between Means Section

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.(
Low_PE__Sharpe_-High_PE__Sharpe_<>0	16.4576	0.000000	Reject Ho	1.000000	1.000000
Low_PE__Sharpe_-High_PE__Sharpe_<0	16.4576	1.000000	Accept Ho	0.000000	0.000000
Low_PE__Sharpe_-High_PE__Sharpe_>0	16.4576	0.000000	Reject Ho	1.000000	1.000000

Nonparametric Tests Section

Quantile (Sign) Test

Hypothesized Value	Quantile	Number Lower	Number Higher	Prob Lower	Prob Higher	Prob Both
0	0.5	0	25	0.000000	1.000000	0.000000

Wilcoxon Signed-Rank Test for Difference in Medians

W Sum Ranks	Mean of W	Std Dev of W	Number of Zeros	Number Sets of Ties	Multiplicity Factor
325	162.5	37.16349	0	1	6

	Exact Probability		Approximation Without Continuity Correction			Approximation With Continuity Correction		
Alternative Hypothesis	Prob Level	Decision (5%)	Z-Value	Prob Level	Decision (5%)	Z-Value	Prob Level	Decision (5%)
X1-X2<>0			4.3726	0.000012	Reject Ho	4.3591	0.000013	Reject Ho
X1-X2<0			4.3726	0.999994	Accept Ho	4.3860	0.999994	Accept Ho
X1-X2>0			4.3726	0.000006	Reject Ho	4.3591	0.000007	Reject Ho

Paired T-Test Report

Page/Date/Time	2 7/19/2005 12:57:45 PM
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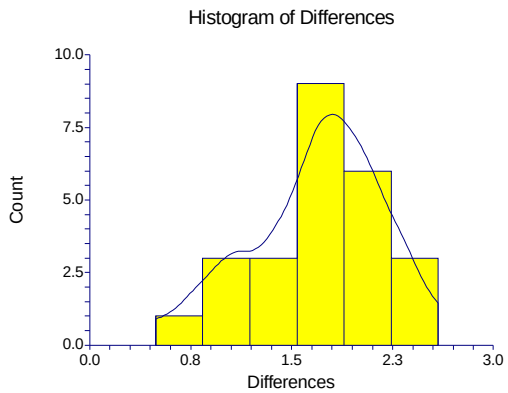
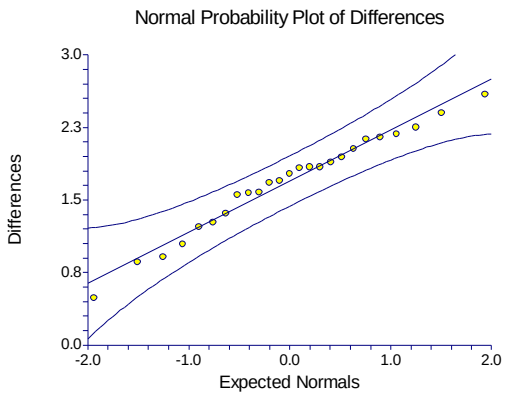
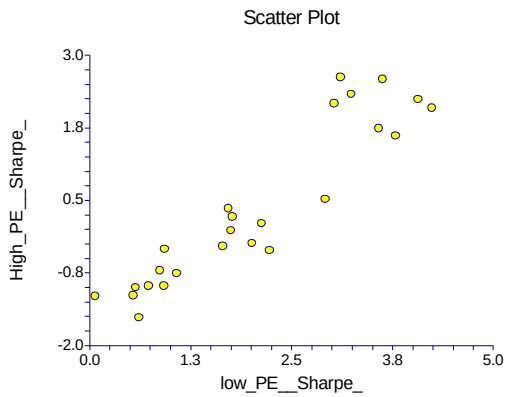
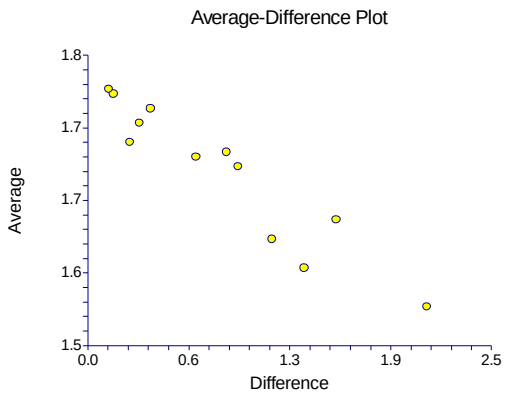
Variable	X1 = low_PE__Sharpe_, X2 = High_PE__Sharpe_

Plots Section









Appendix 9.3: Paired t-test report for abnormal returns of portfolios

Paired T-Test Report

Page/Date/Time 1 7/19/2005 12:56:17 PM
Database E:\DOCUMENTS AND SETTINGS\MBAD\THESIS\DATABASE NCSS\PE.S0
Variable X1 = Ab_Lo_PE_Shrpe, X2 = Ab_Hi_PE_Shrpe

Descriptive Statistics Section

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Ab_Lo_PE_Shrpe	25	0.9992	0.6510499	0.13021	0.7304598	1.26794
Ab_Hi_PE_Shrpe	25	-0.5896	0.5423059	0.1084612	-0.8134528	-0.3657471
Difference	25	1.5888	0.522927	0.1045854	1.372946	1.804654

T for Confidence Limits = 2.0639

Tests of Assumptions about Differences Section

Assumption	Value	Probability	Decision(5%)
Skewness Normality	-0.1110	0.911596	Cannot reject normality
Kurtosis Normality	-0.2014	0.840421	Cannot reject normality
Omnibus Normality	0.0529	0.973911	Cannot reject normality
Correlation Coefficient	0.629495		

T-Test For Difference Between Means Section

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01
Ab_Lo_PE_Shrpe-Ab_Hi_PE_Shrpe<>0	15.1914	0.000000	Reject Ho	1.000000	1.000000
Ab_Lo_PE_Shrpe-Ab_Hi_PE_Shrpe<0	15.1914	1.000000	Accept Ho	0.000000	0.000000
Ab_Lo_PE_Shrpe-Ab_Hi_PE_Shrpe>0	15.1914	0.000000	Reject Ho	1.000000	1.000000

Nonparametric Tests Section

Quantile (Sign) Test

Hypothesized Value	Quantile	Number Lower	Number Higher	Prob Lower	Prob Higher	Prob Both
0	0.5	0	25	0.000000	1.000000	0.000000

Wilcoxon Signed-Rank Test for Difference in Medians

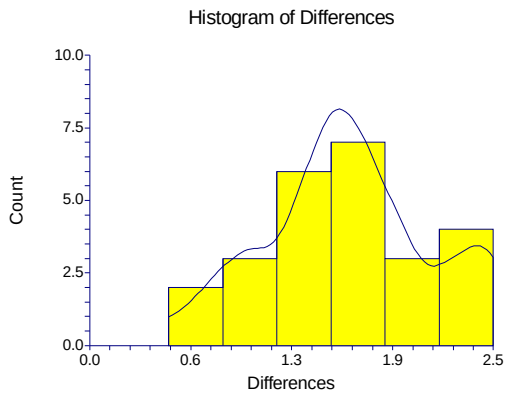
W Sum Ranks	Mean of W	Std Dev of W	Number of Zeros	Number Sets of Ties	Multiplicity Factor
325	162.5	37.16181	0	2	12

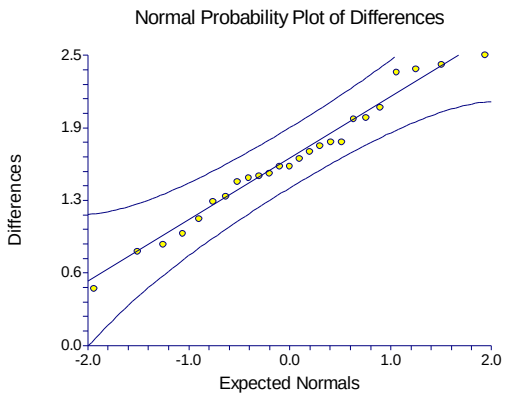
	Exact Probability		Approximation Without Continuity Correction			Approximation With Continuity Correction		
Alternative Hypothesis	Prob Level	Decision (5%)	Z-Value	Prob Level	Decision (5%)	Z-Value	Prob Level	Decision (5%)
X1-X2<>0			4.3728	0.000012	Reject Ho	4.3593	0.000013	Reject Ho
X1-X2<0			4.3728	0.999994	Accept Ho	4.3862	0.999994	Accept Ho
X1-X2>0			4.3728	0.000006	Reject Ho	4.3593	0.000007	Reject Ho

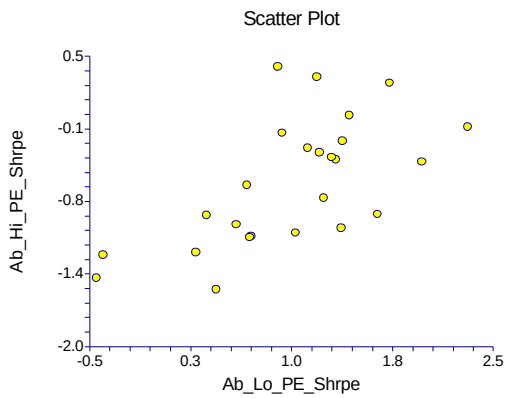
Paired T-Test Report

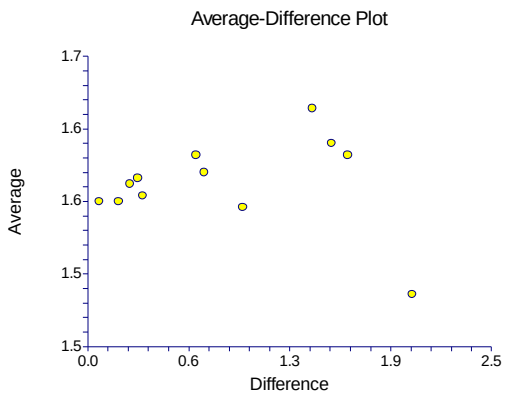
Page/Date/Time	2 7/19/2005 12:56:17 PM
Database	E:\DOCUMENTS AND SETTINGS\MBAD\THESIS\DATABASE NCSS\PE.S0
Variable	X1 = Ab_Lo_PE_Shrpe, X2 = Ab_Hi_PE_Shrpe

Plots Section









Appendix 9.4: The Stock Exchange of Mauritius –Official Quotation

The official quotations of the SEM as per the portfolio formation dates, namely 29th December 2000, 31st December 2001 and 31st December 2002, are given in this section.

THE STOCK EXCHANGE OF MAURITIUS

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET FRIDAY 29 DECEMBER 2000

Code	Securities	N.V.	Previous Price	Obs	Current Price	Obs	Net Chg	% Chg	Volume	Value Traded (Rs)	P/E Ratio	Div Yld %	EPS	52 Weeks High	Obs	52 Weeks Low	Obs	Spread +6%	Spread -6%	Financial Year End
	BANKS & INSURANCE																			
11071	B A I	1.00	3.60	I	3.60	I	-	0.00%			6.0	11.1	0.60	3.95		3.60		3.80	3.40	Dec-99
11591	DELPHIS BANK	1.00	3.50		3.50	I	-	0.00%			10.3	4.3	0.34	4.20		3.25		3.70	3.30	Dec-99
10011	M C B	10.00	81.00		81.00		-	0.00%	1,100	89,100.00	4.9	5.1	16.50	97.00		80.00		86.00	76.00	Jun-00
11151	MEI	10.00	50.50		50.50	I	-	0.00%			5.2	9.2	9.76	54.50		42.30		53.50	47.50	Dec-99
10621	M U A	10.00	31.10	I	31.10	I	-	0.00%			9.2	8.0	3.39	34.00		29.40		33.00	29.20	Dec-99
11271	S B M	1.00	16.40		16.40		-	0.00%	36,300	595,320.00	7.6	4.3	2.16	18.00		15.60		17.40	15.40	Jun-00
10131	SWAN	5.00	37.60		37.60		-	0.00%	500	18,800.00	6.5	8.6	5.79	41.50		36.90		39.90	35.30	Dec-99
	INDUSTRY																			
11191	GAMMA CIVIC	10.00	20.00	I	20.00	I	-	0.00%			4.7	5.0	4.22	24.80		19.00		21.20	18.80	Jun-00
10581	M B L ^	10.00	52.00	I	52.00	I	-	0.00%			7.0	5.8	7.43	82.50		51.50		55.00	48.90	Jun-00^
10061	M C F I	10.00	6.45		6.45		-	0.00%	15,500	99,975.00	4.5	10.9	1.42	8.50		5.35		6.85	6.05	Jun-00
10091	M O R	5.00	8.10		8.25		0.15	1.85%	11,155	92,028.75	5.8	9.1	1.43	12.40		8.10		8.75	7.75	Jun-00
10031	M S M	10.00	44.40		44.40	I	-	0.00%			4.9	7.3	8.99	49.50		41.00		47.10	41.70	Jun-00
10701	P I M ^	10.00	13.50	I	13.50	I	-	0.00%			3.2	9.3	4.22	17.50		10.20		14.30	12.70	Jun-00^
10051	U B P	10.00	26.50		26.50	I	-	0.00%			5.0	7.2	5.26	27.50		23.60		28.10	24.90	Jun-00
	INVESTMENTS																			
10251	B M H	10.00	46.20	I	46.20	I	-	0.00%			6.3	8.7	7.35	51.50		34.00		49.00	43.40	Dec-99
11211	FINCORP	1.00	3.20		3.20	I	-	0.00%			7.6	8.8	0.42	4.45		3.20		3.40	3.00	Jun-00
10111	G I D C (O) ^	1.00	5.95	I	5.95		-	0.00%			7.3	6.7	0.81	5.95		4.35		6.30	5.60	Jun-00 ^
10114	G I D C (P) ^	1.00	4.80	I	4.80	I	-	0.00%			5.9	8.3	0.81	5.70		3.95		5.10	4.50	Jun-00 ^
11091	L I T	10.00	13.40	I	13.40	I	-	0.00%			14.7	4.5	0.91	14.90		10.10		14.20	12.60	Sep-00
10021	M D I T	1.00	2.75		2.75		-	0.00%	403	1,108.25	6.5	12.7	0.42	3.10	@	2.15		2.90	2.60	Jun-00
11121	N I T	10.00	12.90	ED	12.90		-	0.00%	1,275	16,447.50	12.5	7.0	1.03	14.00		9.20		13.70	12.10	Jun-00
10741	P.A.D	5.00	7.35		7.30		(0.05)	-0.68%	591	4,314.30	7.9	5.5	0.92	11.00		7.05		7.75	6.85	Jun-00
10711	P O L I C Y	1.00	2.20		2.20		-	0.00%	11,147	24,523.40	2.5	9.5	0.89	3.90		2.20		2.35	2.05	Dec-99
11749	P O L I C Y P / P		1.30	I	1.30	I	-	0.00%			-	-	-	1.40		1.20		1.40	1.20	Dec-99
11031	UTD DOCKS ^	10.00	30.00	I	30.00	I	-	0.00%			10.6	9.7	2.82	32.50		28.40		31.80	28.20	Jun-00 ^
	SUGAR																			
10141	H. FRERES	10.00	22.00	I	22.00	I	-	0.00%			-	4.5	-	33.50		21.60		23.30	20.70	Dec-99
10071	M D A (O)	25.00	50.00	I	50.00	I	-	0.00%			2.3	9.0	22.11	65.00		44.50		53.00	47.00	Dec-99
10074	M D A (P)	25.00	48.20		48.20	I	-	0.00%			2.2	9.3	22.11	62.00		42.90		51.00	45.30	Dec-99
10161	MOUNT	10.00	9.25		9.25	I	-	0.00%			51.4	6.5	0.18	12.60		9.25		9.80	8.70	Dec-99
10041	M T M D	7.50	23.50	I	23.50	I	-	0.00%			8.0	12.3	2.93	32.80		21.00		24.90	22.10	Mar-00
10081	SAVA (O)	10.00	97.50	I	97.50	I	-	0.00%			1.9	4.6	50.75	112.00		94.50		103.00	91.50	Dec-99
10084	SAVA (P)	10.00	89.00	I	89.00	I	-	0.00%			1.8	5.1	50.75	102.00		87.50		94.50	83.50	Dec-99
	COMMERCE																			
10121	COURTS	1.00	3.90	I	3.90	I	-	0.00%			3.6	4.4	1.08	7.40		3.20@		4.15	3.65	Mar-00
10171	C M P L	10.00	6.50	I	6.50	I	-	0.00%			59.1	9.2	0.11	10.00		6.50		6.90	6.10	Dec-99
10601	H W F ^	10.00	20.00		20.00		-	0.00%	739	14,780.00	7.1	6.0	2.82	21.70		17.00		21.20	18.80	Jun-00 ^
10151	H. MALLAC	10.00	22.30	I	22.30	I	-	0.00%			5.6	9.9	3.96	27.90		22.30		23.60	21.00	Dec-99
11201	I B L	10.00	19.00	I	19.00	I	-	0.00%			6.7	4.7	2.82	23.40		16.50		20.10	17.90	Dec-99
10101	ROGERS	10.00	97.00		97.00	I	-	0.00%			5.8	5.7	16.65	101.00		70.00* *		103.00	91.00	Sep-00
11021	SHELL	10.00	32.00	I	32.00		-	0.00%	20	640.00	7.5	10.5	4.24	34.20		29.00		33.90	30.10	Dec-99

THE STOCK EXCHANGE OF MAURITIUS

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET FRIDAY 29 DECEMBER 2000

Code	Securities	N.V.	Previous Price	Obs	Current Price	Obs	Net Chg	% Chg	Volume	Value Traded (Rs)	P/E Ratio	Div Yld %	E.P.S	52 Weeks High	52 Weeks Low	Spread +6%	Spread -6%	Financial Year End
	LEISURE & HOTELS													Obs	Obs			
11081	A S L	10.00	25.00	I	25.00	I	-	0.00%			8.7	10.0	2.86	29.30	20.00	26.50	23.50	Dec-99
10511	G B H	10.00	54.50		54.50	I	-	0.00%			10.1	8.3	5.39	70.00	54.50	58.00	51.00	Sep-00
10691	N M H	10.00	34.70	I	34.70	I	-	0.00%			10.7	7.2	3.24	50.00	33.80	36.80	32.60	Sep-00
10821	SUN RESORTS	10.00	48.90		48.90	I	-	0.00%			9.4	7.7	5.20	52.00	45.50	52.00	46.00	Dec-99
	TRANSPORT																	
11261	AIR MTIUS " "	10.00	15.90		16.00		0.10	0.63%	51,020	816,320.00	2.6	12.1	6.24	34.00	14.70	17.00	15.00	Mar-00

Code	Debentures	N.V.	Previous Price	Obs	Current Price	Obs	Net Chg	% Chg	Volume	Value Traded (Rs)	YTR %	YTM %	Accrued Interest #	52 Weeks High	52 Weeks Low	Spread +6%	Spread -6%	Redep/Matr Date
41711	BNPI - 11.75 %	1,000	1053.00	I	1053.00		-	0.00%	143	150,579.00	8.87	10.14	29.05	1053.00	1052.00	1116.00	990.00	Dec 02-04
41501	CAUDAN - 10%	1,000	990.00	I	990.00	I	-	0.00%			13.53	10.49	20.92	1001.00	930.00	1049.00	931.00	Apr 01-03
41221	CMT - 10.5%	1,000	1000.00	I	1000.00	I	-	0.00%			10.50	10.50	7.88	1005.00	946.00	1060.00	940.00	Dec 00-02
41351	FINLEASE - 12%	1,000	1011.00	I	1011.00	I	-	0.00%			-	10.77	7.33	1030.00	990.00	1072.00	950.00	Mty Dec-01
41391	FINLEASE - 10.5%	1,000	1000.00	I	1000.00	I	-	0.00%			-	10.50	5.83	1011.00	960.00	1060.00	940.00	Mty Dec-02
41561	FINLEASE - 11.75% -1st Series	1,000	1010.00	I	1012.00	I	2.00	0.20%			10.87	11.33	2.28	1040.00	995.00	1073.00	951.00	Jun 02-04
41601	FINLEASE - 11.75% - 2nd Series	1,000	1031.00	I	1031.00	I	-	0.00%			10.54	10.54	2.61	1041.00	1000.00	1093.00	969.00	Dec 03-03
41441	GAMMA CIVIC - 10.75%	1,000	999.00	I	999.00	I	-	0.00%			-	10.83	8.86	1010.00	938.00	1059.00	939.00	Mty May-02
41661	HAREL FRERES - F.I.R	1,000	1005.00	I	1005.00	I	-	0.00%			11.59	11.69	107.87	1005.00	1000.00	1065.00	945.00	Jan 02-07
41451	HWFs - 10.5%	1,000	1000.00	I	1000.00	I	-	0.00%			-	10.50	6.13	1009.00	950.00	1060.00	940.00	Mty Jun-02
40181	M L C - 11% - 6th Series	1,000	1000.00	I	1000.00	I	-	0.00%			-	11.00	26.90	1004.00	961.00	1060.00	940.00	Mty Mar-01
41481	M L C - 10% - 7th Series	1,000	997.00	I	997.00	I	-	0.00%			11.34	10.11	24.46	1000.00	902.00	1057.00	937.00	Mar 01-04
41551	M L C - 12%- 8th Series	1,000	1024.00	I	1024.00	I	-	0.00%			10.09	11.30	29.35	1039.00	1000.00	1085.00	963.00	Apr 02-05
41681	M L C - 12%- 9th Series	1,000	1002.00	I	1002.00	I	-	0.00%			11.90	11.95	29.35	1078.00	1002.00	1062.00	942.00	Apr 03-06
40621	MUA - 10%	1,000	990.00	I	990.00	I	-	0.00%			-	10.56	3.06	1005.00	945.00	1049.00	931.00	Mty Dec-02
40691	NMH - 10%	1,000	993.00	I	993.00	I	-	0.00%			-	10.44	1.67	1000.00	949.00	1053.00	933.00	Mty Sep-02
40721	PCM - 10.25%	1,000	989.00	I	989.00	I	-	0.00%			-	10.91	17.55	1001.00	955.00	1048.00	930.00	Mty Oct-02
41411	ROGERS - 10.5%	1,000	994.00	I	994.00	I	-	0.00%			-	11.02	2.92	1011.00	965.00	1054.00	934.00	Mty Mar-02
40101	ROGERS - 9.5%	1,000	974.00	I	974.00	I	-	0.00%			10.81	10.81	1.06	1000.00	945.00	1032.00	916.00	Mar 03-03
40821	SUN RESORTS - 10%	1,000	984.00	I	984.00	I	-	0.00%			-	11.10	16.85	1002.00	940.00	1043.00	925.00	Mty Jul-02
SEMDEX		100	389.98		390.10		0.12	0.03%						436.60	389.62			
SEM -7		100	94.64		94.68		0.04	0.04%						106.51	94.06			

Market Volume Traded (shares)	129,893
Market (Turnover) Value Traded (Rs)	1,923,936.20
Market Capitalisation (Rs)	37,034,909,667.40

FOREIGN LISTING

Code	Security	N.V.	Previous Price	Obs	Current Price	Obs	Net Chg	% Chg	Volume	Value Traded (Rs)	P/E Ratio	Div Yld %	E.P.S	52 Weeks High	52 Weeks Low	LISTING ON THE LONDON STOCK EXCHANGE	
61281	MTS FUND	0.10	$11.83	I	$11.83	I	-	0.00%			45.5	2.1	0.26	12.20	11.83	Bid= $4.00, Offer= $5.00	27/12/2000

AUTHORISED MUTUAL FUND

Code	Name	NAV	Obs	Date
81751	CIRNE GROWTH FUND	13.53	OFFICIAL	27/12/2000

OR=Offre Reduite, DR=Demande Reduite, CTA=Cours Touche Achat, CTV=Cours Touche Vente, CB =Cum Bonus, CD=Cum Dividend, D=Demande, O=Offert, ME=Marche Equilibre,NC=Non Cote
CR=Cum Rights, EB=Ex Bonus, ED=Ex Dividend, ER=Ex Rights, CBR=Cum Bonus/Cum Rights, EBR=Ex Bonus/Ex Rights, P/P=Partly-Paid, I = Indicatif.

YTR = Yield to Redemption, YTM = Yield-to-Maturity, S= suspended, Redep/Matr = Redemption/Maturity,Obs = Observation.
*^ = Provisional & Unaudited, @ = Adjustment in respect of corporate action, # =Round off to two decimal places, *= Updated Div Yld in respect of last final dividend.*

*** =Adjustment in respect of dividend in specie,"" =Adjustment in respect of Bonus Issue,"" "=Adjustment in respect of Rights Issue.*

"Publication of the above figures has been done with reasonable care and diligence. However the Stock Exchange of Mauritius Ltd. makes no representations, gives no warranty and does disclaim all liability in respect thereof and shall not be held liable for any damage, loss or costs incurred resulting from any error in the information or any use of the said information."

THE STOCK EXCHANGE OF MAURITIUS LTD

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET ON MONDAY 31 DECEMBER 2001

EQUITY BOARD																	
Code	Security ID	Nominal Value	Last Closing Price	Today's Closing Price	High	Low	Volume Traded	Value Traded (Rs)	P/E Ratio	Div Yld %	EPS	DPS	Reference Price	Spread +15%	Spread -15%	Financial Year End
BANKS & INSURANCE																
BAI.N0000	B A I	1.00	3.40	3.40					5.15	12.06	0.66	0.41	3.40	3.90	2.90	Dec-00
DBL.N0000	DELPHIS BANK	1.00	2.65	2.65	2.65	2.65	1,800	4,770.00	13.25	7.55	0.20	0.20	2.65	3.00	2.30	Dec-00
MCB.N0000	M C B	10.00	82.00	82.00			76	6,206.50	4.25	6.10	19.29	5.00	82.00	94.00	70.00	Jun-01
MEI.N0000	MEI	10.00	44.00	44.00					4.81	10.80	9.15	4.75	44.00	50.50	37.40	Dec-00
MUA.N0000	M U A	10.00	33.00	33.00					8.41	8.79	3.90	2.90	32.80	37.70	27.90	Dec-00
SBM.N0000	S B M	1.00	10.50	10.50	10.50	10.50	185,491	1,947,610.00	4.38	7.62	2.40	0.80	10.50	12.00	8.95	Jun-01
SWAN.N0000	SWAN	5.00	44.10	44.10					5.78	8.50	7.63	3.75	44.10	50.50	37.50	Dec-00
COMMERCE																
CMPL.N0000	C M P L	10.00	8.05	8.05					5.48	7.45	1.47	0.60	8.05	9.25	6.85	Dec-00
COUR.N0000	COURTS	1.00	2.45	2.45					2.14	6.94	1.15	0.17	2.45	2.80	2.10	Mar-01
HML.N0000	H. MALLAC	10.00	25.70	25.70					3.97	10.51	6.48	2.70	25.70	29.50	21.90	Dec-00
HWF.N0000	H W F	10.00	18.00	18.00					6.23	6.67	2.89	1.20	18.00	20.70	15.30	Jun-01
IBL.N0000	I B L	10.00	11.00	11.00					3.14	15.00	3.50	1.65	11.00	12.60	9.35	Dec-00
ROGE.N0000	ROGERS	10.00	65.00	65.00			37	2,405.00	4.73	9.23	13.74	6.00	65.00	74.50	55.50	Sep-00
SHEL.N0000	SHELL	10.00	40.00	40.00	40.00	40.00	231	9,150.10	7.62	12.50	5.25	5.00	40.00	46.00	34.00	Dec-00
INDUSTRY																
GCL.N0000	GAMMA CIVIC	10.00	26.50	27.00	27.00	27.00	5,000	135,000.00	18.75	3.70	1.44	1.00	27.00	31.00	23.00	Jun-01
MBL.N0000	M B L	10.00	47.00	47.00					6.16	7.98	7.63	3.75	47.00	54.00	40.00	Jun-01
MCFI.N0000	M C F I ^	10.00	6.80	6.80					3.78	11.76	1.80	0.80	6.80	7.80	5.80	Jun-01 ^
MOR.N0000	M O R ^	5.00	8.10	8.10					6.64	9.26	1.22	0.75	8.10	9.30	6.90	Jun-01 ^
MSM.N0000	M S M	10.00	39.00	39.00					4.03	9.62	9.68	3.75	39.00	44.80	33.20	Jun-01
PIM.N0000	P I M ^	10.00	24.50	24.50					4.86	5.10	5.04	1.25	24.50	28.10	20.90	Jun-01 ^
UBP.N0000	U B P ^	10.00	31.00	31.00					5.57	6.45	5.57	2.00	31.00	35.60	26.40	Jun-01 ^
INVESTMENTS																
BMHL.N0000	B M H	10.00	45.00	45.00					3.65	9.33	12.34	4.20	45.00	51.50	38.30	Dec-00
FINC.N0000	FINCORP	1.00	3.40	3.40	3.40	3.40	10,000	34,000.00	3.82	9.41	0.89	0.32	3.40	3.90	2.90	Jun-01 ^
GIDC.N0000	G I D C (O) ^	1.00	3.55 CD	3.55 ED					16.19	11.27	0.21	0.40	3.40	3.90	2.90	Jun-01 ^
GIDC.P0000	G I D C (P) ^	1.00	3.60 CD	3.60 ED					16.43	11.11	0.21	0.40	3.45	3.95	2.95	Jun-01 ^
LIT.N0000	L I T	10.00	10.50	10.50					10.88	5.71	0.91	0.60	9.90	11.30	8.45	Sep-00
MDIT.N0000	M D I T	1.00	3.10	3.10					6.46	13.55	0.48	0.42	3.10	3.55	2.65	Jun-01
NIT.N0000	N I T ^	10.00	10.30 CD	11.00 ED	11.00	10.50	1,100	11,800.00	15.94	4.55	0.69	0.50	11.00	12.60	9.35	Jun-01 ^
PAD.N0000	P.A.D	5.00	9.75	9.00	9.75	9.00	800	7,575.00	2.91	5.00	3.09	0.45	9.00	10.30	7.65	Jun-01
POL.N0000	P O L I C Y	1.00	1.85	1.85					16.19	7.57	0.11	0.14	1.85	2.10	1.60	Dec-00
UTDL.N0000	UTD DOCKS	10.00	32.00	32.00					15.92	6.56	2.01	2.10	32.00	36.80	27.20	Jun-01
LEISURE & HOTELS																
ASL.N0000	A S L	10.00	22.00	22.00					8.70	11.36	2.53	2.50	22.00	25.30	18.70	Dec-00
GBH.N0000	G B H	10.00	39.00	39.00					7.24	10.26	5.39	4.00	39.00	44.80	33.20	Sep-00
NMHL.N0000	N M H	10.00	25.10	25.50	25.50	25.50	19,100	487,050.00	7.87	9.80	3.24	2.50	25.50	29.30	21.70	Sep-00
SUN.N0000	SUN RESORTS	10.00	38.00	38.00	38.00	38.00	3,016	114,560.00	6.53	11.16	5.82	4.24	38.00	43.70	32.30	Dec-00

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET ON MONDAY 31 DECEMBER 2001

EQUITY BOARD																
Code	Security ID	Nominal Value	Last Closing Price	Today's Closing Price	High	Low	Volume Traded	Value Traded (Rs)	P/E Ratio	Div Yld %	EPS	DPS	Reference Price	Spread +15%	Spread -15%	Financial Year End
SUGAR																
HARF.N0000	H. FRERES	10.00	22.50	22.50					8.52	13.33	2.64	3.00	22.50	25.80	19.20	Dec-00
MDA.N0000	M D A (O)	25.00	70.00	70.00					-	8.93	-	6.25	70.00	80.50	59.50	Dec-00
MDA.P0000	M D A (P)	25.00	60.00	60.00					-	10.42	-	6.25	60.00	69.00	51.00	Dec-00
MOUN.N0000	MOUNT	10.00	8.80	8.80					5.61	13.64	1.57	1.20	8.80	10.10	7.50	Dec-00
MTMD.N0000	M T M D	7.50	42.00	44.00	44.00	41.00	21,940	924,270.00	20.28	4.77	2.17	2.10	44.00	50.50	37.40	Mar-01
SAVA.N0000	SAVA (O)	10.00	125.00	125.00					35.71	6.00	3.50	7.50	125.00	143.00	107.00	Dec-00
SAVA.P0000	SAVA (P)	10.00	110.00	110.00					31.43	6.82	3.50	7.50	103.00	118.00	88.00	Dec-00
TRANSPORT																
AIRM.N0000	AIR MTIUS	10.00	11.40	11.00	11.00	11.00	100	1,100.00	-	9.09	-	1.00	11.00	12.60	9.35	Mar-01

DEBT BOARD											
Code	Debentures	Nominal Value	Opening Price	Today's Closing Price	Volume Traded	Value Traded (Rs)	YTR %	YTM %	Accrued Interest #	Redemption Date	Maturity Date
BNPI /D/ 0537	BNPI - 11.75%	1,000	1,031.58	1,031.58			8.41	10.50	2.61	30-Dec-2002	30-Dec-2004
CAUD /D/ 0521	CAUD - 10%	1,000	988.31	988.31			-	11.00	23.37	-	13-Apr-2003
CMT /D/ 0525	CMT - 10.5%	1,000	980.28	980.28			-	12.84	10.50	-	2-Dec-2002
FIN /D/ 0337	FIN-11.75% -2nd	1,000	1,011.32	1,011.32			-	11.09	5.55	-	21-Dec-2003
FIN /D/ 0537	FIN 11.75% 1st	1,000	1,009.87	1,009.87			9.55	11.28	5.22	22-Jun-2002	22-Jun-2004
FIN /D/ 0625	FIN-10.5%	1,000	992.38	992.38			-	11.38	8.46	-	9-Dec-2002
GCL /D/ 0527	GCL-10.75%	1,000	999.44	999.44			-	10.88	11.52	-	29-May-2002
HARF/D/ 0700	HARF-7 YEARS	1,000	1,000.91	1,000.91			8.67	10.22	96.60	28-Jan-2002	28-Jan-2007
HWF /D/ 0525	HWF-10.5%	1,000	993.91	993.91			-	12.00	8.75	-	8-Jun-2002
MLC /D/ 0621	MLC-10 % 7th Series	1,000	996.68	996.68			-	10.17	1.94	-	20-Mar-2004
MLC /D/ 0641	MLC- 12% 8th Series	1,000	1,017.09	1,017.09			6.50	11.38	2.33	30-Apr-2002	30-Apr-2005
MLC /D/ 1641	MLC-12%9th Series	1,000	1,003.12	1,003.12			11.74	11.91	2.33	17-Apr-2003	17-Apr-2006
MUA /D/ 0521	MUA - 10%	1,000	999.95	999.95			-	10.00	5.56	-	17-Dec-2002
NMHL/D/ 0521	NMH - 10%	1,000	990.30	990.30			-	11.44	4.17	-	23-Sep-2002
PCM /D/ 0523	PCM - 10.25%	1,000	1,000.19	1,000.19			-	10.22	20.05	-	26-Oct-2002
ROGE/D/ 0515	ROGERS - 9.5%	1,000	991.86	991.86			-	10.22	3.43	-	25-Mar-2003
ROGE/D/ 0525	ROGERS - 10.5%	1,000	996.74	996.74			-	12.13	5.54	-	19-Mar-2002
SUN /D/ 0521	SUN RESORTS-10%	1,000	998.12	995.13	300	298,539.00	-	10.91	19.29	-	27-Jul-2002

		Base Value	Last closing	Today's closing
SEMDEX		100	339.45	340.92
SEM -7		100	74.65	74.65
Market Volume Traded			248,991	
Market (Turnover) Value Traded (Rs)			3,984,035.60	
Market Capitalisation (Rs)			32,147,404,155.75	

Notes:

(i) The "Volume Traded" on the Equity Board consists of sum of the volume traded in respect of each security on Normal Equity ,Odd, Crossings and AoN Boards.

(ii) The "Volume Traded" on the Debt Board consists of sum of the volume traded in respect of each debt instrument on the Normal Debt and Crossings Boards.

(iii) The "Value Traded" for each stock and each debt instrument reflects the sum of value traded during the market day, where trades may have been effected at different prices.

(iv) The "Closing Price" for each debt instrument has been rounded to 2 decimal places.

(v) "Today's Closing Price" reflects the last traded price of securities and debt instruments on the Normal Equity and Debt Boards.

AUTHORISED MUTUAL FUND

Code	Name	NAV (Rs)	Obs		Date
81751	CIRNE GROWTH FUND	10.26	OFFICIAL		27-Dec-01

CR=Cum Rights, ER=Ex Rights, CB=Cum Bonus , EB= Ex Bonus, CD=CUM Dividend, ED= Ex Dividend

YTR = Yield to Redemption, YTM = Yield-to-Maturity, #=Accrued Interest on Settlement Date (T+3).

^ = Provisional & Unaudited.

"Publication of the above figures has been done with reasonable care and diligence. However, the Stock Exchange of Mauritius Ltd makes no representation, gives no warranty and does disclaim all liability in respect thereof and shall not be held liable for any damage, loss or cost incurred resulting from any error in the information or any use of the said information.

THE STOCK EXCHANGE OF MAURITIUS LTD

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET ON TUESDAY 31 DECEMBER 2002

EQUITY BOARD																	
Code	Security ID	Nominal Value	Last Closing Price	Today's Closing Price	Today's High	Today's Low	Volume Traded	Value Traded (Rs)	P/E Ratio	Div Yld %	EPS	DPS	Reference Price	Spread +15%	Spread -15%	Financial Year End
BANKS & INSURANCE																
BAI.N0000	B A I	1.00	3.15	3.15					6.06	13.02	0.52	0.41	3.15	3.60	2.70	Dec-01
MCB.N0000	M C B	10.00	91.00	91.00	91.00	90.50	4,391	399,541.00	4.59	6.48	19.81	5.90	91.00	104.00	77.50	Jun-02
MEI.N0000	MEI	10.00	48.50	48.50					5.14	9.79	9.44	4.75	48.50	55.50	41.30	Dec-01
MUA.N0000	M U A	10.00	30.50	30.50	30.50	30.50	634	19,337.00	6.31	8.52	4.83	2.60	30.50	35.00	26.00	Dec-01
SBM.N0000	S B M	1.00	12.30 CD	11.60 ED	11.60	11.60	450	5,220.00	4.43	8.62	2.62	1.00	11.60	13.30	9.90	Jun-02
SWAN.N0000	SWAN	5.00	48.00	48.00					5.78	8.33	8.30	4.00	48.00	55.00	40.80	Dec-01
COMMERCE																
CMPL.N0000	C M P L	10.00	10.10	10.10					5.32	9.90	1.90	1.00	10.10	11.60	8.60	Dec-01
COUR.N0000	COURTS	1.00	2.20	2.20	2.20	2.20	300	660.00	2.14	7.73	1.03	0.17	2.20	2.50	1.90	Mar-02
HML.N0000	H. MALLAC	10.00	29.10	29.10					4.53	9.28	6.42	2.70	29.10	33.40	24.80	Dec-01
HWF.N0000	H W F	10.00	17.90	17.90					6.86	6.70	2.61	1.20	17.90	20.50	15.30	Jun-02
IBL.N0000	I B L	10.00	17.30	17.00	17.00	17.00	649	11,039.60	8.50	7.35	2.00	1.25	17.00	19.50	14.50	Dec-01
ROGE.N0000	ROGERS ^	10.00	81.00	81.00					5.87	7.41	13.81	6.00	81.00	93.00	69.00	Sep-02 ^
SHEL.N0000	SHELL	10.00	45.00	45.00					7.73	11.56	5.82	5.20	45.00	51.50	38.30	Dec-01
INDUSTRY																
GCL.N0000	GAMMA CIVIC ^	10.00	21.50	21.50					2.32	19.77	9.27	4.25	21.50	24.70	18.30	Jun-02 ^
MBL.N0000	M B L	10.00	44.00	44.00					7.80	9.09	5.64	4.00	44.00	50.50	37.40	Jun-02
MCFI.N0000	M C F I	10.00	7.85	8.00	8.00	8.00	10,000	80,000.00	4.37	10.00	1.83	0.80	8.00	9.20	6.80	Jun-02
MOR.N0000	M O R ^	5.00	9.00	9.00					7.76	8.33	1.16	0.75	9.00	10.30	7.65	Jun-02 ^
MSM.N0000	M S M	10.00	40.70	40.70					4.52	11.06	9.01	4.50	40.70	46.80	34.60	Jun-02
PIM.N0000	P I M	10.00	21.00	21.00					3.57	14.29	5.89	3.00	21.00	24.10	17.90	Jun-02
UBP.N0000	U B P ^	10.00	36.00	36.00					3.93	5.56	9.15	2.00	36.00	41.40	30.60	Jun-02 ^
INVESTMENTS																
BMHL.N0000	B M H	10.00	47.00	47.00					1.93	9.68	22.05	4.55	42.50	48.80	36.20	Dec-01
CAUD.N0000	CAUDAN DEV.	1.00	0.77	0.77	0.77	0.76	51,525	39,259.50	19.25	3.90	0.04	0.03	0.77	0.88	0.66	Jun-02
FINC.N0000	FINCORP	1.00	4.25	4.25					7.73	8.24	0.55	0.35	4.25	4.85	3.65	Jun-02
GIDC.N0000	G I D C (O)	1.00	2.95	2.95					-	6.78	-	0.20	2.80	3.20	2.40	Jun-02
GIDC.P0000	G I D C (P)	1.00	2.95	2.95					-	6.78	-	0.20	2.80	3.20	2.40	Jun-02
LIT.N0000	L I T	10.00	10.30	10.30					11.35	5.83	0.85	0.60	9.65	11.00	8.25	Sep-02
MDIT.N0000	M D I T	1.00	3.65	3.65					7.93	11.78	0.46	0.43	3.65	4.15	3.15	Jun-02
NIT.N0000	N I T	10.00	9.80	9.80					13.80	7.14	0.71	0.70	9.80	11.20	8.35	Jun-02
PAD.N0000	P.A.D	5.00	11.00	11.00	11.00	11.00	567	6,237.00	10.28	4.09	1.07	0.45	11.00	12.60	9.35	Jun-02
POL.N0000	P O L I C Y	1.00	1.90	1.90	1.90	1.90	16,500	31,350.00	10.00	8.42	0.19	0.16	1.90	2.15	1.65	Dec-01
UTDL.N0000	UTD DOCKS ^	10.00	30.00	30.00					33.71	7.00	0.89	2.10	30.00	34.50	25.50	Jun-02 ^
LEISURE & HOTELS																
ASL.N0000	A S L	10.00	18.90	18.90					8.59	10.58	2.20	2.00	18.90	21.70	16.10	Dec-01
GBH.N0000	G B H ^	10.00	40.00	SUSPENDED					-	-	-	-		SUSPENDED		Sep-02 ^
NMHL.N0000	N M H ^	10.00	37.00	37.00	37.00	37.00	260,337	9,632,461.30	8.81	6.76	4.20	2.50	37.00	42.50	31.50	Sep-02 ^
SUN.N0000	SUN RESORTS	10.00	45.00	45.50	45.50	45.50	3,300	150,150.00	7.51	9.56	6.06	4.35	45.50	52.00	38.70	Dec-01

QUOTATION OF SECURITIES ON THE OFFICIAL MARKET ON TUESDAY 31 DECEMBER 2002

EQUITY BOARD																
Code	Security ID	Nominal Value	Last Closing Price	Today's Closing Price	Today's High	Today's Low	Volume Traded	Value Traded (Rs)	P/E Ratio	Div Yld %	EPS	DPS	Reference Price	Spread +15%	Spread -15%	Financial Year End
SUGAR																
HARF.N0000	H. FRERES	10.00	38.50	38.50					3.48	7.79	11.05	3.00	38.50	44.20	32.80	Dec-01
MDA.N0000	M D A (O)	25.00	77.00	77.00					5.72	16.23	13.47	12.50	64.50	74.00	55.00	Dec-01
MDA.P0000	M D A (P)	25.00	70.50	70.50					5.23	17.73	13.47	12.50	58.00	66.50	49.30	Dec-01
MOUN.N0000	MOUNT	10.00	9.55	9.55					7.02	12.57	1.36	1.20	9.55	10.90	8.15	Dec-01
MTMD.N0000	M T M D	7.50	45.00	45.00	45.00	45.00	200	9,000.00	2.29	34.56	19.69	15.55	45.00	51.50	38.30	Dec-02 **
SAVA.N0000	SAVA (O)	10.00	85.00	85.00					2.67	5.88	31.81	5.00	80.00	92.00	68.00	Dec-01
SAVA.P0000	SAVA (P)	10.00	84.00	84.00					2.64	5.95	31.81	5.00	79.00	90.50	67.50	Dec-01
TRANSPORT																
AIRM.N0000	AIR MTIUS	10.00	12.60	12.60	12.60	12.60	900	11,340.00	2.54	11.90	4.97	1.50	12.60	14.40	10.80	Mar 02

DEBT BOARD											
Code	Debentures	Nominal Value	Opening Price	Today's Closing Price	Volume Traded	Value Traded (Rs)	YTR %	YTM %	Accrued Interest #	Redemption Date	Maturity Date
BNPI /D/ 0537	BARCLAYS - 11.75%	1,000	1,009.83	1,009.83			-	11.19	2.61	-	30-Dec-2004
CAUD /D/ 0521	CAUD - 10%	1,000	1,000.06	1,000.06			-	9.97	23.37	-	13-Apr-2003
FIN /D/ 0337	FIN-11.75% -2nd	1,000	1,000.49	1,000.49			-	11.69	5.55	-	21-Dec-2003
FIN /D/ 0537	FIN 11.75% 1st	1,000	999.94	999.94			-	11.75	5.22	-	22-Jun-2004
HARF/D/ 0700	HARF-7 YEARS	1,000	968.83	968.83			-	10.22	87.18	-	28-Jan-2007
MLC /D/ 0621	MLC-10 % 7th Series	1,000	998.26	998.26			-	10.16	1.94	-	20-Mar-2004
MLC /D/ 0641	MLC- 12% 8th Series	1,000	1,014.50	1,014.50			-	11.28	2.33	-	30-Apr-2005
MLC /D/ 1641	MLC-12%9th Series	1,000	1,004.21	1,004.21			10.45	11.84	2.33	17-Apr-2003	17-Apr-2006
ROGE/D/ 0515	ROGERS - 9.5%	1,000	998.36	998.36			-	10.25	3.43	-	25-Mar-2003

	Base Value	Last Closing	Today's closing
SEMDEX	100	401.73	399.26
SEM -7	100	89.19	88.45
SEMTRI (in Rs Terms)	100	809.57	812.56
SEMTRI (in US $ Terms)	100	431.92	433.96
Market Volume Traded		349,753	
Market (Turnover) Value Traded (Rs)		10,395,595.40	
Market Capitalisation (Rs)		38,641,073,425.50	

Notes:

(i) The "Volume Traded" on the Equity Board consists of sum of the volume traded in respect of each security on Normal Equity ,Odd, Crossings and AoN Boards.

(ii) The "Volume Traded" on the Debt Board consists of sum of the volume traded in respect of each debt instrument on the Normal Debt and Crossings Boards.

(iii) The "Value Traded" for each stock and each debt instrument reflects the sum of value traded during the market day, where trades may have been effected at different prices.

(iv) The "Closing Price" for each debt instrument has been rounded to 2 decimal places.

(v) "Today's Closing Price" reflects the last traded price of securities and debt instruments on the Normal Equity and Debt Boards.

TRADE CANCELLATION : OF 20 000 SHARES OF SBM LTD AT RS 11.50

** M T M D : Change of Financial Year from 31 Mars 2002 to 31 December 2002.

AUTHORISED MUTUAL FUND

Code	Name	NAV (Rs)	Obs	Date
81751	CIRNE GROWTH FUND	9.73	INDICATIVE	27-Dec-02

CR=Cum Rights, ER=Ex Rights, CB=Cum Bonus , EB= Ex Bonus, CD=CUM Dividend, ED= Ex Dividend

YTR = Yield to Redemption, YTM = Yield-to-Maturity, #=Accrued Interest on Settlement Date (T+3).
^ = Provisional & Unaudited, P / P = Partly Paid , ~ ! = The DPS is adjusted on Ex Date , following a final dividend in respect of its final year .

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