# VALUE INVESTING VERSUS GROWTH INVESTING IN SOUTH AFRICA: VALUATION DISPARITIES AND SUBSEQUENT PERFORMANCE

**by**

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# DECLARATION

By submitting this thesis titled "*Value Investing versus Growth Investing in South Africa: Valuation Disparities and Subsequent Performance"* electronically, I, Stefanus du Toit, declare that the entirety of the work contained herein is my own original work, that I am the author thereof (save to the extent explicitly stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

**DECEMBER 2012**

..... .....

**S G DU TOIT** **DATE**

**Ter nagedagtenis aan**

## COENRAAD (COENIE) LOUBSER DU TOIT

**1 Maart 1960 tot 24 September 2012**

**Jy was 'n ongelooflike oom, maar selfs nog 'n beter vriend.**
**Rus in vrede tot ons mekaar weer eendag sien.**

**"… ons is maar grassade, my kind, en net 'n kersvlam in die wind …"**

# ERKENNINGS

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# OPSOMMING

Verskillende beleggingstyle en meer spesifiek, die relatiewe uitprestering van sekere style onder verskillende mark omstandighede, is wyd nagevors oor die afgelope paar dekades. Professionele beleggers is ook gedurig op die uitkyk vir moontlike faktore wat die uitprestering van sekere beleggingstyle vooraf kan aandui. Met die waarde-groei verskynsel sentraal in hierdie debat, is die doelwit in hierdie studie om die waarde-groei verskynsel te ondersoek vanuit 'n eg Suid-Afrikaanse mark perspektief.

Deur maandelikse data vir die periode 1991 tot 2011 te gebruik en daaropvolgende prys-tot-boekwaarde (P/B) verhoudings te bereken vir al die aandele wat deel was van die FTSE/JSE Alle-Aandele Indeks, sal daar in hierdie studie die metodologie van 'The Brandes Institute' (2009A) in die Verenigde State van Amerika, gebaseer op die werk van Lakonsihok, Shleifer en Vishny (1994), toegepas word om te probeer bepaal of die relatiewe uitprestering van waarde aandele oor groei aandele vooraf voorspel kan word.

Aandele is maandeliks ingedeel op die basis van hul onderskeie P/B verhoudings. Deur hierdie proses is daar maandeliks vier nuwe portefeuljes geskep, met die groei portefeulje wat die hoogste 25% van P/B verhouding aandele bevat het en die waarde portefeulje wat die laagste 25% van P/B verhouding aandele verteenwoordig. Prestasie beoordeling van die nuut geskepde portefeuljes was die volgende stap in die navorsingsproses waar kwartiel-tot-kwartiel prestasie beoordeling oor die daaropvolgende vyf-jaar periode na portefeulje ontstaan, plaasgevind het. Die relatiewe prestasie van die waarde en groei portefeuljes is vergelyk met die waardasie pariteit maatstaf, wat bereken is as die mediaan P/B verhouding van die groei portefeulje gedeel deur die mediaan P/B verhouding van die waarde portefeulje. Hierdie vergelyking is gebruik om te bepaal of 'n verhouding tussen die onderskeie waardasies van groei en waarde aandele en daaropvolgende prestasie bestaan. Die alle aandele segment is verder ook opgedeel in drie onderskeie indekse om te bepaal of 'n verwantskap binne al die verskillende markkapitalisasie sektore bestaan. Die grootste markkapitalisasie aandele is verteenwording deur die FTSE/JSE Top-40 Indeks; die medium markkapitalisasie aandele deur die FTSE/JSE Mid-Cap Indeks; en die kleinste markkapitalisasie aandele wat deel vorm van die

FTSE/JSE Alle-Aandele Indeks is verteenwoording deur die FTSE/JSE Small-Cap Indeks.

'n Beduidende verwantskap is gevind tussen die waardasie pariteit maatstaf en daaropvolgende vyf-jaar prestasie van waarde en groei aandele. Histories hoe hoër die waardasie pariteit maatstaf, hoe groter die relatiewe uitprestering van waarde aandele oor die daaropvolgende vyf-jaar periode. Hierdie verskynsel is beduidend gevind vanuit 'n FTSE/JSE All-Share Indeks, FTSE/JSE Top-40 Indeks, FTSE/JSE Mid-Cap Indeks en FTSE/JSE Small-Cap Indeks perspektief. 'n Uitsondering was die FTSE/JSE Top-40 Indeks vir die periode na 2002, waar dit nie moontlik was om 'n beduidende verwantskap te identifiseer nie.

# ABSTRACT

Investment styles and more particularly the relative outperformance of certain styles under differing market conditions have been widely researched. Furthermore, investment professionals are constantly on the lookout for factors that could possibly be indicative of the subsequent outperformance of certain investment styles. With the value-growth phenomenon at the centre of this debate, there is an attempt in this study to shed some light on this anomaly from a purely South African perspective.

Using monthly data for the period 1991 to 2011, and calculating price-to-book value (P/B) ratios for all the stocks included in the FTSE/JSE All-Share Index, the methodology employed by The Brandes Institute (2009A), based on work of Lakonishok, Shleifer and Vishny (1994), will be utilised in this study in order to determine whether the relative outperformance of value stocks over growth stocks can be anticipated in advance.

Stocks were ranked monthly on the basis of their relative P/B ratios and subsequently four new portfolios were created each month, with the growth portfolio consisting of the highest 25% P/B ratio stocks and the value portfolio capturing the lowest 25% P/B ratio stocks. After portfolio creation, quartile-by-quartile performance was tracked over the following five years. The relative performance of the value versus growth portfolio was compared to the valuation difference multiple, calculated as the median P/B ratio of the growth portfolio divided by the median P/B ratio of the value portfolio, to determine if a relationship existed between valuation disparities and the subsequent relative performance of value and growth stocks. The all-cap (FTSE/JSE All-Share Index) segment was further divided into large-cap (FTSE/JSE Top-40 Index), mid-cap (FTSE/JSE Mid-cap Index) and small-cap (FTSE/JSE Small-cap Index) segments in order to determine if a consistent relationship could be identified within different market capitalisation sectors of the market.

A significant relationship was found between the valuation difference multiple and subsequent performance of value and growth stocks in all segments of the JSE Mainboard. Historically, the higher the valuation difference multiple, the higher the subsequent outperformance of value stocks over the subsequent five-year period, as compared to growth stocks. This was found to be significant within the FTSE/JSE All-

Share Index, the FTS/JSE Top-40 Index, the FTSE/JSE Mid-Cap Index and the FTSE/JSE Small-Cap Index. An exception to the above findings was the post-2002 period within the FTSE/JSE Top-40 Index. During this period it was not possible to identify a relationship between the valuation difference multiple and subsequent value stock outperformance.

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ALL-CAP | FTSE/JSE All-Share Index / All-Capitalisation |
| ALSI | FTSE/JSE All-Share Index |
| AMEX | American Stock Exchange |
| AR(1) | Autoregressive model of the order one |
| ARCH | Autoregressive Conditional Heteroscedasticity |
| BTM | Book-to-market equity |
| BVPS | Book Value per Share |
| CAPM | Capital Asset Pricing Model |
| DY | Dividend yield |
| EMH | Efficient Market Hypothesis |
| EPS | Earnings per Share |
| GARCH | Generalised Autoregressive Conditional Heteroscedasticity |
| GS | Growth in Sales |
| JSE | Johannesburg Stock Exchange |
| LARGE-CAP | FTSE/JSE Top-40 Index / Large-Capitalisation |
| MID-CAP | FTSE/JSE Mid-Cap Index / Medium-Capitalisation |
| MSCI EAFE | Morgan Stanley Capital International Europe/Australasia/Far East Index |
| NYSE | New York Stock Exchange |
| OLS | Ordinary Least Squares |
| P/B and $\frac{\mathbf{P}}{\mathbf{B}}$ | Price-to-book value ratio |
| P/CF and $\frac{\mathbf{P}}{\mathbf{CF}}$ | Price-to-cash flow ratio |
| P/E and $\frac{\mathbf{P}}{\mathbf{E}}$ | Price-to-earnings ratio |
| P/S and $\frac{\mathbf{P}}{\mathbf{S}}$ | Price-to-sales ratio |
| SMALL-CAP | FTSE/JSE Small-Cap Index / Small-Capitalisation |
| USA | United States of America |
| USD | United States of America Dollar |
| ZAR | Republic of South Africa Rand |

# GLOSSARY OF TERMS

| | |
|---|---|
| ANOMALY | The EMH states that it is not possible to consistently outperform the market. However, certain investment strategies have been identified, labelled anomalies, which consistently outperform the market, although the reasons for the respective outperformances is not as clear. These anomalies include the small-firm effect, the January effect, the low book value effect and the neglected firm effect, to name a few. |
| AR(1) | A random process utilising previous outcomes to predict a future outcome of a process. In an AR(1) process, the previous output and the error term contribute to the predicted future outcome of the process. |
| BETA | From a risk perspective beta is a measure of a stock's risk relative to the overall market; a higher beta indicates increased exposure to market risk. Market risk is risk present in all investments and can thus not be eliminated through diversification. The CAPM views beta as the only source of risk as a rational investor would have eliminated all other sources of risk through diversification. From a return perspective beta indicates a stock's relationship with the return of the overall market. A positive beta indicates a positive relationship with the overall market, indicating that a rise in the overall market will in all likelihood lead to an increase in the individual stocks price. |
| BOOK VALUE | A measure of a company's net asset value to shareholders. It is obtained from the financial statements by subtracting liabilities from assets. An indication of common shareholders' value in the company at a given point in time as it is theoretically the value that shareholders would receive if the company is liquidated. |

| | |
|---|---|
| BOOK VALUE PER SHARE | A company's book value divided by its ordinary shares outstanding. A measure of stockholders' value per common share. |
| BOOK-TO-MARKET-EQUITY | Measure of a firm's book value relative to its market price. High BTM ratio stocks are classified as value stocks, with low BTM ratio stocks representing growth stocks. The BTM ratio is an inverse relationship of the P/B ratio. |
| CAPITAL ASSET PRICING MODEL | A model which recognises beta (market risk) as the only measure of risk, since all other risks have been eliminated through diversification. The model states that higher risk should be rewarded with higher returns and vice versa. |
| CETERIS PARIBUS | Keeping all other factors/variables constant. |
| DEVELOPED MARKETS | Term used for countries which are believed to be the most developed and as a result less risky. |
| DIVIDEND YIELD | A percentage measure of annual dividends paid by a company relative to its market price. It is calculated as the total annual dividends per share divided by the price per share. |
| DUAL CAPACITY TRADING | Formed part of the 1994-1995 restructuring/deregulation of the JSE, which allowed stockbrokers to act as both a principal and an agent when dealing with clients. Previously stockbrokers could only act as agents. |
| EFFICIENT MARKET HYPOTHESIS | A theory implying that it is impossible to constantly outperform the market as the prices of securities reflect all relevant information at a given point in time. |
| EMERGING MARKETS | Countries which business and social activities are in the stage of high and fast development, resulting in rapid economic growth. Considered riskier than developed markets. |
| EQUITY | Refers to ownership interest in a business. |

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| EXCESS RETURN | Return of a value portfolio minus the return of the comparable growth portfolio. |
| GROWTH STOCK | A stock which is believed to have superior earnings growth in future relative to the market. Usually stocks with high P/B, P/E and P/S ratios combined with lower dividends as these companies prefer to reinvest their earnings. |
| HETERO-SCEDASTICITY | Heteroscedasticity is present when the assumption of homoscedasticity is violated. The assumption of homoscedasticity states that the error term's (ε) probability distribution remains the same for all observations of X, thus it assumes a constant variance for the ε, irrespective of the level of X. |
| MARKET VARIABLES | Includes beta, size, debt-to-equity, book-to-market, price-to-earnings, price-to-sales and price-to-book value variables, to name a few. |
| MEAN-REVERSION | The concept of mean-reversion theory suggests that on average certain observed variables will tend to eventually revert back to its mean, where mean can be defined as its long-term average. In essence it means that the high and low points of an observed variable are temporary as it will in time revert back to its mean. |
| ORDINARY LEAST SQUARES | A statistical method used to determine unknown parameters of a linear regression model. |
| P/B | The market price of a stock divided by its book value per share. A measure of the amount paid per unit of net assets. |
| P/CF | The market price of a stock divided by its operating cash flow per share. A measure of the amount paid per unit of operating cash flow. |

| | |
|---|---|
| P/E | The market price of a stock divided by its earnings per share. A measure of the amount paid per unit of earnings. |
| P/S | The market price of a stock divided by its revenue (turnover) per share. A measure of the amount paid per unit of revenue. |
| SERIAL CORRELATION | Also referred to as autocorrelation. When the value of ε (random/error term) is correlated with preceding values of ε in earlier periods there is serial correlation of the random (error) variables. |
| STRUCTURAL BREAKPOINTS | An econometric term used to describe an unexpected shift in time series data, which can lead to errors in forecasting and unreliable models, if not accounted for. |
| STYLE INVESTING | Investment strategies based on certain predetermined underlying stock characteristics. |
| VALUE STOCK | A stock which trades at a price which is perceived to be low when compared to some underlying fundamentals. Usually stocks with low P/B, P/E and P/S ratios and high dividend yields. |

# CHAPTER 1

# ORIENTATION

## 1.1 INTRODUCTION

Investment management is a service provided by professionals whereby the money of individual clients is invested with the aim of achieving specified levels of return for a given level of risk. These money managers' income is fee driven and in most instances is based on a so-called performance fee. It is thus of the utmost importance for the professionals to achieve results that are superior to those of their peers. It is due to this competition that many investment professionals utilise the investment strategy of active management. This is contrary to the belief of the passive investor who believes that markets are efficient in the sense that prices fully reflect all current information, as stated by the Efficient Market Hypothesis (EMH). Markets thus are believed to be correctly priced and it is not possible to outperform the market on a consistent basis, except by chance. These passive investors will base their investments on market weights, referred to as indexing. In contrast to the belief of passive managers, active managers believe that it is possible to outperform the market on a consistent basis.

The theory of active management can be reconciled with the notion of market equilibrium. Active managers are constantly searching for securities believed to be mispriced, in the hope of achieving higher returns. The competition amongst managers ensures that prices are kept in a close range to their fair value. If no analyst could outsmart the market, the priority would be to minimise cost through a less expensive passive strategy. In such a case, active managers would cease to exist and prices would not reflect research and forecasts made by such professionals. The resulting mispricing would lure active managers to the market once again in an attempt to achieve abnormal returns. Thus active management has its place in the modern investment world even if markets are believed to be nearly efficient.

All investment professionals, whether active or passive, construct investment portfolios to satisfy specific needs, goals and objectives. Within a constantly changing

investment world, this is a difficult and complicated process to say the least. Although the notion of diversification has been around for many years, portfolio construction theory dates back to research done by Markowitz (1952). Markowitz (1952) distinguished between efficient and inefficient portfolios, based on the underlying selection criteria of expected (mean) return and the variance of returns. Research such as Markowitz (1952) combined with Sharpe (1964) and Treynor and Black (1973) revolutionised the way investment professionals thought about portfolio construction and security selection and evolved to become the modern concept of portfolio theory. Modern portfolio theory states that an investment professional attempts to maximise expected portfolio return for a given level of risk or to minimise portfolio risk for a given level of expected return. Determining acceptable levels of risk and return is certainly one of the most important steps in the investment process.

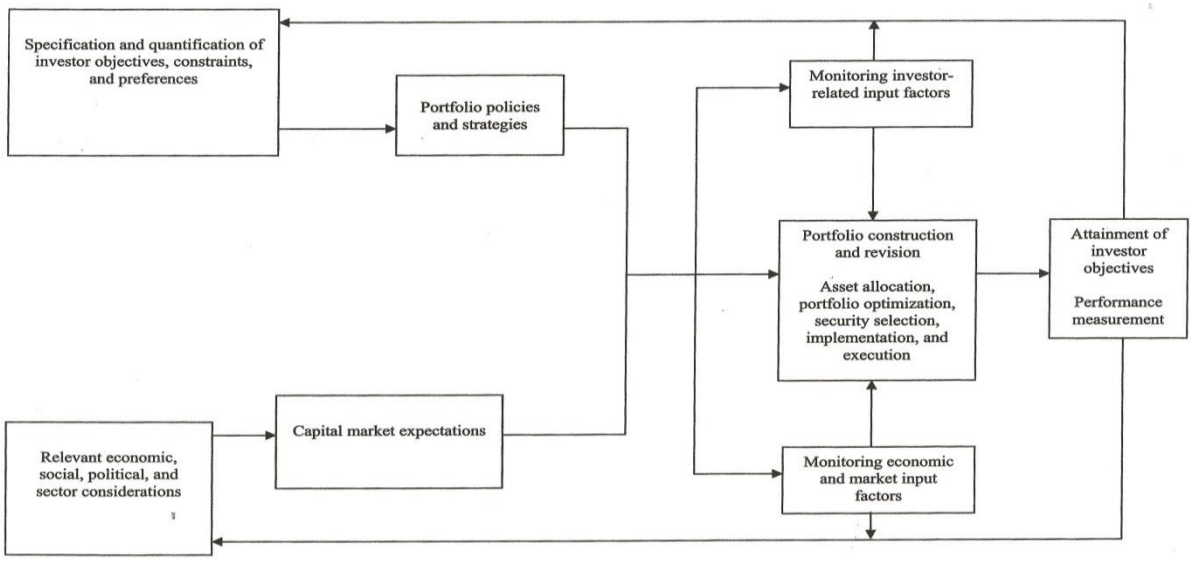



**Figure 1.1: The Portfolio Construction, Monitoring and Revision Process**

Source: CFA Institute (2010), Level 2 2010, Volume 6, p 558.

As can be seen in Figure 1.1, the investment and portfolio management process is a dynamic process which requires constant evaluation and adjustment of a portfolio's long term objectives, expectations and relevant capital market factors. It is also important to specify acceptable benchmarks for performance evaluation. This is critical in the evaluation of the preferred investment strategy and its significance in current market conditions. The investment process is thus a dynamic process that requires constant evaluation and adjustment to ensure that stated objectives and mandates are adhered to.

Selecting the correct investment strategy is of the utmost importance in achieving the needs, goals and objectives of a specific investment portfolio, as discussed above. There have been numerous studies indicating that investment style ultimately has an effect on investment return. Style investing and more specifically the risk and return patterns of different styles, have been a major area of research for years. Firstly, as discussed above, investors can be classified as either active or passive. The most frequently utilised passive strategy is indexing, which includes full replication, stratified sampling and optimization. With passive and active management the two extremes, semi-active equity management such as enhanced indexing or risk-controlled active management can be seen as the middle road between the two approaches. Active investors can further be divided according to the strategies they follow, namely value-, growth- or market-oriented investing. Some investors base their strategy on the relative size of the underlying companies with alternate firm-size strategies focusing on large-, mid- and small-cap stocks respectively. It is not uncommon to find a mixture of the different strategies. Warren Buffet once said: "Growth and value investing are joined at the hip" (www.investopedia.com).

Advocates of the notion that markets are not perfectly efficient and therefore constant outperformance is possible, try to take advantage of the systematic inefficiencies present in markets. Active managers use a variety of factors to construct their portfolios, believing that these underlying factors are systematically incorrect. Value and growth strategies are based on the underlying valuations and price multiples of stocks. For example, investors who follow momentum strategies, a subcategory of growth investing, invest in stocks that have performed strongly in the recent past. These investors believe that the upward price movement/momentum will continue in the future. In contrast to momentum investors, contrarian strategies, which is a subcategory of value investing, seek stocks which are out of favour with investors, thus they tend to invest in stocks that the majority of investors believe will perform poorly.

Growth investing can be defined as seeking stocks which are deemed to have good growth potential. The growth stock strategy as promoted by respected investment professionals such as Thomas Rowe Price, Jr., considered the "father of growth investing" (www.investopedia.com), and David Babson (1951) was a particular area of focus in the period post-World War 2. Price developed a theory that investing was

superior to speculating and argued that superior returns were possible by investing in established well-managed companies where earnings and dividends could reasonably be expected to grow at a rate higher than inflation and the economy. Normally growth stocks tend to be those of "a company whose earnings are expected to grow at an above-average rate compared to its industry or the overall market" (www.investopedia.com). Investors may invest in growth stocks even if the price is rather high, the main requirement being that of high future expected growth. However, some growth investors utilise a more disciplined approach with regard to the price of the underlying asset and thus the price of future growth in earnings. These investors seek growth at a reasonable price (GARP). These investors follow a more balanced approach of solid earnings and good value. Due to the fact that investors do not search for stocks with lower prices, growth stocks will tend to have higher price multiples such as price-to-earnings (P/E), price-to-book value (P/B), price-to-sales (P/S) and price-to-cash flow (P/CF) ratios.

Value investing is based on the premise of selecting stocks that currently trade at a discount to their intrinsic value. Benjamin Graham, thought of as the father of fundamental analysis, believed in the strategy of out-of-favour stocks currently trading at below their intrinsic value (Graham and Dodd, 1934). A more recent proponent of value investing is Warren Buffet, who invests in stocks believed to be substantially below intrinsic value. Estimating a company's intrinsic value is the biggest drawback of value investing. Intrinsic value is the expected cash flows of a company in future, discounted to the present. This requires subjective judgement and may therefore differ between investors. Since value stocks tend to have lower prices, as compared to intrinsic value, they tend to have lower than average P/E, P/B, P/S and P/CF ratios and/or higher dividend yields.

The topic of style investing is well documented in international research papers. There is ample evidence, especially in developed markets, that value stocks tend to outperform growth stocks over longer investment horizons (see for example Fama and French, 1992; Lakonishok, Shleifer and Vishny, 1994). With these findings in mind and considering the fact that emerging markets offer their own unique risk-return characteristics, it is important to look at style investing from an emerging market perspective, taking local emerging market variables into consideration, to come to a conclusion based on such data. Subsequently the focus in this research report is on

value and growth investing from a purely South African perspective, with the main objective of determining whether the outperformance of value stocks can be anticipated through the observation of certain price multiples.

It should be noted in advance that a distinction is made between growth and glamour stocks within academic research papers. Lakonishok *et al*. (1994) as well as The Brandes Institute (2008A, 2009A and 2009B) used the term glamour stocks, where glamour indicates stocks that are currently in favour with investors. However, as will be explained later, Lakonishok *et al*. (1994) do not believe that value stocks outperform glamour due to more risk, and thus the use of glamour seems appropriate. Contrary to the Lakonishok *et al*. (1994) view, Fama and French (1992) argue that low P/B ratio stocks, a common value measure, are riskier and thus the use of growth instead of glamour, were glamour relates to irrational investor behaviour, would suit their explanation. Barberis, Shleifer and Wurgler (2002) as well as Barberis and Shleifer (2003) have a pure-sentiment view on the growth versus glamour debate. They believe that value stocks are stocks lacking common risk fundamentals, but argue that the lower valuations are simply due to the fact that they are out of favour with investors, while glamour stocks are growth stocks that are currently favoured by investors. However, Campbell, Polk and Vuolteenaho (2010) state that "growth stocks are not merely glamour stocks whose systematic risks are purely driven by investor sentiment" (Campbell *et al*., 2010: 305). The distinction between growth and glamour stocks does not fall within the scope of this study and subsequently the term growth stocks will be used in the traditional sense, indicating established, mature companies with P/E, P/B and P/S ratios higher that the industry average.

The remainder of this chapter is organised as follows. In Section 2 the problem statement, the reason for the choice of subject to be studied, is given. In section 3 the main and secondary objectives of this research are explained. Primary and secondary research is discussed in section 4 under the heading of data and methodology. In section 5 some of the limitations that should be considered are listed. This chapter is concluded with an orientation of study in section 6.

## 1.2 PROBLEM STATEMENT

The debate on value versus growth investing has been a heated topic for many years, with much evidence supporting the premise that value investing outperforms growth investing over the longer term. However, the reason for this outperformance is not as clear. Furthermore, investment professionals have for many years tried to identify variables that could possibly be indicative of a relative value or growth cycle in advance. Although it is a well-known fact that past performance cannot simply be extrapolated into the future due to the fact that the past may not repeat itself, past data is still one's biggest source of information and thus it can be profitable to understand past performance before attempting to predict the future. Exploring the interaction between style effects and average return can lead to a better understanding of relevant "style variables" (Robertson and Van Rensburg, 2003: 75) influencing the returns of value and growth portfolios. Identifying relevant growth and value cycles in advance can lead to better investment returns over a long, medium and short investment horizon. This can be achieved by identifying and timing cycle changes correctly, which in turn will benefit all parties involved.

The purpose of this study is to determine what the experience in South Africa has been over the past 20 years and whether it is possible to identify a relationship between stock market returns and characteristics inherent in the specific investment style. Identifying relevant variables that could be indicative of a value phenomenon, lies at the heart of this study.

## 1.3 OBJECTIVES OF THE RESEARCH

Some of the first research on the topic of style investing was done by Stattman in the 1980s. In his research a firm's book value was compared to its market value in an attempt to determine whether a relationship existed between this variable and a specific stock's performance. He identified a positive relationship between a stock's average return over time and the firm's book-to-market equity (BTM) ratio. After the findings of Stattman (1980) on the USA equity market were made public, many investment professionals attempted to explain why a value investment style delivers superior performance to a growth investment style under certain market conditions. However, the debate surrounding value and growth investing and the relative reasons

for the outperformance and the merits thereof have remained inconclusive. Despite ample evidence suggesting that a value approach outperforms over a longer time horizon, there are, however, certain periods during which a growth approach delivers superior returns.

During 2007 value investors underperformed by quite a wide margin when compared to growth investors (Morgan, 2008). The 2007 growth cycle occurred during tough market conditions and sparked a new interest in the value versus growth debate. Investment professionals seemed to have found a new interest in developing models that could possibly predict value and growth cycles in advance. After much research done on the topic of value versus growth (see for example Fama and French, 1992; Lakonishok *et al*., 1994), The Brandes Institute in 2009 conducted a study: "Value vs. Growth Revisited: Historical P/B ratio Disparities and Subsequent Value Stock Outperformance." They adjusted the Lakonishok *et al*. (1994) methodology slightly and used it in a clever manner in order to determine whether it is possible to predict a value cycle in advance.

The primary objective of this study on the South African equity market is to apply a revised version of the methodology as applied by The Brandes Institute (2009A), to determine whether a significant relationship exists between valuation disparities and the subsequent relative performance of value and growth stocks. The Brandes Insitute is a division of Brandes Investment Partners®, situated in San Diego, United States of America (USA). The main focus of The Brandes Institute is to educate investment professionals through research and publications. The Institute is known for its ground-breaking and thorough research as well as for employing capable and creative individuals. The Brandes Institute's unique and proven investment research process is summarised in Figure 1.2.


**Figure 1.2: The Brandes Institute Research Process**

Source: The Brandes Institute (2011)

The primary objective of the present study was achieved by dividing stocks that were constituents of the FTSE/JSE All-Share Index into value and growth portfolios based on their relative P/B ratios and tracking the performance of each portfolio over the subsequent five-year period. As the aim of this study was to compare valuations at extreme ends of the spectrum, the relative difference in valuations between value and growth stocks was used as a measure of disparity in stock market valuations at a given point in time. Once the valuation difference was calculated and subsequent performance tracked, there was an attempt to identify relationships between historic value cycles and the valuation difference multiple that can be used to predict the outperformance of value stocks in future.

The secondary objective in this research was to split the All-Cap sample of stocks into Large-Cap, Mid-Cap and Small-Cap stocks, with the aim of determining whether there is a consistent relationship between value and growth stocks in the All-Cap, Large-Cap, Mid-Cap and Small-Cap segments of the South African equity market.

## 1.4 DATA AND METHODOLOGY

### 1.4.1 Primary Research

Differentiating between style investments can be done by analysing different market variables such as beta, company size, debt-to-equity, P/B, P/E and P/S ratios, to name a few. The primary research in this study was to calculate the P/B ratios of all the stocks that are constituents of the FTSE/JSE All-Share Index on a monthly basis. This was done through observations and data gathering over the period 1991 to 2011. In order to calculate monthly P/B ratios, each stock's month-end price was represented by that stock's closing price on the Johannesburg Stock Exchange (JSE) on the last working day of each month. Book value is the value at which an asset is shown in a company's financial statements. It is thus not necessary to calculate an asset's book value, this is observed directly from the financial statements. The P/B ratio is calculated using the following formula:

$$\text{Price} - \text{to} - \text{Book value ratio} = \frac{\text{Market Price per Ordinary Share}}{\text{Book Value per Ordinary Share}}$$

Subsequently all the stocks which are constituents of the FTSE/JSE All-Share Index were ranked according to their relative P/B ratios. This was done in order to create monthly value and growth portfolios. The growth portfolios consisted of the highest 25% of P/B ratio stocks, whilst the value portfolios were made up of the lowest 25% of P/B ratio stocks. This exercise was repeated on a monthly basis during the period of investigation, thus at each month-end four new portfolios were formed.

Once a monthly value and growth portfolio had been formed, the relative performance of each portfolio could be measured. This was done by gathering monthly price and dividend data for each stock in the portfolio. Stocks within the respective portfolios were equally weighted for return calculation purposes. Prices were captured on a monthly basis and dividends were assumed to be paid monthly. The price data and monthly dividends were used in order to determine the subsequent five-year annualised returns for the respective portfolios. This process was repeated on a monthly basis over the research period. Due to the fact that subsequent five-year annualised return had been used to measure performance, the last set of portfolios was constructed on 31 October 2006.

In order to determine whether a relationship exists between a stock's P/B ratio and its subsequent performance, the valuation difference multiple was calculated on a monthly basis. The multiple was calculated by dividing the median P/B ratio of the growth portfolio by the median P/B ratio of the value portfolio.

This ratio was calculated on a monthly basis in order to compare it with the annualised five-year excess return, where excess return was calculated as the five-year annualised return of the value portfolio minus the five-year annualised return of the growth portfolio. Once it had been determined whether a relationship existed between the valuation difference multiple and subsequent relative performance, it was important to determine how consistent this relationship, if at all found present, was at various P/B multiples. This was determined by dividing the calculated valuation difference multiples over the entire research period into quartiles. Quartile 1 contained the highest 25% of valuation difference multiples, while quartile 4 constituted the lowest 25% of valuation difference multiples. The average and median five-year annualised return for each quartile was subsequently calculated and compared in order to determine if a consistent relationship existed.

A database was constructed for purposes of descriptive and inferential analysis. All the relevant data necessary to conduct the primary research was captured within the database.

#### *1.4.1.1 Population*

All the ordinary stocks listed on the JSE were included in the population. As at 31 October 2011, the JSE had a total market capitalisation of all listed securities amounting to ZAR6 964 771 594 775 with a total of 845 listed securities. Of the total market capitalisation ZAR6 383 218 249 833 can be attributed to listed ordinary stocks, with a total number of 409 ordinary stocks listed on the JSE. The JSE market capitalisation of USD809 285 000 000 ranks it the 20$^{th}$ largest exchange in the world and the largest in Africa (Information supplied by the JSE Education Department).

#### *1.4.1.2 Sample*

Only stocks listed on the JSE Main Board which are included in the FTSE/JSE All-Share Index were included in the sample. In this study the focus was on the

FTSE/JSE All-Share Index due to the fact that it represents the truly investable universe of stocks available to institutional investors most accurately and is seen as an indicator of market wide performance.

The JSE currently utilises the FTSE/JSE Africa Index Series system. However, before 24 June 2002, the Actuaries Index Series was used and thus the relevant requirements to be included in JSE indices changed. The new management system changed the calculation methodology of indices with the purpose of ensuring that indices reflected market movements more accurately. The method employed by the FTSE/JSE Africa Index Series is known as Cap-Weighted Indexing. This allows for continual calculation of index levels, where index level is displayed to one decimal point:

$$\text{IV} = \frac{\sum_{i=1}^{n}(P_i * S_i * F_i)}{D} \; for \; i = 1, 2, 3, \ldots n$$

where: IV = Index Value;

$P_i$ = The latest trade price for the $i^{th}$ component security;

$S_i$ = Shares in issue for the $i^{th}$ security;

$F_i$ = Free-float factor for the $i^{th}$ security;

D = Total issued share capital of the index at the base date.

According to this method of index value calculation, the total market value, after free-float adjustments, of all stocks included in an index is used to determine the value of the index.

#### *1.4.1.3 Primary Research Method*

Analysis of all the ordinary stocks in the sample was the primary step in this study. This included the construction and classification of relevant indices for the period 1991 through 2011 and utilising indices' data where available and applicable. Constructing a user-friendly database was of the utmost importance in achieving the desired results during this study. Data included in the database is stock constituents, prices, dividend yields, book values and shares issued. With this data descriptive analysis could be done.

#### *1.4.1.4 Acquisition of Data*

All relevant data for the period 1991 to 2011 was captured in a database from where analysis could take place. It has to be stated that the current study's database is of a similar format to one constructed by Rickus Ferreira, previously employed by Plexus Asset Management, which has been utilised in studies leading up to this research. Rickus Ferreira constructed a database for the period 1995 to 2006. The original database compiled by Rickus Ferreira was constructed using four databases. These included work by Professor P. van Rensburg (UCT), I-Net Bridge, McGregor BFA and research conducted by Professor W. Hamman (USB). Rickus Ferreira's capturing process and criteria formed the basis of this study's database.

However, since the original Rickus Ferreira database utilised yearly data for the period 1996-2006, it was necessary to construct a new monthly database which covered a longer period, as required for this study. The process of constructing a database with the necessary data was a complicated process since data on listed and delisted stocks was required. For this purpose a combination of databases was used. As primary databases, data from the JSE, McGregor BFA and I-Net Bridge was utilised as the combination ensured the availability of accurate data on both listed and delisted stocks.

#### *1.4.1.5 Data Analysis*

All data necessary to conduct the research is included in the database. This includes market information as well as financial statement data. Once the data was captured and analysed, descriptive statistics and findings could be drawn. Subsequent to descriptive conclusions, inferential analysis by means of statistical software was conducted in order to determine whether findings are significant.

### 1.4.2 Secondary research

Due to the worldwide importance of risk and return characteristics of different subsets of stocks, resulting in the classification of stocks into large-capitalisation, medium-capitalisation and small-capitalisation based on size characteristics, the secondary research of this study entailed dividing the All-Cap (FTSE/JSE All-Share Index) sample into Large-Cap (FTSE/JSE Top-40 Index), Mid-Cap (FTSE/JSE Mid-Cap

Index) and Small-Cap (FTSE/JSE Small-Cap Index) segments. The segmentation of stocks was based on the FTSE/JSE Africa Index Series classification criteria and thus is a true reflection of Large-Cap, Mid-Cap and Small-Cap stock segmentation and trading as defined by the FTSE/JSE. This segmentation was done in order to determine whether a significant relationship can be established between value and growth strategies when comparing Large-Cap, Mid-Cap and Small-Cap stocks on the South African equity market.

The classification into Large-Cap, Mid-Cap and Small-Cap is necessary in order to determine whether the value premium is present in all segments of the market and within which segment of the market it is more evident. Once the classification between Large-Cap, Mid-Cap and Small-Cap had been made, the analysis followed the same path as explained for the primary research.

## 1.5 LIMITATIONS OF THE STUDY

Firstly, it must be remembered that research is based on historical data and thus relevant conclusions must be used with caution. Due to the fact that the investment field is dynamic, underlying fundamentals are susceptible to change and as such historical findings cannot simply be extrapolated into the future. Since historical data is one's primary source of data, it is however important to grasp and understand historical patterns before future predictions are attempted.

Secondly, historical data and portfolio construction of value and growth stocks based on current data may perform differently than expected when the market nears extreme ends of the valuation spectrum. This can possibly occur during times of heavy distress or extreme bull markets. The fundamentals used to construct portfolios based on underlying stock characteristics may not be relevant and applicable in such instances.

Thirdly, as a result of recent economic developments and loss of value on markets around the globe, there have been several calls from investment professionals demanding that a bigger focus be put on risk control, shifting the primary focus from return. This might cause models to be altered in order to incorporate risk measures more accurately.

Lastly, it must be mentioned that data issues could arise with the use of the All-Share constituents. With the change in methodology calculation methods during 2002, the process for calculating indices' values and determining eligibility of constituents underwent substantial changes. Although actual data is available for the period after 2002, it was necessary to use backtracked data for the period prior to 2002.

## 1.6 ORIENTATION OF STUDY

This research report will comprise of the following chapters:

- Literature Review

  Analysing past research forms an integral part of this study. However, it is important to remember that this research must be seen in a South African context. This section will explain the theory behind style investing and analyse past research conducted on style investing.

- Data and Methodology

  Analysing collected data must be done in such a way that the reader finds it user-friendly and easy to interpret. In this chapter collected data will be processed in a way that makes interpretations and conclusions possible.

- Findings

  After the analysis, as explained in the data and methodology chapter, has been done, the results can be interpreted. It is hoped that the results will be understandable, reliable and easy to use.

- Conclusions

  In this section of the study the researcher will give his opinions and make recommendations on the topic of style investing and how it is relevant in the investment world.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 INTRODUCTION

Although there are many theories pertaining to finance, one of the most important concepts in the modern market is market efficiency. The Efficient Market Hypothesis (EMH) as defined by Fama (1970) states that current prices reflect all information and risks inherent in an investment and therefore no free profits are possible. Although there have been many debates surrounding the EMH, Malkiel (2003) states that no superior returns are possible through technical and fundamental analysis if the EMH is true. Even though the EMH has been shown to be present in modern financial markets and despite the fact that many theories in finance support the premise that investors cannot consistently earn above-average risk-adjusted returns, investment professionals still pursue various investment strategies which they believe will lead to outperformance of the market.

Much research has been done on style investing and the effect thereof on explaining average returns across investment horizons, such as the studies done by Fama and French (1992), Lakonishok *et al*. (1994), Graham and Uliana (2001) and Scher and Muller (2005). Style investing can be categorized into three distinct strategies, namely value-, growth- and market-oriented investing. Value investors focus on undervalued securities, utilising high dividend yield, low price multiple and contrarian strategies. Growth investors focus on growth potential of the underlying investment, therefore utilising consistent earnings growth and momentum strategies. Market-oriented investing describes investors that do not purely focus on either a value or growth strategy. Market-oriented investing can be divided into market-oriented with a value tilt, market-oriented with a growth tilt, growth at a reasonable price and style rotation. These investment styles are based on the principle of selecting stocks which satisfy certain predetermined underlying principles. During 1934, Benjamin Graham and David Dodd published a book called "Security Analysis". They stated that out-of-favour stocks, known as value stocks today, are sometimes under-priced by the market,

allowing investors that identified and acted on this phenomenon to realize strong returns. They observed that stocks with a low price-to-book value (P/B) ratio tend to outperform stocks with a higher P/B ratio over the long term. Graham and Dodd (1934) focused on two value components. The first measure looked at book value by comparing the amount of capital raised by a company to how much of the profits were retained and used for reinvestment. The second measure focused on a company's dividend-payout ratio.

The strategy of value investors is to buy stocks that appear undervalued relative to some fundamental measure. According to valuation metrics, value stocks are stocks with low price-to-book value (P/B), price-to-earnings (P/E), price-to-sales (P/S) and price-to-cash flow (P/CF) ratios and higher dividend yields. These stocks are often associated with companies operating in a mature industry, experiencing difficult operating conditions or conditions that adversely affect such companies' performance. Growth investing, which is the opposite of value investing, is the strategy of buying stocks that are believed to have substantial growth potential. Growth shares may even appear expensive at current levels, but can still be bought if the prospect of substantial future growth is present. When classifying growth shares according to valuation metrics, they are on the opposite side of the spectrum with high P/B, P/E, P/S and P/CF ratios. Growth stocks tend to have acceptable profit margins and above-average cash reserves to guard them in difficult times. They normally operate in dynamic industries with a higher than average profile, with substantial institutional following, research and investment.

Economies as well as financial markets move through phases, more commonly referred to as cycles. It is important that an investment professional should observe the appearance of value cycles and growth cycles as this could lead to different shares outperforming in alternate periods. The recent global economic meltdown led to a substantial outperformance of growth stocks during 2007, as stated by Morgan (2008). As noted by Robertson and Van Rensburg (2003), an investor should always position himself in such a way that he is able to take advantage of any potential cycle changes that may occur.

Some value investors deny that markets tend to be efficient and thus differ from Fama (1970). These investors believe prices change in reaction to irrational investor

behaviour where investors are either over-optimistic or too pessimistic about future prospects. Sometimes these investors may believe the market has priced a stock incorrectly, but what if the stock price is correctly anticipating a deterioration of a company's fundamentals? In such an instance, an investor can find himself within a value trap, which has the possibility of substantial losses. However, risks are part of the investment profession, but as defined by the Capital Asset Pricing Model (CAPM), an investor must to be rewarded with higher returns for additional risk taken by investing in certain classes of stocks, for example the value trap explained above. Fama and French (1992) argue that the higher return of value stocks is due to higher risk taken.

According to Siegel (2007) most investment professionals agree that over the long term, value investing tends to outperform growth investing, but over the short term there are certain sub-periods during which growth investing performs better than value investing. In an article by Waggoner (2007) it is stated that growth funds soared more than 10% in three months during 2007. This rebirth of growth stocks followed a period in which value stocks gave investors better average risk-adjusted returns. The value cycle that preceded the 2007 growth cycle lasted from 2002 to 2007. The statement by Waggoner is confirmed by Morgan (2008) who claimed that "the year 2007, on a rolling 5-year basis, eliminated the underperformance of growth stocks" (Morgan, 2008: 9). This occurred during a period of tough market conditions, where basically all stock prices plummeted.

Within the framework of the EMH, there are many different theories surrounding style investing and whether investors can consistently achieve superior returns in relation to the market or any other underlying benchmark. Due to the increasing competitiveness of the investment profession, achieving consistent above-average returns is even more important in the modern investment era with investors constantly requiring "positive performance persistence" (Scher and Muller, 2005: 5) from an investment manager before they are willing to invest. This is one of the reasons why style investing is one of the most widely researched topics in the investment field, as it is believed to add value. It is important for investment professionals to understand the concepts underlying style investing in order to achieve the maximum gain.

The remainder of this chapter is structured as follows: In section 2 the relationship between style investing and the Efficient Market Hypothesis will be examined. In section 3 the value effect will be explained and further investigation will be done into whether such a value effect does indeed exist. In section 4 the relevant risks associated with value and growth investing will be identified. In section 5 style timing and the importance thereof will be explained. In section 6 the Lakonishok *et al*. (1994) sample and methodology are examined and explained in detail. In section 7 the various sample and methodology differences between Lakonishok *et al*. (1994) and The Brandes Institute (2008A, 2009A and 2009B) study are examined. In section 8 value and growth investing will be looked at from a South African perspective. A conclusion is drawn in section 9.

## 2.2 STYLE INVESTING AND THE EFFICIENT MARKET HYPOTHESIS

Style investing, which is based on the premise that above-average rates of return can be achieved with lower risk, has been a subject of debate for decades. The Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1965) and Black (1972) (together SLB) has been used by many investment professionals to shape the way they think about risk and return. However, within the SLB model there are several restrictions which have come to the fore in recent times. Banz (1981) questions whether it is possible to explain average return without taking the size effect into account. He researched the size effect and found that the market capitalisation of a stock plays an important role in explaining the cross-section of average returns. After Banz (1981) published his findings on size, the reliability of the SLB model, as a measure of risk and return, became a subject of debate. This paved the way for widespread research on beta, as defined by the SLB model, and possible other factors that could explain average returns over time.

Stattman (1980) as well as Rosenberg, Reid and Lanstein (1985) conducted studies on a firm's ratio of book-to-market equity (BTM) and average stock returns. In both cases it was found that these two variables were positively related. However, most of the research on the topic of BTM and the influence thereof in explaining average stock returns, was based on United States data and therefore evidence was limited in terms of other world markets. This led to a study done by Chan, Hamao and Lakonishok (1991) who observed the effects of BTM relating to average stock returns on the

Japanese stock market over the period 1971 to 1988. Chan *et al*. (1991) tested a combination of anomalies which included the earnings yield, size effect and BTM ratio. They found that the value anomaly did indeed exist on the Japanese Stock Market. The results indicated that BTM ratios and cash-to-book value ratios have the most significant impact on average return differences amongst stocks. Their research confirmed the findings of Stattman (1980) and Rosenberg *et al*. (1985).

The United States of America and the Japanese markets were two of the biggest financial markets at the time of the above research. With evidence that both of these markets rejected beta as the only risk-return measure, beta's credibility as a measure of risk was in danger as many investment professionals started to believe that there were other relevant variables that could be used to more accurately explain average stock returns versus risks. With the credibility of beta hanging by a thread and increasing interest in the notion of value stock outperformance, Fama and French (1992) conducted a study on the "joint roles of market beta, size, E/P, leverage and book-to-market equity in the cross-section of average returns on NYSE, AMEX and NASDAQ stocks" (Fama and French, 1992: 428). It was found that the relationship between beta and average returns existed for the period pre-1963, but disappeared during the period 1963 to 1990. Fama and French (1992) therefore concluded that the prediction made by the SLB model that average stock returns and market betas are positively related, did not hold in the modern investment era. However, a significant relationship was found between the other variables tested and as documented by Fama and French (1992), they contributed to the explanation of the cross-section of average stock returns, finding a negative relationship with size and a strong positive relationship with BTM, arguing that the size effect is of importance, but that "book-to-market equity has a consistently stronger role in average returns" (Fama and French, 1992: 428). Their findings thus supported previous arguments by Stattman (1980), Banz (1981) and Rosenberg *et al*. (1985). From an emerging market perspective, the insignificance of beta was confirmed by Rahmani, Sheri and Tajvidi (2006) on the Tehran Stock Exchange (Iran) as well as Van Rensburg and Robertson (2003B) on the JSE.

The other variables tested by Fama and French (1992) were used to create a three-factor model in order to explain the cross-section of average returns more accurately than before. This model combined the value effect, the size effect and the momentum

effect. It was found that BTM (labelled the value effect) consistently had a stronger influence in explaining the cross-section of average stock returns during their research period and that a positive relationship existed between these two variables. They concluded that a higher BTM ratio will in all likelihood lead to higher average stock returns, thus a value strategy was found to generate superior returns over their research period. This served as proof that it was possible to outperform the market on a risk-adjusted basis with style investing, a phenomenon which is perceived to be inconsistent with the EMH. However, Fama and French (1992) did not reject the EMH in its entirety but rather created a model that can be used in conjunction with the EMH.

The ground-breaking work done by Fama and French (1992) changed the way in which scholars and investment professionals viewed value and growth investing, as well at the risk-return relationship as defined by the SLB model. Whereas average returns were previously evaluated in terms of the CAPM, which stated that an investor should be rewarded for additional risk, Fama and French (1992) argued that beta alone was not suitable for explaining the cross-section of average returns and that other variables were of much greater importance in explaining the average returns on stocks.

Fama and French (1992) concluded that the tendency of value stocks to outperform growth stocks can be attributed to risk, arguing that value stocks are inherently riskier than growth stocks. Their view as to why value stocks perform superior is in stark contrast to the explanation provided by Lakonishok *et al*. (1994), which is discussed in greater detail in section 2.6 (p. 31). Lakonishok *et al*. (1994) believe that value strategies produce higher returns due to the fact that they are "contrarian to naïve strategies followed by other investors" (Lakonishok *et al*., 1994: 1542), thus not attributing higher returns to increased risk.

Variables and findings such as those by Fama and French (1992) and Lakonishok *et al*. (1994) resemble market anomalies. Market anomalies represent inconsistent risk-return relationships and can therefore cause a market to be inefficient. It is thus important to observe such anomalies closely within the EMH and to identify any opportunities or threats that might arise from such inefficiencies.

Value investing and growth investing are some of the most researched anomalies in the investment profession. These anomalies arise due to the fact that investors

believe superior returns can be achieved in future, based on historical research. This clearly causes a conflict with the EMH which states that past information cannot be used to predict future returns. Most style investors do not believe in the EMH due to the fact that they believe securities can be incorrectly priced, while growth investors believe that earnings can be predicted based on certain historic underlying principles (Black and McMillan, 2004).

Due to the impact of the influential Fama and French (1992) study, Lakonishok *et al*. (1994) published a landmark article in the value versus growth canon. Lakonishok *et al*. (1994) found that BTM does indeed have a positive relationship with average stock returns. However, they differed from Fama and French (1992) in the sense that they did not create a model that accepted the EMH. Lakonishok *et al*. (1994) rejected the EMH in their research, arguing that securities can be incorrectly priced as a result of irrational investor behaviour, and thus it is possible to outperform the market consistently.

## 2.3 DOES THE VALUE EFFECT EXIST?

Widespread research has been done on the subject of value investing versus growth investing in the modern investment era. Apart from research conducted on the size effect, the value effect is one of the most documented anomalies, shown to be significant and persistent, in the last couple of years. Studies such as those of Basu (1983), Rosenberg *et al*. (1985) and De Bondt and Thaler (1985 and 1987) have all identified a value effect. However, the reasons underlying this phenomenon and its presence under different market conditions in the modern investment era still leave much room for debate. Fama and French (1992) and Lakonishok *et al*. (1994) confirmed the earlier value effect findings, stating that over the longer term a value strategy tends to outperform a growth strategy.

Shefrin and Statman (1995) tried to prove why investors would acquire growth stocks even though value stocks have been proven to outperform growth stocks. They used the Fortune 500 as explanation and stated that investors associate low BTM ratio stocks with good companies and these companies are perceived to be a good investment, which is not *per se* true. Their conclusion contradicts past research, arguing that when a good company's (low BTM ratio) stock price decreases and

investors lose money due to the decreasing stock price, it is perceived as the market's fault. However, when a low-quality company's (high BTM ratio) stock price declines and money is lost, it is considered an investor's mistake as it was perceived as a poor stock and should not have been invested in from the start. They argue that investors buy stocks with low BTM ratios, believing that they are stocks of companies with good fundamentals, which is not always the case.

Fama and French (1992) as well as Lakonishok *et al*. (1994) found that value stocks do tend to outperform growth stocks over the long term. However, their reasoning for the higher average returns of value stocks differed. Fama and French (1992) acknowledged style as an additional source of risk. They argued that a non-diversifiable risk was present in high BTM ratio stocks. This risk is not explained by the CAPM and therefore the investor needs to be rewarded for taking on additional risk. The value investor is rewarded with an additional value risk premium when the value strategy is preferred and thus they explain higher average returns in terms of additional risk. Lakonishok *et al*. (1994) argue that the additional premium of value stocks is not due to more risk, but rather a result of investors overweighting growth stocks due to their constant overvaluation of growth relative to value. This is due to the fact that forecasts are more heavily weighed on recent data and thus these investors are making "sub-optimal decisions" (Black and McMillan, 2004: 440). Auret and Sinclaire (2006) note that the inherent uncertainty surrounding the inflow and outflow of future earnings and their influence on the book value of a firm, results in different valuations amongst firms. With the marginal utility of risk perceived to always be negative, as stated by Markowitz (1959), it is probable that an investment with less uncertainty and lower risk will be favoured above an investment with higher risk. This results in a higher market value for less risky investments, relative to more uncertainty. With this in mind, the ratio of BTM of a less risky investment should be lower due to the higher demand and resulting price, as compared to investments with more uncertainty and risk. As a result of higher risk and resulting higher returns, inducing investors to purchase riskier investments, a positive relationship between BTM and subsequent returns is found.

With the majority of research conducted focusing on the United States of America (USA), Bauman, Conover and Miller (1998) conducted a study with the aim to determine the state in other international markets. They thought this important since it

is possible for anomalies to differ amongst markets due to the fact that transparency of research information (availability, quality and timeliness) frequently differs amongst countries, as found by Bauman (1989 and 1996) and Bauman and Johnson (1996). They included Canada and 20 established countries in the MSCI Europe/Australasia/Far East (EAFE) Index for the period 1986 to 1996. Stocks were classified according to P/E, P/B, P/CF and dividend yield (DY). Value stocks were found to outperform growth stocks in all four stock classifications, with the widest margin of outperformance when stocks are classified according to the P/B ratio. They concluded that value stocks outperformed growth stocks on a total-return basis and a risk-adjusted basis over the entire research period, in the majority of individual years and in the majority of national markets. They further confirmed the firm-size effect and found that value stocks still outperformed growth stocks when stocks are classified according to market capitalization. A significant outperformance of value stocks could, however, not be identified in the smallest market capitalization classification.

However, there have been certain sub-periods during which growth stocks outperformed value stocks. This was confirmed by Bauman *et al*. (1998), stating that when "growth stocks outperformed, the margin of difference was small" (Bauman *et al*., 1998: 75). It is thus important to know which variables can be used for predicting the returns of a value strategy relative to a growth strategy. In an article written by Black and McMillan (2004) the returns of value and growth stocks are analysed. The BTM ratio is used in order to construct the portfolios of value versus growth. After the different portfolios had been constructed, certain market and macro-economic variables were observed in order to determine if they were related to either a growth or a value phenomenon. It was found by Black and McMillan (2004) that there is a non-linear relationship between value and growth stocks on the one hand and certain market and macro-economic variables, such as industrial production, inflation rates as well as short and long term rates, on the other hand.

Apart from the study by Bauman *et al*. (1998), Capual, Rowley and Sharpe (1993) as well as Fama and French (1998) also proved that the value effect is present outside the USA. Furthermore The Brandes Institute published a paper "Value vs. Glamour: A Global Phenomenon" during 2008 in which it is documented that "a persistent value premium for the world's developed markets in aggregate and on an individual country basis" (The Brandes Institute, 2008A: 17) is evident in countries that provided enough

data from which significant conclusions could be drawn. The Brandes Institute continued their ground-breaking research during 2009, publishing an article "Value vs. Glamour Revisited: Historical P/B Ratio Disparities and Subsequent Value Stock Outperformance." This included two articles, respectively based on USA and non-USA data. It was found that historically a significant relationship existed between valuation disparities (valuation difference multiple) of value and growth stocks and the subsequent relative performance in the USA and non-USA developed markets.

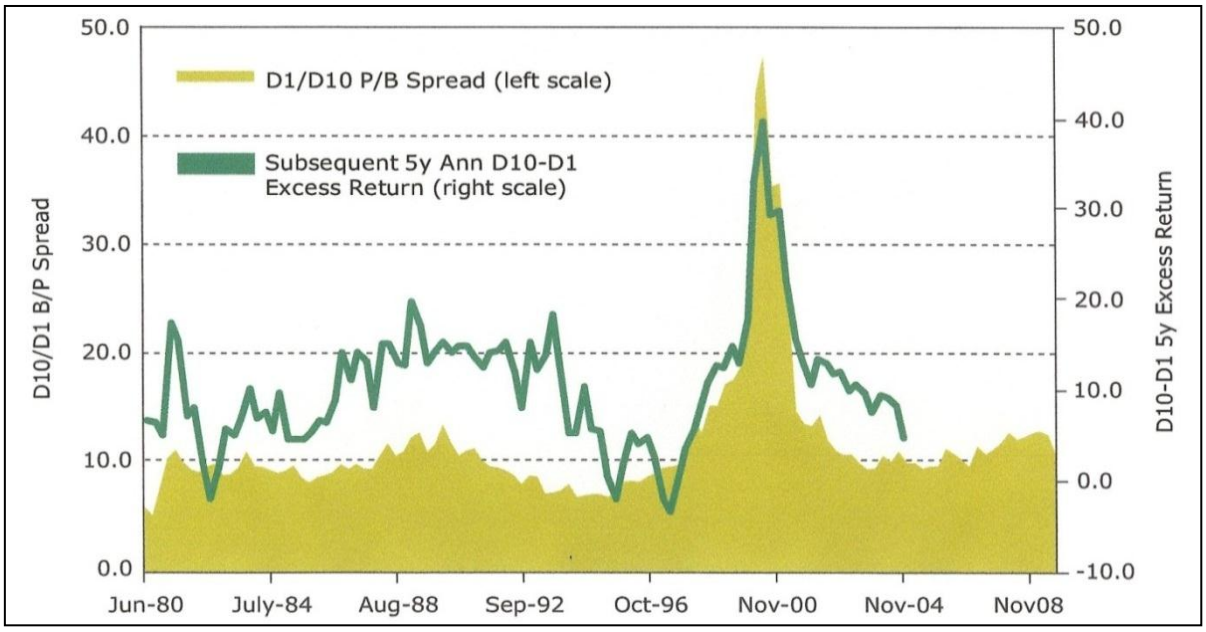



**Figure 2.1: Value vs. Growth P/B Multiples for Non-US Stocks and Subsequent Five-Year Annualised Excess Returns**

Source: The Brandes Institute (2009B); Worldscope via FactSet.

Figure 2.1 is based on non-USA data, as researched by The Brandes Institute during 2009. From Figure 2.1 it is clear that value stocks outperformed growth stocks in most years, measured in terms of five-year annualised excess return (value return – growth return) on the right axis. Furthermore, The Brandes Institute identified a relationship between the valuation difference multiple (left axis) and subsequent performance (right axis). Historically, during times when the valuation difference multiple peaked, value stocks delivered meaningful subsequent outperformance in the form of annualised five-year return.

Research conducted by Bo and Krige (2008) on an emerging market confirmed the outperformance of value stocks. Bo and Krige (2008) conducted a study on the Hong

Kong stock market over the period 1981 to 2005. According to "The Economist" (www.economist.com), Hong Kong is classified as an emerging market and thus is in a way comparable and important to the South African market with its emerging market status. The aim of the Bo and Krige (2008) study was to determine whether value stocks outperformed growth stocks, as proved to be the case in other developed world markets. Bo and Krige (2008) found significant value stock outperformance on the Hong Kong market, for the periods both before and after the 1997 Asian financial crisis. This anomaly was found to be greater in equally weighted portfolios, as compared to value-weighted portfolios, and was still evident once the firm size effect was accounted for. Malkiel and Jun (2009) found similar results when conducting a study based on the Chinese market over the period 1999 to 2008. They documented a value effect on the Chinese markets but noted that some degree of mean reversion was evident over time. They concluded that value-tilted portfolios' relative return outperformance followed periods when value tilts had been less effective.

The Brandes Institute extended previous research through the inclusion of emerging market data in their paper "Value Investing: Has It Worked in Emerging markets?" (The Brandes Institute, 2008B). Emerging market stocks were ranked according their relative P/B ratios and subsequently segmented into deciles. The lowest P/B ratio stocks represented the value portfolio, with the highest P/B ratio stocks forming the growth portfolio.

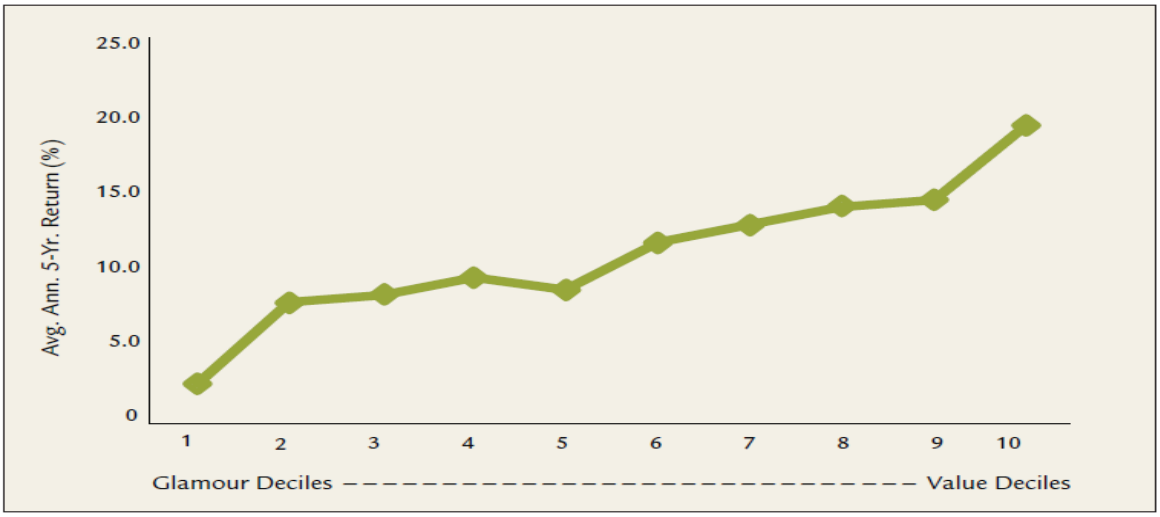



**Figure 2.2: Annualised Average Five-Year Returns, P/B Deciles, Value vs. Growth in Emerging Markets, June 30, 1980 to June 30, 2007**

Source: The Brandes Institute (2008B), Wordscope via FactSet as at 30/6/2007.

Figure 2.2 clearly indicates the existence of a value premium in emerging markets with the average five-year annualised return for decile 10 and decile 1 stocks being 19.6% and 2.6% respectively. Similar research on non-USA developed markets (The Brandes Institute, 2009B) indicate a value premium of 8.3% on average, more than half the 17.0% found for emerging markets. The Brandes Institute took the additional step of analysing Value vs. Growth returns of the MSCI China Index.

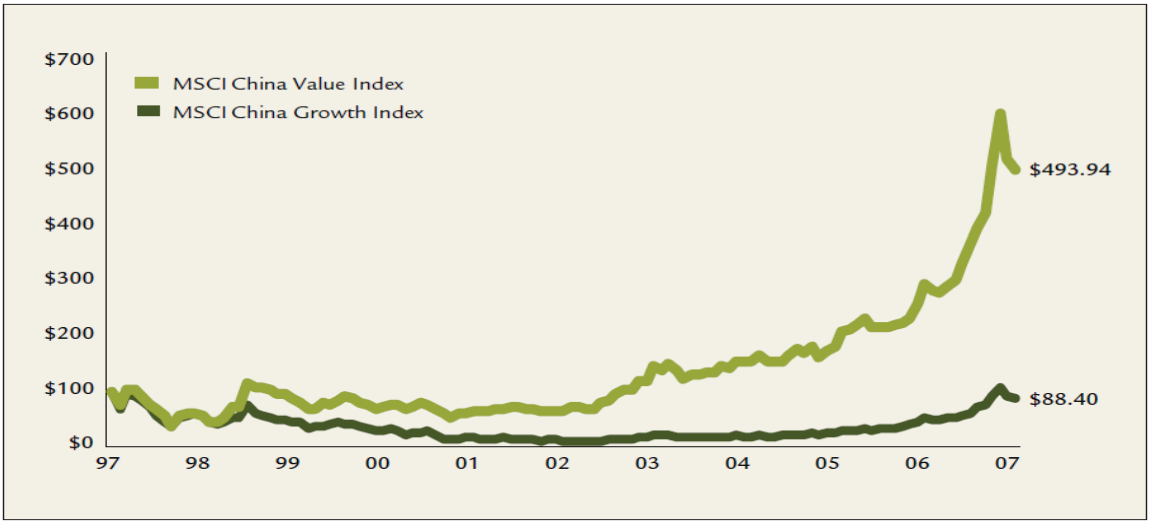



**Figure 2.3: Growth of $100 in MSCI China Value Index vs. MSCI China Growth Index, Dec. 31, 1997 to Dec. 31, 2007**

Source: The Brandes Institute (2008B), MSCI via FactSet as at 31/12/2007.

In Figure 2.3 there is a comparison between the growth of $100 invested in the MSCI China Value and MSCI China Growth Indices. It is clear that over a longer investment horizon, out-of-favour value stocks have rewarded the emerging market investor with substantial returns. The above performance of the MSCI China Value Index and MSCI China Growth Index is equivalent to cumulative rates of return equalling 394% and -12% respectively.

## 2.4 RISKS ASSOCIATED WITH VALUE AND GROWTH INVESTING

The main risks to which a value manager is exposed can be attributed to two factors. Firstly, as Christopherson and Williams (1997) indicate, in order to capitalise on the expected price increase, the timing of the purchase is of critical importance. Secondly, a value stock's price might be undervalued for a valid reason, thus price appreciation may not occur. For a growth manager, who invests on the prospect of future earnings

growth, the main risk is that the expected earnings growth may not materialise in future.

The influential articles by Fama and French (1992) and Lakonishok *et al*. (1994) created an on-going debate on the higher average returns of value stocks over the long term and to which possible characteristics of value stocks this higher return can be attributed. This led to several articles attempting to explain the higher returns of value stocks. Petkova and Zhang (2005) investigated the relative risks of value and growth stocks. Their primary objective was to determine whether value investing was riskier than growth investing and if it was possible that the higher average returns of value stocks was due to a higher non-diversifiable risk, as was stated by Fama and French (1992).

The findings of Petkova and Zhang (2005) were significant in the sense that they proved Fama and French's (1992) findings to be consistent with their view and therefore rejected the arguments put forward by Lakonishok *et al*. (1994). They identified style as an additional source of risk. Petkova and Zhang argue as follows:

1. "Time-varying risk" (Petkova and Zhang, 2005: 188) can be used to explain additional returns for value investing. Value betas have a positive covariance and growth betas a negative covariance with the expected risk premium of the market. Thus value minus growth betas have the tendency to be positively correlated with the expected risk premium of the market;
2. Although the first finding is consistent with previous views, they found it too small to explain the magnitude of the average higher value returns in the context of the CAPM.

Although investment professionals agree on the anomaly of value stock outperformance over longer time horizons, the presence of higher inherent risk resulting in higher returns of value stocks, as compared to growth stocks, is still controversial as other arguments and beliefs have been documented for the phenomenon. Davis, Fama and French (2000) summarised the difference in opinions as to the reasons why value stocks tend to outperform growth stocks. Their four interpretations are as follows:

- According to Black (1993) and MacKinlay (1995) the value premium is unlikely to be observed in different samples as it is the result of random chance;
- The value premium is seen as compensation, rewarding the investor in a risk/return framework such as the multifactor Intertemporal Capital Asset Pricing Model (ICAPM) of Merton (1973) or the arbitrage pricing theory (APT) of Ross (1976). The Fama and French (1992) arguments can be explained under this risk/return framework;
- The value premium is due to irrational investor behaviour leading to overreaction as a result of company performance (De Bondt and Thaler, 1987; Lakonishok *et al*., 1994);
- The value premium can be attributed to stocks that have similar underlying characteristics, for example stocks in the same industry (Daniel and Titman, 1997).

It seems evident from empirical research that irrational investor behaviour in estimating expected earnings and growth contributes in some way to the value-growth anomaly. As the current value of stocks is based on expectations, Kahneman and Tversky (1982) argue that investors overweight the most recent data as compared to older information. Similar findings by Lakonishok *et al*. (1994) and De Bondt and Thaler (1985 and 1987) respectively conclude that investors tend to extrapolate the most recent information and overreact to the most recent events. Previous research by Ball and Watts (1972) stated that a random walk is present in the actual pattern of annual corporate earnings changes. However, Bauman and Miller (1997) document a mean-reversion tendency over time in the earnings per share (EPS) growth pattern, with Malkiel and Jun (2009) also identifying a mean-reversion tendency when comparing value and growth strategies for the period 1937 to 2008. Bauman and Miller (1997) thus argue that analysts systematically overstate expectations of growth stocks' EPS relative to value stocks' EPS, not accounting for the tendency of mean-reversion.

## 2.5 STYLE TIMING

Style investing, whether based on size, asset class or a similar measure, is an important concept that must be understood by an investor due to the fact that active managers believe that one can outsmart the market through timing and changing of styles during different periods and cycles. Specific timing of an equity style is just as important as an investor's choice of style. Efficient implementation of styles and the correct timing thereof, was found by Kao and Shumaker (1999) to increase the probability of investors outperforming the market by wider margins.

Most studies conducted on return and style investing have been done over a long term investment horizon. However, Kao and Shumaker (1999) conducted a study on equity style timing and investment returns over shorter time periods for the period 1979 through 1997. Size, style and market strategies were used as potential sources of value added. The size effect referred to small-capitalisation versus large-capitalisation investing; style referred to value versus growth investing and the market strategy consisted of equities versus other asset classes. In order to determine the extent to which value can be added through timing strategies, it was necessary to control for any benefits received from tactical asset allocations. Kao and Shumaker (1999) conducted the following simulations:

- Within style timing, assets were allocated between Large-Cap value and Large-Cap growth, as well as Small-Cap value and Small-Cap growth. This was done in order to control for the size effect;
- The same method was used to control for the value versus growth effect within the size timing strategy. Large-cap value versus Small-Cap value and Large-Cap growth versus Small-Cap growth were used to isolate the style effect.

Kao and Shumaker (1999) found that superior timing of these strategies could lead to better performance. Timing strategies based on asset class and size has on average provided the investor with more opportunity for outperformance of the market, than a strategy based on value versus growth investing. Kao and Shumaker (1999) proved these findings to be significant within the modern investment era and therefore reiterated the importance of style investing and timing.

Kao and Shumaker (1999) utilised the three-factor model developed by Fama and French (1992) to analyse returns that could have been achieved through timing strategies, over a period of approximately thirty years. They evaluated the returns over five-year moving-average periods and incorporated this into the three-factor model. Their results are summarised in Figure 2.4.

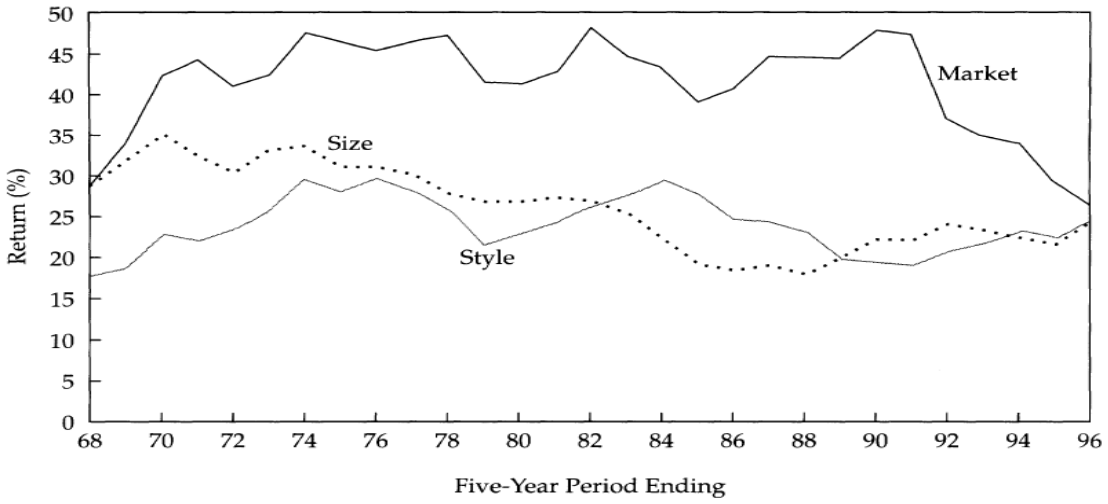



**Figure 2.4: Annualised Five-Year Moving Averages of Returns**

Source: Kao and Shumaker (1999); adapted from Fama and French (1992).

The possible returns based on style allocations fluctuated over the period, but without any significant trends. The opportunities to profit from tactical allocations based on market and size strategies initially occurred quite often but became scarce over time. Towards the end of 1996, which marked the end of the five-year moving-average returns, the difference in returns which could be attributed to one of the three strategies had almost disappeared. With all three strategies providing positive returns, the market strategy outperformed by quite a margin in the early stages, with the style strategy providing positive returns within a much narrower band, when compared to the market and size strategies. Correctly anticipating and timing cycles and the resulting asset allocation is thus of critical importance to investment professionals attempting to consistently outperform their peers.

Mutooni and Muller (2007) conducted a study based on style timing on the South African market. Their results proved quite interesting and some of them are worth mentioning. Firstly, they found the value effect present in the South African market and showed that it was evident across the whole size spectrum. Furthermore they

stated that "style timing can improve returns to investors" (Mutooni and Muller, 2007: 23). Thus timing cycles correctly and anticipating relative performance of differing investment styles correctly do have definite benefits. For example, if a style manager buys a stock prematurely, he/she is exposed to extended periods of underperformance. Thus, due to the cyclical nature of investment styles, it is of critical importance to ensure that the timing of purchases, sales and investment style changes is as optimal as possible, although this proves to be a very difficult task to say the least.

## 2.6 UNDERSTANDING LAKONISHOK, SHLEIFER AND VISHNY (1994)

Lakonishok *et al*. (1994) extended previous research on the value-growth phenomenon, providing further evidence as to the existence of a value effect. They conducted a study on all the companies listed on the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) in the USA for the period April 1968 to April 1989. Their data was market capitalisation-constrained, thus included data on only the largest 50% of stocks (ranked according to market capitalisation) on the NYSE and AMEX. This was done to ensure that the research sample was a true reflection of the investable universe available to institutional investors. The value versus growth phenomenon was tested by Lakonishok *et al*. (1994) utilising four different criteria, resulting in stocks being ranked according to:

- Book-to-market equity ratio (BTM);
- Cash flow-to-price ratio (CF/P);
- Earnings-to-price ratio (E/P);
- Growth in sales (GS).

Once stocks had been ranked according to the above-mentioned criteria, stocks were grouped according to their relative ranking, thus forming ten portfolios each year on April 30. Stocks with the highest ratios, according to their relative BTM, CF/P, E/P and GS ratio, formed the decile 10 portfolios. With each consecutive decile the ratios decreased, with the lowest ratio stocks captured in decile 1. Decile 1 represented the growth portfolio, while the portfolio with the highest ratio stocks, decile 10, represented the value portfolio. Following portfolio construction, aggregate performance of each of

the ten portfolios was tracked over a five-year period and subsequently annualised. Thus each year on April 30, ten new portfolios were formed and their decile-by-decile performance was recorded over the five-year period subsequent to inception. When the process was completed, Lakonishok *et al*. (1994) had created 22 sets of BTM deciles, 22 sets of CF/P deciles, 22 sets of E/P deciles and 22 sets of growth in sales deciles.

Value and growth strategies were evaluated over one-year, three-year and five-year investment horizons. Their findings are summarised in Figure 2.5.

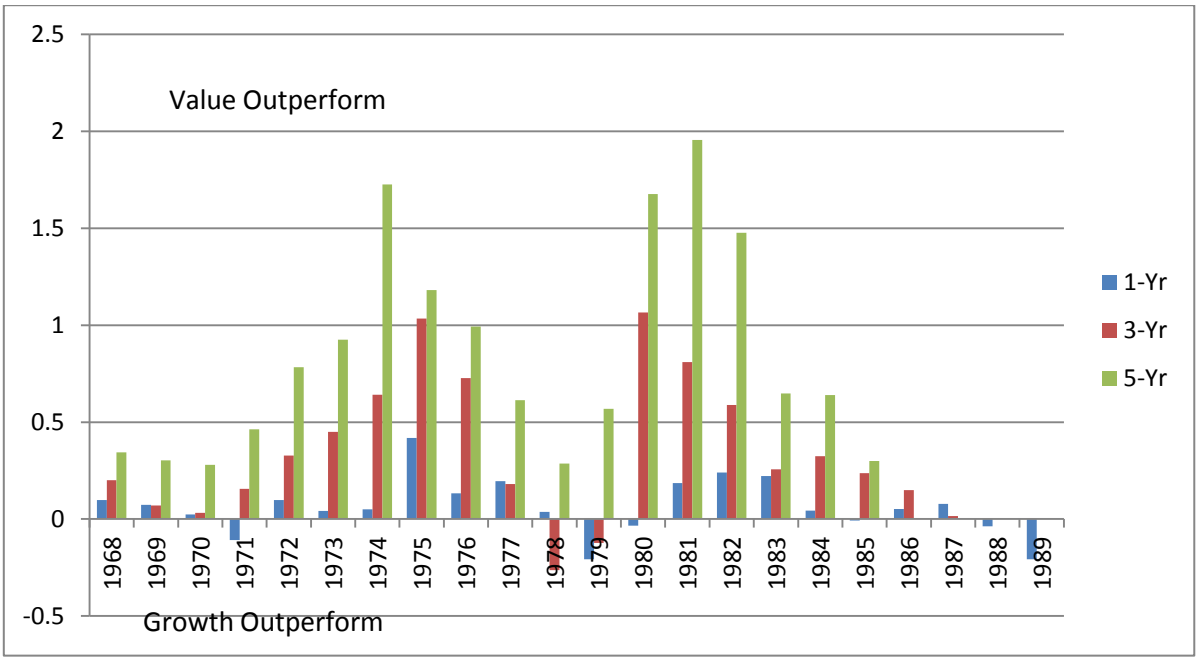



**Figure 2.5: Book-to-Market Annualised Excess Returns, 1968-1989**

Source: Adapted from Lakonishok, Shleifer and Vishny (1994).

In Figure 2.5 the outperformance of value stocks over growth stocks for the period 1968 to 1989, as found by Lakonishok *et al*. (1994), is illustrated. It is evident that the value effect is even more significant over longer investment horizons. Subsequently the performance data were averaged across the 22 decile sets to compare the relative performance of value and growth portfolios.

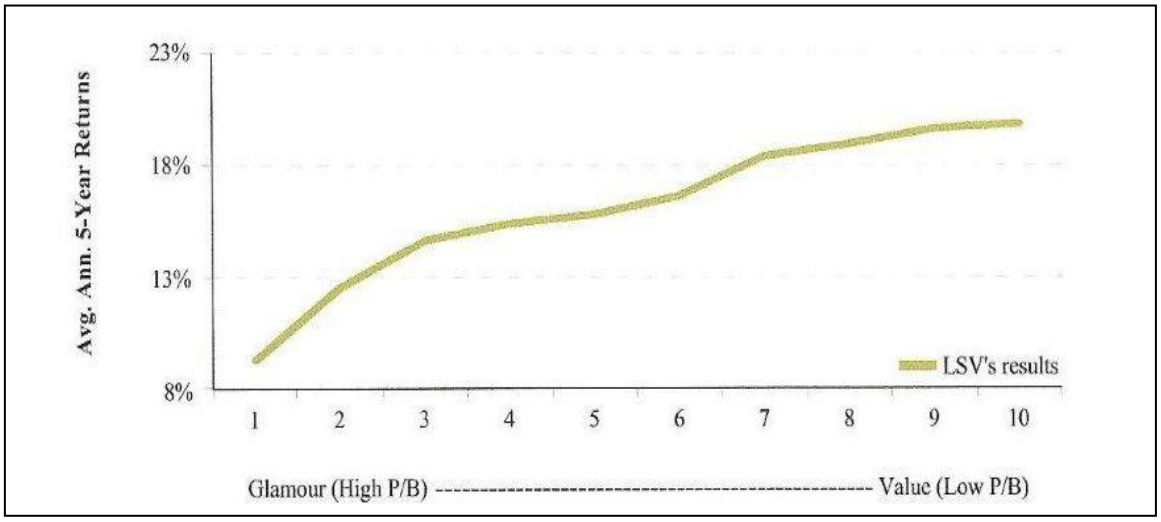



**Figure 2.6: Average Annualised Five-Year Returns, P/B Deciles**

Source: The Brandes Institute (2008A); adapted from Lakonishok, Shleifer and Vishny (1994).

Figure 2.6 is based on the 22 sets of portfolios ranked according to the stocks' relative BTM ratios, as utilised by Lakonishok *et al*. (1994), and altered to reflect the P/B ratio as utilised by The Brandes Institute (2008A). The five-year annualised return of each of the 10 portfolios over the research period was averaged in order to construct the above chart. As can be seen Lakonishok *et al*. (1994) found that value stocks outperformed growth stocks by wide average margins over the research period. The value portfolio had a five-year annualised average return of 19.8% per annum, compared to the growth portfolio with a five-year annualised average return of 9.3% per annum.

The above-mentioned process based on BTM ratios was also repeated for CF/P, E/P and GS. The authors found that value stocks outperformed their growth counterparts by wide margins for each of the four classification criteria. Lakonishok *et al*. (1994) argue that the value effect exists due to the fact that "investors are excessively optimistic about glamour stocks and excessively pessimistic about value stocks because they tie their expectations of future growth to past growth" (Lakonishok *et al*., 1994: 1559). Their view of the value premium is thus not explained by higher risk, but rather by irrational investor behaviour.

## 2.7 THE BRANDES INSTITUTE'S CONTRIBUTION TO THE VALUE VERSUS GROWTH DEBATE

More recently The Brandes Institute conducted studies on both the USA market and non-USA developed markets. They used the Lakonishok *et al*. (1994) methodology as basis for their study with the objective of determining whether it is profitable to invest in value stocks, and if found profitable, the optimal timing of investing in value stocks and vice versa. In order to determine whether the Lakonishok *et al*. (1994) findings were due to random chance, The Brandes Institute extended their research sample and methodology in four ways.

Firstly, The Brandes Institute extended their study to mid-2008 in order to incorporate the most recent market trends into their model. Research was conducted for the period April 1968 to April 2008. Secondly, Lakonishok *et al*. (1994) only included stocks that were listed on the NYSE and AMEX. The Brandes Institute altered their sample to include all the stocks of companies domiciled in the USA that were listed on at least one USA exchange. Furthermore, the Lakonishok *et al*. (1994) sample of stocks raised questions regarding the market capitalisation of some of the stocks. It included a large number of small capitalisation stocks, which raised the question if the sample was representative of the "truly investable universe" (The Brandes Institute, 2008A: 5) available to large investors. Thus as a third adjustment to the Lakonishok *et al*. (1994) study, The Brandes Institute excluded the smallest 50% of companies according to their relative market capitalisations. As a fourth and final adjustment, after removing the micro-capitalisation (Micro-Caps) stocks, the remaining companies in The Brandes Institute sample were divided into a Large-Cap and Small-Cap segment. The largest 30% of remaining companies according to their relative market capitalisations were classified as Large-Caps, with the remaining 70% of companies assigned to the Small-Cap segment. This was done in order to determine whether a consistent value-growth relationship could be found across different size segments of the market.

Except for the above-mentioned adjustments, The Brandes Institute used the same methodology as Lakonishok *et al*. (1994). In their "Value vs. Glamour: A Global Phenomenon" paper published in 2008, The Brandes Institute "identified a persistent value premium for the world's developed markets in aggregate and on an individual

country basis" (The Brandes Institute, 2008A: 17). These findings were consistent with those of Lakonishok *et al*. (1994) and thus rejected the critics' view that the value premium was due to random chance. Furthermore, The Brandes Institute (2008A) found that the degree of value stocks' outperformance across the data sets varied but that the value premium exhibited some consistency across:

- Valuation multiples (P/B, P/CF, P/E and growth in sales);
- Across time (1968 to 2008 for USA data and 1980 to 2008 for non-USA data);
- Across regions;
- Across market capitalisations (consistent value-growth relationship found amongst the Large-Cap and Small-Cap segments).

During 2009 The Brandes Institute extended their value versus growth research with a paper "Value vs. Glamour Revisited: Historical P/B Ratio Disparities and Subsequent Value Stock Outperformance" (The Brandes Institute, 2009A). Extending their previous research, they focused on two aspects within the USA equity market:

1. The relative difference in valuation (P/B ratios) between value stocks and growth stocks;
2. Whether a significant relationship exists between the valuation difference multiple and subsequent relative performance of value and growth stocks.

A "market capitalisation-constrained subset of all companies domiciled in the United States" (The Brandes Institute, 2009A: 2) was once again utilised in order to conduct the study and as in their previous research excluded Micro-Caps. The Compustat database was used to construct the subset of companies domiciled in the USA. As previously stated, a shortcoming of the Lakonishok *et al*. (1994) database was the fact that it included quite a substantial number of firms with relatively small market capitalisations. In order for the sample to reflect the "truly investable universe" (The Brandes Institute, 2009A: 3) available to large institutional investors it was necessary to exclude the smallest 50% of companies according to market capitalisation.

Regarding the methodology, The Brandes Institute followed three basic steps, which were adopted from the Lakonishok *et al*. (1994) study:

1. The "market capitalisation-constrained" (The Brandes Institute, 2009A: 2) sample of companies was divided into ten portfolios (deciles) based on relative P/B ratio rankings. Decile 1 contained stocks with the highest P/B ratios (growth portfolio), with the lowest P/B ratios stocks forming decile 10 (value portfolio). P/B ratios were calculated annually;
2. The performance of each portfolio was recorded over a five-year period after the inception date;
3. The first and second steps were repeated on each April 30 for the period 1968 through 2004 in order to construct 10 new portfolios annually.

**Table 2.1: Universe, Decile 10 and Decile 1 Characteristics**

| | Universe | Value Stocks (Decile 10) | Glamour Stocks (Decile 1) |
|---|---|---|---|
| Number of Securities | 2,674 | 267 | 267 |
| Median P/B Ratio | 1.53 | 0.50 | 7.69 |
| Avg. Market Cap. (millions) | $3,799 | $1,086 | $6,884 |

Source: The Brandes Institute (2009A); Compustat via FactSet as at 30/4/2009.

The basic characteristics of The Brandes Institute (2009A) sample, as at 30 April 2009, are summarised in Table 2.1. Their "market capitalisation-constrained subset" (The Brandes Institute, 2009A: 2) of companies used was 2674 with the number of securities in the value and growth portfolio equal to 267 each, as at 30 April 2009.

Once the above steps had been completed, it was necessary for The Brandes Institute to determine the difference in relative valuation between value and growth stocks. The valuation difference multiple is calculated as the ratio of the median decile 1 P/B ratio divided by the median decile 10 P/B ratio:

$$\text{Valuation difference multiple} = \frac{\text{Median}\,\frac{\text{P}}{\text{B}}\,\text{ratio of the Decile 1 Portfolio}}{\text{Median}\,\frac{\text{P}}{\text{B}}\,\text{ratio of the Decile 10 Portfolio}}$$

The valuation difference multiple is a measure of disparity (or uniformity) in valuations at extreme ends of the market. At a given point in time, a higher valuation difference

indicates more disparity, thus when comparing growth and value stocks, a higher ratio suggests that growth stocks are much more expensive relative to value stocks. Greater dispersions in relative valuations are potentially the result of uncertainty or lack of confidence in the underlying security prices.

The primary focus of their study was to determine whether a relationship exists between valuation disparities and subsequent performance. In order to determine this, it was necessary to track the performance of each portfolio for five years after the inception date. Once the five-year annualised return was recorded for each portfolio (decile), annualised excess return was calculated by subtracting the five-year annualised return of each growth portfolio from the five-year annualised return of each corresponding value portfolio. In order to determine whether a significant relationship existed, the valuation difference was compared to the excess five-year annualised returns (depicted in Figure 2.7).


**Figure 2.7: Value vs. Growth P/B Multiples and Subsequent Five-Year Annualised Excess Returns**

Source: The Brandes Institute (2009A); Compustat via FactSet.

As can be seen from Figure 2.7, based on USA data, The Brandes Institute found that historically when the valuation difference multiple (left axis) peaked, value stocks delivered substantial outperformance (right axis), as compared to growth stocks, over the subsequent five-year period after inception. The valuation difference multiple peaked during February 2000 at 81.1. This reflected a period during which growth

shares were 80 times more expensive than their value counterparts. For the period 1968 to 2008, the average valuation difference multiple was 12.3 with a median of 11.1. With a multiple of 20.0 on February 2009, value stock outperformance is expected over the subsequent five-year period.

## 2.8 VALUE AND GROWTH PHENOMENA ON THE JSE LTD

When comparing the number of style-based research studies on the JSE to the number of international studies, it is quite clear that papers on the South African market is lacking quite substantially in this regard. Despite numerous international research papers, the question remained open as to whether trends in the South African market were consistent with trends on international markets. Special interest was paid to the value-growth phenomenon in South Africa, with its emerging market status, due to the fact that differing international views on why value stocks tend to outperform growth stocks over the long term existed with no clear agreement amongst investment professionals. This induced some interest in terms of value and growth investing in South Africa and led to several studies investigating the value effect on the South African equity market.

Research by Plaistowe and Knight (1986) was one of the first South African studies focusing on the value-growth phenomenon from a South African perspective. Plaistowe and Knight (1986) documented the existence of a value effect in the South African market utilising the BTM ratio and subsequently classifying stocks as either premium or discount stocks. The discount BTM stocks outperformed both the total sample of stocks and the premium BTM stocks in the period ranging from 5 to 50 weeks after the release of an annual report, with the premium BTM stocks realising the lowest returns amongst the three groupings. Page and Palmer (1993) found that firms with low P/E ratios delivered significant risk-adjusted excess returns over high P/E ratio firms. Their findings were corroborated by Gates (1997) and Van Rensburg (2001), both finding evidence of a value effect in the South African equity market.

Fraser and Page (1999) conducted a study in which it was found that value-based portfolios on the JSE do offer higher average returns. However, this study did not specifically look at a value-growth phenomenon on the JSE. The lack of research conducted on the South African market induced a study by Graham and Uliana

(2001). The primary aim of their study was to "determine whether or not the value-growth phenomenon is evident in South Africa" (Graham and Uliana, 2001: 7). Their study covered the period 1987 to 1996. They utilised the BTM ratio in order to classify stocks as either value or growth and subsequently constructed value and growth portfolios. The top 50% of the BTM ratio stocks made up their value portfolio while the bottom 50% of the BTM ratio stocks made up their growth portfolio.

Results from the Graham and Uliana (2001) study show that mean excess monthly returns (equal-weighted portfolios) were higher in the case of value portfolios in 1987 and for the period 1993 to 1996, as can be seen from Table 2.2, but that growth portfolios outperformed value portfolios for the period 1988 to 1992. The period 1987 marked a recession in the South African market with tough economic conditions prevailing at the time. It is thus to be expected that growth stocks outperformed during that time.

**Table 2.2: Equal-Weighted Portfolios (reformed annually)**

| **Panel A: Mean Excess monthly returns** | | | | | | |
|---|---|---|---|---|---|---|
| Year | Growth | Value | Return difference | Superior portfolio | *T*-stat | *P*-value |
| 1987 | 0.74% | 3.62% | 2.88% | V | **-2.19** | **0.030** |
| 1988 | 3.86% | 0.26% | -3.60% | G | 1.36 | 0.170 |
| 1989 | 2.16% | 0.70% | -1.46% | G | 1.72 | 0.090 |
| 1990 | -0.47% | -1.13% | -0.66% | G | 1.14 | 0.000 |
| 1991 | 1.93% | 0.81% | -1.12% | G | 1.13 | 0.250 |
| 1992 | -0.23% | -2.13% | -1.90% | G | **2.18** | **0.030** |
| 1993 | 1.04% | 1.15% | 0.11% | V | 0.14 | 0.890 |
| 1994 | 2.02% | 5.75% | 3.73% | V | **-3.15** | **0.002** |
| 1995 | -0.46% | 1.52% | 1.98% | V | **-2.98** | **0.003** |
| 1996 | -2.20% | -1.62% | 0.58% | V | -0.64 | 0.500 |

Significant statistics: *T*-crit = 1.96

*T*-stats in bold = **significant**

Source: Graham and Uliana (2001).

**Table 2.3: Period Returns on Equal-Weighted Portfolios**

**(not reformed annually)**

| **Panel A: Returns** | | | | | | |
|---|---|---|---|---|---|---|
| Periods | Growth | Value | Return Difference | Superior Portfolio | *T*-stat | *P*-value |
| **10 Year Period** | | | | | | |
| 1987-1996 | 112.5% | 95.3% | -17.2% | G | -0.37 | 0.714 |
| | | | | | | |
| **5 Year Period** | | | | | | |
| 1987-1991 | 28.5% | 56.7% | 28.3% | V | 1.38 | 0.166 |
| 1992-1996 | -15.3% | 21.8% | 37.2% | V | -1.18 | 0.236 |
| | | | | | | |
| **3 Year Period** | | | | | | |
| 1987-1989 | 81.9% | 54.2% | -27.8% | G | 0.752 | 0.452 |
| 1990-1992 | -4.8% | -9.9% | -5.1% | G | 0.284 | 0.776 |
| 1993-1995 | 33.7% | 98.5% | 64.8% | V | **-3.415** | **0.001** |

| **Panel B: Sharpe ratios** | | | |
|---|---|---|---|
| **Periods** | **Growth** | **Value** | **Superior Risk Adj. Return** |
| | | | |
| **10 Year Period** | | | |
| 1987-1996 | 0.51 | 0.57 | V |
| | | | |
| **5 Year Period** | | | |
| 1987-1991 | 0.07 | 0.05 | G |
| 1992-1996 | 0.03 | 0.05 | V |
| | | | |
| **3 Year Period** | | | |
| 1987-1989 | 0.08 | 0.10 | V |
| 1990-1992 | -0.01 | -0.02 | G |
| 1993-1995 | 0.10 | 0.19 | V |

Significant statistics: *T*-crit = 1.96

*T*-stats in bold = **significant**

Source: Graham and Uliana (2001).

From Table 2.3 it is evident that the pre-1992 period returns do not show any clear evidence of significant value stock outperformance over a three-year period. However, after 1992 it is possible to identify that value stocks significantly outperformed growth stocks over a 3-year period stretching from 1993 to 1995. Over the entire 10-year period value stocks were found to have a better risk-adjusted return than growth stocks, supporting the premise of value stock outperformance over the long term. Prior to 1992 there was a trade-off between value and growth strategies, with neither strategy generating superior returns. Possible explanations for the fundamental changes after 1992 could include the following:

- Political and economic changes in South Africa in the early 1990s;
- Re-acceptance of South Africa in the global economy;
- The re-acceptance of South Africa induced increased investment by foreigners;
- World acceptance and a more open economic environment brought South Africa in line with international financial trends, such as value and growth phenomena;
- In the period 1987 to 1992 South Africa experienced double digit inflation rates;
- From 1993 to 1996 the average inflation rate in South Africa was below 10%;
- During a time of high inflation, growth stocks performed in a superior fashion, but when inflation stabilised, value stocks made a comeback.

The Graham and Uliana (2001) study reflected periods between 1987 and 1992 when growth stocks outperformed value stocks, which was inconsistent with international studies. After 1992 the trend on the JSE is, however, in line with international trends, with value stocks outperforming growth stocks.

Since dramatic changes occurred within the South African market during the period 1990 to 1995, the question remained open if modern day trends were consistent with international findings on the value-growth phenomenon. Scher and Muller (2005) conducted a contradicting study on South African unit trusts. Their research shows that Small-Cap and value unit trusts were consistently underperforming relative to other unit trusts. Possible explanations for this phenomenon could be poor management by unit trust managers or high management fees.

Robertson and Van Rensburg (2003) extended previous style research on the South African equity market, investigating the effect of style variables on the cross-section of equity returns on the JSE and the explanatory power thereof. They found that historically P/E ratios and the size effect had the strongest explanatory power of the cross-section of average stock returns on the JSE. Their research included a large number of financial ratios in order to try to determine whether "different properties across the major JSE industry sectors" (Robertson and Van Rensburg, 2003: 75) existed. The results were significant, with several measures and variables indicating the existence of a value phenomenon, exhibiting a "positive relationship with equity returns within all industry sectors" (Robertson and Van Rensburg, 2003: 75). The value effect was found to be stronger within the financial and industrial sector, with the resources sector not being influenced to the same extent. They also established that the financial sector is the only sector within which the returns are positively correlated to the companies' debt-to-equity ratios. This is in contrast to the findings of Rahmani *et al*. (2006), where a relationship between the debt-to-equity ratio and stock returns could not be identified on the emerging market of Iran. However, Robertson and Van Rensburg (2003) did not evaluate the effect and possible relationship between BTM ratios, as a value-growth parameter, and average stock returns. It seems clear from this article that a value phenomenon does indeed exist over the long term on the JSE. With this in mind, it is important to determine whether the relative outperformance of value and growth stocks can be anticipated in advance through the observation of certain variables.

Auret and Sinclaire (2006) conducted a study on BTM ratios and the perceived relationship between BTM ratios and a stock's return within the risk/return framework. They found that the BTM ratio can be "interpreted as a proxy for some underlying risk relating to a particular stock" (Auret and Sinclaire, 2006: 36). Subsequently it was found that a significant positive relationship exists between a stock's BTM ratio and returns. The BTM ratio was also added to the Van Rensburg and Robertson (2003A) two-factor model, which modelled size and P/E as explanatory variables. The BTM attribute was found to have significantly more explanatory power than the other two variables; however, it failed to improve the original two-factor model when included. This was found to be largely due to the high correlation with the other attributes. However, the consideration of the BTM ratio would be a useful extension.

More recently Strugnell, Gilbert and Kruger (2011) conducted a study for the period 1988 through 2007 on all the stocks listed on the JSE Mainboard. The aim was to determine whether the persistent size and P/E effect, as well as the insignificance of beta, as found by Van Rensburg and Robertson (2003B), were robust and valid. It should be noted that in order to estimate beta, return data over 60 months were required. Thus, it was only possible for the first portfolio to be formed on 31 December 1993. Strugnell *et al*. (2011) considered this to be appropriate considering the "structural shift in the socio-political landscape of the country and as a consequence its economy, from 1994" (Strugnell *et al*., 2011: 5). They concluded that the size and value effect is evident on the JSE as measured by the P/E ratio. They found the anomalies to be "significant and pervasive" (Strugnell *et al*., 2011: 14) arguing that the JSE represented some form of market inefficiency which could be contributed to a "misspecification of equilibrium pricing models such as CAPM which assume that market covariance alone constitutes rewarded systematic risk" (Strugnell *et al*., 2011: 14). It should be noted that the size premium was concentrated in the smallest stocks on the JSE. Their research also supported the findings of Van Rensburg and Robertson (2003B), indicating an inverse relationship of beta with return, showing the beta findings of Van Rensburg and Robertson (2003B) to be not sample-specific.

## 2.9 CONCLUSION

Although value investing has enjoyed strong returns since the beginning of the 21st century, the momentum clearly shifted towards growth investing during 2007. In an article "Optimists Look to Growth Investing" by Morgan (2008) it is stated that the underperformance of growth stocks was eliminated during the year 2007 on a five-year rolling basis. The reasons for the turnaround phenomenon are debatable, but what is certain is the fact that this change in cycle occurred during a time of high interest rates, tough market conditions and a very challenging credit environment, during which stock prices plummeted, and a subsequent recession resulted.

The influential Fama and French (1992) article identified market value (firm size) and BTM as primary determinants of cross-sectional expected stocks returns, which "sentenced the death of beta" (Chou, Chou and Wang, 2004: 18). Fama and French (1992) view size and BTM as distressed factors that were not captured by the CAPM.

Schwert (2002) proves that market anomalies tend to disappear after academic papers on them are published. If this is true, the findings of Fama and French (1992) should be insignificant for the period after 1992. It is for this reason that Chou *et al*. (2004) conducted research "on the cross-section of expected stock returns: Fama and French ten years later" (Chou *et al*., 2004: 18). Their research was done over the period 1963 to 2001 with the primary objective of determining whether the Fama-French anomalies still existed after 1992. Chou *et al*. (2004) found the Fama and French (1992) arguments significant for 1963 to 2001 and concluded that both the size and the BTM effect survived the Fama and French (1992) article.

The Lakonishok *et al*. (1994) research paper paved the way for future research as it altered the dynamics of the value-growth anomaly and resulted in new thought processes as investment professionals attempted to understand and take advantage of the value premium. Their ground-breaking research led to many studies following their methodology. Some critics argued that their results were sample-specific and due to random chance. This was proved false by Fama and French (1998), who documented that the value premium is of a global nature. The Brandes Institute identified the Lakonishok *et al.* (1994) paper as a "seminal entry in the value vs. glamour canon" (The Brandes Institute, 2008A: 2). They corroborated the Lakonishok *et al.* (1994) methodology and findings as significant for periods after 1989. It seems consensus indicates that arguments made by Lakonishok *et al.* (1994) are relevant to modern era investment professionals.

In an efficient market, wider disparity between value and growth stocks should be indicative of wider outperformance of growth stocks relative to value stocks. However, this is not supported by historical evidence. During 2009 The Brandes Institute published an article "Value vs. Glamour Revisited: Historical P/B Ratio Disparities and Subsequent Value Stock Outperformance" (The Brandes Institute, 2009A). They confirmed the presence of a value phenomenon and stated that greater disparity in valuations between value and growth stocks in all likelihood is indicative of future value stock outperformance. A similar argument was made by Rob Arnott during 2009 in the article "Bleak times may prove boon for value" (Arnott, 2009).

According to Arnott (2009: 24):

> "Over the past 50 years, when the average growth stock was priced at less than a 60 per cent premium to the average stock, growth beat value nearly two-thirds of the time. When the average growth stock was priced at more than a 120 per cent premium, growth beat value only twice (1989 and 1999). Today that spread is 140 per cent."

According to statements by Arnott (2009) and findings by The Brandes Institute (2009A and 2009B), it seems that a significant relationship can be identified between valuation multiples, or valuation disparities as labelled by The Brandes Institute, and subsequent relative performance. Results prove that an unusually wide dispersion between the valuation multiple of value and growth stocks could possibly be indicative of future value stock outperformance.

The rebirth of growth stocks after 2007 brought the discussion on value versus growth investing right back into the spotlight, with the speculation of possible trigger variables of value and growth cycles being the main topic of debate. This unexpected turnaround shows that some uncertainty on this topic and the timing of style investing still exists. With clear evidence supporting value stock outperformance over longer investment horizons, it is much more difficult to support only one view on the reasons for the value premium as much contradictory research on the topic exists. What is, however, of critical importance is positioning a portfolio correctly in anticipation of expected market movements. It is therefore of the utmost importance to identify factors within the South African market driving value and growth cycles.

# CHAPTER 3

# DATA AND METHODOLOGY

## 3.1 RESEARCH OBJECTIVES AND HYPOTHESIS

With ample evidence indicating the outperformance of value stocks over longer investment horizons, the primary objective in this study on the South African market is to apply the revised Lakonishok *et al*. (1994) methodology, as used by The Brandes Institute (2009A), to the South African equity market in order to determine whether a significant relationship exists between valuation disparities and the subsequent relative performance of value and growth stocks. Research was conducted on all stocks that formed part of the FTSE/JSE All-Share Index for the period 1991 to 2011. Constituents were divided into value and growth portfolios based on their relative price-to-book value (P/B) ratios. Once relevant stocks were classified as either value or growth, the relative difference in valuation between value and growth stocks was calculated. The performance of the various portfolios was subsequently tracked over a five-year period. Once the valuation difference multiple, serving as a standardised proxy for valuation disparities, had been calculated and the subsequent five-year performance captured, there was an attempt to identify relationships between historic value cycles and the valuation difference multiple that can be used to predict the outperformance of value stocks in future.

The secondary objective of this study was to split the sample of stocks into large-capitalisation (Large-Cap), medium-capitalisation (Mid-Cap) and small-capitalisation (Small-Cap) stocks, with the aim of determining whether there is a consistent relationship between value and growth stocks in the All-Cap, Large-Cap, Mid-Cap and Small-Cap segments of the South African equity market.

Formulating and testing a relevant hypothesis for a specific study is of the utmost importance. This study's primary and secondary objectives were split into two hypotheses. With the general belief that value stocks tend to outperform growth stocks on a risk-adjusted basis (Fama and French, 1992), the first part of this study's objectives is to determine whether this is in fact true. Secondly it was attempted to find

a significant relationship between valuation disparities and subsequent performance of value and growth stocks, as found by The Brandes Institute (2009A). With this in mind the relevant first null hypothesis was that no significant difference between the returns of a portfolio of value stocks and the returns of a portfolio of growth stocks existed:

$$H_{01}: R_V - R_G = 0$$

where: $H_{01}$ = First null hypothesis;
$R_V$ = Return of the value portfolio;
$R_G$ = Return of the growth portfolio.

If the first null hypothesis does not hold, this study will concur with the general belief that it is possible to achieve superior returns through active portfolio management, indicating the outperformance of value stocks relative to growth stocks. The first alternative hypothesis will indicate a non-zero difference between the returns of a value portfolio and the returns of a growth portfolio:

$$H_{A1}: R_V - R_G \neq 0$$

The second hypothesis was to test whether a significant relationship can be identified between relative valuation disparities and subsequent performance of value and growth stocks. The second null hypothesis was that no relationship existed between the valuation difference multiple (independent variable X) and subsequent relative value stock outperformance (dependent variable Y):

$$H_{02}: b_1 = 0$$
$$H_{A2}: b_1 \neq 0$$

where: $y = a + b_1x + \varepsilon$, and $\varepsilon \sim N(0, \sigma^2)$.

The second alternative hypothesis above states that a relationship is indeed present between the valuation difference multiple and subsequent relative value stock outperformance, measured in terms of five-year annualised excess return. As found by The Brandes Institute (2009A), historically a higher valuation difference multiple led to significant value stock outperformance in the subsequent five-year period.

These hypotheses were tested at a 5% level of significance through relevant *t*-statistics and associated *p*-values. E-views were employed in this regards with a *t*-test for a zero mean and a *t*-test for a regression (or correlation) coefficient respectively.

## 3.2 DUPLICATING AND ADJUSTING THE BRANDES INSTITUTE (2009A) STUDY

From a South African viewpoint it is important to recognise that there are significant differences when comparing South Africa to the United States of America (USA) or other developed markets, as well as certain constraints, which make adjustments to the methodology and sample used by The Brandes Institute (2009A) on USA data unavoidable. South Africa, as an emerging market, possesses less liquidity and more data constraints when compared to developed markets such as that of the USA. It was found by Bauman (1989 and 1996) and Bauman and Johnson (1996) that transparency of research information (availability, quality and timeliness) frequently differs amongst countries and could as a result cause anomalies to differ amongst markets.

To accommodate the South African shortcomings it was necessary to adjust the methodology and sample in four ways. The universe of available stocks in the USA is much bigger than that of the South African equity market. The Brandes Institute (2009A) included the stocks of all the companies domiciled in the USA and then excluded the smallest 50% of stocks according to their market capitalisations. This was done in order for their sample to reflect the truly investable universe of stocks available to institutional investors more accurately. From a South African context most of the large investors focus on shares within the FTSE/JSE All-Share Index and thus the sample used in the present study based on South African data did not exclude certain stocks based on market capitalisation but rather focused on the FTSE/JSE All-Share Index as a whole. It may be debatable whether it is possible for large institutional investors to invest in all the stocks that form part of the FTSE/JSE All-Share Index as many seek more liquidity in the form of the FTSE/JSE Top-40 Index. However, as the FTSE/JSE All-Share Index includes the most actively traded stocks and is seen as an indicator of market wide performance, it was felt that it provided a sufficient balance between liquidity and an adequate sample size required to conduct relevant research. All the stock constituents of the FTSE/JSE All-Share Index were

thus included as it was felt that this most accurately represented the truly investable universe available to investors on the South African equity market.

Secondly, due to the smaller sample used, the sample was split into quartiles, whereas The Brandes Institute utilised deciles to classify their stocks. This is necessary to construct monthly portfolios of reasonable size based on calculated P/B ratios.

Thirdly, The Brandes Institute formed ten portfolios each year on 30 April for the period 1968 to 2008. The present study was based on monthly portfolio construction and P/B ratios for the period 1991 to 2011.

As a fourth adjustment, this study's sample of stocks was classified into Large-Cap, Mid-Cap and Small-Cap segments in order to determine whether the value-growth phenomenon exists within the different market capitalisation environments and whether the outperformance of value stocks, if found present, can be anticipated in advance. The relative classifications were based on FTSE/JSE Africa Index Series classification criteria.

## 3.3 RESEARCH METHOD

### 3.3.1 Primary Research

Differentiating between style investments could be done by analysing different market variables. The primary research in this study was to calculate the P/B ratios of all the stocks that were constituents of the FTSE/JSE All-Share Index on the last day of each month for the period 1991 to 2011. The price of relevant stocks was represented by the closing price of that specific stock as at the last working day of each month. Book value is the value of shareholders' interest in a company's financial statements and is equal to the value of the assets minus the value of the liabilities. Book value per share (BVPS) is calculated as total book value divided by the number of ordinary shares outstanding at year end. The P/B ratio was calculated by using the following formula:

$$\text{Price} - \text{to} - \text{Book value ratio} = \frac{\text{Market Price per Ordinary Share}}{\text{Book Value per Ordinary Share}}$$

Since it is possible for the book value of a company to be negative in some instances, Auret and Sinclaire (2006) utilised the book-to-market equity (BTM) ratio, arguing that it captured a more continuous relationship. However, the author of the present study is of the opinion that including negative book value companies, utilising the BTM ratio, may negatively impact on the comparison of extreme values. For example when using the earnings-to-price (E/P) ratio, where earnings can be negative for numerous natural reasons, negative earnings stocks would be ranked within the growth spectrum. Some companies may report negative earnings due to the business cycle experienced at the time and thus ranking stocks as growth could be inappropriate. Utilising the price-to-earnings (P/E) ratio places negative earnings shares amongst value stocks, which also has its arguments of inappropriateness. This is also true for the P/B ratio, although book value tends to be negative less frequently than earnings. It is thus the opinion of the author that including negative book value companies has the potential to obscure the desired comparison of extreme values. The potential for inaccurate ratio calculation and subsequent stock ranking and portfolio construction, becomes a concern when book value approaches zero from a positive or negative base. A small change in book value from just above zero to just below would cause 'n massive jump in the P/B ratio, moving a stock from the very top of the P/B ratio distribution to the very bottom. This can cause inconsistency in the calculation of stocks' P/B ratios and the resulting portfolio construction. Although the BTM ratio is well documented in literature (for example Fama and French, 1992; Auret and Sinclaire, 2006), it is debatable whether it actually ensures continuity and thus it was thought best to exclude negative book value companies from this analysis. It should, however, be noted that negative book value companies weren't ignored for analytical purposes; they were grouped together and analysed as a separate category.

All the relevant information gathered was summarised in a database. This database formed the primary source used for most of the research. Subsequently after the necessary data had been captured in the database and the relevant P/B ratios had been calculated, all stocks that formed part of the FTSE/JSE All-Share Index were ranked according to their relative P/B ratios. This was done in order to divide the stocks into four monthly portfolios. Quartile 1 consisted of stocks with the highest P/B ratios. Within each consecutive quartile, P/B ratios decreased, with the smallest P/B ratios captured in quartile 4. This classification process created 4 portfolios at the end

of each month, with quartile 1 forming the growth portfolios (highest 25% of P/B ratios) and quartile 4 representing the value portfolios (lowest 25% of P/B ratios). This exercise was repeated on a monthly basis during the period of investigation, thus at each month-end four new portfolios were formed.

Once the portfolio formation processes had been completed, the relative performance of each portfolio was tracked over the subsequent five-year period. A period of five years was utilised for two reasons. Firstly, this was the investment horizon as specified by The Brandes Institute. Lakonishok *et al*. (1994) state that a five-year investment horizon was chosen to ensure strategies that were suitable to long-term investors. Secondly, as stated by Bradfield (2003) the use of historical data for estimation purposes over many years could be negative and regarded as having little relevance, since the nature of business risk, as undertaken by companies, is susceptible to significant changes over such long periods. Gonedes (1973) and Kim (1993) found beta, a measure of market risk inherent in the underlying stock, to be reasonably stable over five-year periods. Bradfield (2003) concluded that "the selection of a five-year period represents a satisfactory trade-off between a large enough sample size to enable reasonably efficient estimation and a short enough period over which the underlying beta could be assumed to be stable" (Bradfield, 2003: 50). A five-year period of performance tracking was thus thought to be suitable and most relevant. Relative performance was captured and determined through price and dividend data for each stock in the four newly formed portfolios. Stocks within the portfolios were equally weighted in order to calculate portfolio return. Prices were captured on a monthly basis whereas monthly dividend yields were used to account for dividend payments. Monthly capital gains or losses were calculated and one-twelfth of the monthly dividend yield was added in order to calculate the total monthly return. It would have been ideal to use actual dividends, but due to the nature and variance of dividend payments, this would have been a complex process to say the least. It was thus felt unnecessary since the one-twelfth dividend approximation was believed to capture the dividend effect accurately enough at a portfolio level. In the case of stocks delisting or stocks that no longer formed part of the FTSE/JSE All-Share Index, the proceeds were assumed to be equally invested in the remaining stocks in the portfolio as of the first day of the following month. The calculated total monthly returns were used to determine the subsequent five-year returns of the

respective portfolios. The above process was repeated on a monthly basis over the research period. For each new set of portfolios created at month end, the quartile-by-quartile performance was tracked over the subsequent five years after the inception date. Each portfolio's return over the subsequent five-year period was annualized for comparison purposes. Due to the fact that subsequent five-year annualised performance was calculated, the last set of portfolios was constructed on 31 October 2006.

Once the five-year annualised return of each portfolio had been determined, as explained above, and all the relevant P/B ratios had been calculated, it was important to determine whether a relationship existed between a stock's relative P/B ratio and its subsequent relative performance. This was accomplished by calculating the valuation difference multiple on a monthly basis. For a given month, the multiple was calculated as follows:

$$\text{Valuation difference multiple}_t = \frac{\text{Median}\,\frac{\text{P}}{\text{B}}\,\text{ratio of the Growth (Q1)Portfolio in Month t}}{\text{Median}\,\frac{\text{P}}{\text{B}}\,\text{ratio of the Value (Q4) Portfolio in Month t}}$$

This multiple was calculated on a monthly basis in order to compare it with each subsequent monthly five-year annualised excess return, where excess return was defined as the return of the value portfolio minus the return of the comparable growth portfolio. Once the multiple and excess return had been compared to one another and it had been established whether a relationship existed, it was important to determine whether the relationship was consistent at various valuation difference multiple ranges. Determining consistency across the Q1/Q4 valuation difference multiples was done by dividing the Q1/Q4 valuation difference multiples into quartiles. Quartile 1 contained the highest 25% of Q1/Q4 valuation difference multiples, while quartile 4 represented the lowest 25% of Q1/Q4 valuation difference multiples. In order to gauge the consistency of returns across various levels of the valuation difference multiples, the average five-year annualised excess return as well as the median five-year annualised excess return, was calculated on a quartile-by-quartile basis.

#### *3.3.1.1 Population*

The population consisted of all the listed and delisted stocks on the JSE Main Board. According to the JSE Education Department there was a total of 330 ordinary stocks of companies, with a total market capitalisation of ZAR6 375 085 141 243, listed on the JSE Main Board as at 31 October 2011.

#### *3.3.1.2 Sample*

The sample consisted of all the stocks that were constituents of the FTSE/JSE All-Share Index. This study focused on the FTSE/JSE All-Share Index due to the fact that it most accurately represents the truly investable universe of stocks available to institutional investors and is seen as an indicator of market-wide performance.

During June 2002 the JSE Actuaries Index was replaced by the FTSE/JSE Africa Index Series as a result of a joint venture between the JSE Limited and the FTSE Group. The most noticeable difference between the pre- and post-index calculation methodology is a free-float investability weighting, which replaced full market capitalisation. The FTSE/JSE Africa Index Series is an arithmetic weighted index series calculating constituent weights based on the "free-float market capitalisation of each company" (FTSE/JSE, 2004: 3). The new management system changed the methodology and calculation of indices and thus ensured that indices reflected market movements more accurately. The method employed by the FTSE/JSE Africa Index Series is known as Cap-Weighted Indexing. According to this method of index value calculation, the market value of individual companies within an index is based on the number of free-float shares outstanding for that specific issue. The total index value is calculated as the sum of all the individual market values of companies within an index.

The FTSE/JSE Africa Index Series was created in order to represent relative performance of JSE listed companies more accurately. The indices that form part of the FTSE/JSE Africa Index Series can be grouped as follows:

- Headline Indices: the FTSE/JSE All-Share Index (All-Share Index), the FTSE/JSE Top-40 Index (Top-40 Index), the FTSE/JSE Mid-Capitalisation Index (Mid-Cap Index), the FTSE/JSE Small-Capitalisation Index (Small-Cap Index) and the FTSE/JSE Fledgling Index;

- Tradeable Indices;
- All-Share Industry Indices;
- All-Share Supersector Indices;
- All-Share Sector Indices;
- All-Share Subsector Indices;
- Secondary Markets Indices;
- Specialist Indices;
- Namibia Indices;
- Capped Indices;
- Shareholder Weighted Indices;
- Style Indices;
- The FTSE/JSE Preference Share Index;
- The FTSE/JSE Equally Weighted Index.

The JSE is responsible for the daily operations of the FTSE/JSE Africa Index Series. Constituents of the different indices are based on re-occurring discussions and agreement between the JSE Limited and the FTSE Group. Securities that are eligible for inclusion in the FTSE/JSE Africa Index Series are "all classes of ordinary shares, excluding inward foreign listings" (FTSE/JSE, 2011: 9). These ordinary shares are also subject to certain free-float and liquidity requirements. Convertible preference shares and loan stocks are not included in the FTSE/JSE Africa Index Series until the time when actual conversion takes place. According to the FTSE/JSE (2011: 10) free-float restrictions include the following:

- "Trade investments in an index constituent either by another or non-constituent company or entity;
- Significant long term holdings by founders, their families and/or directors;
- Employee share schemes (if restricted);
- Government holdings;
- Foreign ownership limits and;
- Portfolio investment subject to a lock-in clause, for the duration of that clause."

Form the article "FTSE/JSE Africa Index Series: A Comprehensive Guide" (FTSE/JSE, 2008) it is clear that a further distinction is made between full market

capitalisation and free-float market capitalisation. Full market capitalisation is calculated as the total amount of listed shares of a stock multiplied by the stock's current market price, before any investability weighting adjustments. Free-float market capitalisation is an adjusted market capitalisation measure which is used to determine the relative weighting of securities within their respective indices. Free-float gives a more accurate representation of the actual number of shares available to investors, thus excluding shares restricted to certain groups or individuals.

Apart from the above-mentioned criteria, stocks are also subject to specified index qualification criteria. Within the JSE Main Board, stocks can be split into four indices, the FTSE/JSE Top-40 Index, the FTSE/JSE Mid-Cap Index, the FTSE/JSE Small-Cap Index and the FTSE/JSE Fledgling Index. The FTSE/JSE All-Share Index consists of the three largest indices, according to full market capitalisation, namely the FTSE/JSE Top-40, FTSE/JSE Mid-Cap and FTSE/JSE Small-Cap Indices. The FTSE/JSE All-Share Index represents the 99% largest full market capitalisation stocks, measured in terms of ordinary shares listed on the JSE Main Board. The FTSE/JSE Top-40 Index consists of the largest forty companies, ranked according to full market capitalisation. The FTSE/JSE Mid-Cap Index consists of the subsequent 60 companies, ranked according to full market capitalisation. Thus, the Mid-Cap Index comprises of companies forty-one to one hundred, ranked according to their relative full market capitalisations. The FTSE/JSE Small-Cap Index consists of the rest of the FTSE/JSE All-Share Index constituent companies, thus company one hundred and one (ranked according to full market capitalisation) and onwards. The constituents of the Top-40 Index and the Mid-Cap Index are kept at a constant number. The lowest 1% of full market capitalisation stocks listed on the JSE Main Board form part of the FTSE/JSE Fledgling Index. Review of above-mentioned indices occurs on a quarterly basis.

The sample used to conduct the present study was based on the new index calculation methodology. Since 2002 this data has been available in electronic format from the JSE and thus was used as such in this study. The only actual JSE All-Share data available for the period prior to 2002, was based on the old index calculation methodology. In order for this research to capture the true dynamics of value and growth investing it was important that the sample be consistent across the entire research period. For the pre-2002 period the JSE provided data that was back-tested and as such used to create a hypothetical JSE All-Share Index for the period 1995 to

2002, based on the new FTSE/JSE Africa Index Series calculation methodologies. The JSE back-tested data was utilised as main source of All-Share data for the period 1995 to 2002. For the period pre-1995 no such data is available. However, the JSE was able to supply data on all the companies that were listed on the JSE Main Board between 1991 and 1995. With this data a hypothetical All-Share Index for the period 1991 to 1995 was created based on the new index calculation methodology. This allowed research to be conducted on a consistent sample across the entire research horizon.

In order to account for the problem of survivorship bias, all delisted stocks were included for analytical purposes and as such values of delisted stocks were only terminated after the delisting date. Data was further checked for errors, corrected and cleaned where possible to ensure a high quality data set. In cases where sufficient data on stocks were not available, stocks were eliminated from the data set. The data set was further adjusted in order to account for corporate actions, thus ensuring comparability between stock returns and P/B ratios.

#### *3.3.1.3 Primary Research Method*

Analysis of all the stocks included in the FTSE/JSE All-Share Index was the primary focus of this study. Constructing a user-friendly database was of the utmost importance in achieving the desired results. The database contains market capitalisations and book values of each company that was included in the FTSE/JSE All-Share Index as well as the monthly closing prices for the period 1991 to 2011. Monthly investment income was also captured in order to account for dividend payments. From this data the P/B ratio of each stock could be calculated. It must be noted that the winsorisation of P/B data was considered. Winsorisation of data entails the transformation of statistical data by limiting the effect that spurious outliers can possibly have on the conclusions drawn from the data. The process of winsorisation holds that all outliers are set to a specified percentile, for instance a 90% winsorisation will set all the data below the $5^{th}$ percentile equal to the $5^{th}$ percentile and all the data above the $95^{th}$ percentile equal to the $95^{th}$ percentile. However, the effect of winsorisation was found undesirable for two reasons. Firstly, it would have no effect on the construction of the monthly value- and growth portfolios. Secondly, since the purpose of this study was to measure extreme values, quartile 1 through to quartile 4,

winsorisation of data had the potential to obscure the intended comparison. Winsorisation of data was thus not utilised.

#### *3.3.1.4 Acquisition of Data*

Data necessary to conduct the research was gathered from a number of sources. This included data from the JSE, McGregor BFA and I-Net Bridge. Data was captured in a user-friendly database in order to ensure optimal analysis. The database was constructed in three broad steps.

Firstly, for the period 1991 to 1995 an All-Share Index was created, based on the new FTSE/JSE African Index Series calculation methodology. The JSE provided data on all the stocks that were listed on the JSE Main Board for the period 1991 through 1995; this included monthly prices and dividend yields. The number of ordinary shares outstanding at year end was extracted from the I-Net Bridge database. In the event of I-Net Bridge data being incomplete or insufficient, the JSE was able to provide the necessary data. The JSE and I-Net Bridge data were combined in order to construct an All-Share Index for the period 1991 to 1995. It must be noted that the All-Share Index constructed for the period 1991 to 1995 is, in broad terms, based on the new index calculation methodology, but some differences still exist. An All-Share Index was created quarterly by ranking stocks according to their relative full market capitalisations and subsequently classifying stocks as either Large-Cap, Mid-Cap or Small-Cap. When the JSE reviews All-Share constituents, the following criteria are used to classify individual stocks within the underlying indices based on their respective appreciation or depreciation in price:

- Risen to 35$^{th}$ or above - FTSE/JSE Top-40 Index;
- Risen to 85$^{th}$ or above - FTSE/JSE Mid-cap Index;
- Fallen to 46$^{th}$ or below - FTSE/JSE Mid-cap Index;
- Fallen to 116$^{th}$ or below - FTSE/JSE Small-cap Index.

These steps were, however, not adhered to in the construction of the All-Share Index for the period 1991 to 1995. Since the primary focus of this study was not to construct an All-Share Index, but rather to focus on valuation disparities and subsequent performance, it was felt sufficient to rank stocks quarterly based on full market capitalisation and subsequently classifying them, without regard to the above criteria.

This process provided a sufficient sample of stocks for the period, from which primary and secondary research could be conducted.

Secondly, for the period 1995 to 2002 the JSE provided back-tested All-Share data. This included a JSE back-test that backtracked market data to create an All-Share Index for the period 1995 to 2002 based on the new index calculation methodology. The back-test data served as the primary source of data for the period 1995 to 2002. The JSE back-tested database included dividend yields for the period. Ordinary shares outstanding were extracted from I-Net Bridge, with the JSE supplying data in cases where I-Net Bridge provided insufficient data. Prices were supplied by the JSE.

For the period 2002 through 2011 actual FTSE/JSE All-Share data was used. This data was supplied directly by the JSE and no alterations were necessary. It included price data, dividend yields and ordinary shares outstanding. The above-mentioned data was combined in order to create an All-Share Index, based on the new index construction methodology, for the period 1991 to 2011.

Apart from the above-mentioned data, book values were primarily gathered from the BFA McGregor database. Book value was calculated as total assets minus liabilities. Standardised financial statement data, as provided by BFA McGregor, was used to extract relevant data. The aim of standardised financial statements is to ensure that companies that apply accounting conventions differently are more comparable. When extracting standardised ratios from the BFA McGregor database, the most notable alteration to standardised financial statements is the fact that goodwill is excluded from the ratio calculation for analytical purposes. Some sources calculate book value as total tangible assets minus liabilities. However, since book value is the difference in resources expected to add value or result in future inflows (assets) and obligations expected to destroy value or result in future outflows (liabilities), it was felt that some intangible assets provide value and future income and are thus important for analytical purposes. For this reason the only intangible asset excluded in the calculation of a stock's book value, was goodwill. All data were combined in order to create a user-friendly database for the period 1991 to 2011, which served as the foundation for the primary and secondary analysis. As all data analysed were secondary of nature and as such available in the public domain, it was not necessary to obtain ethical clearance as the research had minimal ethical risks.

#### *3.3.1.5 Data Analysis*

The research process was conducted in five broad steps. The first step was to create a user-friendly database that reflected the most recent market information. This included construction of a hypothetical All-Share Index for the period 1991 to 1995. Data included in the database for all the constituents of the All-Share Index are ordinary shares outstanding, book value per share, monthly prices and dividend yields. Broadly, book value per share (BVPS) can be defined as follows:

$$\text{Book Value per Share} = \frac{\text{Total assets} - \text{Goodwill} - \text{Liabilities}}{\text{Ordinary Shares Outstanding}}$$

Subsequently, P/B ratios of every stock included in the FTSE/JSE All-Share Index were calculated using the information from the database. The P/B ratios were calculated every month by dividing the stock's month end price by its book value per share. The results were used to construct monthly value and growth portfolios in the second step.

Once the correct P/B ratios had been calculated, the second step in the research process was to rank the stocks according to their relative P/B ratios. Subsequent to the ranking process, stocks were divided into four separate portfolios. The top 25% of P/B ratio stocks formed the growth portfolio (quartile 1), while the bottom 25% of P/B ratio stocks represented the value portfolio (quartile 4). For a stock to be included in the respective portfolios at least one total monthly return was required in the period directly following the inception date of the portfolio. This step was repeated on a monthly basis (last business day of each month) during the research period and thus four new portfolios was constructed at the end of each month, based on the P/B ratios calculated in step one.

The third step in the research process was to calculate the subsequent five-year annualised return of each newly formed portfolio at month end. This was done by giving each stock in the respective portfolios equal weighting. Investment return was calculated on a monthly basis, thus each month a monthly return for the respective portfolios was calculated, equating to 60 monthly returns over the five-year period per portfolio. These were linked together in order to calculate the total return for the portfolio over the five-year holding period. Subsequently the five-year annualised

return for each portfolio was calculated. Each month the investment performance of each stock within its respective portfolio was calculated on the following basis:

$$\text{Holding Period Return}_t\ (\text{HPR}_t) = \frac{P_t - P_{t-1} + D}{P_{t-1}}$$

where: $HPR_t$ = Total return in month t;

$P_t$ = Price at the end of the month;

$P_{t-1}$ = Price at the beginning of the month;

D = One-twelfth of the annual dividend yield.

A buy-and-hold strategy was utilised. In instances where stocks had been delisted or were dropped from the FTSE/JSE All-Share Index, the proceeds were assumed to be invested equally in the remaining portfolio constituents as of the first day of the subsequent month. In order to compare returns to disparity in valuations, with the aim to identify a relationship, the five-year annualised excess return was calculated. Excess return was defined as the return of the value portfolio minus the return of the comparable growth portfolio. Sub-periods during which this value is positive were defined as value cycles, while a negative value was indicative of a growth cycle.

The fourth step in the research was to calculate the valuation difference multiple at each month end:

$$\text{Valuation difference multiple}_t = \frac{\text{Median}\,\frac{P}{B}\,\text{ratio of the Growth (Q1) Portfolio in Month t}}{\text{Median}\,\frac{P}{B}\,\text{ratio of the Value (Q4) Portfolio in Month t}}$$

Utilising the median growth P/B ratio as the numerator and the median value P/B ratio as the denominator, the multiple measures the relative disparity (or uniformity) between the highest P/B ratio stocks (growth) and the lowest P/B ratio stocks (value) at a given point in time. According to The Brandes Institute "greater dispersion in valuations potentially indicates uncertainty or lack of confidence in asset prices" (The Brandes Institute, 2009A: 2). Research steps 3 and 4 were of the utmost importance in identifying desired results during the last part of the study.

Step five in the research process was to compare the valuation difference multiple (step four) with the corresponding five-year annualised excess return (as calculated in

step three above) at each month end. This was done in order to determine whether a relationship existed between relative P/B ratios and subsequent performance of value and growth stocks.

Once it was determined whether a relationship existed between valuation difference multiples and subsequent performance, it was necessary to test for statistical significance. This was done at a 5% level of significance by using *t*-tests and associated *p*-values. The first null hypothesis states that there is no difference between the returns of a value portfolio and a growth portfolio, while the alternative hypothesis indicates that a non-zero difference between the return of value and growth portfolios exists. The second null hypothesis states that there is no linear relationship between the valuation difference multiple and a stock's subsequent performance. The second alternative hypothesis indicates a relationship between the two variables.

### 3.3.2 Secondary Research

The Capital Asset Pricing Model (CAPM) as defined by Sharpe (1964), Lintner (1965) and Black (1972), together SLB, was one of the first asset pricing models to indicate the significant relationship between risk and return of securities. It held that an investor must be rewarded whenever he is willing to take on more risk. The reward for the higher risk on stocks is in the form of higher returns.

The worldwide phenomenon of classifying stocks into Large-Cap, Mid-Cap and Small-Cap stocks relates closely to the notion of risk and return. The relative risk and return characteristics of the three size classifications vary widely and thus it is important to determine whether a consistent value-growth relationship can be identified across the spectrum of Large-Cap, Mid-Cap and Small-Cap stocks.

The secondary research of this study was to divide the All-Cap sample used in the primary research into Large-Cap, Mid-Cap and Small-Cap segments. The segmentation of stocks was based on the FTSE/JSE Africa Index Series classification criteria and thus is a true reflection of the spread between Large-Cap, Mid-Cap, and Small-Cap stocks on the JSE. This segmentation was done in order to determine whether a significant value premium exists within each size segment and within which segment it is more evident. It was also important to determine whether a consistent

relationship can be identified between valuation disparities and subsequent relative performance of value and growth stocks within a Large-Cap, Mid-Cap and Small-Cap environment. Bauman *et al*. (1998) found the value premium present in "all firm capitalization-size categories except the smallest" (Bauman *et al*., 1998: 75). Once the classification between Large-Cap, Mid-Cap and Small-Cap had been done, the analysis followed the same path as explained for the primary research.

## 3.4 INFERENTIAL ANALYSIS

As stated earlier, all descriptive results were tested using inferential statistical techniques. Inferential statistics are used to draw conclusions on the population based on characteristics of the underlying sample. This is important from an analytical perspective, since descriptive findings may indicate a relationship, but the relationship may not be significant from a statistical perspective.

Testing for statistical significance forms an integral part of any study. This is done by means of various statistical inference techniques at different levels of significance. Once relevant tests had been completed, *t*-statistics and *p*-values were used in order to determine whether a meaningful statistical relationship exists between variables tested. The *p*-value is the minimum level of significance at which the null hypothesis can be rejected. For example a $p<.05$ indicates that the null hypothesis can be rejected at a 5% level of significance and thus a statistically significant relationship exists. According to Cant, Gerber-Nel, Nel and Kotze (2005) the *p*-value is the "probability of obtaining a test statistic value equal or greater than the value actually obtained if the null hypothesis is actually true" (Cant *et al*., 2005: 223). They further stated that the *p*-value should always be used as a measure of statistical significance. The use of the *p*-value is confirmed by De Vries (2010: 109), stating that a lower *p*-value indicates stronger evidence of statistical significance and vice versa.

Correlation and regression analysis were used to analyse the relevant variables of this study. Hair, Money, Samouel and Page (2007) state that it is possible to detect the presence and nature of a relationship, as well as the direction and strength of the relationship, with these tests.

### 3.4.1 Regression and Correlation Analysis

Regression analysis, used as a method to analyse and model relevant variables tested, is a measure of causality between independent and dependent variables. The most basic form of a multiple regression model is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k + \varepsilon$$

where: $Y$ = Dependent variable;
$\beta_0$ = Intercept term;
$\beta_k$ = Regression coefficient;
$X_k$ = Independent variable;
$\varepsilon$ = Error term.

The purpose of a regression model, utilising ordinary least squares (OLS) estimates, is to explain Y in terms of X, holding other factors constant. For example, for a given change in $X_1$, the approximate value change of Y is $\beta_1 X_1$, *ceteris paribus*. More simply, $\beta_1$ is the approximate change in Y for a one unit change in $X_1$, *ceteris paribus*. The intercept term represents the y-axis intercept, with the regression coefficient the slope of the trend line.

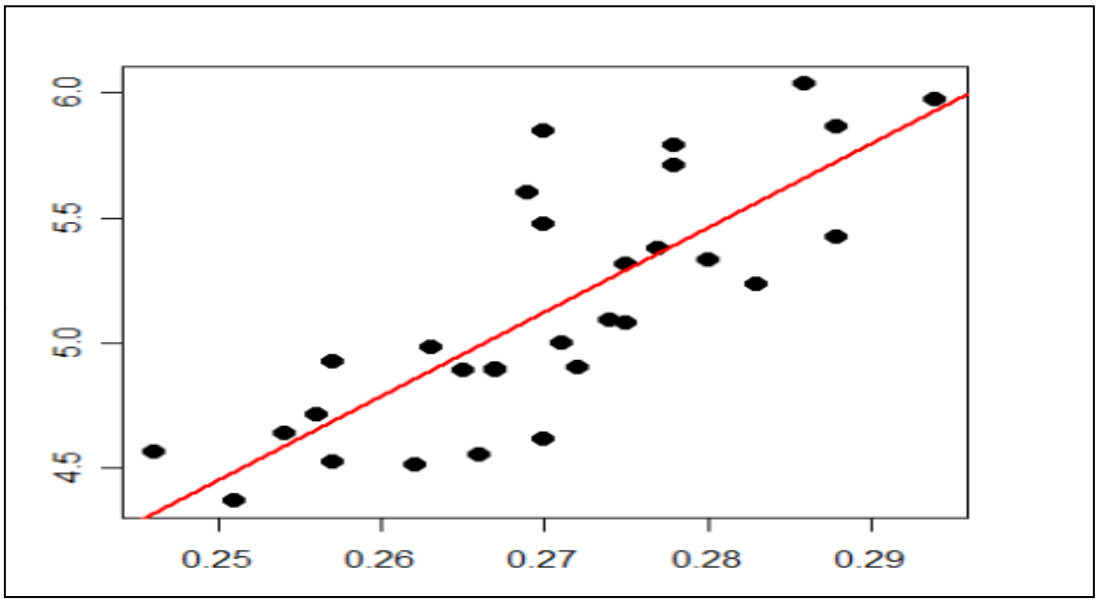



**Figure 3.1: Example of Linear Regression**

Source: Carvalho (2012).

Figure 3.1, also called a scatterplot, represents an example of the outcome of a linear regression process. The blue dots are different data points with the red line indicating the regression line (also known as the trend line or line of best fit). The regression line shows an approximate relationship between variables. If the pattern of dots and the prevailing trend line slope from the lower left to the upper right, as is evident in Figure 3.1, a positive correlation exists between the tested variables. A line sloping from upper left to lower right indicates negative correlation. The steeper the trend line, the stronger the relationship and vice versa.

Correlation analysis depends on the underlying data the study utilises. The correlation coefficient is a measure of the direction and strength of the relationship between variables. Correlation coefficients have a fixed range of -1 to +1, with -1 indicating a perfect negative relationship and +1 a perfect positive relationship. A correlation coefficient of 0 represents no significant relationship.

### 3.4.2 Unique Considerations of Time Series Data

In statistics a distinction must be made between cross-sectional data and time series data. Cross-sectional data is many units of a variable observed at one point in time. This ensures that no specific ordering of the data points occurs, data points are randomly selected and the observations are independent. In contrast to cross-sectional data, time series data is one unit of a variable, observed in many different time periods. There is thus no independence of the variable across time, as the current period depends on past periods, which makes it more complicated to analyse as the data exhibits temporal ordering. It also requires alterations to the assumptions used under cross-sectional data, since the data no longer consists of a random sample of observations; instead it is one realization of a stochastic process. The most basic form of the time series model is:

$$Y_t = \beta_0 + \beta_1 X_{t1} + \beta_2 X_{t2} + \ldots + \beta_k X_{tk} + \varepsilon_t$$

where: $Y_t$ = Dependent variable at time t;
$B_0$ = Intercept term;
$B_1$ = Regression coefficient;
$X_t$ = Independent variable;
$\varepsilon_t$ = Error term.

In a static time series model the independent variable z is believed to have an immediate effect on the dependent variable $Y_t$:

$$Y_t = \beta_0 + \beta_1 Z_t + \varepsilon_t,$$

thus a change in $Y_t$ is given by $\beta_1 Z_t$, when $\varepsilon_t = 0$. In a finite distribution lag (FDL) model, the model takes into account that one or more of the independent variables can possibly have had a lagged effect on $Y_t$:

$$Y_t = \alpha_0 + \delta_0 Z_t + \delta_1 Z_{t-1} + \delta_2 Z_{t-2} + \varepsilon_t$$

where $\delta_0$, the impact propensity, reflects the immediate change in Y given a change in Z. In such an instance, if the shock was temporary, the process will return to its status quo level in period q+1, where q is the number of lags. Together $\delta_0$, $\delta_1$, $\delta_2$, …, $\delta_q$ is the long-run propensity, which indicates the approximate long run change in Y for a permanent change in Z.

As stated above, time series data is more complicated to analyse and thus requires different assumptions compared to cross-sectional data. The Gauss-Markov Time Series Assumptions (Wooldridge, 2009: 370-371) as used for statistical inference, when analysing time series data, are as follows:

- Assumption TS.1 Linearity in Parameters
  - The stochastic process $\{(x_{t1}, x_{t2}, \ldots, x_{tk}, y_t): t = 1, 2, \ldots, n\}$ follows the linear model

    $$y_t = \beta_0 + \beta_1 x_{t1} + \ldots + \beta_k x_{tk} + \varepsilon_t,$$

    where $\{\varepsilon_t: t = 1, 2, \ldots, n\}$ is the sequence of errors or disturbances. Here, n is the number of observations (time periods).

- Assumption TS.2 No Perfect Collinearity
  - In the time series process, no independent variable is constant or a perfect linear combination of the other.

- Assumption TS.3 Zero Conditional Mean
  - Given the independent variables for all time periods, the expected value of $\varepsilon_t$ for each t, is zero. Mathematically, $E(\varepsilon_t|x) = 0$, t = 1,2, …, n. This implies that ε is uncorrelated with the independent variables in all time periods.

- Assumption TS.4 Homoscedasticity
  - Conditional on x, the variance of $\varepsilon_t$ is the same for all t: $Var(\varepsilon_t|x) = Var(\varepsilon_t) = \sigma^2$, t = 1, 2, …, n.

- Assumption TS.5 No Serial Correlation
  - Conditional on x, the error terms in two different time periods are uncorrelated: $Corr(\varepsilon_t, \varepsilon_s|x) = 0$, for all $t \neq s$.

- Assumption TS.6 Normality
  - The errors $\varepsilon_t$ are independent of x and are independently and identically distributed as Normal $(0, \sigma^2)$.

Assumption TS.1 – TS.3 establishes unbiased OLS estimators. TS.6 allows for exact statistical inference on any sample size. Under all six assumptions the OLS estimators are BLUE:

- Best – it has the smallest, most efficient variance;
- Linear – it is a function of the data (x and y);
- Unbiased – the expected value of the estimator is the population value;
- Estimator – a rule that can be applied to any sample data to obtain an estimate.

However, a common problem with time series data is that it usually has a trend. Even if the variables tend to trend closely together, it will be inappropriate to conclude that a causal relationship exists, since the relationship may be due to certain unobserved factors. A trending series cannot be stationary, which is required to draw meaningful conclusions, since the mean changes over time. In order for data to be stationary the expected value $\{E(x_t)\}$ and the variance $\{Var(x_t)\}$ of the time series over different time periods must be approximately constant. Further the probability distribution must be constant over time and the correlation $\{Corr(x_t, x_{t+h})\} \rightarrow 0$ as $h \rightarrow \infty$. It is, however, possible to control for the trend by regressing each variable in the model on the time variable. In such a model, the residuals form the detrended series and thus the trend has been controlled for. One of the advantages of the detrended series is that it better reflects the $R^2$, which is a measure of the amount of variance in the dependent variable explained by the independent variables considered by the model.

Due to the time series nature of the study's data, special attention was given to the statistical analysis of the data in order to ensure results that are of the highest quality and creditworthiness. Data were rigorously tested to ensure that in most instances there is adherence to the unique time series assumptions, ensuring BLUE OLS estimates. The Durbin-Watson test statistic was used extensively to determine the presence of serial correlation (TS. 5), while the Breusch-Pagan and Ljung-Box-Pierce tests (to the squared residuals) were conducted to detect the presence of heteroscedasticity (TS. 4). It was further also decided not to utilise detrended data, as explained in detail under heading 3.4.3.

### 3.4.3 Stock Markets and Mean-Reversion

Many studies have documented the mean-reversion effect present on stock markets around the world. The theory of mean-reversion states that a stochastic process tends to remain near or return to its long run mean over time. Mean-reversion and thus stationarity on stock markets can be difficult to observe when looking at time series data over a period of weeks, months or even years, since the mean-reverting tendency may only be evident over very long horizons.

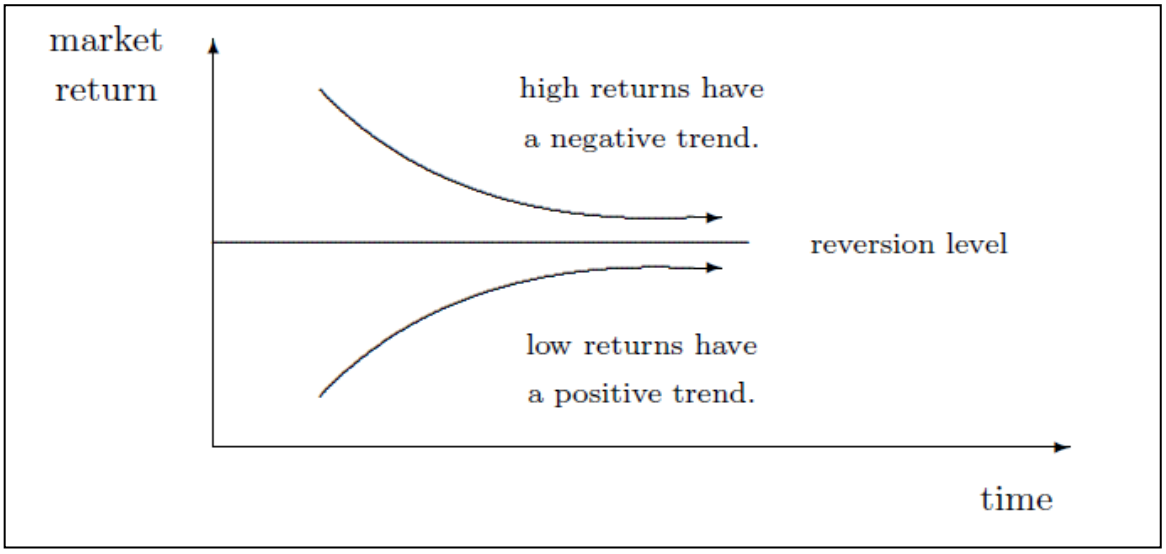



**Figure 3.2: The Concept of Mean-Reversion**

Source: Hillebrand (2003).

From a stock market point of view, many relevant variables have been shown to be mean-reverting; these include interest rates, implied volatilities, price-to-earnings (P/E) ratios and stocks market returns. Black (1988) suggests that stock market crashes can

be caused by errors in mean-reversion expectations and the perceived rate of mean-reversion. His view is supported by Hillebrand (2003) who found that mean-reversion expectations were substantially underestimated in the 9 months leading up to the 1987 stock market crash, compared to the period 1982 to 1986. He further found that for a period of five years after the crash, mean-reversion was much higher than before. Timmer (2010) states that the mean-reversion process is present in stock prices as well as reported earnings. He further found that portfolios with value or growth attributes will on average "drift towards the mean valuation ratio" (Timmer, 2010: 1).

From an emerging market perspective Chaudhuri and Wu (2004) found the mean-reversion tendency present in seventeen emerging markets over the period 1985 to 2002. Cubbin, Eidne, Firer and Gilbert (2006) found that on the South African equity market portfolios that contained stocks with low P/E ratios significantly outperformed portfolios consisting of high P/E ratio stocks over the subsequent five-year period. They argued that a portfolio of low P/E ratio stocks can thus be profitable as these stocks tend to revert to the mean P/E multiple.

The present study primarily focuses on two stock market variables, namely the P/B ratio and stock return. Both of these variables are believed to have a mean-reversion tendency over long periods of time. Due to the nature of the current study, the lack of relevant and applicable historical data and the substantial changes on the South African market during the 1990s, the time horizon of the sample may be detrimental to the determination of mean-reversion tendencies and subsequent stationarity of data. However, this tendency has been proved to be present on the South African equity market and therefore for purposes of inferential analysis, these variables were thus assumed to be mean-reverting and, as a result, stationary over the research period.

# CHAPTER 4

# FINDINGS

## 4.1 INTRODUCTION

South Africa as a country and as a market, underwent significant changes during 1994 and 1995. According to a Financial Mail survey (1992), the JSE suffered a number of country-specific challenges before 1994. These included political instability, international sanctions and regulatory economic structures imposed by the financial authorities. The pre-1995 JSE did not even meet one of Reilly and Norton's (1999) criteria for a 'good' exchange, lacking accurate information, providing insufficient liquidity, charging high transaction costs and supplying inefficient price information. After the first democratic election in 1994, the management of the JSE thought it appropriate to restructure its systems during 1994 and 1995. According to Mkhize and Msweli-Mbanga (2006) the restructuring process included the following:

- Dismantling of exchange controls;
- Allowing for Dual Capacity Trading where stockbrokers could act as agents and principals;
- Deregulation through legislation in areas ranging from membership to taxation, with the aim of improving marketability, attracting foreign investors and aligning local tax laws with international trends.

The substantial changes during the period 1994 and 1995 structurally changed the South African market allowing integration into an international environment, resulting in increased international funds flowing to South Africa and a subsequent higher correlation with international markets. It was thus important to determine if trends were consistent with international evidence during the post-liberalisation period.

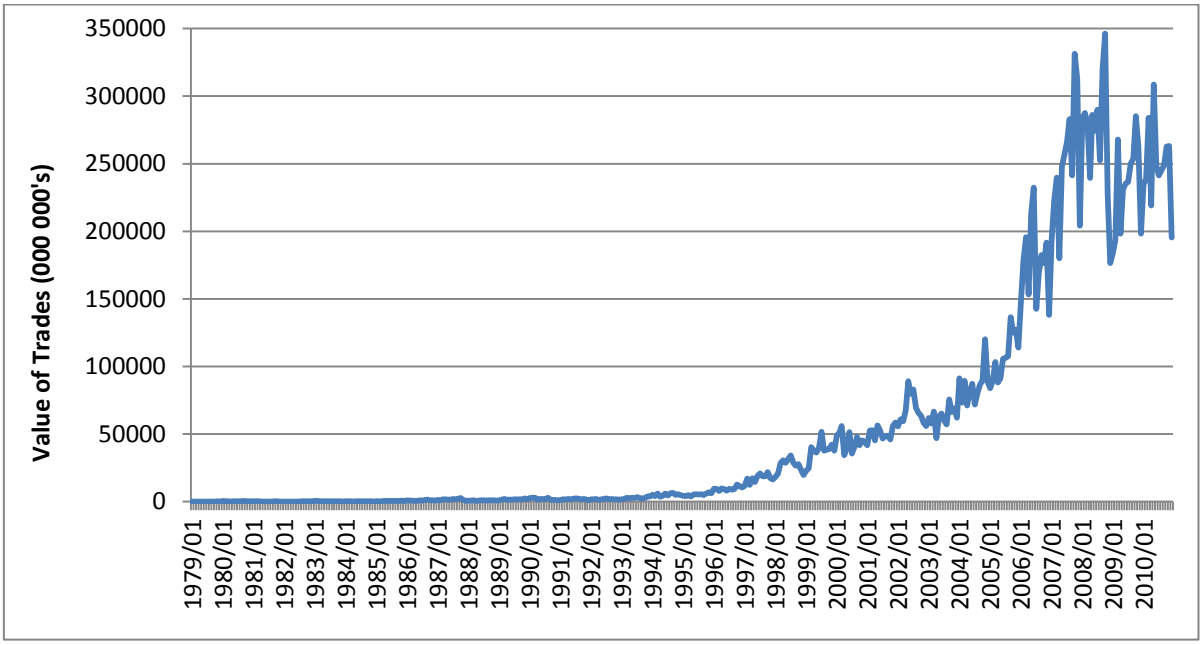



**Figure 4.1: Value of Trades on the JSE**

Source: FTSE/JSE (2011).

Figure 4.1 indicates the low levels of trading that persisted on the JSE in the period prior to 1996. With shortcomings identified and restructuring implemented during 1994 and 1995, the post-restructuring period is reflective of modern day trends as well as increased investment by the international community, which was the result of increased confidence in the South African economy.

To gauge the significance of the study's descriptive findings, a linear regression test was conducted where the five-year annualised excess return (dependent variable) was regressed on the valuation difference multiple (independent variable). Testing for statistical significance, the log of the valuation difference multiple was utilised, as the relationship between spreads and returns is not purely linear. For example a 1 percentage point (PP) change in spreads when spreads are 5 times does not result in the same subsequent return from a 1 PP change in spreads when they are much wider at 10 times. Utilising the log effectively restates the percentage (%) changes and more effectively reflects the relationship between the five-year annualised excess return and the valuation difference multiple, resulting in increased stability in the underlying data. Some interesting observations were made, with definite evidence of structural breaks within the different samples over the research period.

Although the assumption of mean-reversion and therefore stationarity was made in chapter 3, relevant data was still tested for this assumption to determine whether applicable and acceptable. The Augmented Dickey-Fuller test was utilised to test for the stationarity of data. This method utilises a unit-root test to determine if data is stationary. The null hypothesis indicates the presence of a unit-root, with the alternative hypothesis representing variables with no unit-root. Variables with no unit-root are defined as stationary over time. If data was found to have a unit-root, thus indicating that individually they are non-stationary, the ΔY and ΔX (differenced) were tested to determine if they exhibited a linear trend over time. If the differenced variables were found not to have a unit-root and thus exhibit a linear trend over time, the residuals of regressing Y on X were tested for stationarity through the Augmented Dickey-Fuller test. If the residuals of the regression were found not to have a unit-root and therefore stationary, it was concluded that the Y and X variables are cointegrated, which is abnormal but also desirable, since it indicates that the linear relationship between Y and X is too strong to be coincidence. It must be noted that the relatively short research horizons made testing for stationarity problematic since it is possible that stationarity may only be observed over longer periods of time. Variables were, however, found to exhibit a linear trend over time and to be cointegrated within the majority of samples, validating the assumption of stationary data.

Data was further tested for the presence of serial correlation and heteroscedasticity. The Durbin-Watson test statistic was utilised to determine the presence of serial correlation, where a Durbin-Watson test statistic of 2 is indicative of no serial correlation and thus desirable. In the event of serially correlated error terms, autoregressive (AR) modelling techniques were employed to account for the presence of serial correlation. This was done by modelling appropriate AR models of the order one, AR(1), to the residuals. The Breusch-Pagan and Ljung-Box-Pierce tests (to the squared residuals) were conducted to detect the presence of heteroscedasticity. In the event of significant heteroscedasticity, autoregressive conditional heteroscedasticity (ARCH) and generalised autoregressive conditional heteroscedasticity (GARCH) models were employed to correct for heteroscedasticity in the residuals.

With descriptive statistics indicating the possibility of changing trends, combined with the above-mentioned changes occurring between 1994 and 1995, it was thought necessary to test data for structural breaks. Initial structural breakpoints were

identified through the Quants-Andrews unknown breakpoint test. Structural breakpoints as indicated by the Quants-Andrews test were confirmed with the Chow known breakpoint test. Periods after breakpoints were analysed to determine if identified trends remained present in the modern era.

It should be noted that the Schwarz criterion was used extensively during statistical model estimation to compare different statistical models. The criterion is used to identify the optimal model amongst a given set of models. By adding parameters to a certain model, it is possible to increase the likelihood of such a model, but the addition of variables may ultimately result in overfitting of the model. However, the Schwarz criterion accounts for the possibility of overfitting by including a penalty term that penalises the outcome of a model based on the number of parameters included. Given any two outputs from estimated models, the model with the lower Schwarz criterion is preferred.

At the start of the research it was hoped that findings would be in line with international studies (see for example The Brandes Institute, 2009A and 2009B) which indicated that historically when disparity in valuations, as calculated by the median price-to-book value (P/B) ratio of growth and value stocks, increased, value stocks tended to outperform over the subsequent five-year period. From a strictly South African perspective, some interesting results were found. It must be reiterated that South Africa is seen as an emerging market and therefore it is expected that South Africa should provide higher return opportunities than its developed counterparts (USA and Europe for example). This is especially true after the recent global financial crisis, with much of the developed world showing below par growth, resulting in investors seeking acceptable growth in emerging countries. It is thus possible for research based on emerging markets to differ in some ways from results found in the developed world.

## 4.2 PERFORMANCE BASED ON THE FTSE/JSE ALL-SHARE INDEX

Each month four portfolios were constructed on the basis of P/B ratio classification, with quartile 1 constituting the highest 25% of companies according to P/B ratios (growth portfolio) and quartile 4 consisting of the 25% lowest P/B ratio companies (value portfolio). Subsequently the return of each portfolio was tracked over the

following five years. This method was utilised on a monthly basis for the period 1991 through 2011 based on FTSE/JSE All-Share Index data.

### 4.2.1 Value versus Growth Relative Performance

As a first hypothesis, the performance of value versus growth portfolios over longer investment horizons was tested, to determine if the anomaly of value stock outperformance was present on the South African equity market over the past 20 years. In Figure 4.2 the five-year annualised returns of the value and growth portfolios constructed for the period January 1991 to October 2006 are plotted.

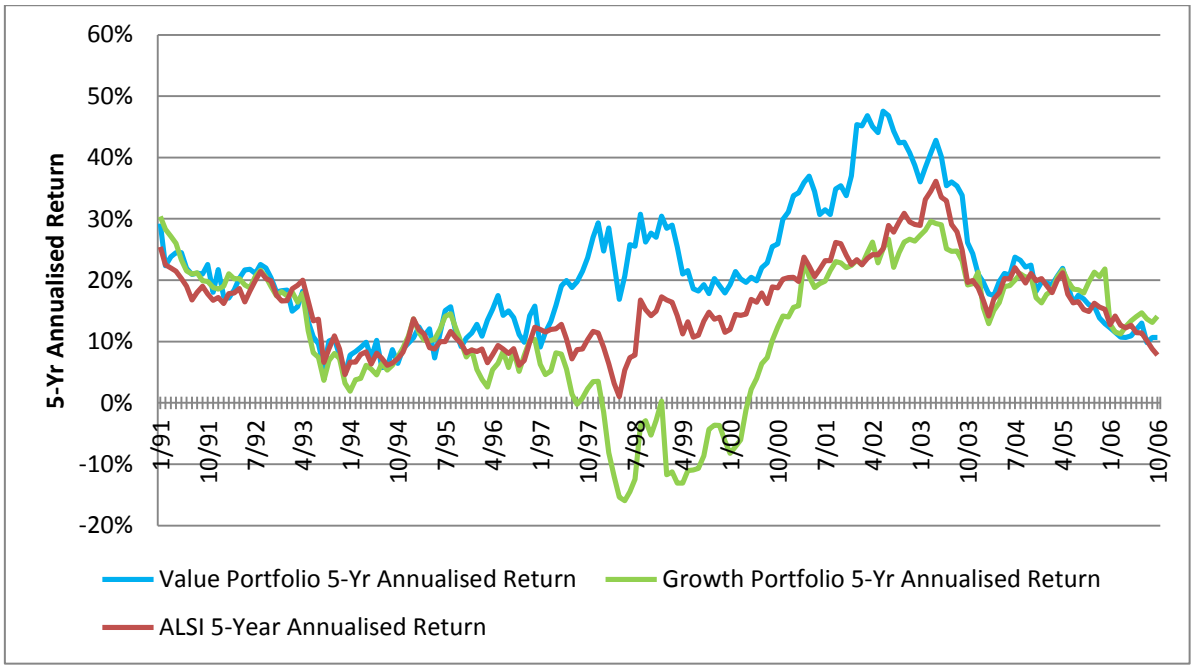



**Figure 4.2: All-Cap Actual Five-Year Annualised Returns of Value, Growth and ALSI**

As is evident from Figure 4.2, the value portfolios delivered positive returns across the entire research period, with the growth portfolios delivering returns on both sides of the spectrum. The highest five-year annualised return achieved by a value- and growth portfolio was 47.54% (June 2002) and 29.63% (March 2003) respectively. This equates to cumulative rates of return of 599% and 266% respectively over a five-year investment horizon. A value cycle can clearly be identified for the period January 1997 to December 2003, with the value portfolios outperforming its growth counterparts with an average annualised excess return of 20.02% over this period. However, this is not the case for the subsequent period, where portfolios were negatively influenced by

substantial decreases in stock prices due to the sub-prime crisis in the United States of America (USA) and the resulting global economic meltdown. Portfolios tended to move in close proximity during the period Jan 2004 to October 2006, with the growth portfolios outperforming in most of the periods. During this period the growth portfolio delivered an average five-year annualised return of 17.09% compared to the marginally lower 16.71% of the value portfolio. The relative value and growth cycles are consistent with international trends, as per the study "Value vs. Glamour: Historical P/B Ratio Disparities and Subsequent Value Stock Outperformance" (The Brandes Institute, 2009A).

Many researchers have found that over a longer investment horizon value stocks tend to outperform growth stocks, see for example Lakonishok *et al*. (1994) and The Brandes Institute (2008A, 2009A and 2009B). As can be seen from Figure 4.3, the current research supports that premise. It is clearly demonstrated in Figure 4.3 that on average, value stocks outperformed growth stocks over five-year investment horizons on the South African equity market. As P/B ratios decreased within each consecutive quartile, the average five-year annualised return increased, with an average return of 21.25% for the value portfolios, as compared to the average return of 13.20% for the growth portfolios, over the period 1991 to 2006. The average five-year annualised return for the FTSE/JSE All-Share index as a whole was 16.86% over the same period. This indicates quite a substantial outperformance of value stocks over the research period.

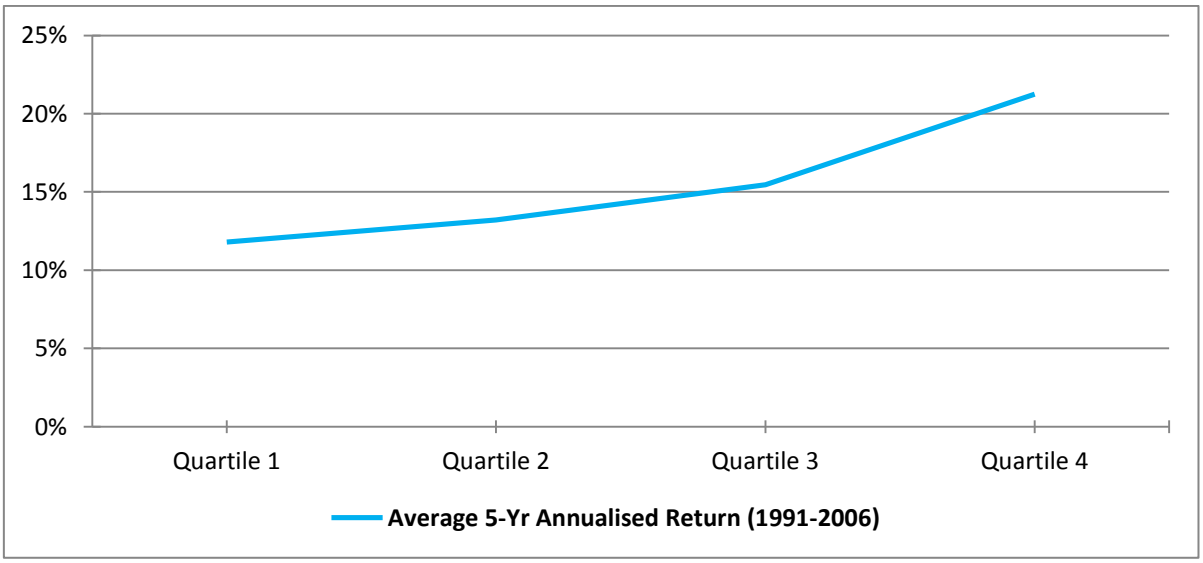



**Figure 4.3: All-Cap Average Five-Year Annualised Quartile-by-Quartile Return**

The above-mentioned performance of the value and growth portfolios over the period 1991 to 2006 is equivalent to cumulative rates of return equal to 162% and 86% respectively over a five-year investment horizon.

The outperformance of value portfolios over the period 1991 to 2006 was tested for statistical significance. Testing whether the excess return (value return minus growth return), significantly differs from zero, a *t*-value of 11.16 was obtained. With a critical value of 1.96, the null hypothesis of no difference in the returns of value and growth portfolios can be rejected, indicating a significant outperformance of value stocks on the FTSE/JSE All-Share Index over the period 1991 to 2006.

### 4.2.2 Valuation Disparities and Subsequent Performance

In order to further gauge the relative outperformance of value stocks over growth stocks, the relative spread in valuations was taken into account in order to determine when the biggest margin of outperformance was historically experienced. For this purpose it was necessary to calculate a standardised ratio that could serve this purpose. With a value and growth portfolio based on the relative ranking of P/B ratios of the individual stocks created each month, the median P/B ratio of each portfolio was used to calculate the valuation difference multiple. The valuation difference multiple was calculated as the median P/B ratio of the growth portfolio divided by the median P/B ratio of the value portfolio. Greater dispersion in valuations amongst value and growth stocks would result in higher valuation difference multiples.

The relationship between valuation disparities and subsequent performance of value and growth portfolios is plotted in Figure 4.4. On the left axis the ratio of the valuation difference multiple is captured with subsequent performance on the right axis measured in terms of the return of the value portfolio minus the comparable growth portfolio return. It must be remembered that significant changes occurred on the JSE during 1994 and 1995, which could possibly explain the changed pattern of P/B ratios after 1995.

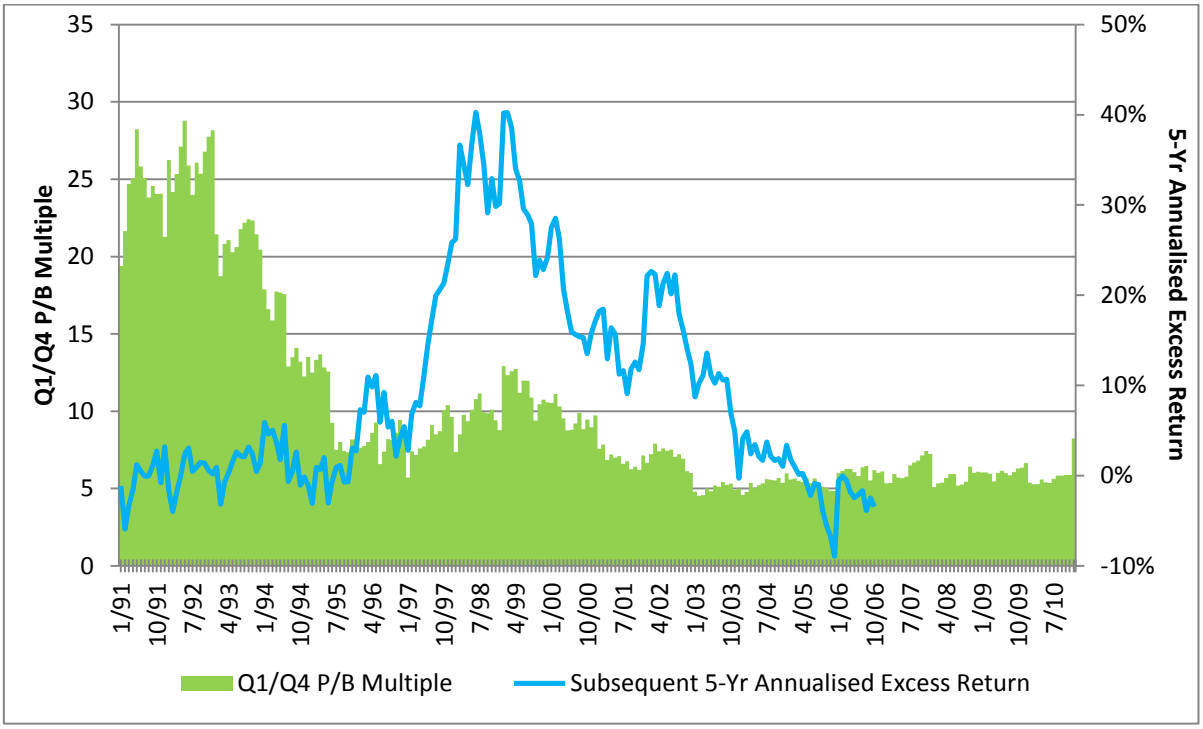



**Figure 4.4: All-Cap Valuation Difference Multiples and Subsequent Five-Year Annualised Excess Returns**

Although the valuation difference multiple trend, depicted in Figure 4.4, seems quite different pre- and post-1996, some interesting and significant conclusions can be drawn. Graham and Uliana (2001) found no clear evidence of value stock outperformance over a five-year period during the pre-1992 period of their research. This was inconsistent with international findings for the same period. However, they identified the value anomaly as present in the post-1992 period. From Figure 4.4 a consistent value effect is not identifiable for the period January 1991 to June 1995. As indicated by the findings of Graham and Uliana (2001), combined with significant changes occurring within the South African market in the pre-1995 period, the pre-1995 results depicted in Figure 4.4, were in a way expected, and clearly indicated the existence of a structural breakpoint.

Considering the full research period, the following observations were made from a statistical point of view. Testing for a significant relationship between the valuation difference multiple and five-year annualised excess return a positive significant relationship was identified. The *t*-statistic and *p*-value of 4.57 and 0.00 respectively indicate that a strong relationship was found present over the period 1991 to 2006. A linear regression utilising ordinary least squares (OLS) indicated that a one point

increase in the valuation difference multiple should result in an approximate increase of 2.00% in the five-year annualised excess return. A Durbin-Watson test statistic of 2.20 is sufficient to conclude uncorrelated residuals and thus proving that a meaningful statistical relationship exists.

Utilising the Quant-Andrews Unknown Breakpoint test and the Chow Known Breakpoint test, a structural breakpoint was identified in February 1996, which coincides with changing trends as seen in Figure 4.4. As this was to be expected, analysis of the post-structural breakpoint period was critical, as it represented the most likely estimates of modern day trends.

Analysing the period March 1996 to October 2006 a strong positive relationship can historically be identified from Figure 4.4 between the valuation difference multiples (left axis) and subsequent five-year annualised excess returns (right axis), indicating that when the valuation difference multiple peaked, value stocks delivered meaningful outperformance over the subsequent five-year period. The multiple's highest value for the period March 1996 to October 2006 was 12.91 at the end of January 1999. This indicated a period during which growth stocks were almost 13 times more expensive than value stocks. From January 1999 onwards, the value portfolio outperformed the growth portfolio by a staggering 40.21% annualised over the subsequent five-year period. For the period March 1996 to December 2010 the average and median valuation difference multiple was 7.11 and 6.32 respectively. At the end of December 2010 the multiple increased in value to 8.24, going above 8 for the first time since 2000.

Given the strong outperformance of value stocks, as is evident from Figure 4.2 (p. 73) and 4.3 (p. 74), combined with the positive relationship identified between the valuation difference multiples and subsequent value stock outperformance in Figure 4.4 (p. 76), it was important to determine whether this relationship was strong and consistent through time and at different multiple ranges. In order to achieve this, the complete set of data points in the valuation difference multiple time series was classified in quartiles based on the ranking of the individual data points. This process created four subsets of valuation difference multiples, which were compared in terms of average and median five-year annualised excess return over the period March 1996 to October 2006.

**Table 4.1: All-Cap Sample Valuation Difference Multiple Ranges and Subsequent Five-Year Annualised Excess Return (Mar96-Oct06)**

| | Multiple Range | | | | | 5-Yr Annualised Excess Return | |
|---|---|---|---|---|---|---|---|
| **Quartile** | **High** | **Low** | **Average** | **Median** | **# obs.** | **Average (%)** | **Median (%)** |
| **1** | 12.91 | 9.34 | 10.57 | 10.35 | 32 | 28.03 | 28.72 |
| **2** | 9.27 | 7.22 | 8.15 | 8.13 | 32 | 16.08 | 16.66 |
| **3** | 7.19 | 5.65 | 6.38 | 6.27 | 32 | 6.87 | 7.03 |
| **4** | 5.61 | 4.53 | 5.15 | 5.2 | 32 | 3.37 | 2.31 |

The results of the segmentation process are summarised in Table 4.1. As the valuation difference multiple decreased, the subsequent five-year annualised excess return declined, as measured on an average and median basis. Table 4.1 serves as further evidence of the strong positive relationship between the valuation difference multiple and subsequent outperformance of value stocks, which was found to be present through time and at different multiple ranges.

Gauging the statistical significance of the above descriptive findings, a simple linear regression was conducted with the five-year annualised excess return (dependent variable) and valuation difference multiple (independent variable). The relationship is plotted in Figure 4.5.

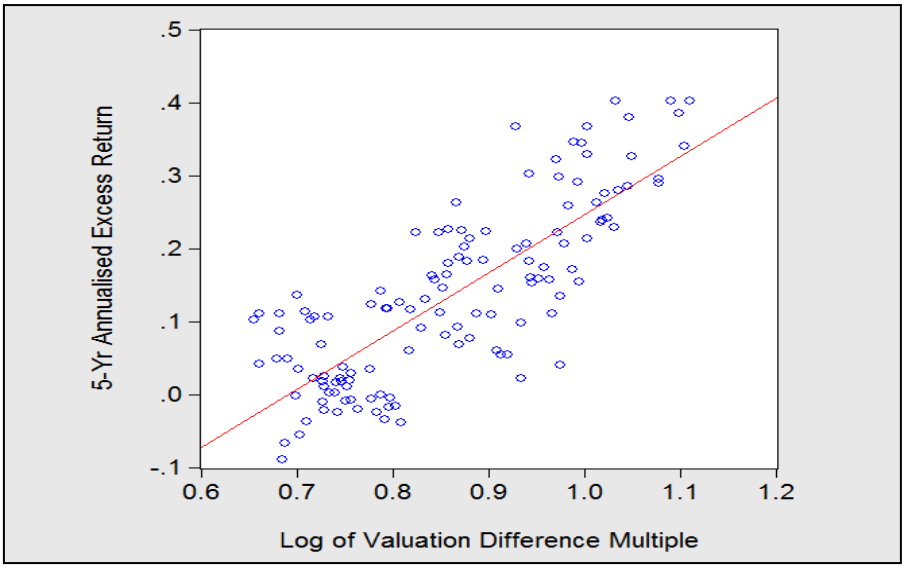
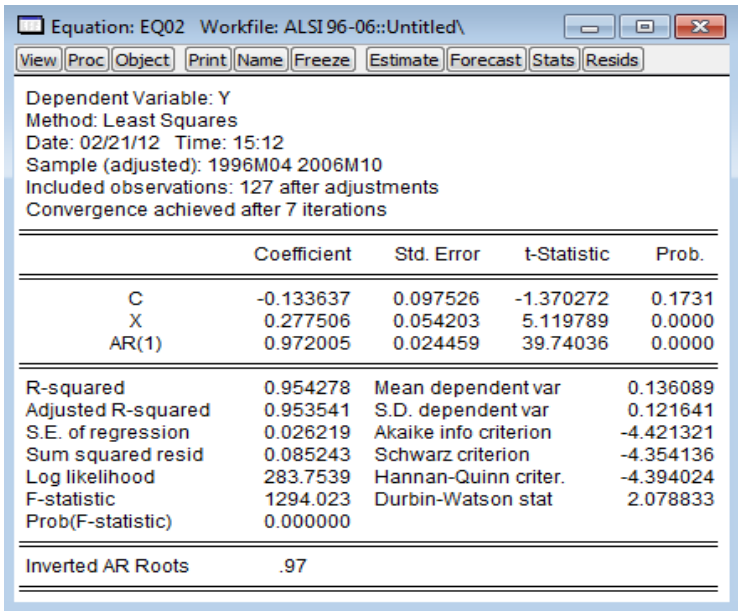



**Figure 4.5: All-Cap Linear Regression Line, Mar96 – Oct06**

The upward sloping trend line (red line) in Figure 4.5 indicates a strong positive relationship between the variables and provides additional evidence of the validity of the above-mentioned descriptive findings for the period March 1996 to October 2006. Special mention should be made of the high positive correlation coefficient of 0.80 between the five-year annualised excess returns and the valuation difference multiples.

A linear regression estimation utilising OLS was subsequently done, with the five-year annualised excess return representing the dependent variable (Y) and the valuation difference multiple representing the independent variable (X). Figure 4.6 indicates the outcome of the OLS estimation.


Equation: EQ02 Workfile: ALSI 96-06::Untitled\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 02/21/12 Time: 15:12
Sample (adjusted): 1996M04 2006M10
Included observations: 127 after adjustments
Convergence achieved after 7 iterations

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.133637 | 0.097526 | -1.370272 | 0.1731 |
| X | 0.277506 | 0.054203 | 5.119789 | 0.0000 |
| AR(1) | 0.972005 | 0.024459 | 39.74036 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.954278 | Mean dependent var | 0.136089 |
| Adjusted R-squared | 0.953541 | S.D. dependent var | 0.121641 |
| S.E. of regression | 0.026219 | Akaike info criterion | -4.421321 |
| Sum squared resid | 0.085243 | Schwarz criterion | -4.354136 |
| Log likelihood | 283.7539 | Hannan-Quinn criter. | -4.394024 |
| F-statistic | 1294.023 | Durbin-Watson stat | 2.078833 |
| Prob(F-statistic) | 0.000000 | | |

Inverted AR Roots .97

**Figure 4.6: All-Cap OLS Estimation Output, Mar96 – Oct06**

Figure 4.6 represents the regression output after autoregressive modelling techniques have been utilised to account for the presence of serial correlation. A Durbin-Watson test statistic of 2.08 is sufficient to indicate uncorrelated residuals and thus that a valid significant relationship has been found. Further evidence of the strong relationship is the high *t*-statistic of 5.12 (critical value of 1.96) and *p*-value of 0.00, indicating rejection of the null hypothesis at a 1% level of significance. The $R^2$ is a measure of the variation in the dependent variable (Y) which is explained by the independent variables (X). Both the $R^2$ and adjusted $R^2$ indicate that roughly 95% of the variance in excess return is explained by the valuation difference multiple.

To further gauge the significance of the findings, the OLS estimates were back tested to determine the historical accuracy of the model. This was accomplished by plotting the actual five-year annualised excess return against the OLS predicted five-year annualised excess return. The process of simply applying the historical valuation difference multiples to the coefficients of the OLS regression output and subsequently plotting them against the actual five-year annualised excess return was utilised to serve this purpose.

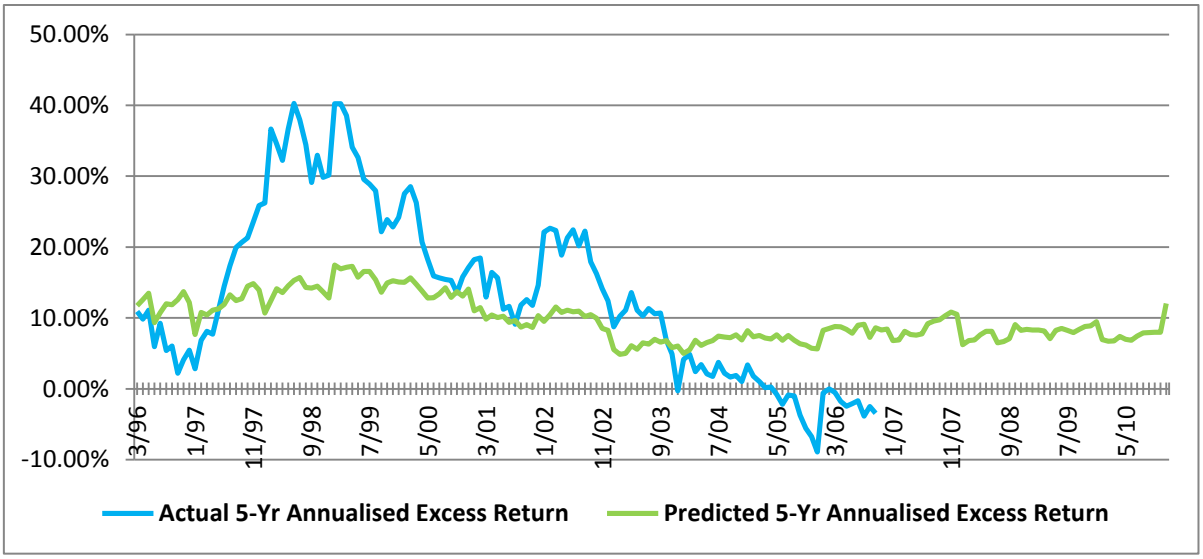



**Figure 4.7: All-Cap Actual vs. Predicted Five-Year Annualised Excess Returns**

Figure 4.7 shows much more variation in the actual five-year annualised excess return as compared to the predicted line. However, the more conservative estimation process broadly trends in the same direction as the actual returns over the research period. At the end of 2010, the model predicted significant outperformance of value stocks over the subsequent five-year period.

## 4.3 PERFORMANCE BASED ON CONSTITUENT INDICES OF THE FTSE/JSE ALL-SHARE INDEX

The FTSE/JSE All-Share Index is compiled from three independent indices, namely the FTSE/JSE Top-40 Index, the FTSE/JSE Mid-Cap Index and the FTSE/JSE Small-Cap Index. The distinction between the indices is important since the risk and thus arguably the return patterns of these indices differ. This in turn influences the trading on these indices, as different investment professionals have different mandates and risk-return profiles to adhere to.

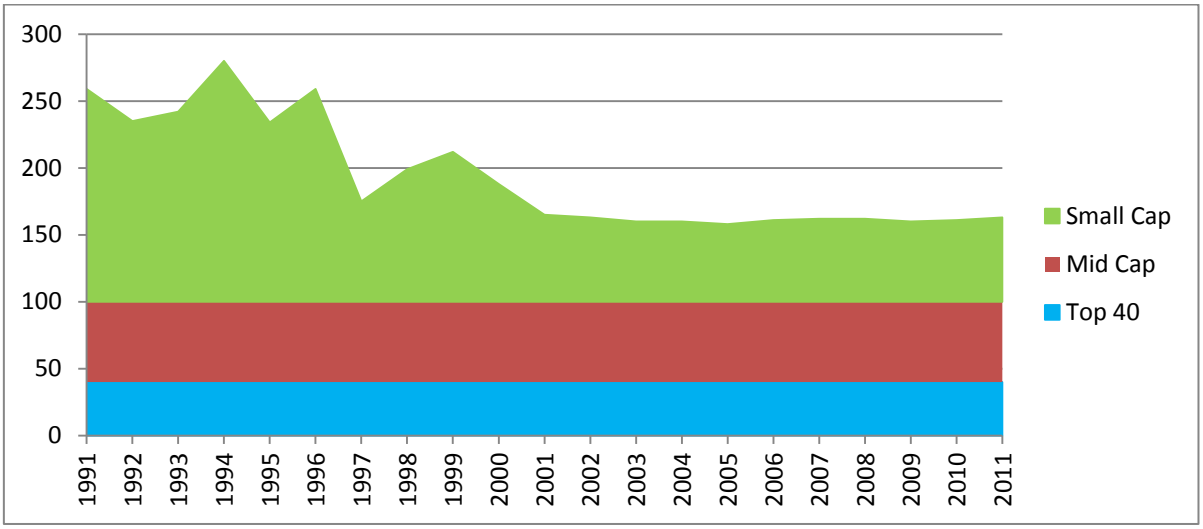



**Figure 4.8: Sample Size (1991-2011)**

As can be seen from Figure 4.8, with the new index calculation methodology, the number of stock constituents of the FTSE/JSE All-Share Index since 2002 is maintained within a narrow margin. As stated in chapter 3, the FTSE/JSE Top-40 Index and the FTSE/JSE Mid-Cap Index constituents are kept at a constant number.

When analysing the constituent indices of the FTSE/JSE All-Share Index more closely, it becomes evident that the FTSE/JSE Top-40 Index, and even more so the top 15 stocks according to market capitalisation, have a significant influence on the performance of the overall index.

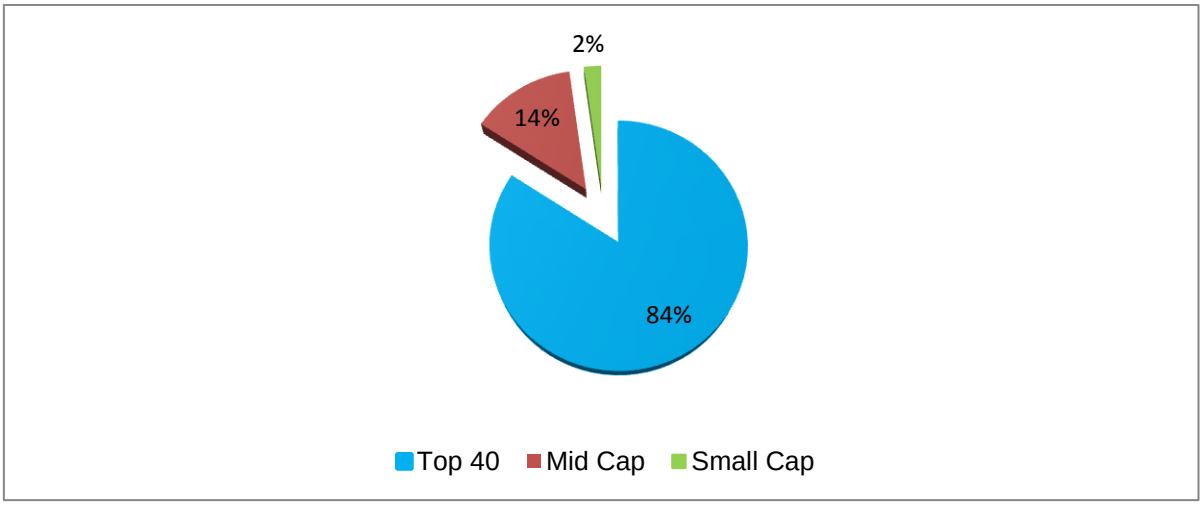



**Figure 4.9: Weights of the FTSE/JSE All-Share Index Constituents**

As at 31/10/2011.

Figure 4.9 illustrates that a substantial part of the FTSE/JSE All-Share Indices total market capitalisation, as at 31 October 2011, can be contributed to the FTSE/JSE Top-40 Index. The FTSE/JSE Top-40 Index represents 84% of the FTSE/JSE All-Share Indices market capitalisation, with the FTSE/JSE Small-cap Index contributing only 2%. The analysis of the FTSE/JSE Top-40 Index constituents results in some interesting findings.

**Table 4.2: Top 15 FTSE/JSE All-Share Index Constituents**

| Rank | Alpha | Instrument Name | All-Share Weight (%) |
|---|---|---|---|
| 1 | BIL | BHP Billiton | 11.989 |
| 2 | AGL | Anglo American | 8.874 |
| 3 | SAB | SABMiller | 8.052 |
| 4 | MTN | MTN Group | 5.799 |
| 5 | CFR | Compagnie Financiere Richemont AG | 5.304 |
| 6 | SOL | Sasol | 5.068 |
| 7 | SBK | Standard Bank Group | 3.441 |
| 8 | NPN | Naspers | 3.407 |
| 9 | ANG | Anglogold Ashanti | 3.038 |
| 10 | IMP | Impala Platinum Hlds | 2.573 |
| 11 | GFI | Gold Fields | 2.195 |
| 12 | FSR | Firstrand Limited | 1.848 |
| 13 | OML | Old Mutual | 1.795 |
| 14 | SHP | Shoprite | 1.405 |
| 15 | SLM | Sanlam | 1.384 |

As at 31/10/2011.

The biggest 10 companies, according to market capitalisation (Table 4.2), account for approximately 57% of the FTSE/JSE All-Share Indices total market capitalisation, whilst the top 15 companies account for roughly 66%. It is thus quite clear that the FTSE/JSE Top-40 Index and more specifically the largest 15 companies have quite a substantial influence on the FTSE/JSE All-Share Index performance. It was thus of the utmost importance to determine whether a consistent value effect and relationship between the outperformance of value stocks and valuation disparities can be identified within the different indices.

Research on the FTSE/JSE Top-40 Index, the FTSE/JSE Mid-Cap Index and the FTSE/JSE Small-Cap Index was conducted utilising similar research techniques and steps as applied to the FTSE/JSE All-Share Index. Four portfolios were created monthly based on the stocks' relative P/B ratio rankings. Subsequent to portfolio creation the portfolio return was tracked over a five-year period.

### 4.3.1 FTSE/JSE Top-40 Index

Bauman *et al*. (1998) as well as The Brandes Institute (2008A) found relative value stock outperformance over longer investment horizons when segmenting Large-Cap stocks together. In the current research the FTSE/JSE Top-40 Index represents the Large-Cap segment of the market. In Figure 4.10 there is a comparison of performance of value and growth portfolios constructed from FTSE/JSE Top-40 Index constituents.

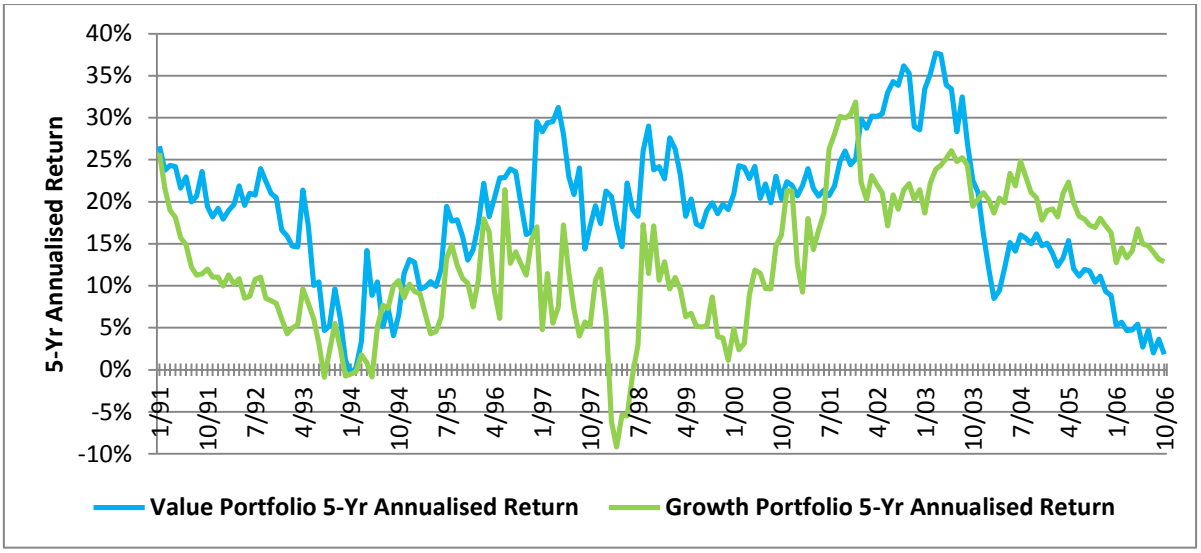



**Figure 4.10: Large-Cap Actual Five-Year Annualised Returns of the Value and Growth Portfolios**

Over longer investment horizons, value portfolios outperformed their growth counterparts in most of the research periods. The relative highest periods of outperformance by a value and growth portfolio were March 2003 and December 2001 respectively. From March 2003 onwards the value portfolio achieved an annualised return of 37.69% over the subsequent five-year period as compared to the five-year annualised return of 23.88% achieved by the growth portfolio. As of December 2001 the growth portfolio returned 31.88% annualised over the subsequent five-year period,

compared to the 25.09% achieved by the value portfolio over the same period. The best performing value and growth portfolio returns are equivalent to cumulative returns of 395% and 299% respectively over a five-year investment period. The consistency of the value outperformance was further analysed in terms of quartile-by-quartile returns.

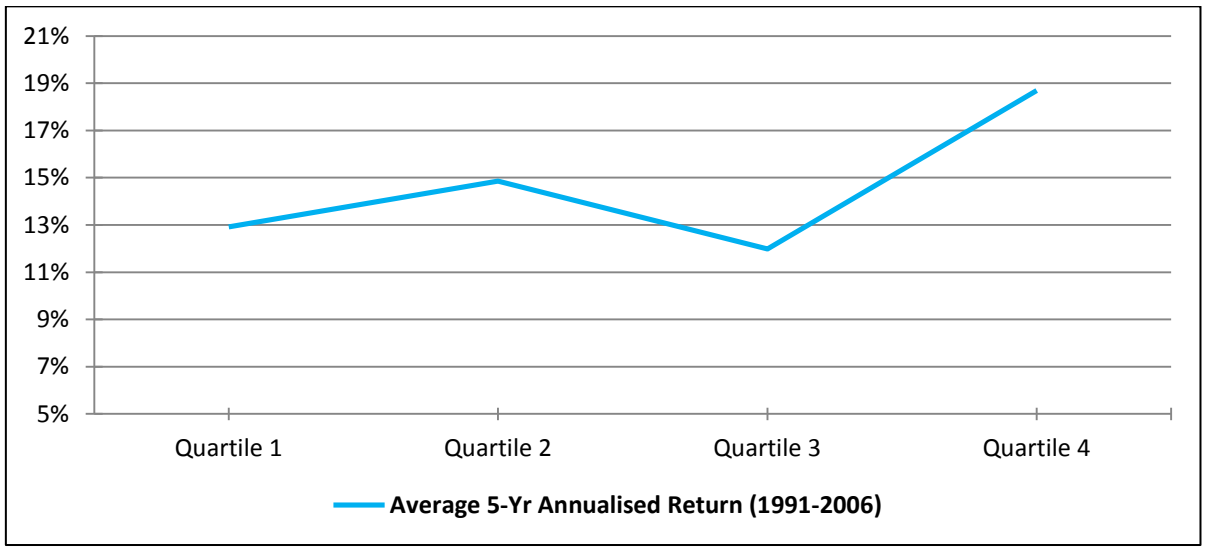



**Figure 4.11: Large-Cap Average Five-Year Annualised Quartile-by-Quartile Return**

Figure 4.11 indicates that within the FTSE/JSE Top-40 Index value stocks on average delivered superior performance to growth stocks. Average five-year annualised return increased as the P/B ratios decreased. The value portfolios (quartile 4) delivered an average five-year annualised return of 20.50%, compared to 14.91% returned by the growth portfolios (quartile 1). This equates to cumulative returns of 154.06% and 100.35% respectively over a five-year period.

The outperformance of value portfolios was supported by statistical findings. Testing the hypothesis that value significantly outperformed growth, returned a *t*-statistic of 8.92 (critical value of 1.96), indicating statistical significance as the null hypothesis can be rejected. The null hypothesis tested whether the excess return (value return minus growth return) equals zero, whilst the alternative hypothesis indicates a non-zero excess return. If $H_o$ is rejected, it indicates the potential to achieve higher returns through active management. The significant t-statistic was supported by a *p*-value of 0.00 over the period 1991 to 2006.

Subsequent to confirming that the value effect is present in the largest-capitalisation stocks on the JSE, it was important to determine when this outperformance was at its largest. For this purpose the valuation difference multiple was utilised as a measure of disparity amongst stock price valuations.

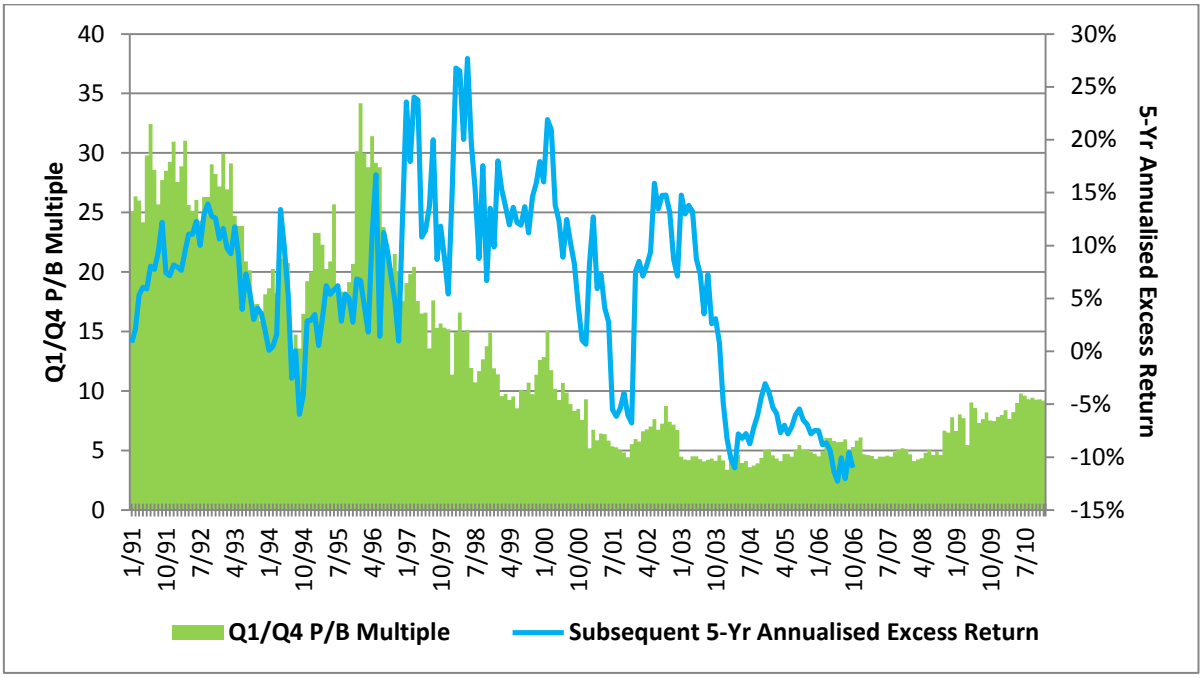



**Figure 4.12: Large-Cap Valuation Difference Multiples and Subsequent Five-Year Annualised Excess Returns**

In Figure 4.12 the valuation difference multiple (left axis) is plotted against the subsequent five-year annualised excess return (right axis). A clear declining trend of valuation difference multiples is evident over the first period of the research, once again indicating the possibility of a structural breakpoint. However, with this in mind, it is still possible to identify a relationship over the entire research period, with the five-year annualised excess return increases coinciding with increases in the valuation difference multiple.

Prior to testing for structural breakpoints, data over the entire research period was tested for statistical significance. Conclusions of a positive descriptive relationship between the five-year annualised excess return and the valuation difference multiple were supported from a statistical perspective with a *z*-statistic and *p*-value of 5.57 and 0.00 respectively, indicating a strong significant relationship. OLS estimates indicated that a one point increase in the valuation difference was expected to be accompanied

with an approximate increase of 1.51% in the five-year annualised excess return. Autoregressive estimation techniques and GARCH models were applied to account for serial correlation and conditional heteroscedasticity. A Durbin-Watson test statistic of 2.29 is believed to be indicative of uncorrelated residuals, thus it was concluded that a valid statistical relationship exists.

The process of testing for structural breakpoints within the FTSE/JSE Top-40 Index data identified two independent breakpoints. The first breakpoint was identified at December 1996 and the second at February 2002. This was, however, to be expected as initial statistical analysis indicated the potential of breakpoints at these time intervals.

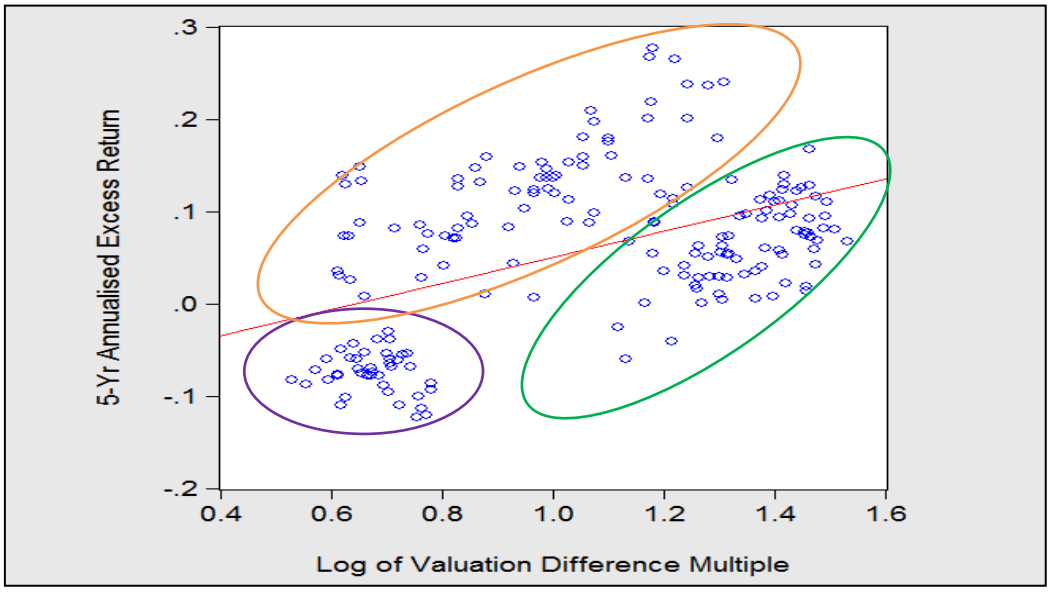



**Figure 4.13: Large-Cap Linear Regression Line, Jan91 – Oct06**

Figure 4.13 clearly indicates three separate clusters on the scatter plot of the five-year annualised excess returns and the valuation difference multiples. The upward sloping regression line indicates a positive relationship over the period, but upon further investigation it became clear that significant structural changes occurred. The green cluster, as indicated on Figure 4.13, contains almost all of the data points prior to December 1996, with the purple cluster containing data points post the February 2002 breakpoint. The orange cluster contains the majority of the data points between the two breakpoints. The green and orange clusters showed a positive significant relationship between the five-year annualised excess returns and the valuation difference multiples. However, this could not be confirmed for the purple cluster.

#### *4.3.1.1 FTSE/JSE Top-40 Index: January 1997 – February 2002*

From a descriptive analysis point of view a positive relationship can be identified between the five-year annualised excess returns and the valuation difference multiples for the period January 1997 to February 2002, as is evident form Figure 4.12 (p. 86). This was a period during which the South African market became integrated into the global economy and thus the existence of global anomalies and trends should be present in the South African equity market.

Further analyses of the descriptive relationship between the five-year annualised excess returns and the valuation difference multiples were conducted to determine if the anomaly is consistent at various valuation difference multiple ranges. All the FTSE/JSE Top-40 Index valuation difference multiples over the period January 1997 to February 2002 were segmented into quartiles for this purpose. Quartile 1 contained the highest multiple data points, with multiple values declining within each consecutive quartile. Table 4.3 summarises the segmentation process of the valuation difference multiples into quartiles in order to determine if value stocks outperform at higher multiple levels.

**Table 4.3: Large-Cap Sample Valuation Difference Multiple Ranges and Subsequent Five-Year Annualised Excess Return (Jan97-Feb02)**

| | Multiple Range | | | | | 5-Yr Annualised Excess Return | |
|---|---|---|---|---|---|---|---|
| **Quartile** | **High** | **Low** | **Average** | **Median** | **# obs.** | **Average (%)** | **Median (%)** |
| **1** | 20.42 | 14.93 | 16.61 | 16.08 | 16 | 18.08 | 20.03 |
| **2** | 14.90 | 10.71 | 12.21 | 11.90 | 15 | 14.66 | 15.29 |
| **3** | 10.67 | 8.49 | 9.54 | 9.56 | 15 | 11.32 | 12.33 |
| **4** | 8.34 | 4.44 | 5.91 | 5.79 | 16 | 2.03 | 3.43 |

Table 4.3 confirms the descriptive relationship between the five-year annualised excess returns and the valuation difference multiples. The widest margins of outperformance by value stocks over the period, January 1997 to February 2002, were at the highest multiple level, with the five-year annualised excess returns declining on an average and median basis as the valuation difference multiple became

smaller in each consecutive quartile. During this period the highest valuation difference multiple was 20.42 at the end of March 1997, with an annualised excess return of 24.01% over the subsequent five-year period. The average and median valuation difference multiples were 11.07 and 10.69 respectively, with an average and median five-year annualised excess return of 11.48% and 12.06% respectively over the period January 1997 to February 2002.

The positive descriptive relationship identified was confirmed from a statistical point of view. In Figure 4.14 the orange cluster is plotted from Figure 4.13 (p. 86).

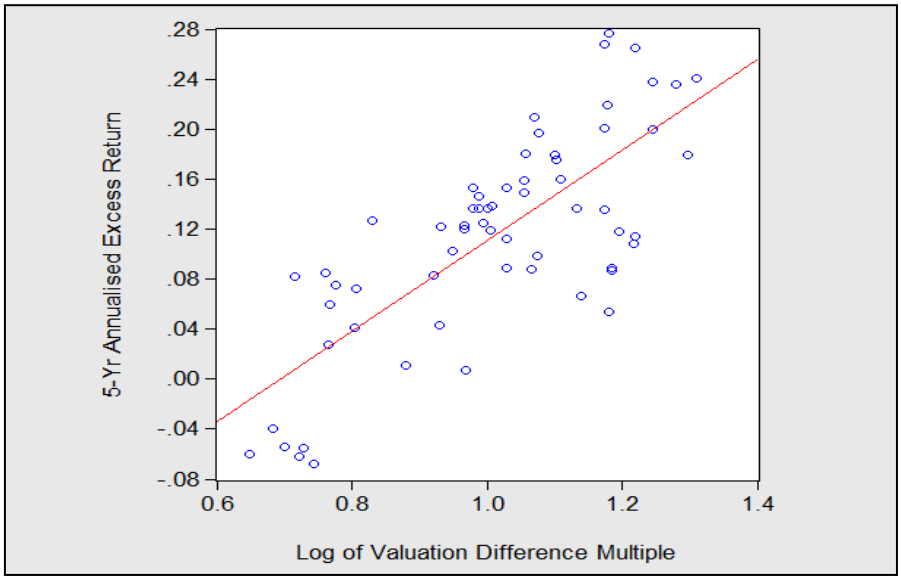
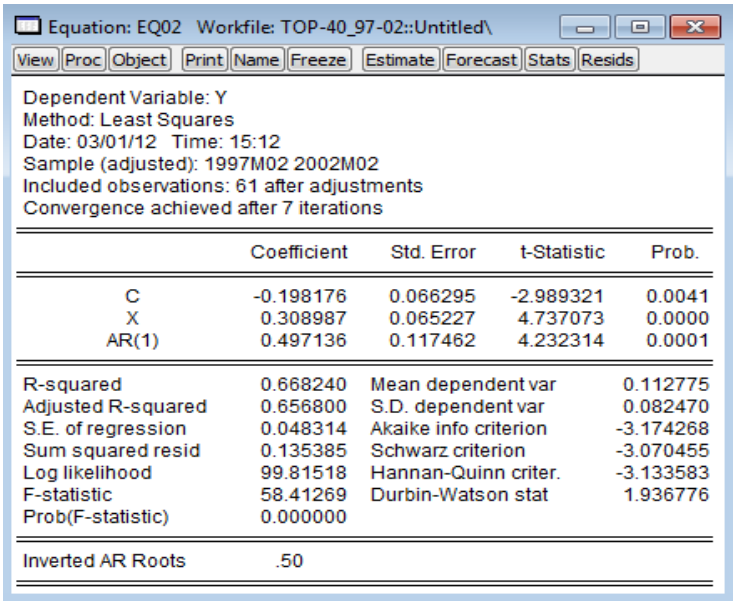



**Figure 4.14: Large-Cap Linear Regression Line, Jan97 – Feb02**

The upward sloping regression line in Figure 4.14 indicates a strong positive relationship between the five-year annualised excess returns and the valuation difference multiples. Special mention should be made of the high correlation coefficient of 0.76 between the variables.



Equation: EQ02 Workfile: TOP-40_97-02::Untitled\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 03/01/12 Time: 15:12
Sample (adjusted): 1997M02 2002M02
Included observations: 61 after adjustments
Convergence achieved after 7 iterations

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.198176 | 0.066295 | -2.989321 | 0.0041 |
| X | 0.308987 | 0.065227 | 4.737073 | 0.0000 |
| AR(1) | 0.497136 | 0.117462 | 4.232314 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.668240 | Mean dependent var | 0.112775 |
| Adjusted R-squared | 0.656800 | S.D. dependent var | 0.082470 |
| S.E. of regression | 0.048314 | Akaike info criterion | -3.174268 |
| Sum squared resid | 0.135385 | Schwarz criterion | -3.070455 |
| Log likelihood | 99.81518 | Hannan-Quinn criter. | -3.133583 |
| F-statistic | 58.41269 | Durbin-Watson stat | 1.936776 |
| Prob(F-statistic) | 0.000000 | | |

Inverted AR Roots .50

**Figure 4.15: Large-Cap OLS Estimation Output, Jan97 – Feb02**

A statistically significant relationship was identified between the five-year annualised excess return (dependent variable Y) and the valuation difference multiple (independent variable X), as seen in Figure 4.15. The *t*-statistic and *p*-value of 4.74 and 0.00 respectively indicate a highly significant relationship. Autoregressive modelling techniques were utilised to account for the presence of serial correlation in the error term, resulting in a Durbin-Watson test statistic of 1.94, which is sufficiently close to 2 to conclude uncorrelated residuals. It is thus believed that the model used is optimal and indicative of a valid statistical relationship. The OLS estimates predicted that an increase of one point in the valuation difference multiple should result in an approximate value stock outperformance of 3.09% annualised over the subsequent five-year period.

The linear regression output was utilised to determine the historical appropriateness of the model and the strength thereof in explaining and predicting five-year annualised excess returns. This was done by simply adding the actual valuation difference multiples over the period to the OLS coefficients. The outcome of this process is demonstrated in Figure 4.16.

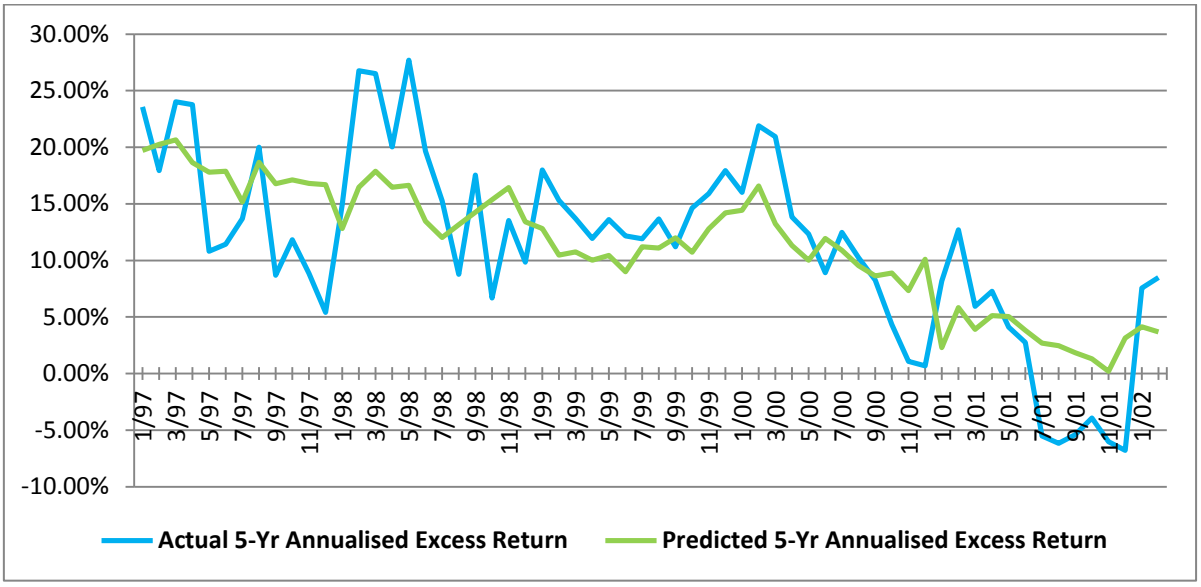



**Figure 4.16: Large-Cap Actual vs. Predicted Five-Year Annualised Excess Returns**

The blue line in Figure 4.16 plots the actual excess returns over the period. The green line in Figure 4.16 represents the outcome of combining the linear regression model and the actual valuation difference multiples over the period. A close trend can be identified between the actual and observed five-year annualised excess return values. This serves as evidence to the appropriateness of the above linear regression model.

#### *4.3.1.2 FTSE/JSE Top-40 Index: March 2002 – October 2006*

The period 2007 to 2009 was characterised by substantial declines in value on stock markets around the globe. With signs of an overpriced housing market in the USA during 2006 and the subsequent sub-prime crisis during 2007, followed by a household debt crisis and sovereign debt crisis, stock market declines were an everyday occurrence. Some value was restored on stock markets during 2010 and 2011 following the sub-prime crisis and global economic meltdown. However, the recent past has been characterised by a high correlation in stock price movements around the world. With two market extremes, a bull and a bear market, being reached within a couple of months apart, some inconsistent patterns are to be expected and thus caution should be exercised when using historical models during such periods of distress.

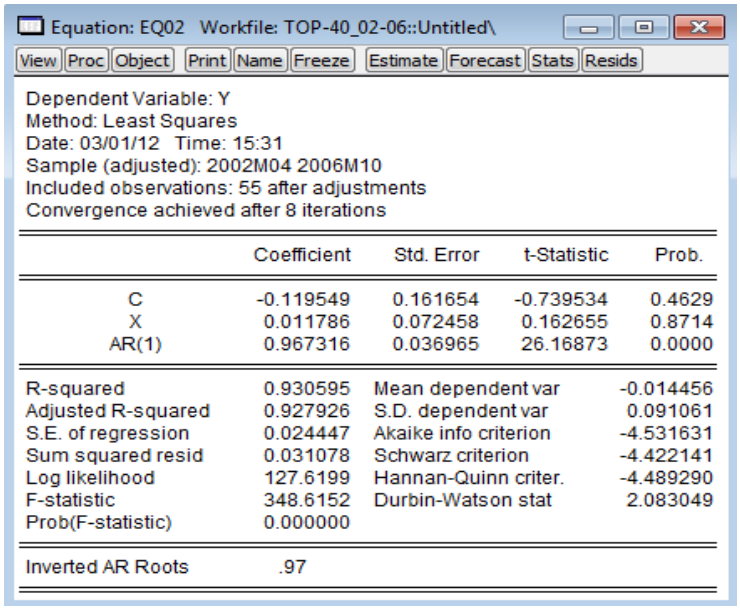
Portfolios constructed after the second structural breakpoint of February 2002 include share price movements during the 2007 to 2008 period of distress and subsequent high correlation in stock price movements after 2009. From a descriptive point of view, no clear evidence of a positive relationship can be identified from Figure 4.12 (p. 85). During the period March 2002 to October 2006, substantial declines in five-year annualised excess returns occurred, coinciding with no change or increases in the valuation difference multiples.

The valuation difference multiples for the period March 2002 to Oct 2006 were segmented into quartiles in order to determine if a decline in the level of the valuation difference multiple coincided with a decline in the five-year annualised excess return.

**Table 4.4: Large-Cap Sample Valuation Difference Multiple Ranges and Subsequent Five-Year Annualised Excess Return (Mar02-Oct06)**

| | Multiple Range | | | | | 5-Yr Annualised Excess Return | |
|---|---|---|---|---|---|---|---|
| **Quartile** | **High** | **Low** | **Average** | **Median** | **# obs.** | **Average (%)** | **Median (%)** |
| **1** | 8.74 | 5.81 | 6.85 | 6.76 | 14 | 5.07 | 8.41 |
| **2** | 5.72 | 4.71 | 5.14 | 5.08 | 14 | -7.61 | -7.64 |
| **3** | 4.71 | 4.24 | 4.47 | 4.50 | 14 | -0.54 | -4.80 |
| **4** | 4.23 | 3.40 | 4.00 | 4.10 | 14 | -2.09 | -6.66 |

Table 4.4 is a summary of the findings of the segmentation process. Although value stocks still outperformed by the widest margin in quartile 1, a definite decline in the valuation difference multiple and subsequent annualised excess return is not as evident as in the pre-breakpoint period.



Equation: EQ02 Workfile: TOP-40_02-06::Untitled\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 03/01/12 Time: 15:31
Sample (adjusted): 2002M04 2006M10
Included observations: 55 after adjustments
Convergence achieved after 8 iterations

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.119549 | 0.161654 | -0.739534 | 0.4629 |
| X | 0.011786 | 0.072458 | 0.162655 | 0.8714 |
| AR(1) | 0.967316 | 0.036965 | 26.16873 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.930595 | Mean dependent var | -0.014456 |
| Adjusted R-squared | 0.927926 | S.D. dependent var | 0.091061 |
| S.E. of regression | 0.024447 | Akaike info criterion | -4.531631 |
| Sum squared resid | 0.031078 | Schwarz criterion | -4.422141 |
| Log likelihood | 127.6199 | Hannan-Quinn criter. | -4.489290 |
| F-statistic | 348.6152 | Durbin-Watson stat | 2.083049 |
| Prob(F-statistic) | 0.000000 | | |

Inverted AR Roots .97

**Figure 4.17: Large-Cap OLS Estimation Output, Mar02 – Oct06**

Figure 4.17 is a summary of the outcome of the linear regression process. Autoregressive modelling techniques were employed to account for the presence of serial correlation. The *t*-statistic and *p*-value of 0.16 and 0.66 respectively indicate that it is not possible to reject the null hypothesis of no relationship between the five-year annualised excess return (dependent variable Y) and the valuation difference multiple (independent variable X). For the period March 2002 to October 2006 it is thus not possible to identify a statistically significant relationship.

### 4.3.2 FTSE/JSE Mid-Cap Index

The first aim of research on the FTSE/JSE Mid-Cap Index was to determine whether the value effect has been present historically. In order to achieve this, monthly portfolios were created based on relative P/B ratio rankings and performance capturing over the subsequent five-year period. In Figure 4.18 the annualised performance of constructed value and growth portfolios over the research period is plotted.

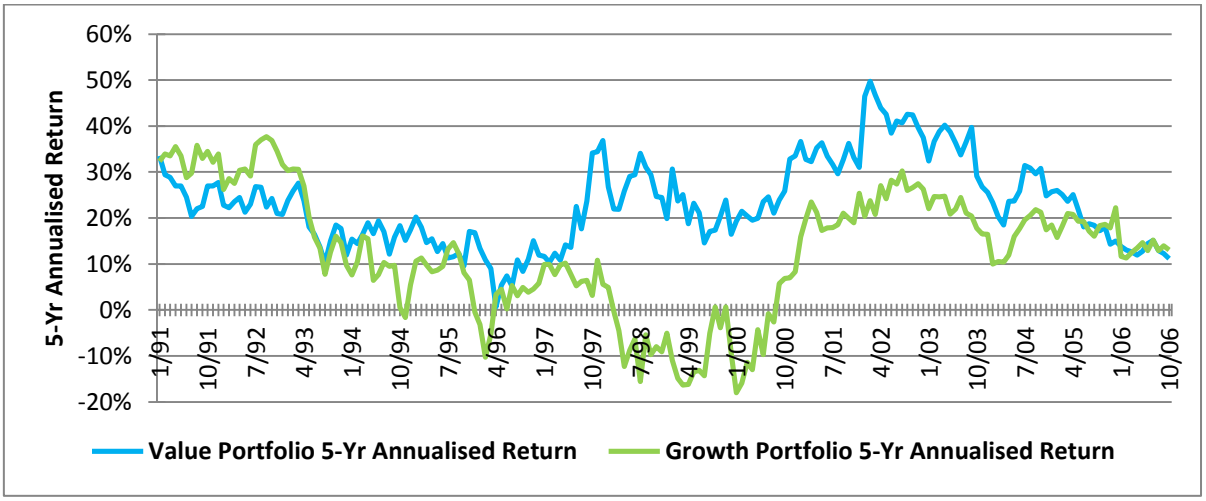



**Figure 4.18: Mid-Cap Actual Five-Year Annualised Returns of the Value and Growth Portfolios**

Value portfolios outperformed in most of the research periods, as indicated by Figure 4.18. Over five-year investment horizons not one value portfolio produced a negative return, with the growth portfolios returning multiple negative returns over the period 1994 to 2000. The highest five-year annualised return achieved by a value portfolio is 49.70% for the portfolio created in February 2002, with the comparable growth portfolio achieving 23.79%. The best performing growth portfolio of July 1992 achieved a five-year annualised return of 35.97%, as compared to the 26.80% achieved by the comparable value portfolio. The respective top performing value and growth portfolios' five-year annualised returns are equivalent to cumulative returns of 652% and 365% respectively. To further gauge the strong performance of value stocks, average five-year annualised quartile-by-quartile returns are plotted in Figure 4.19.

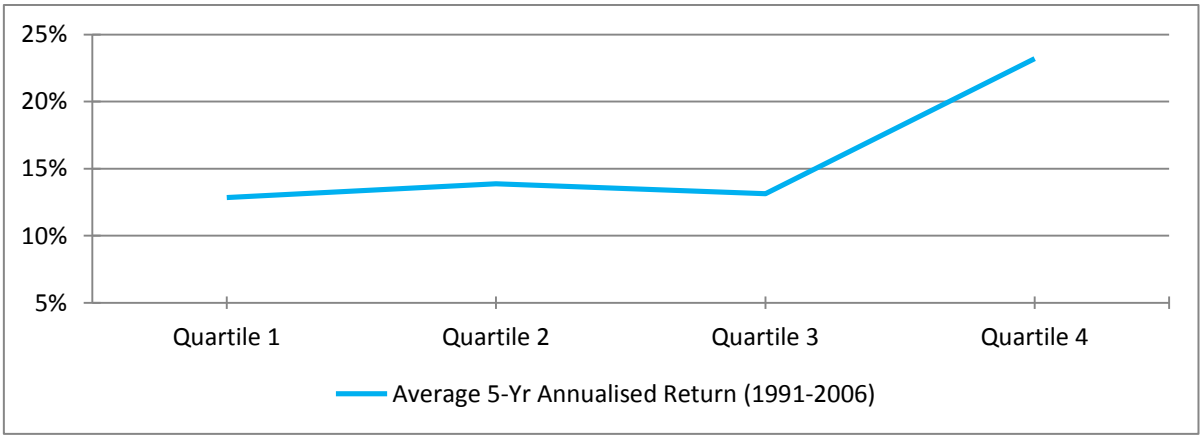



**Figure 4.19: Mid-Cap Average Five-Year Annualised Quartile-by-Quartile Return**

In Figure 4.19 the presence of the value effect, indicating strong outperformance of value stocks over the period is confirmed, with the value portfolios delivering an average five-year annualised return of 23.19%, as compared to the 12.85% of growth portfolios. The value effect was also found to be statistically significant within the FTSE/JSE Mid-Cap Index as indicated by a *t*-value and *p*-value of 10.68 (critical value of 1.96) and 0.00 respectively.

Subsequent to confirming that the value effect is present in Mid-Cap stocks on the JSE, the disparity in valuations between value and growth stocks, utilising the valuation difference multiple, was compared to the subsequent five-year annualised excess returns. The comparison is illustrated in Figure 4.20.

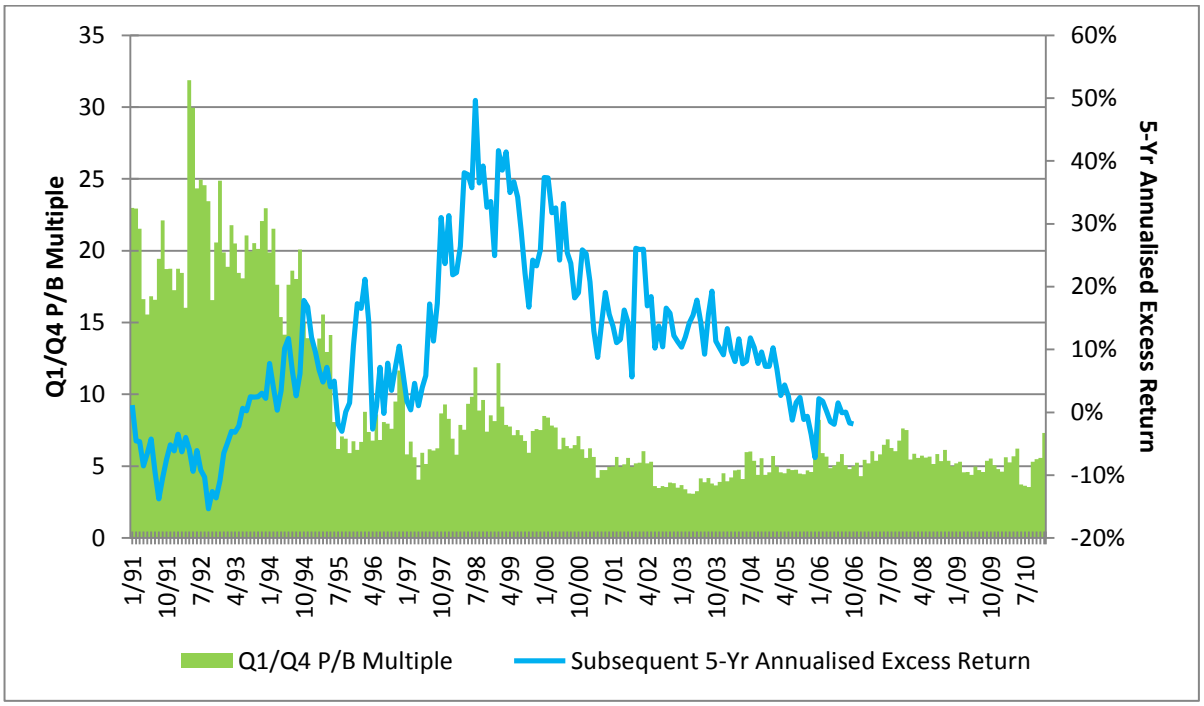



**Figure 4.20: Mid-Cap Valuation Difference Multiples and Subsequent Five-Year Annualised Excess Returns**

Further evidence to the value effect in the form of positive excess returns in most of the periods under investigation is provided in Figure 4.20. The highest outperformance of value stocks over growth stocks was in July 1998 when the valuation difference multiple was at 11.89. This indicated a period during which value stocks outperformed their growth counterparts by 49.64% annually over the subsequent five-year period. The average five-year annualised excess return for the entire research period was 10.34%. The average valuation difference multiple was 8.89 and the median 6.15. At

the end of 2010 the multiple was at 7.32, rising above 7 for only the second time since January 2001.

Prior to testing for structural breakpoints, the entire dataset was tested for statistical significance. As indicated by a *t*-statistic and *p*-value of 3.58 and 0.00 respectively, a positive significant relationship was identified between the five-year annualised excess return and the valuation difference multiple. The OLS estimates indicated that a one point increase in the valuation difference multiple was expected to be accompanied by an increase of approximately 1.81% in the five-year annualised excess return. Autoregressive modelling techniques were utilised to account for the presence of serial correlation in the error terms. Subsequently to confirming the positive relationship between the five-year annualised excess returns and the valuation difference multiples, data was tested for the presence of structural breakpoints. A breakpoint was identified at July 1997, resulting in research methods being applied to the post-breakpoint data, in order to evaluate modern day trends.

In order to further gauge the strong descriptive and inferential results stated above, the dataset for the post-breakpoint period was segmented into quartiles in order to determine how strong the relationship between the five-year annualised excess returns and the valuation difference multiples was at different multiple ranges. Table 4.5 is a summary of the segmentation process.

**Table 4.5: Mid-Cap Sample Valuation Difference Multiple Ranges and Subsequent Five-Year Annualised Excess Return (Aug97-Oct06)**

| | Multiple Range | | | | | 5-Yr Annualised Excess Return | |
|---|---|---|---|---|---|---|---|
| **Quartile** | **High** | **Low** | **Average** | **Median** | **# obs.** | **Average (%)** | **Median (%)** |
| **1** | 12.17 | 7.16 | 8.47 | 8.18 | 28 | 32.55 | 33.90 |
| **2** | 7.09 | 5.38 | 6.09 | 6.03 | 28 | 15.58 | 17.02 |
| **3** | 5.32 | 4.57 | 4.91 | 4.94 | 27 | 7.89 | 6.88 |
| **4** | 4.50 | 3.07 | 3.88 | 3.87 | 28 | 11.05 | 10.81 |

Table 4.5 provides robust evidence of the strong outperformance of value stocks at higher valuation difference multiple levels within the FTSE/JSE Mid-Cap Index. As the valuation difference multiple decreased within each consecutive quartile, it was accompanied with a decline in the five-year annualised excess return.

Subsequent to confirming the presence of the value effect as well as the relationship between the five-year annualised excess returns and the valuation difference multiples, through descriptive analysis, for the period August 1997 to October 2006, data was tested for statistical significance over the post-breakpoint period. A linear regression was conducted with the five-year annualised excess return as the dependent variable and the valuation difference multiple as the independent variable.

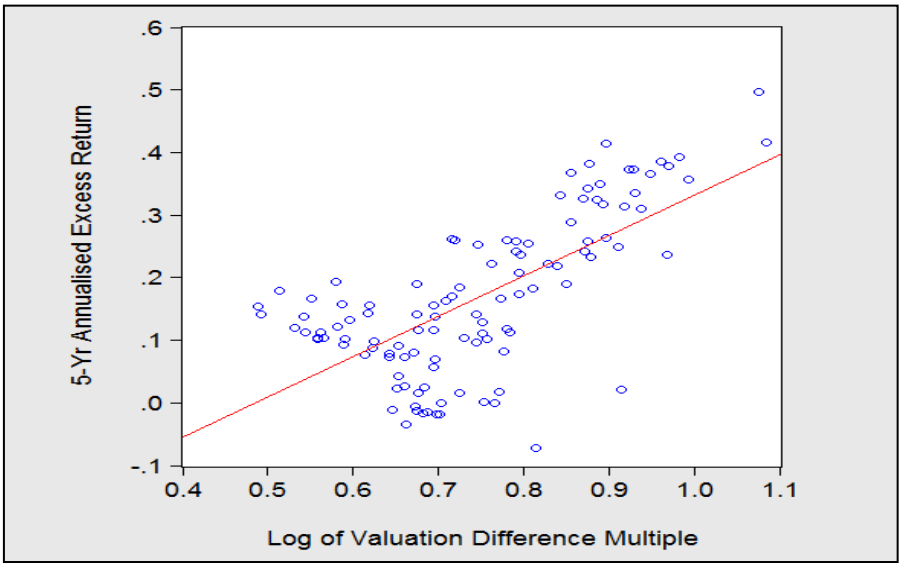
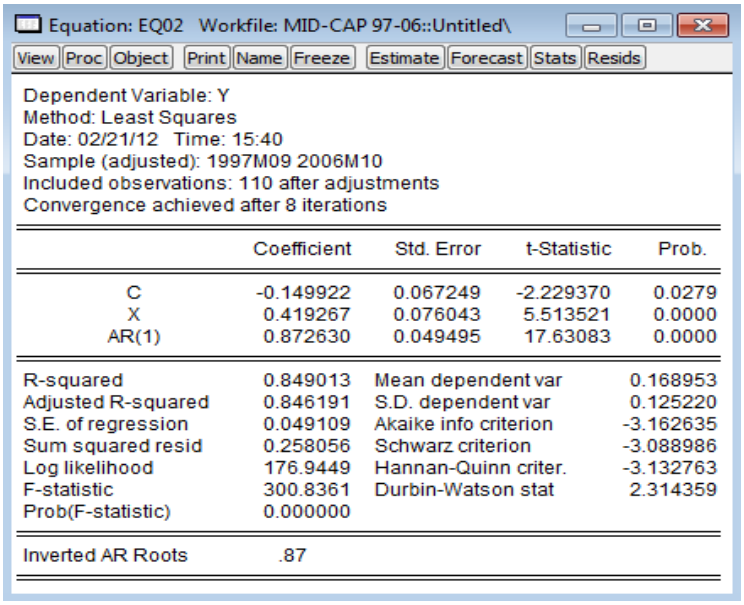



**Figure 4.21: Mid-Cap Linear Regression Line, Aug97 – Oct06**

Figure 4.21 confirms the robust positive relationship between the five-year annualised excess returns and the valuation difference multiples. The upward sloping regression line indicates a positive relationship between the variables. Special mention should be made of the high correlation coefficient of 0.68 between the five-year annualised excess return and the valuation difference multiple.



Equation: EQ02 Workfile: MID-CAP 97-06::Untitled\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 02/21/12 Time: 15:40
Sample (adjusted): 1997M09 2006M10
Included observations: 110 after adjustments
Convergence achieved after 8 iterations

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.149922 | 0.067249 | -2.229370 | 0.0279 |
| X | 0.419267 | 0.076043 | 5.513521 | 0.0000 |
| AR(1) | 0.872630 | 0.049495 | 17.63083 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.849013 | Mean dependent var | 0.168953 |
| Adjusted R-squared | 0.846191 | S.D. dependent var | 0.125220 |
| S.E. of regression | 0.049109 | Akaike info criterion | -3.162635 |
| Sum squared resid | 0.258056 | Schwarz criterion | -3.088986 |
| Log likelihood | 176.9449 | Hannan-Quinn criter. | -3.132763 |
| F-statistic | 300.8361 | Durbin-Watson stat | 2.314359 |
| Prob(F-statistic) | 0.000000 | | |

| | |
|---|---|
| Inverted AR Roots | .87 |

**Figure 4.22: Mid-Cap OLS Estimation Output, Aug97 – Oct06**

Figure 4.22 indicates a strong relationship between the five-year annualised excess return and the valuation difference multiple over the period August 1997 to October 2006. Evidence of the significant relationship is given by the *t*-statistic of 5.51 (critical value of 1.96) and *p*-value of 0.00. Autoregressive modelling techniques were utilised to account for the presence of serial correlation, resulting in a Durbin-Watson test statistic of 2.31, which support the validity of the findings as it can be concluded that residuals are uncorrelated. The model predicted that a one point increase in the valuation difference multiple should lead to an approximate increase of 4.19% in the subsequent five-year annualised excess return.

Based on the linear regression model and the OLS estimates as identified in Figure 4.22, the subsequent step was to determine how accurate the model has been historically. This was done by adding the actual valuation difference multiples to the OLS coefficients and plotting the relationship between the actual five-year annualised excess returns and the predicted five-year annualised excess returns. The returns are plotted in Figure 4.23.

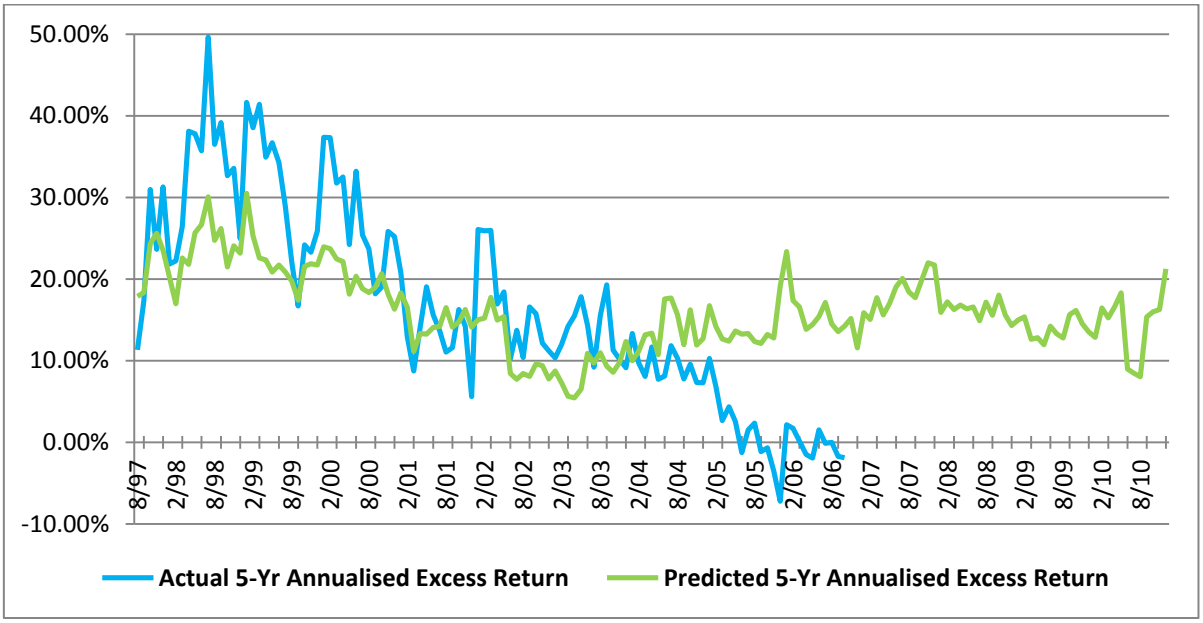



**Figure 4.23: Mid-Cap Actual vs. Predicted Five-Year Annualised Excess Returns**

Figure 4.23 displays a close trend between the actual five-year annualised excess returns and the predicted five-year annualised excess returns over the period 1997 to 2004. The wider dispersion between the actual and predicted line for the post-2004 period is due to extremely bearish sentiments which were present in global markets due to the start of the sub-prime crisis and the subsequent global economic meltdown.

### 4.3.3 FTSE/JSE Small-Cap Index

Bauman *et al*. (1998) could not find the value effect present in the smallest firm capitalisation stocks in a study conducted on international markets. The objective of this part of the study was to determine the situation from a small-capitalisation perspective on the JSE. Stock constituents of the FTSE/JSE Small-Cap Index were ranked according to their respective P/B ratios, resulting in the formation of monthly value and growth portfolios. Performance was tracked for five years after the portfolio inception date, which was annualised for comparison purposes. In Figure 4.24 the respective value and growth portfolios' five-year annualised returns are compared.

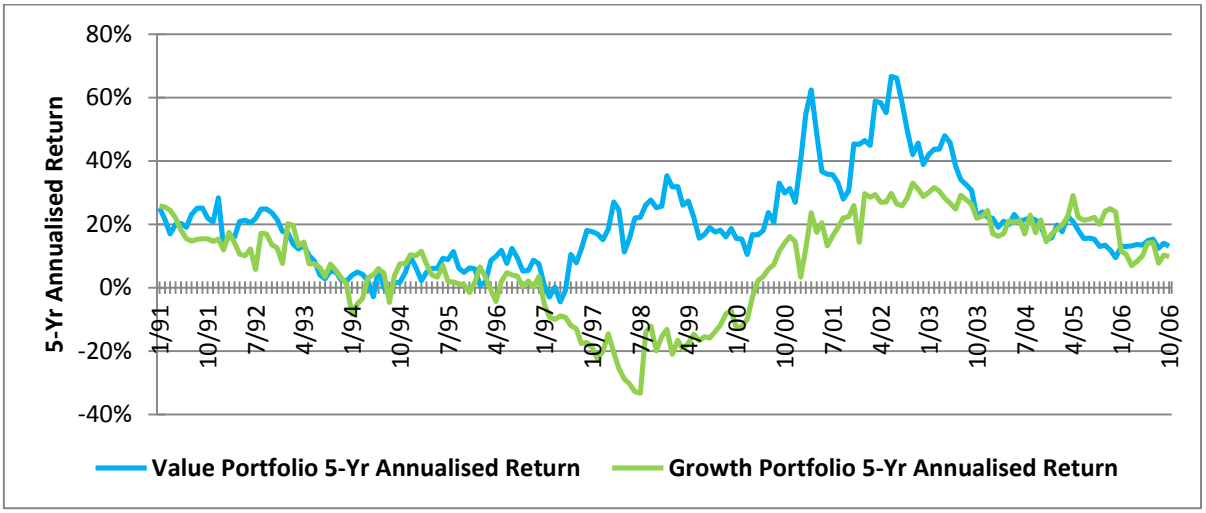



**Figure 4.24: Small-Cap Actual Five-Year Annualised Returns of the Value and Growth Portfolios**

Figure 4.24 shows clear evidence of a value cycle within the FTSE/JSE Small-Cap Index for the period January 1997 to October 2003. Periods before and after the value cycle are characterised by a high correlation in the returns of the respective portfolios. A growth cycle is also identifiable during 2005. The highest return by a value portfolio was 66.57% annualised achieved for the portfolio of June 2002. The coinciding growth portfolio returned 29.80%. The best-performing growth portfolio delivered a return of 32.97% annualised for the five-year period starting in October 2002, with the comparable value portfolio achieving 42.02%. When the quartile-by-quartile returns are analysed, as in Figure 4.25, the average outperformance of value stocks is supported.

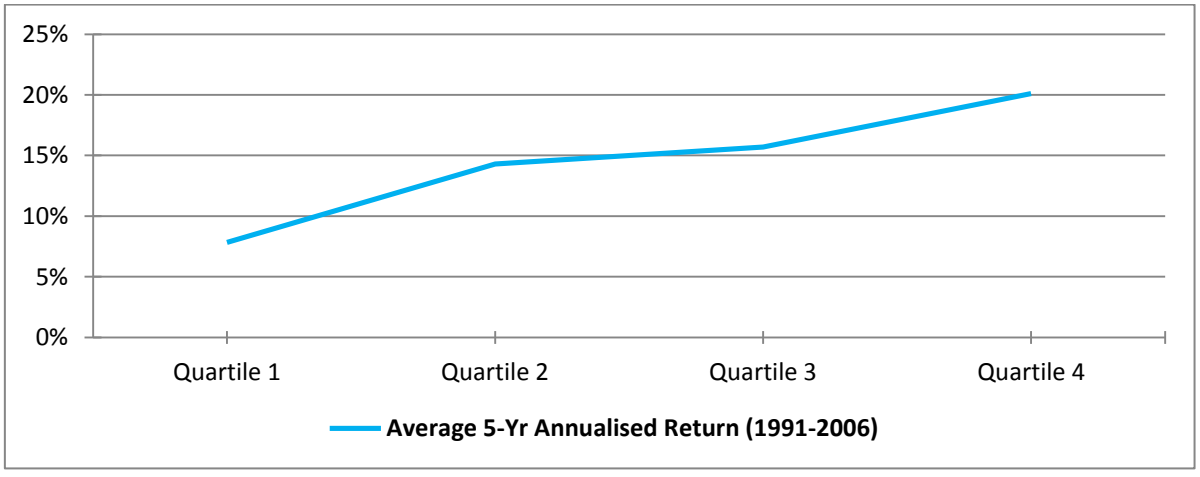



**Figure 4.25: Small-Cap Average Five-Year Annualised Quartile-by-Quartile Return**

As is evident from Figure 4.25, as P/B ratios decreased within each consecutive quartile, the average five-year annualised return increased. The value portfolios (quartile 4) achieved a five-year annualised return of 20.10%, compared to the 14.29% of the quartile 1 growth portfolios. The outperformance of value stocks within the small-cap segment of the market was confirmed from a statistical point of view. Testing the hypothesis of value outperforming growth over the period 1991 to 2006, provided a *t*-statistic and *p*-value of 10.70 and 0.00 respectively, indicating that value stocks outperformed growth stocks significantly over the period of investigation. This study thus found that a value effect was present in the Small-Cap segment of the JSE.

Subsequent to confirming the value effect in the Small-Cap segment of the JSE, it was important to determine during which periods this anomaly was at its strongest. The valuation difference multiple, which measures the disparity in valuations between value and growth stocks, was utilised to serve this purpose.

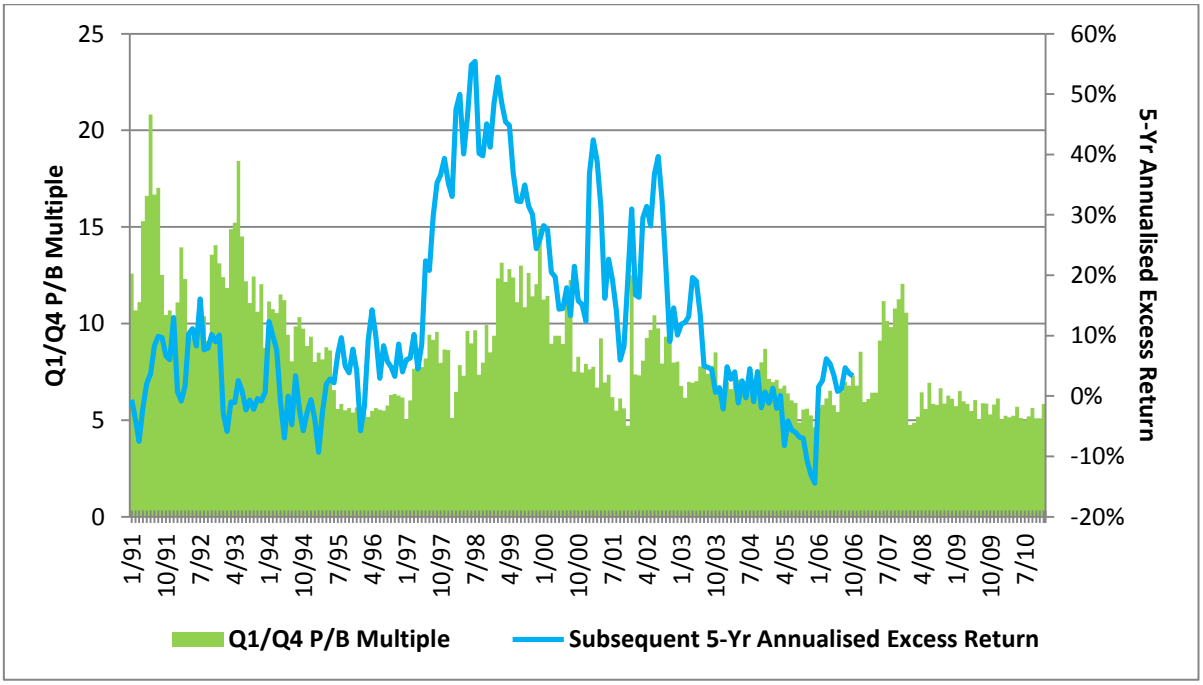



**Figure 4.26: Small-Cap Valuation Difference Multiples and Subsequent Five-Year Annualised Excess Returns**

As illustrated by Figure 4.26, historically when the valuation difference multiple increased, value stocks outperformed their growth counterparts by wide margins. An increasing trend in the five-year annualised excess return along with an upward trend in the valuation difference multiple can clearly be identified. Figure 4.26 exhibits

substantial volatility in the valuation difference multiples. This is in contrast to valuation difference multiple trends identified for the FTSE/JSE All-Share Index (Figure 4.4, p. 76), the FTSE/JSE Top-40 Index (Figure 4.12, p. 85) and the FTSE/JSE Mid-Cap Index (Figure 4.20, p. 94) which showed clear valuation difference multiple trends and less volatility. This could, however, have been expected as more price discrepancies may be present in the Small-Cap index due to less coverage and lower levels of trading to keep market prices close to their fair values.

Analysing the entire period and testing for statistical significance between the five-year annualised excess returns and the valuation difference multiples, the presence of a positive relationship between the variables was confirmed. Applying autoregressive modelling techniques to account for serial correlation and heteroscedasticity, a significant *z*-statistic and *p*-value of 3.20 and 0.00 respectively were obtained. A Durbin-Watson test statistic of 2.00 supported the validity of the findings, indicating that the residuals are indeed uncorrelated. The OLS estimates indicated that a one point increase in the valuation difference multiple should in all likelihood lead to an increase of 1.83% in the five-year annualised excess return.

A structural breakpoint was identified in May 1997 within the FTSE/JSE Small-Cap Index data. Data was subsequently analysed for the period June 1997 to October 2006 to determine if a change in trends can be identified. From a descriptive view a relationship can still be identified between the five-year annualised excess returns and the valuation difference multiples. The highest valuation difference multiple over the period June 1997 to October 2006 was 14.92 in December 1999, reflecting a period during which value stocks outperformed growth stocks by 25.91% annually, over the subsequent five-year period. The average and median ratio over the period June 1997 to October 2006 was 7.66 and 7.02 respectively. When comparing the valuation difference multiple of 5.84 on 31 December 2010 to historical multiple levels, as well as the above-stated average and median multiples, the ratio is found to be relatively low, indicating the possibility of close return patterns between value and growth portfolios in the near future.

In order to determine how consistent the observed positive relationship between the five-year annualised excess returns and the valuation difference multiples was over

the period June 1996 to October 2006, the valuation difference multiple data points were segmented into quartiles ranging from highest to lowest.

**Table 4.6: Small-Cap Sample Valuation Difference Multiple Ranges and Subsequent Five-Year Annualised Excess Return (Jun97-Oct06)**

| | Multiple Range | | | | | 5-Yr Annualised Excess Return | |
|---|---|---|---|---|---|---|---|
| **Quartile** | **High** | **Low** | **Average** | **Median** | **# obs.** | **Average (%)** | **Median (%)** |
| **1** | 14.92 | 9.31 | 11.14 | 11.24 | 29 | 33.42 | 32.22 |
| **2** | 9.25 | 7.63 | 8.35 | 8.16 | 28 | 24.00 | 25.97 |
| **3** | 7.52 | 6.78 | 7.14 | 7.10 | 27 | 10.27 | 4.74 |
| **4** | 6.71 | 4.63 | 5.91 | 6.02 | 29 | 5.27 | 1.57 |

Table 4.6 supports arguments of historical value stock outperformance during times when the valuation difference multiple increased in value within the FTSE/JSE Small-Cap Index. Table 4.6 further indicates that the widest margins of outperformance by value stocks were historically achieved at higher levels of the valuation difference multiple. As the valuation difference multiple decreased within each consecutive quartile, average and median five-year annualised excess return declined.

Statistical inference was subsequently utilised to determine the direction and strength of the relationship between the five-year annualised excess return and the valuation difference multiple. A linear regression was conducted with the five-year annualised excess return as the dependent variable and the valuation difference multiple as the independent variable.

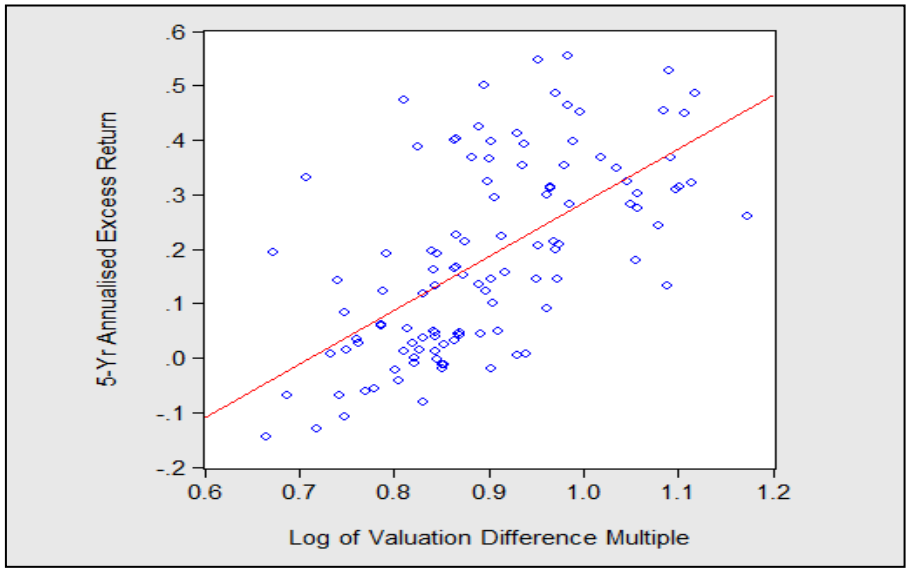



**Figure 4.27: Small-Cap Linear Regression Line, Jun97 – Oct06**

In Figure 4.27 the relationship between the five-year annualised excess returns and the valuation difference multiples is plotted. The upward sloping regression line indicates a strong positive relationship between the variables, which is confirmed by a correlation coefficient of 0.62.

Equation: EQ02 Workfile: SMALLCAP 97-06::Untitled\

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: Y
Method: Least Squares
Date: 02/13/12 Time: 12:03
Sample (adjusted): 1997M07 2006M10
Included observations: 112 after adjustments
Convergence achieved after 6 iterations

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.058131 | 0.108482 | -0.535862 | 0.5931 |
| X | 0.243490 | 0.075854 | 3.209987 | 0.0017 |
| AR(1) | 0.934149 | 0.035346 | 26.42873 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.888649 | Mean dependent var | 0.182944 |
| Adjusted R-squared | 0.886606 | S.D. dependent var | 0.176256 |
| S.E. of regression | 0.059352 | Akaike info criterion | -2.784226 |
| Sum squared resid | 0.383976 | Schwarz criterion | -2.711409 |
| Log likelihood | 158.9167 | Hannan-Quinn criter. | -2.754682 |
| F-statistic | 434.9440 | Durbin-Watson stat | 1.942316 |
| Prob(F-statistic) | 0.000000 | | |

| | |
|---|---|
| Inverted AR Roots | .93 |

**Figure 4.28: Small-Cap OLS Estimation Output, Jun97 – Oct06**

Figure 4.28 indicates a strong positive relationship between the five-year annualised excess return and the valuation difference multiple over the period July 1997 to October 2006. The significance of the relationship is confirmed by a *t*-statistic of 3.21 (critical value of 1.96) and a *p*-value of 0.00. Autoregressive modelling techniques

were utilised to account for serial correlation, resulting in a Durbin-Watson test statistic of 1.94, which support the validity of the findings, as it can be concluded that the residuals are uncorrelated. According to the OLS estimates provided in Figure 4.28, a one point increase in the valuation difference multiple will result in an increase of approximately 2.43% in the five-year annualised excess return.

Subsequent to confirming the relationship between the five-year annualised excess returns and the valuation difference multiples, the model was tested to determine how appropriate and correct it was historically. In order to achieve this, the actual valuation difference multiples were simply added to the OLS coefficients in order to calculate the predicted values. Once the predicted five-year annualised excess return values had been calculated, they were plotted against the actual five-year annualised excess returns to determine historical success.

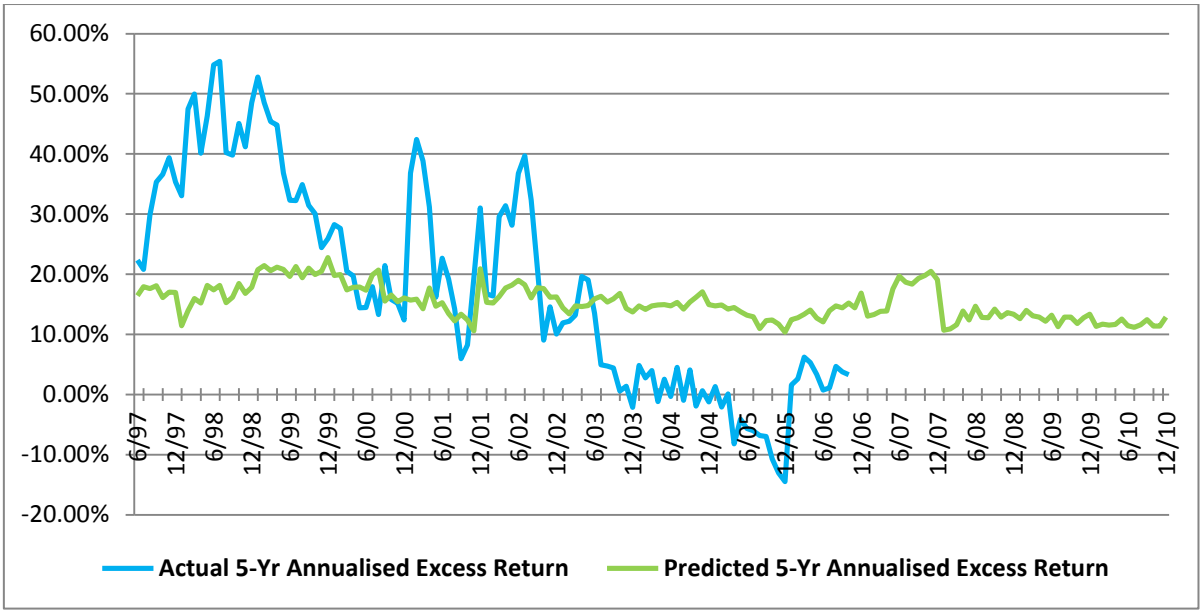



**Figure 4.29: Small-Cap Actual vs. Predicted Five-Year Annualised Excess Returns**

A close trend between the actual five-year annualised excess returns and the predicted five-year annualised excess returns are not as evident in Figure 4.29 as was the case from an FTSE/JSE All-Share, FTSE/JSE Top-40 and FTSE/JSE Mid-Cap Index perspective. With the increased potential of price discrepancies and resultant large price changes to correct for the discrepancies, combined with the variability in the valuation difference multiples, the findings in Figure 4.29 were to be expected.

## 4.4 NEGATIVE BOOK VALUE STOCKS

Book value of a company can occasionally be negative due to a multitude of reasons, making such book values of companies difficult to interpret. Inclusion of negative book value stocks have the potential to distort findings as problems existed with the calculation of P/B ratios and subsequent portfolio creation, as these stocks have no intuitive definition of either value or growth. As a result, for analysis purposes, all negative book value stocks were excluded from the primary and secondary research and subsequently analysed as a separate category to ensure findings of the highest quality. Table 4.7 summarises the outcome of the negative book value stock analysis.

**Table 4.7: Negative Book Value Stock Summary**

| | | # Data points | Avg. Return (%) | Med. Return (%) |
|---|---|---|---|---|
| **ALSI** | **Entire Period** | 362 | 1.59 | 3.27 |
| | **Post-breakpoint** | 344 | 3.98 | 5.82 |
| **TOP-40** | **Entire Period** | 100 | -4.45 | 8.60 |
| | **Post-breakpoint 1** | 54 | -22.22 | -12.64 |
| | **Post-breakpoint 2** | 46 | 16.41 | 16.69 |
| **MID-CAP** | **Entire Period** | 123 | 27.57 | 12.37 |
| | **Post-breakpoint** | 111 | 31.49 | 14.83 |
| **SMALL-CAP** | **Entire Period** | 139 | -17.31 | -47.55 |
| | **Post-breakpoint** | 118 | -10.75 | -43.24 |

Negative book value stocks were analysed from an All-Cap, Large-Cap, Mid-Cap and Small-Cap perspective respectively. Returns were captured over a five-year period and subsequently annualised. The average and median five-year annualised returns of the different market size segments, are summarised in Table 4.7. As indicated by Table 4.7, most negative book value data points (stocks) were found within the FTSE/JSE Small-Cap Index (139 out of 362). This was, however, to be expected as smaller, less established companies which can easily suffer losses over multiple periods, form part of the FTSE/JSE Small-Cap Index.

## 4.5 CONCLUSION

Evidence of the value effect was found in all segments of the JSE Mainboard. It was further established that the outperformance of value stocks, over their growth counterparts, was greater in periods during which the valuation difference multiple increased in value. This was true in all market capitalisation segments and research periods except for the post-March 2002 FTSE/JSE Top-40 segment, where a relationship could not be identified. All findings were confirmed as statistically significant and in general showed a robust, positive relationship, between variables tested.

# CHAPTER 5

# CONCLUSION

With much more emphasis on risk-adjusted returns in the modern investment era, especially after the recent global economic meltdown and resulting increased focus on risk management, rather than achieving a specific return, it is important for investment professionals to understand the effect style investing has on a portfolio's risk/return framework. Correctly anticipating different cycles in advance can greatly improve one's ability to achieve superior returns while maintaining acceptable levels of investment risk.

International research on the value anomaly has indicated it to be present in most developed markets. This includes studies by Fama and French (1992), Lakonishok *et al*. (1994) and Bauman *et al*. (1998) on developed markets such as Australia, Japan, the United Kingdom and the United States of America, to name a few. The Brandes Institute (2008B) conducted an emerging market study, utilising the Worldscope database. They found that on average value stock outperformed their growth counterparts over five-year investment horizons in emerging markets.

The Brandes Institute (2009A) further investigated possible factors that could be indicative of value stock outperformance. They found that within the United States of America (USA) and other developed world markets a positive relationship existed historically between relative valuations of value and growth stocks and the subsequent outperformance of value stocks. Historically when the valuation difference multiple peaked, representing a standardised measure of the relative disparity in valuations between value and growth stocks, value stocks tended to outperform their growth counterparts by wide margins over the subsequent five-year period.

Utilising the methodology of The Brandes Institute (2009A), the value effect was found present in all segments of the JSE Mainboard and this was confirmed through statistical inference. The value effect was further found to be at its strongest during periods when the valuation difference multiple increased in value, confirming a positive relationship between valuation disparities and subsequent value stock

outperformance. An exception to the anomaly was the period post-2002, within the FTSE/JSE Top-40 Index, which was characterised by the outperformance of growth stocks in most periods, resulting from a global economic meltdown and subsequent high correlation in the movement of stock markets and prices around the globe. Concerning the other areas of investigation, the value anomaly was present for the period 1991 to 2006, with value stocks consistently outperforming their growth counterparts by wide margins, and the outperformance of value stocks was found to have a statistically significant relationship with the valuation difference multiple. Table 5.1 is a summary of the post-structural breakpoint quartile-by-quartile performance of all constructed portfolios.

**Table 5.1: Post-Structural Breakpoint Quartile-by-Quartile Summary**

| | | Growth Quartiles | | | Value Quartiles |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| All-Cap | Ann. Return | 10.85% | 13.08% | 17.59% | 24.44% |
| | Stan. Dev. | 12.35% | 11.07% | 9.56% | 10.02% |
| | Sharpe Ratio | -0.03 | 0.17 | 0.67 | 1.32 |
| | # Periods | 128 | | | |
| | Outperformed | 19 | | | 109 |
| Large-Cap Jan97 - Feb02 | Ann. Return | 10.88% | 11.80% | 13.84% | 22.36% |
| | Stan. Dev. | 9.06% | 7.98% | 7.95% | 3.83% |
| | Sharpe Ratio | -0.20 | -0.12 | 0.14 | 2.51 |
| | # Periods | 62 | | | |
| | Outperformed | 6 | | | 56 |
| Large-Cap Mar02 - Oct06 | Ann. Return | 19.61% | 16.61% | 16.69% | 18.31% |
| | Stan. Dev. | 3.50% | 5.55% | 7.22% | 11.31% |
| | Sharpe Ratio | 3.12 | 1.43 | 1.11 | 0.85 |
| | # Periods | 56 | | | |
| | Outperformed | 35 | | | 21 |
| Mid-Cap Aug97 - Oct06 | Ann. Return | 10.29% | 15.60% | 19.72% | 27.13% |
| | Stan. Dev. | 13.43% | 11.46% | 11.33% | 9.08% |
| | Sharpe Ratio | -0.02 | 0.44 | 0.81 | 1.83 |
| | # Periods | 111 | | | |
| | Outperformed | 10 | | | 101 |
| Small-Cap Jun97 - Oct06 | Ann. Return | 8.41% | 15.41% | 21.16% | 26.74% |
| | Stan. Dev. | 18.69% | 14.77% | 10.63% | 13.96% |
| | Sharpe Ratio | -0.12 | 0.33 | 0.99 | 1.16 |
| | # Periods | 113 | | | |
| | Outperformed | 16 | | | 97 |

The number of periods indicates the number of data points in the post structural breakpoint period used to calculate the average five-year annualised return and standard deviation, whereas the outperformance cell indicates the number of periods during which value portfolios or growth portfolios outperformed. The Sharpe ratio is an indicator of portfolio efficiency and is stated as the amount of return achieved in excess of the risk-free rate per unit of risk and is calculated as the portfolio return minus the appropriate risk-free rate divided by the standard deviation of the portfolio. Higher Sharpe ratios indicate more efficient portfolios. Risk was measured using standard deviation and a proxy for the risk-free rate was the average of the 91-day T-Bill rate over the period analysed.

In most of the segments value quartiles on average outperformed their growth counterparts by wide margins in the post-structural breakpoint periods. From a risk-adjusted basis value portfolios also outperformed growth portfolios as the Sharpe ratios indicate that value portfolios delivered higher excess returns per unit of risk. During the research period, most sub-periods were characterised by the outperformance of value stocks on a total return and risk-adjusted basis.

As discussed in much more detail during the preceding findings, the strong outperformance of value stocks was found to have a statistically significant relationship with the valuation difference multiple. The valuation difference multiple was used as a measure of disparity in valuations between value and growth stocks, with periods of wider disparity resulting in higher valuation difference multiples. Historically, as the valuation difference multiple increased, it was found that value stocks tended to outperform their growth counterparts by wider margins, as measured by the five-year annualised excess return, where excess return is calculated as the value portfolio return minus the comparable growth portfolio return. This anomaly was found significant in all market capitalisations over the period 1991 to 2006, except the FTSE/JSE Top-40 Index over the period March 2002 to October 2006.

The period from 2006 was characterised by substantial declines in stock prices around the world, triggered by the USA sub-prime crisis and subsequent household debt and sovereign debt crisis. This resulted in the biggest decline on stock markets since the 1929 depression. During this period investors fled risky investments, with established and trusted investments enjoying the inflow of capital. With this in mind it could have

been expected in some way that investors felt more comfortable during this period of distress to invest in established, liquid and well managed growth companies.

With much of the current research in line with international studies, it is clear that South Africa as a financial market cannot be viewed in isolation from other countries. This is mainly due to the advances in international communication, technological development and the increase in international capital flows which resulted in globalisation and the integration of financial markets around the world. This is especially true for South Africa in the post-1994 era. With a focus on more responsible monetary and fiscal policy in the post-1994 period, a significant decrease in the rate of inflation in South Africa was experienced over the period, following the international trend of lower inflation.

With increasing competition amongst investment firms, consistently achieving above-average returns is of the utmost importance. Over the long term sustainable returns attract new clients, which in turn widens the asset base and supports future growth. With a growing interest in style investing, it is important to note that these strategies exhibit distinct risks and that relative performance of chosen investment styles should not only achieve above-average returns, but should also reward the investor for the additional risks taken.

It should be remembered that past trends or anomalies are no guarantee of future performance. As such past findings and conclusions cannot simply be extrapolated into the future without regard to relevant underlying fundamentals and variables which might influence investment returns in future. It can, however, be instructive to have a thorough understanding of market mechanics and history when attempting to predict the future. As Fama and French (1992) and Lakonishok *et al*. (1994) provide different arguments for value stock outperformance, it was not the purpose of this study to determine the merits of each. This study's findings are, however, consistent with both in the sense of value stocks' outperformance. This current study on the South African equity market further supports the notion of a positive relationship between value stock outperformance and the level of the valuation difference multiple as originally found by The Brandes Institute (2009A) on developed markets. Comparing the findings of the current study to those of international studies, results in the conclusion that South Africa as an emerging market is indeed an international follower, rather

than an economic instigator, making international developments and trends very important to the relative performance of certain classes of stocks within the South Africa market.

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