The application of Fundamental Indexing to the South African Equity Market for historical data dating back to 1996.

Promoter: Prof. JD KRIGE
Student: Rickus Ferreira

Declaration

Hereby I, Rickus Ferreira, declare that this research report is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university in order to obtain an academic qualification.

R Ferreira 15 October 2008

In memory of Willie du Toit

12 November 1984 to 9 April 2007.

You were a good friend and influenced my life in great and special way. I will always keep you in my memories.

"The swift don't win the race. It goes to the worthy, who can divide the word of truth."

- Bob Dylan

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Opsomming

Dit is net moontlik om te meet hoe goed ‘n finansiële portefeulje presteer as dit teenoor ‘n ander soorgelyke portefeulje se prestasie gemeet kan word. Die erkende maatstaf wat al vir jare in die bedryf gebruik word om prestasie te meet, is markkapitalisasie-indekse.

Markkapitalisasie-indekse het die probleem dat hulle outomaties opbrengste verlaag omdat hulle blootstelling aan oorgewaardeerde aandele te hoog is en hul blootstelling aan ondergewaardeerde aandele te laag is. Dit is hierdie blootstellingsprobleem wat gelei het tot die ontwikkeling van die Fundamentele Indeks-konsep deur Research Affiliates in 2005. Die Fundamentele Indeks-konsep weeg elke aandeel in die indeks volgens sy ekonomiese voetspoor in die mark en nie volgens sy markkapitalisasie nie. Die ekonomiese voetspoor vir elke maatskappy word bereken deur vier fundamentele faktore in ag te neem. Die faktore is verkope, boekwaardes, kontantvloeie en dividende.

Die Fundamentele Indeks-konsep het baie goeie resultate opgelewer toe dit in hierdie studie op die Suid-Afrikaanse aandelemark toegepas is. Die Suid-Afrikaanse Fundamentele Indeks het die FTSE/JSE Alle Aandele-indeks geklop met 5.55% p.j., jaarliks saamgestel, oor die periode vanaf 1995 tot 2006. Die hoër opbrengs was verkry met soortgelyke vlakke van risiko as die FTSE/JSE Alle Aandele-indeks. Die Fundamentele Indeks het ook soortgelyke omset gehad as die Alle Aandele-indeks. Die Suid-Afrikaanse Fundamentele Totale Inkomste Index het ook die FTSE/JSE Alle Aandele-indeks uitpresteer met 5.48% p.j., saamgestel oor dieselfde periode.

Die Fundamentele Indeks se uitprestasie is ‘n duidelike bewys dat die sogenaamde effektiewe markteorie nie waar is nie. Volgens moderne portefeuljeteorie behoort dit ontmoontlik te wees om konstante, abnormale wins te maak, wat die opbrengs van ‘n markkapitalisasie-indeks oorskry. Die sukses van Fundamentele Indekse is ‘n bewys dat markkapitalisasie-indekse nie optimaal is nie maar eerder sub-optimaal. Deur spesifiek na die Suid-Afrikaanse mark te kyk, kan gesien word dat hierdie mark ook oneffektief is en dat die FTSE/JSE Alle Aandele-indeks nie die beste maatstaf is waarmee die algehele prestasie van die Suid-Afrikaanse mark gemeet moet word nie

Abstract

Measuring the performance of any financial portfolio is only relevant if compared relative to another similar portfolio. Over the years the norm in the industry has been to use market capitalisation indices as benchmarks to measure performance.

Market capitalisation indices, such as the FTSE/JSE ALSI, create a natural return drag because of the overweighting of overvalued stocks and the underweighting of undervalued stocks. It is this return drag that led to the creation of the Fundamental Indexing concept by Research Affiliates in 2005. Fundamental Indexing weights stocks based on their economic footprint in the market rather than their market capitalisation. The Fundamental Indexing approach uses four metrics, namely sales, book values, dividends and cash flows to calculate this economic footprint. The Fundamental Index is referred to as the RAFI (Research Affiliates Fundamental Index) Index

The Fundamental Index concept delivered very good results when applied to the South African stock market. The South African RAFI Composite Index outperformed the FTSE/JSE All Share Index by 5.55% p.a. compounded annually during the period 1995 to 2006. This return was achieved with a similar risk profile as the FTSE/JSE All Share Index. This index also had similar turnover rates relative to the FTSE/JSE All Share Index. The South African RAFI Composite Index also outperformed the FTSE/JSE All Share Index by 5.48% p.a. compounded during the measurement period when investment income is included.

The Fundamental Index outperformance clearly disproves the efficient market hypothesis. According to modern portfolio theory it is impossible to earn abnormal profits in excess of a market capitalisation index. The success of Fundamental Indices proves that market capitalisation indices are not optimal and deliver sub-optimal returns. Specifically, it can be seen that the South African market is inefficient and that the FTSE/JSE All Share Index is not the best tool for measuring the performance of the financial markets in South Africa.

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LIST OF ACRONYMS

ALSI: FTSE/JSE All Share Index

BV: Book Value

CF: Cash Flow

DIV: Dividend

RAFI: Research Affiliates Fundamental Index

1. INTRODUCTION

1.1 Overview

Constructing investment portfolios is a difficult and complicated process. Whether the portfolio of relevant securities is for personal or corporate investment success, the investment will always require predetermined goals. Calculating the level of investment performance that will be acceptable is the starting goal for practically all investors.

Benchmarking is a global phenomenon that is designed to specifically look at the problem of how to define whether an investment was successful or not. All the big equity exchanges have created a variety of indices that form the basis for measuring portfolio performance.

The Johannesburg Stock Exchange (JSE) was the 19th largest exchange in the world at the end of 2006 based on market capitalisation (Market Information Department, 2007). The JSE consisted of 401 listed companies at the end of December 2006 and a total of 1 047 listed securities. This resulted in a total market capitalisation of R5,041,500,000,000 (Market Information Department, 2007). For the year ending December 2006 the JSE published a total of 37 indices. These 37 indices are distributed in six different subsectors: Headline Indices, Tradable Indices, All Share Economic Group, Specialist Indices, Sub-Sector Indices and the Secondary Market.

The JSE used an Actuaries Index Series up and until March 2001. This index was replaced by the current FTSE/JSE Africa Index Series. According to the FTSE/JSE Africa Index Series' Statement of Principles, "The primary purpose of the indices is to reflect movements in the underlying market accurately" (Immelman 2004:2). The method the FTSE/JSE Africa Index Series uses to reflect these specific market movements is arithmetic weighted indices (Immelman, 2004). The basic idea behind this method is to calculate an index

value using the total market value of that specific index. This method is also commonly referred to as cap-weighted indexing.

The cap-weighted method of calculating indices is the most widely used method for calculating index values. As a result, the cap-weighted method is being regarded as the norm and until recently has been unchallenged in the investment world. The S&P 500 (New York), the FTSE (London), the DAX (Frankfurt) and the CAC (Paris) are some of the major indices that are based on this method.

The rationale behind the use of a cap-weighted method for calculating indices is backed by theory created by William Sharpe (1964). His Capital Asset Pricing Model (CAPM) assumes that a cap-weighted index will be efficient. Empirical results have actually shown that this is not the case and that overvalued stocks are over-weighted in the indices while undervalued stocks have a disproportionately low weight in the indices (Hsu and Campollo, 2006).

Arnott, Hsu and Moore (2005) designed a new and revolutionary method for calculating an index. This method is called Fundamental Indexation and it tries to eliminate most of the weaknesses of the traditional cap-weighted model. Arnott *et al.* (2005) tested this method on a number of equity markets across the world and the results were astonishing. Fundamental indices outperformed the S&P 500 (New York) by about 1.97% per year. These results are for the period 1962-2004 and exclude transaction costs. Another critical result that this study provided is that the risk (beta) in respect of the average cap-weighted indices was higher than in the case of the fundamental indices (Arnott *et al.*, 2005). Hsu and Campollo (2006) reproduced these studies for a twenty-year period (1984-2004) and applied it to 23 different countries (excluding South Africa). They then compared their results with the comparable MSCI cap-weighted indices. The results of this study were also amazing. On average, the fundamental indices outperformed the MSCI indices by 3.5% per year and the average volatility of the fundamental indices was less than the volatility of the MSCI indices. The results from the research of Hsu and Campollo (2006) can be seen in the following table:

Table 1.1: Annualised Return: Fundamental vs. MSCI Indices

Country	Fundamental Index	MSCI Benchmark	Value Added
World	12.36%	8.81%	3.55%
AUSTRALIA	14.53%	11.64%	2.89%
AUSTRIA	16.67%	11.07%	5.60%
BELGIUM	14.25%	12.76%	1.49%
CANADA	14.15%	10.39%	3.76%
DENMARK	15.94%	14.40%	1.54%
FINLAND	16.41%	14.83%	1.59%
FRANCE	14.39%	11.93%	2.45%
GERMANY	12.22%	9.90%	2.33%
GREECE	19.32%	16.08%	3.24%
HONG KONG	15.69%	13.74%	1.95%
IRELAND	17.18%	8.40%	8.78%
ITALY	13.14%	10.08%	3.06%
JAPAN	2.35%	-1.32%	3.67%
NETHERLANDS	13.49%	11.45%	2.04%
NEW ZEALAND	8.07%	7.43%	0.64%
NORWAY	15.51%	10.87%	4.64%
PORTUGAL	12.63%	10.34%	2.29%
SINGAPORE	8.93%	5.76%	3.17%
SPAIN	15.90%	12.40%	3.50%
SWEDEN	16.45%	14.25%	2.20%
SWITZERLAND	13.05%	12.53%	0.52%
UK	12.96%	10.21%	2.76%
US	14.74%	12.36%	2.39%

Source: Adapted from Hsu and Campollo (2006).

Due to these phenomenal results this research will focus on the application of the Fundamental Indexation technique to the South African equity market.

1.2 Background

This research is based on an article written by Arnott *et al.* (2005). In this article the researchers critically analysed the cap-weighted method of calculating a relevant market index. The merits of the cap-weighted method are broadly discussed in their article. These merits include the following: that it is a passive strategy, it is an easy way to participate in the equity market and

that market capitalisation, which forms the basis of the cap-weighted method, is closely correlated to trading liquidity.

Harrry Markowitz, one of the most influential and dynamic financial researchers, developed what is known as modern portfolio theory. Markowitz (1952) defined a new way of calculating a so-called optimal portfolio. He discouraged the whole idea that investing in as large a number of stocks as possible was the portfolio with the least amount of risk.

Hicks (1935) stated that by investing money in a range of different risky securities a less risky portfolio will be formed compared with investing all available capital in one security. Markowitz discouraged this statement by stating that all securities are correlated. Using mean-variance analysis Markowitz created an efficient frontier using the formulas:

$$E = \sum_{i=1}^{N} X_i \mu_i$$

Where:

E = Expected return where

X_i = Percentage of the portfolio invested in security *i* and

μ_i = Expected return of individual security *i*

and

$$V = \sum_{i=1}^{N} \sum_{j=1}^{N} \sigma_{ij} X_i X_j$$

Where:

V = Variance representing the associated risk of the portfolio where

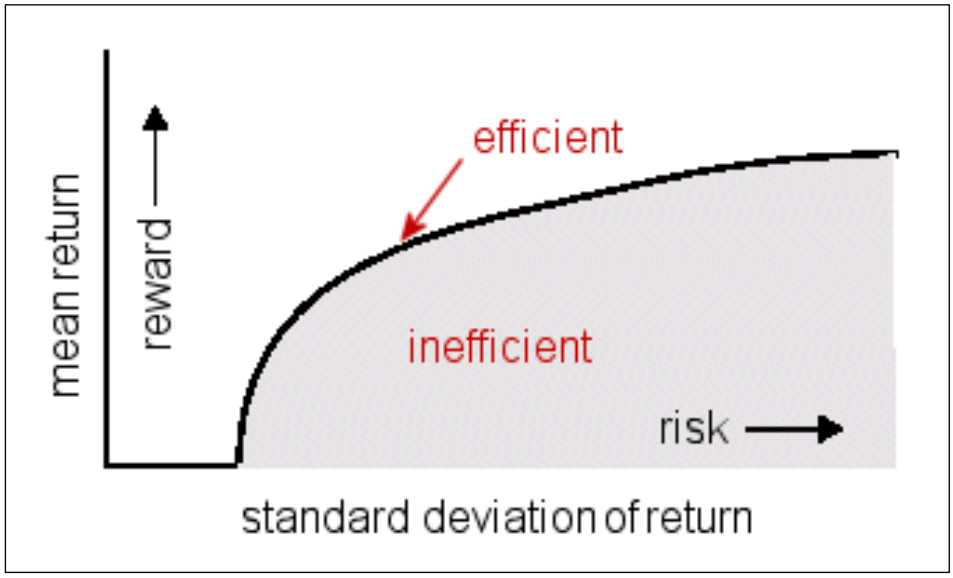
X_i and X_j = Percentage of the portfolio invested in securities *i* and *j* respectively, and

σ_{ij} = Correlation between security *i* and *j*

Markowitz distinguishes himself from Hicks through the last formula. If two stocks are perfectly correlated, they increase the total risk of a portfolio, which

disproves Hicks' statement. The efficient set of securities represented by the mean-variance analysis of Markowitz is shown in Figure 1.1:

Graph 1.1: Efficient Frontier



Source: Adapted from OptQuest: Efficient Frontier (2005).

Brealey (1991) wrote an article that analysed all the major propositions that Markowitz formulated in the world of portfolio theory. The following are two of the most important characteristics that Markowitz defined in terms of investment in a portfolio of securities:

- Diversification is influenced by both mean and variance, and
- Portfolio variance is influenced by individual security variances as well as pair-wise covariances.

Thus, according to the above-stated characteristics of a portfolio, the contribution a security makes to the total risk of a portfolio depends on how it is correlated with other securities.

The relevance of research on portfolio theory with regard to the problem of creating an index is that portfolio theory was the starting point of the Capital Asset Pricing Model (CAPM) (Brealey, 1991).

The CAPM is one of the most widely used and important tools in the investment and corporate world. The CAPM can be used to calculate the cost of capital and it also forms the basis for the measurement of investment performance. The CAPM states in its fundamental form that the “market portfolio” is mean-variance efficient (Arnott *et al.*, 2005). In theory this “market portfolio” contains all securities that can have an influence on an investor’s decision-making ability (Cooley, 1981). It is understandable that finding this range of securities representative of the “market portfolio” is impossible. This need for a “market portfolio” and the difficulty in identifying a relevant “market portfolio” resulted in the creation of an appropriate proxy. This proxy for investing in a portfolio representing the market as a whole is all the relevant **indices** representing the market.

Calculating indices using the cap-weighted approach has always been regarded as a fair reflection of the underlying market it represents. Examples of indices that use the cap-weighted method are the S&P 500, as well as the FTSE/JSE All Share Index. The latter will form the comparable benchmark index in terms of this research.

Hsu (2004) questioned the cap-weighted method as a so-called reflective indexing method and concluded that “cap-weighted portfolios are sub-optimal portfolios*”.* The main conclusion of this research article was that the sub-optimality is a result of the tendency of the cap-weighting method to overweight stocks that are overpriced and underweight stocks that are underpriced. Mispricing exists because of differences between the market value of the stocks and their underlying fundamentals. Hsu (2004) uses a theoretical approach as well as a mathematical approach to emphasise his findings.

In the theoretical approach Hsu (2004) uses a binomial tree example in which the portfolio representing the fair value of the stocks outperforms the conventional cap-weighted portfolio by an amount equal to the noise in the price squared. The empirical evidence concluded that a non-cap-weighted portfolio would outperform a cap-weighted portfolio by $\sigma^2(1 + E[R^*_{I,t+1}])$, where

σ^2 is the variance of the stock and $E[R^*_{I,t+1}]$ is the expected holding period return. Hsu (2004) explains this excess return by the negative alpha of the cap-weighted portfolio.

Reflecting on the CAPM, it is obvious that if the cap-weighted indexing approach is wrong, it will lead to a CAPM that is not mean-variance efficient. Investment decision-making based on a wrong CAPM can have catastrophic consequences.

This obvious problem with the cap-weighted indexing method created a gap in the financial industry for an alternative indexing method. Arnott *et al.* (2005) created the method that is now known as fundamental indexing. Fundamental indexing tries to counter the shortcomings of the cap-weighted method. Hsu (2004) commented that the problem with normal indexing is the inability of stock prices to represent its fundamentals. In creating the Fundamental Index company weights are determined using six crucial fundamentals rather than market capitalisation.

The six crucial fundamentals are **book value, cash flow, revenue, sales, dividends** and **total employment**. In calculating cash flows and revenue, a trailing five-year average is used, and in calculating sales and dividends, trailing five-year gross values are used. Total employment is excluded from calculations because of the immense difficulty in obtaining accurate data with regard to this specific fundamental. In using the fundamental indexing method, separate indices are calculated for the crucial fundamentals excluding employment. Revenue is also excluded due to the similarity between revenue and sales. The Fundamental Composite Index therefore consists of an equally weighted combination of cash flows, sales, book values and dividends. This composite index value is the so-called fundamental index value and is the value that is compared to its cap-weighted counterpart. The cap-weighted counterpart in this research is the FTSE/JSE All Share Index.

One of the main characteristics of the Fundamental Index is that it tries to retain all the advantages the cap-weighted indices have to offer. This includes liquidity, passiveness and easy access to a wide variety of stocks.

The Fundamental Index, like most other financial models, also has hurdles that it has to overcome. Rebalancing of the portfolio in a timely and efficient manner without incurring large transaction costs is possibly the biggest problem. Cap-weighted portfolios rebalance automatically except when a new stock forms part of the securities in the index and subsequently an old stock does not qualify for the index anymore. The Fundamental Index does not automatically rebalance and has to be observed continuously for rebalancing purposes.

Fundamental Indexing gives more weight to low-multiple stocks and a lower weight to high-multiple stocks. This results in a relationship between capitalisation weights and fundamental weights that can be explained by the following formula:

$$\text{Fundamental Weight} = \text{Cap Weight}_i \bullet \frac{\text{Price to Fundamental}_{\text{market}}}{\text{Price to Fundamental}_i}$$

(Brandhorst, 2005a).

Where:

Cap-Weight	= Percentage of share *i* in market cap index
Price to Fundamental$_{Market}$	= Average of the fundamental to price ratios of all shares in the market and
Price to Fundamental *i*	= Price to fundamental ratio of share i.

The application of the Fundamental Indexing method to the JSE requires an understanding of the current state of operations on the JSE. Specific attention has to be given to the Indexing Department of the JSE and its specific calculation methods.

In a simplistic description the current FTSE/JSE Africa Indexing series use the following formula which forms the basis of the cap-weighted method:

$$\textbf{Total market value of all companies} = \frac{\textbf{Index Value}}{\textbf{Latest Index Divisor}}$$

In analysing the FTSE/JSE All Share Index the "total market value of all companies" will be represented by 99% of the total market capitalisation of the JSE equity exchange (Immelman, 2006). The All Share Index therefore consists of the Top 40, Mid-Cap and Small-Cap Indices. The fledgling index is the index that represents the remaining 1% of the total market capitalisation on the equity exchange.

When analysing the more complicated formula for calculating an index, certain other variables appear that are crucial in index calculation. The formula that is based on the chained Paasche method shows the full calculation (Immelman, 2006):

$$\sum_{i=1}^{n} \frac{((p_i \bullet e_i) \bullet s_i \bullet f_i)}{d}$$

Where: n = The number of securities in the Index.

p_i = Price: The latest trade price of the component security (or the price at the close of the Index on the previous day)

e = Exchange Rate: The exchange rate required to convert the security's home currency into the index's base currency. All the JSE shares are traded in rand, and the exchange rate thus remains at a factor of 1.

s = Shares in Issue: The number of shares in issue used by FTSE/JSE for the security, as defined in the Ground Rules.

f = Free Float Factor: The factor to be applied to each security to allow amendments to its weighting, expressed as a number between 0 and 1, where 1 represents a 100% free float. The free float factor for each security is published by FTSE/JSE.

d = Divisor: A figure that represents the total issued share capital of the Index at the base date. The divisor can be adjusted to allow for changes in the issued share capital of individual securities without distorting the Index.

The divisor, shares in issue, exchange rate, price and number of securities are all relatively easy to understand and calculate. Special attention has to be given to the free float factor for each security. The definition of a free float factor is the "portion of shares tradable within the market place for a given stock" (Immelman, 2006). The JSE uses an algorithm to calculate these free float factors and then publishes them. This research will use the free float factors as published by the JSE and will not calculate them separately. The rest of the variables in the Paasche method are easy to obtain.

In a study conducted by Merrill Lynch in their annual fund manager survey during 2006, nine of the 19 fund managers who were interviewed felt that shares on the JSE are overvalued (Mafu, 2007). This feeling provides a basis for justifying this research, especially when looking at the current state of the JSE. If the JSE is currently overvalued as predicted by the fund managers it will result in a Fundamental Index with a higher prospective average return than the FTSE/JSE All Share Index. The reason for this is that the Fundamental Index tries to remove noise inherent in stock prices by calculating its fair value. Thus, the higher the amount of mispricing (noise), the better the Fundamental Index will perform relative to a comparable cap-weighted index.

The biggest beneficiaries of this research will be portfolio managers, pension funds and asset consultants. A fundamental index will provide portfolio managers with a more reliable benchmark for measuring their individual portfolio performance.

Individual investors who hold investments in large portfolios will also be able to benefit from this research. Judging the managers' portfolio performances

based on an alternative indexing method can result in investors changing their perceptions.

The JSE currently publishes two fundamental indices: a FTSE/JSE RAFI Top 40 index and a FTSE/JSE RAFI All Share index. This research will provide insight into how the FTSE/JSE RAFI All Share index is constructed and how it would historically have performed.

1.3 Problem statement

Benchmarking is one of the most important tools for any investor. Comparing results with predetermined goals, as with many facets of life, is one of the most definitive indications of whether a project/investment was successful or not.

The purpose of this study is to determine whether the use of a fundamental indexing method will provide a less biased benchmark than the conventional cap-weighted method currently used by the JSE.

1.4 Objectives of the research

The primary objective of conducting this research on the South African equity market is to determine whether the current use of the traditional cap-weighted index method is an appropriate benchmark for measuring portfolio performance. The main objective is to create an alternative index that should outperform the benchmark index by a reasonable margin.

The Fundamental Index will be calculated for data dating back to 1996, but because the fundamental indices use rolling five-year averages it will be necessary to obtain data from the JSE for the last 15 years.

A secondary objective of the research study is to explore methods to improve the calculation basis of the Fundamental Index. A few sample studies will be

conducted by changing the Fundamental Index method in a specific way. This will not be done in great depth.

Another objective is to investigate which companies were included in the FTSE/JSE All Share Index in the past decade and which of these companies were not represented in the Fundamental Index for the same period. Companies that were included in the Fundamental Index during the past decade and were not represented in the FTSE/JSE All Share Index will also be investigated. This research will also attempt to show how companies were ranked differently relative to their ranking on the FTSE/JSE All Share Index. The results will be used to compile a range of assumptions as to which stocks were possibly overvalued during this period and which stocks were undervalued during the same period. Possible insights might be gained as to the effect of the large mining sector on index representation in the South African market. This objective may also provide insight into the possible current overvaluation of the JSE.

1.5 Methodology

1.5.1 Primary research

1.5.1.1 Population

The population will consist of all the listed securities that have formed part of the JSE since 1996.

1.5.1.2 Sampling

No sampling is needed because this research will require the use of the whole population to achieve consistent and reliable results.

1.5.1.3 Primary research method

The primary research method will be the analysis of all the listed securities that formed part of the JSE equity market from the start of 1996. There are two reasons why this will be the starting point.

In 2002 the JSE changed its indexing method from the JSE Actuaries Indexing method to the FTSE/JSE Africa Indexing method. A rebasing of the so-called “old indices” was conducted in tandem with the replacement of the indexing series, but this was only done for data dating back to July 1995 (Immelman, 2002). The reason why 1996 is chosen as the base year and not 1995 is the fact that the fundamental indexing methodology only rebalances the index once a year on the last trading day. To provide a fair comparison between the Fundamental Index and the FTSE/JSE All Share Index it is considered to be more appropriate to start comparisons only after the first full year for both indices.

The second reason why 1996 is chosen as a base year is that the database used by McGregor BFA for fundamentals only dates back to April 1995 (Palmer, 2007).

1.5.1.4 Acquisition of data

A combination of four databases was used. The Datastream database, provided by Prof Paul van Rensburg from UCT, was used. It must be borne in mind that Datastream does not include information on delisted companies. The I-Net Bridge database was also consulted for currently listed share data not available from Datastream. McGregor BFA was used for all delisted share information in view of the fact that this is the only database containing delisted share data. Reuters was used as a final resort for data not available from the other three databases. All data required for economic statistics or overall market and index statistics was obtained from the I-Net Bridge database.

Professor Willie Hamman from the University of Stellenbosch Business School (USB) was consulted regarding the relevant data for this research. Prof Hamman stated that he has a large database of financials dating back to 1970. The database containing this data was also studied and used. Prof Hamman stated that his data for sales and cash flow figures are particularly detailed and will need little if no modification.

1.5.1.5 Data analysis

The data obtained from all the financial statements was compiled into a database that consisted of all values for the four relevant fundamentals. Five-year rolling averages were also calculated and this information forms part of this database.

The exact model Arnott, Hsu and Moore (2005) used for calculating the Fundamental Index in their research was applied to the database consisting of all the fundamental values for the South African companies.

Included in this model is the composite fundamental index consisting of an equally weighted average of the following four fundamentals: dividends, sales, book values and cash flows.

1.5.2 Secondary research

A wide variety of secondary research initiatives was conducted. Firstly, background information regarding the specific problem in terms of the sub-optimal nature of conventional cap-weighted indices was examined. The formation of the CAPM as a relevant investment tool was researched. The problem of defining a relevant “market portfolio” for use in financial models and its inter-connective relationship with worldwide indices was identified as a relevant topic which could be dissected.

Secondary research focused on the problem of defining the four fundamental values. Cash flows, dividends, sales and book values all have a variety of possible values and meanings. These possibilities were analysed in great depth to provide a list of definitions relevant for use in this research. Specific attention was given to dividends as a fundamental due to changing South African legislation regarding dividends.

1.6 Orientation of the study

The research report will contain the following chapters:

Literature review

This section will analyse past research conducted on the subject of fundamental indexing. The theory behind indexing and the different methods of indexing will be studied. An in-depth study of the JSE will also be conducted.

Methodology

This is the main part of the research. This chapter will contain all the methods that will be used for data analysis.

Results

All relevant results derived from the methodology part of the research will be formulated in such a way that the reader will find it understandable.

Conclusions

After the research is completed the researcher will give his own recommendations as to how the research can be used in the corporate world.

Areas for further research

This study will only focus on the Fundamental Index calculations. The results of this research could provide a guideline for the identification of other areas requiring research.

2. LITERATURE REVIEW

The modern understanding of stock markets and valuations revolve around the concept of market efficiency. The efficient market concept in its most simplified form is the concept of no free profits.

Fama (1970) wrote an influential article on the “Efficient market hypothesis (EMH)”. In this article he defined an efficient market as one where prices “fully reflect” the available information regarding any share. Fama also defined three forms of market efficiency namely: the strong form, semi-strong form and weak form. The strong form represents an efficient market where prices reflect publically available as well as non-public information. The semi-strong form represents a market where prices reflect publically available information and the weak form is where prices reflect historical prices. Malkiel (2003) states if the “EMH” is true, neither technical analysis nor fundamental analysis will be helpful in selecting superior stocks. Technical analysis refers to the analysis of historical stock prices to predict future prices and fundamental analysis refers to the analysis of financial information to select undervalued stocks. Thus, according to the EMH the only way to achieve greater returns is by taking greater risk.

Sharpe (1964) was the first research study to explain the Capital Asset Pricing Model (CAPM). The CAPM was based on a risky asset and a riskless asset. This research was based on extremely simplified assumptions. Litner (1965) took this research a step further and showed how to construct a portfolio in market equilibrium. Market equilibrium is just another way of explaining an efficient market. Market equilibrium refers to the characteristic of financial markets that they always reflect all information available and revert to the mean.

Fama(1970) also showed that the efficient market hypothesis and the CAPM are interconnected, by stating that the efficient market hypothesis is based on the assumption that expected returns, based on the CAPM, can be used to explain an equilibrium market.

Black (1972) took Sharpe's research, which had originally only been proven under harsh assumptions, and expanded it to prove market efficiency under less restrictive assumptions. Fama and Macbeth (1973) formulated rigorous mathematical proof to show market efficiency by looking at beta risk as a form of market risk.

The era of research focused on market efficiency has been followed by research focused on market anomalies. Market anomalies are consistent deviations from market equilibrium not explained by their risk-return relationship. The concept of anomalies, which repeatedly appear in the market, is important. These anomalies critically evaluated and even disproved market efficiency.

The size anomaly has been one of the first market anomalies to be proven. The size effect is the concept that smaller companies, based on total market value, deliver better returns over time than large companies. Banz (1981) conducted research on the returns of a variety of shares. He differentiated between shares by looking at their size. The size of a company was determined by its total market capitalisation. The historical results obtained from the research showed that small companies outperformed large companies. Reinganum (1982) also showed that the size anomaly does exist. He proved that the outperformance delivered by small companies compared to large companies was not due to risk differences.

The second anomaly is the value and growth anomaly. Brandhorst (2005b) explains the concept of value as the idea that stocks with high price-to-earnings ratios are more likely to experience overvaluation errors, while stocks with low price-to-earnings ratios are more likely to experience undervaluation errors. Basu (1975) concluded that the historical earnings yields of companies showed that markets are inefficient. Basu (1983) later did in-depth research to show that earnings yields of shares do predict returns. Rosenberg, Reid and Lanstein (1985) took an alternative view of the earnings yield anomaly and showed that companies with high book-value-to-price

relationships outperformed shares with low book-value-to-price relationships. They also stated that a return strategy based on buying shares with negative returns in prior months outperformed shares with positive returns in previous months. This was clearly seen as proof that prices are inefficient. Davis (1994) also did a study on the explanatory power of several valuation metrics on share returns. This study was conducted on a database free of survivorship bias. The results showed that book-to-market ratios, earnings yields and cash-to-price ratios could all explain the cross-sectional return of stocks. Although these studies were based on historical returns, they clearly showed that in some parts of the market abnormal profits could be achieved.

Bhandari (1988) did research on the impact of financial leverage and returns, and showed that companies' debt-to-equity ratios negatively correlated with their returns. Reinganum (1981) stated that using capitalisation-weighted indices to estimate beta risk was incorrect and that it also proved market inefficiency. Chan, Hamao, and Lakonishok (1991) did research on the Japanese stock market from 1971 to 1988 based on a combination of these anomalies. Their results were consistent with previous studies. The earnings yield, size effect and book-to-market ratio anomalies all existed. They also showed that the cash-flow-to-price ratio positively correlated with share returns. The results showed that the book-to-market ratio and cash-to-book ratios had the most significant impact on return differences.

Fama and French (1992) published a landmark article in financial literature. They combined all the so-called anomalies to create a three-factor model to show market efficiency. The idea was to build a model with the same base as the capital asset pricing model (CAPM). They combined the size effect, value effect and momentum effect, which refers to historical returns predicting future returns. The three-factor model was seen as new proof of market efficiency by incorporating the anomalies into one model.

It was clear that the market contained anomalies and that certain criteria led to better performance results than other. But what were the reasons for these anomalies?

Lakonishok and Shapiro (1986) did an intensive study on the size effect and concluded that the size effect cannot be explained by the risks inherent in the shares. Chan and Chen (1988) suggested that the size effect was due to the miscalculation of betas in the past. They suggested that risk should rather be measured by a multifactor model. Chan and Chen (1991) suggested more reasons for the size effect. They stated that small companies are less efficiently run and may have more financial leverage resulting in normal risk not being a relevant measure of the intrinsic value of a share.

A few research studies tried to explain why the value effect exists. Shefrin and Statman (1995) conducted interesting research. They stated that the Fortune 500 is a possible reason why investors choose growth stocks even if value historically always outperforms growth stocks. They say investors see good companies as companies with low book-to-market ratios, and that “good” stocks are associated with good companies. This view of investors completely contradicts historical research. When high-quality companies loose money it is regarded as the market’s fault. However, when low-quality companies loose money it is regarded as the investors’ mistake. Lakonishok, Shleifer and Vishny (1994) provided evidence that value strategies fare better than growth strategies because they capitalise on suboptimal investor behaviour and not on risk differences. Value strategies on average take three to five years to unlock value, and deviate considerably from the market during that period. The risk is possibly too high for the managers to take on.

Table 2.1 shows the results obtained by Lakonishok *et al.* (1994*)* for the period between 1968 and 1989. It is clear that the value portfolios on the right have higher average returns as well as compounded returns. The same results were obtained for cash flow-to-price ratios and earnings yields.

Table 2.1: Book-to-market ratios

AR = Average return

CR = Compounded return

R_t = The average return in year *t* after formation, *t* = 1,...,5

SAAR = The average annual size-adjusted return computed over 5 postformation years.

	Glamour									Value
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
R_1	0.11	0.117	0.135	0.123	0.131	0.154	0.154	0.17	0.183	0.173
R_2	0.079	0.107	0.14	0.145	0.153	0.156	0.169	0.164	0.182	0.188
R_3	0.107	0.132	0.155	0.167	0.165	0.172	0.191	0.207	0.196	0.204
R_4	0.081	0.133	0.136	0.16	0.17	0.169	0.188	0.204	0.213	0.207
R_5	0.088	0.137	0.163	0.175	0.171	0.176	0.216	0.201	0.206	0.215
AR	0.093	0.125	0.146	0.154	0.158	0.166	0.184	0.189	0.196	0.198
CR	0.56	0.802	0.973	1.045	1.082	1.152	1.32	1.375	1.449	1.462
SAAR	-0.043	-0.02	-0.003	0.004	0.006	0.012	0.024	0.028	0.033	0.035

Source: Adapted from Lakonishok *et al.* (1994).

La Porta, Lakonishok, Shleifer and Vishny (1997) analysed whether events influence returns. Event returns have to do with announcements and expectational errors. They found that event returns account for 25% to 30% of the abnormal returns in shares over 2-year to 3-year periods, and 15% to 30% over 4-year to 5-year periods. Large companies are continuously evaluated and have lower expectational errors. Conrad, Cooper, and Kaul (2003) also analysed the value effect and found that data snooping do explain a large percentage of the excess returns created by value over growth.

Building on the concept of anomalies, a few researchers published work stating that the anomalies are wrongly explained or wrongly defined. Berk (1995) stated that the size effect is not an anomaly and should be observed in any economy, and that the extra returns observed for smaller companies are correct. Jagannathan and Wang (1996) also analysed market anomalies by modifying the Fama and French three-factor model. They dropped the assumptions that beta is constant over time and that the returns on stocks measure the returns on aggregate wealth. They found that after altering the Fama and French model by removing these assumptions the size effect is

much smaller than previously stated, and that even the conditional CAPM explained returns better than the Fama and French model.

Bush (2007) found that value does not outperform growth; only the outliers in value portfolios outperform capitalisation-weighted indices. Ferguson and Shockley (2003) also criticised the concept of market anomalies. According to them beta is related to leverage and therefore related to anomalies. The so-called deviation in the market should not be referred to as market anomalies. Bulkley, Harris and Herrerias (2004) also support the efficient market hypothesis and say the book-to-market ratio explains excess returns and that this finding is consistent with the assumption that it is a risk measure. Chordia, Roll and Subrahmanyam (2005) analysed market efficiency over short periods of time. They found that the market does not have inefficiencies or anomalies at intervals of thirty minutes. They also stated that the market is weak-form efficient between periods of five minutes to one day.

Some more modern work has also been done on style analysis. Bhargava and Malhorta (2006) researched the predictive power of price-earnings ratios under various statistical tests. They found that price-earnings ratios predict prices well and if autocorrelation and heteroscedasticity are removed then the price-earnings ratio has less predictive power. Petkova and Zhang (2005) did in-depth research on the risk return characteristics of value and growth shares. It was found that the risk difference between value and growth shares is too small to explain the difference in returns. Allen (2007) stated that the size effect is important between different asset classes and portfolios.
Over the past three decades style analyses, especially those based on size, value and growth, have formed a significant part of financial market research. William Sharpe, one of the main specialists on the concept of market efficiency, stated that style forms a big part of returns (Sharpe, 1992). He also stated that companies with big research budgets have lower book-to-market ratios. The article stated that 92.2% of returns was due to style selection while only 7.8% was influenced by the remaining factors.

The existence of market anomalies resulted in researchers trying to understand how specific investors value shares. This resulted in the creation of a term called market noise. Market noise refers to that part of the market, which does not trade on correct fundamental values, but simply trades based on some unknown idea.

Black (1986) stated that noise trading results in inefficiencies but because of its unpredictable nature, one cannot act on these inefficiencies. He clearly states that noise trading results in prices being less efficient. Liquid markets require large volumes of trading which will lead to more noise trading and non-perfect markets.

Shefrin and Statman (1994) wrote an influential article on the understanding of market noise. They stated that noise traders move prices away from their predicted prices based on efficient markets. They also stated that this noise trading can result in abnormal profits as explained by the market anomalies. Some moves, but not all moves, are protected by efficient markets. This clearly shows that stock prices should not only be based on information; noise trading must also be looked at.

De Long, Shleifer, Summers and Waldman (1990) stated that noise traders do exist and that they create a place where fundamental analysis is less important for arbitrageurs while pseudosignal analysis is more important. Arnott, Hsu, Lui and Markowitz (2006) stated that noise trading does create size and value effects. Uncertainty in asset values creates noise and this is more so for smaller and so-called cheaper securities. Arnott and Hsu (2006) also wrote a controversial article where they stated that cap-weighted indices, as explained by modern portfolio theory, are suboptimal as can be seen by anomalies. Pricing noise is created by investor herding that creates over-reaction and under-reaction in markets, and this creates anomalies. They also stated that the Fama and French anomalies can be explained if we accept that there is noise in prices.

The over-reaction and under-reaction explained above is well-documented by De Bondt and Thaler (1985). They did research on winners and losers. Winners are defined as stocks that over the previous 36 months performed best while losers are defined as stocks which over the same period of time performed worst. The losers' portfolio is then created by selecting the bottom 10% while winners come from the top 10%. They found that after 36 months the losers outperformed the winners by 24% to 26%. This shows that investors do overreact and that this overreaction is much more focused on losers than winners. They also documented that losers perform best in the month of January. De Bondt and Thaler (1987) then extended their original study to show that the CAPM or size effect does not create the winner-loser effect. These studies on overreaction show that the theory, which states that noise is created by investors' reactions, is viable.

The idea of noise trading which creates market anomalies comes from the fact that not all investors value shares in the same way. According to certain literature, there are specific ways to value companies. The problem is that these valuation methods are mostly based on the concept of an efficient market.

Perold (2004) explains the importance of the CAPM. The capital asset pricing model is an extension of the efficient market concept. The CAPM provides clear guidelines on how to diversify portfolio risk as well as what risks to accept for what expected returns. If all investors valued shares based on the CAPM there would be no noise traders and therefore no abnormal profits would be attainable. This is not the case, as has been discussed above.

Fama and French (2004) point out the logic of the CAPM and say it has a good theoretical ground but has empirical problems like the value anomaly. It should therefore never be used in practice. Markowitz (2005) also states that the CAPM has its problems. He compares the financial world to the science world and states that, just as science theories are based on a frictionless world, the CAPM theory is based on a simplified version of the financial markets, and should therefore be modified.

Lewellen and Nagel (2006) analysed a modified CAPM, namely the conditional CAPM. They did rigorous regression analysis and found that the conditional CAPM does not explain market anomalies.

The big problem in the financial world is share valuation. The original market efficiency concept was disproved and after extensive research on market anomalies and noise trading it became clear that companies' fundamental values are not always reflected in their share prices.

Chan, Karceski and Lakonishok (1998) found that fundamental factors explain risk premiums in returns well. They also found that macro economic factors did not explain the premiums in shares well. The fundamental factors used were cash-flow-to-price ratios, book-to-market ratios, size and dividend yields. Therefore, fundamental strategies for choosing stocks are best.

Hsu (2004) mathematically showed that if markets are noisy, capitalisation-weighted indices are suboptimal. He showed that portfolios based on fundamentals outperformed portfolios based on capital-weighted indices. Extensive literature has shown the market to be noisy which in effect implies that indices based on market efficiency are suboptimal. Arnott (2005) states that capitalisation-weighted indices create a return drag because they overweight stocks which trade above their fundamental value and underweight stocks which trade below their fundamental value.

Treynor (2005) uses a mathematical example to explain the overweighting and underweighting problem. Let us assume that two investors both have R10 to invest and that they can choose between two stocks with the following prices:
Price stock A: R(5 + e)
Price stock B: R(5 – e)
Where e = the price error added and e < 5.
Investor A invests in a market capitalisation index as follows.
Stock A investment R5 + e
Stock B investment R5 – e

The investor gets a true value worth:

$$(5+e)\left[\frac{5}{5+e}\right]+(5-e)\left[\frac{5}{5-e}\right]=10$$

Investor B splits his money equally between the shares:

Stock A: R5

Stock B: R5

The investor gets a true value worth:

$$5\left[\frac{5}{5+e}\right]+5\left[\frac{5}{5-e}\right]=\left[\frac{1}{1-\left(\frac{e}{5}\right)^2}\right]10>10$$

The part in brackets is always greater than 1. As a result, investor B gets more true value than Investor A.

Arnott (2006) uses the technology bubble of the late 1990s to show that capitalisation-weighted indices are at fault. Technology stock prices increased based on predictions and expectations, and not because of fundamentals. This reiterates the point that noise trading influences market movements away from fundamentals.

There are index-specific problems with market-capitalisation indices. Denis, McConnell, Ovtchinnikov and Yu (2003) did research on how shares are affected by inclusion in an index. They specifically looked at how a share's price reacted after that share was included in the S&P 500 Index. The results showed that including a share in the S&P 500 Index resulted in it having higher earnings per share forecasts relative to benchmark companies and a subsequent improvement in realized earnings. The reason for this is that index companies are analysed more than non-index shares. Inclusion in the S&P 500 is therefore not an information-free event. Chen, Noronha and Singal (2006) showed that even though market indices are seen as passive, the index loses money when it is reconstituted. The Russell 2000 lost about 130 basis points per year because of the resulting transaction costs of reconstituting alone.

Arnott *et al.* (2005) then created an index based on fundamental factors rather than market capitalisations. They felt that a portfolio based on fundamentals would be a better representation of overall market movements than normal indices. The index created is called the Fundamental Index. The Fundamental Index tries to weight companies based on their economic footprints. The Fundamental Index uses four metrics to measure any company's economic footprint. Sales, book values, cash flows and dividends are used as metrics. These four metrics are each used to determine a share's economic footprint per factor. The results for all four factors are then averaged to obtain the percentage weight of each share in the Fundamental Index. The historical back-tested results of the index showed that it would have outperformed a similar market capitalisation index by some margin. The RAFI 1000 (Research Affiliates Fundamental Index) outperformed the reference portfolio by 2.12% compounded annually from 1962 to 2004. This was obtained at lower levels of risk. The main concept is to create an indicator of market movements that is not influenced by noise or anomalies in the same way as normal market indices.

Hsu and Campollo (2006) replicated the Fundamental Index concept in 23 other countries. The results showed that the average outperformance over the 23 countries was 2.8% from 1984 to 2004. It was also found that the Fundamental Indices performed poorly in bubble periods but well in post-bubble periods.

Arnott and West (2006) did further research on Fundamental Indices. They found that Fundamental Indices' relative returns were higher in international markets (not USA) and in the case of small company indices. The small composite Fundamental Index outperformed the Russell 2000 by 3.6% from 1979 to 2006. This shows that it does not create excess returns because of the size effect. Estrada (2006) specifically looked at a fundamental index based only on the dividend measure. It was found that the Fundamental Dividend Index outperformed the Capitalisation Index by 1.9%. This research was done from 1974 to 2005.

These results prove that historically, over a long period of time, the Fundamental Index concept clearly adds value relative to market capitalisation indices.

The Fundamental Index concept has not been received well throughout the investment community. The concept that the market is full of noise trading and that it does not represent the underlying fundamentals of shares is controversial.

Perold (2007) states that holding a market capitalisation index does not change the probability that a share is overvalued or undervalued. He states that market capitalisation indices do not impose performance drags on shares. Fama and French (2007) stated that Fundamental Indexing is a triumph of marketing. They state that it is only a new way of marketing value investing and no new idea.

IndexUniverse Staff (2006) wrote an article explaining what Bogle and Malkiel had to say about fundamental indices. According to them, Bogle and Malkiel regard the Fundamental Index concept as a fad that probably does well due to value performance after the technology bubble. Bogle and Malkiel say Fundamental Index returns will be neutralised by reversion to the mean. They say that on average investors underperform in the market as a result of costs and that the Fundamental Index has higher costs resulting in a return drag relative to market capitalisation indices. They also say the Fundamental Index concept will do well in value and small cap booms. The article also explains how William Bernstein showed that two-thirds of the Fundamental Index performance is due to an inadvertent factor and only one-third is due to the fundamental techniques used. He states that this one-third is not significant.

To conclude: the Fundamental Index concept is a revolutionary idea. The historical back-tested results have been good in most, if not all, studies done worldwide. The Fundamental Index creates outperformance because its methodology is based purely on company fundamentals and not on investor sentiment.

The idea that market capitalisation indices are flawed and non-optimal is difficult if not impossible to dismiss. Proof of the performance drags has been seen and is created by several anomalies associated with market capitalisation indices. Small companies outperform large companies, value shares outperform growth shares, losers beat winners, transaction costs when reconstituting an index and a variety of other anomalies are associated with market capitalisation indices. The fact remains: no index will ever be optimal due to noise. The Fundamental Index has resulted in higher returns in the past and has therefore been closer to an optimal index then market capitalisation indices.

A variety of style-based research studies have been conducted in South Africa. Robertson and Van Rensburg (2003) found that value is positively related to all sectors. The value effect was found to be stronger in the industrial and financial sectors, and the weakest in the resources sector. They also found that the financial sector is the only sector in which returns are positively related to companies' debt-to-equity ratios. Fraser and Page (2000) found that value and momentum anomalies do exist on the JSE and can predict prices in one month's time. Van Rensburg and Rousseau (2004) looked at the value effect by considering the price-earnings ratios of shares on the JSE. They found that the value effect becomes larger the longer the holding period. The momentum of value shares over 12 months was found to be poor. They found that the value effect was mostly created by a minority of shares over particular periods. Van Rensburg and Robertson (2002) showed that historical price-earnings ratios and the size effect had the strongest explanatory power of the cross-sectional returns on the JSE. They then extended their research to contradict the CAPM. They found that low price-earnings stocks had lower betas and that beta was inversely related to returns (Van Rensburg and Robertson, 2003). Van Rensburg and Stanley (1997) also studied the concept of anomalies and showed that share returns on the JSE are better explained by a two-factor model consisting of the Gold Index and Industrial Index than a model only consisting of the All Share Index. The All Share Index was found to have less predictive power on share returns in South Africa. Van Rensburg (2002) re-evaluated the previous study and

concluded that the Industrial Index should be replaced by the Financial-Industrial Index and Resources Index.

An article published by Bergesen and Ward (1996) stated that for the period from 1978 to 1992, market-value-to-book-value ratios of companies did not predict their long term returns well. This was a surprising result but is possibly less important due to the study being conducted long before Van Rensburg and Rousseau (2004) showed that the value effect does exist in South Africa. Scher and Muller (2005) published another contradicting article in which they showed that small cap and value unit trusts were consistently the worst performing unit trusts. This could possibly be due to poor management by unit trust managers or to high management fees.

The winner-loser portfolio strategy was replicated in South Africa by Cubbin, Eidne, Firer and Gilbert (2006). The results were consistent with the De Bondt and Thaler (1985) results. This shows that investors on the JSE also overreact. They also stated that the value effect exists in South Africa.

Testing the Fundamental Index concept in the South African market environment has merit. The South African market has been known to deviate from theory. Wolmarans (2000) showed that using dividends to value stocks is insufficient in South Africa, which is contradictory to international research. Based on research in Ghana, Abekah (2005) also showed that fundamentals do not explain stock returns in emerging markets well. The South African market reacts and operates differently to developed markets. The results obtained from a South African Fundamental Index could provide valuable insight into the differences between developed and emerging markets.

3. DATA AND METHODOLOGY

3.1 Data

3.1.1 Acquisition

The Fundamental Index consists of six core accounting values: sales, revenue, dividends, cash flows, book values and employment. Only four of these values are used in the calculation of the Fundamental Index. The two values which are excluded are employment and revenues. The reason for excluding employment is the seemingly impossible task of quantifying such a value. Revenue is excluded because of its close resemblance to sales.

The availability of financial data pertaining to publicly listed companies in South Africa is a huge problem. The main problems are caused by the so-called phenomenon of survivorship bias and look-ahead bias as well as by the number of years for which data is available.

Survivorship bias relates to the problem that arises when a company is delisted from the stock market and is then also removed from the database. Conducting research on variables relating to a database that suffers from survivorship bias usually results in inconsistent and possibly overstated results. In research conducted by Pawley (2006) it is stated that any performance results created by using a data set containing survivorship bias should be re-adjusted.

Look-ahead bias refers to the use of historical data in the wrong time frame. The best example is the release of a company's financial results usually a few months after year-end. Thus, when research is based on such financial statements it is usually stated that these values are year-end values. The problem is that dividends are usually declared a few months after year-end. The research will therefore use dividend values a few months before they were actually declared.

The problem with a database that only covers data for a limited number of years is that the shorter the period over which the financial research is conducted, the less robust the findings are. This is mainly due to the fact that financial markets operate in cycles, and any new financial data will only have legitimacy if it is tested in conditions simulating all possible cycles that a financial market can experience.

To create a Fundamental Index that represents the South African stock market all these problems had to be evaluated. A system was created which combines four different databases, each with its own advantages and disadvantages, in an attempt to obtain the most user-friendly and transparent set of data. The newly created data set was then used as the main source of data for the Fundamental Index.

The following four databases were used: the *Datastream* database from the University of Cape Town, *I-Net Bridge, McGregor BFA* and *Reuters.* The published annual financial statements of certain companies were compared with the financial values contained in the four different databases. To represent the market fairly, the companies chosen for the comparisons were selected from all sectors. *Anglo Ashanti* and *BHP Billiton* were selected from the resources sector. *Standard Bank* and *Old Mutual* were selected from the financial sector, and *Massmart* and *Shoprite* from the industrial sector. The values were mostly identical. Data anomalies or inconsistencies examined during the data comparisons are explained in the section below.

3.1.2 Database selection

This section explains how the problem of biases is solved, as well as which database best represents which value of the Fundamental Index.

3.1.2.1 Survivorship bias

McGregor is the only database that accounts for survivorship bias. The data of all previously delisted companies were therefore obtained from McGregor.

3.1.2.2 Book values

Book values for the specified companies were basically identical in the four databases after adjustment based on a standardised definition, which is explained below. For book values the databases were used in the following order: Datastream followed by I-Net Bridge, McGregor and Reuters. Should a company's data therefore not appear in the Datastream or I-Net Bridge databases, which was always the case for delisted companies, McGregor was used. In very few instances Reuters was used.

3.1.2.3 Dividends

Dividends are best described by the *Datastream* database because of its monthly rebalancing system. This system shows in exactly which month interim as well as final dividends are paid. This eliminates look-ahead bias.

Datastream values were therefore used where possible. The order in which the databases were used was the same as in the case of book values. The only problem with the above-mentioned order is that the companies not included in the Datastream database were not free of look-ahead bias. This is due to the fact that all the other databases used suffer from look-ahead bias. Therefore, because all the data of delisted companies were obtained from McGregor, all the delisted companies' data suffers from look-ahead bias. Delisted companies on average form a fairly small part of the market and are therefore not seen as a big problem.

3.1.2.4 Sales

Sales was a difficult value to standardise. In the end it was decided that the values in the Datastream, I-Net Bridge and McGregor databases were basically equal in terms of the values pertaining to the resources and industrial sectors. However, for the financial sector only McGregor data were used.

The reason for this is that resource and industrial companies sell physical products and the number of products sold can be quantified. On the other side of the spectrum financial companies do not sell physical products. Financial companies generate turnover or sales from a range of sources. This range of sources necessitated the creation of a standardised definition of sales for financial institutions. The McGregor database provides a detailed breakdown of the income statement for each company. The definition for the sales of financial companies was created using a composition of different income statement items. Resource and industrial databases were therefore used in the same order as dividends and book values. However, for financial companies only the McGregor database was used.

3.1.2.5 Cash flow

Cash flow values were obtained from the McGregor income statement values. One of the most commonly used values in the definition of a company's cash flow is *net cash flow before operating income.* This value is obtained from a company's cash flow statement. The databases used in this study were inconsistent and incomplete in terms of their cash flow statements. Due to these inconsistencies it was decided to create a standardised definition of the cash flows of each company by also using the income statement values in the financial companies' sales scenarios.

3.1.3 Defining the specific data values

3.1.3.1 Book values

McGregor, Datastream and I-Net Bridge used the same definition for book values. According to this definition book value is ordinary shareholders' capital plus non-distributable reserves plus distributable reserves.

3.1.3.2 Dividends

According to the manual created by Rob Arnott for the Fundamental Index the dividend amount that should be used is all cash dividends paid. This study did exactly the same and only used cash dividends paid.

3.1.3.3 Sales

Sales created a big problem in terms of the financial companies. Financial institutions make money by lending, borrowing and investing money. This creates the following dilemma: What is the core money-making activity of a financial institution in terms of its main revenue?

According to the JSE manual (Forsman, 2005) financial firms can be subdivided into the following categories:

Table 3.1 : Financial subcategories on the JSE			
Financials	Banks	Banks	Banks
	Insurance	Non-life Insurance	Full Line Insurance
			Insurance Brokers
			Property & Casualty Insurance
			Reinsurance
		Life Insurance	Life Insurance
	Financial Services	Real Estate	Real Estate Holding & Development
			Real Estate Investment Trusts
		General Financial	Asset Managers
			Consumer Finance
			Specialty Finance
			Investment Services
			Mortgage Finance
		Equity Investment Instruments	Equity Investment Instruments
		Non-equity Investment	Non-equity Investment Instruments

Source: Adapted from Forsman (2005).

The categories (highlighted in red) which created the problems were banks, all the insurance companies, the real estate investment trusts, investment services, equity investment instruments and non-equity investment instruments.

After careful consideration and interviews with Ilise Botha, CA at Distell, and Leon Brummer, manager of McGregor BFA, the following was decided: Sales for banks, real estate investment trusts, investment services and investment instruments should be represented by interest earned on deposits, and sales for insurance companies should be represented by premiums earned.

3.1.3.4 Cash flow

The Fundamental Index manual (FTSE/RAFI, 2007) states that the cash flow value used in the calculation of all the RAFI indices is defined as operating income plus depreciation.

In analysing the McGregor database it was found that implementing this definition would cause inconsistencies. The reason for this is that in the McGregor data set operating income is calculated before interest income and expenses. Using this value in the research would create a bias towards non-financial companies.

Financial companies receive a large portion of their income from interest. Therefore, eliminating interest from the equation would result in cash flow that does not properly represent the cash generated by financial companies.

Cash flow was defined as *profit before taxation plus depreciation plus extraordinary profits*, where profit before tax equals net income plus taxation, and extraordinary profits are profits gained from extraordinary activities

3.2 Methodology

In this research it was attempted to recreate the exact methodology used in the *Fundamental Indexation* article by Rob Arnott, Jason Hsu and Phillip Moore in 2005.

Creating any alternative index (a non-cap-weighted index) is based on the idea of creating an index where the weights given to each asset in the relevant index are different from their cap-weights. The idea of a Fundamental Index is underpinned by the following question: Do the market cap-weights of each company actually represent the value of the company?

The Fundamental Index weighs companies by analysing their economic size rather than their relative market size (Arnott *et al.*, 2005). Defining the

economic size of a company relative to the universe of stocks is another problem. A company's economic size can be represented by what it will produce in the future or it can be measured by looking at what profits and performance it has achieved in the past.

Arnott *et al.* (2005) decided to combine four historical values to create the Fundamental Index of each stock universe. The reasoning is that the only true way in which a company can be measured is by what it has done historically, as the future of any company is impossible to predict.

Arnott *et al.* (2005) decided to combine four historical economic values for each company to measure its economic footprint. The reason for using four values instead of only one is because this method would render more accurate values. Combining these four economic values removes the weaknesses of each value independently and replaces it with a composite value. For example: A dividend-only index will underperform in bull markets and will have a larger tracking error (Arnott and West, 2006). In a South African context companies with large dividend payouts are usually in the financial sector and usually produce less growth but more stability, whereas companies with large book values produce more growth but less stability.

Immelman (2004) in the calculation guide for the JSE Africa Index Series explains the exact method of how FTSE calculates a cap-weighted index. The basic equation is:

$$\textbf{Index Value} = \frac{\textbf{Total Free Float Adjusted Market Capitalisation}}{\textbf{Divisor}}$$

When an index is formed for the first time the divisor is an arbitrary number. This number is chosen to give the index a fixed value at its starting date. The index value is only a number which represents how a set of values has moved since its starting date, i.e. the date on which the value was fixed. In the case of a cap-weighted index the movement in the index would reflect the

movement in the total market capitalisation of the universe of stocks being indexed.

The table below explains how an index represents stock price changes based on the assumption that the market consists of three stocks with the following characteristics:

Table 3.2: A practical example of a Cap-Weighted Index

	Free Float Market Capitalisation on Day 1	Free Float Market Capitalisation on Day 2
Stock A	R1,200,000	R1,500,000
Stock B	R3,500,000	R3,600,000
Stock C	R2,600,000	R2,650,000

Now set the Index Value = 100 on Day 1.
The equation above the divisor can therefore be calculated as follows:

$$100 = \frac{1{,}200{,}000 + 3{,}500{,}000 + 2{,}600{,}000}{Divisor}$$

$$Divisor = \frac{7{,}300{,}000}{100}$$

$$= 73{,}000$$

The divisor is therefore 73,000 at the end of Day 1.
The index value now changes to the following on Day 2:

$$IndexValue = \frac{1{,}500{,}000 + 3{,}600{,}000 + 2650{,}000}{Divisor}$$

$$= \frac{7{,}750{,}000}{73{,}000}$$

$$= 106{,}16$$

The index changed from 100 on Day 1 to 106.16 on Day 2. This equates to a 6.16% increase in the index value as well as a 6.165% increase in the total free float adjusted market cap. Note that the divisor stays constant while the total free float adjusted market cap changes, which results in the change in the index.

The reason why the above method uses the divisor is to ensure that changes in the structure of the market do not affect the consistency of the index value. The divisor allows the index equation to handle the deletion and addition of companies in the market as well as stock splits, without being affected.

Continuing from the previous example it is easy to see how the different companies are weighted in a cap-weighted index. Each company is weighted according to its representation of the total market capitalisation. On Day 1, Company A represents (1,200,000/7,300,000)*100 = 16.44% of the market in terms of capitalisation. Using the same calculation method it can also be calculated that on Day 1 Company B and Company C represent 47.95% and 35.61% of the market respectively.

In order for this research to be applicable the index being created should be comparable with a relevant benchmark. The benchmark should be a cap-weighted index as the Fundamental Index claims to be an improvement on cap-weighted indexing. The Fundamental Index methodology will in theory measure how the relevant cap-weighted index compares to the Fundamental Index by using the same indexing data but with different company weights. The cap-weighted index will weigh companies based on their market cap and the Fundamental Index will weigh all the relevant companies based on their economic footprint, which will be represented by the four factors proposed by Arnott *et al.* (2005).

The cap-weighted index that will be used as benchmark and basis for the research is the JSE ALSI.

The JSE ALSI is the index representing the movement in the market capitalisation of the top 99% of companies listed on the JSE, based on their individual market capitalisation.

The ALSI is calculated by the using the following formula, which is a standardised calculation method used by the FTSE worldwide (Immelman, 2004):

$$\frac{\sum_{i=1}^{n}((p_i \bullet e_i) \bullet s_i \bullet f_i)}{d}$$

$$i = 1,2,3.....,n$$

Where: n = Number of securities in the Index.

p = Price: The latest trade price of the component security (or the price at the close of the Index on the previous day).

e = Exchange rate: The exchange rate required to convert the security's home currency into the index's base currency. All JSE shares are traded in rand, and the exchange rate therefore remains at a factor of 1.

s = Shares in issue: The number of shares in issue used by FTSE/JSE for the security, as defined in the Ground Rules.

f = Free float factor: The factor to be applied to each security to allow amendments to its weighting, expressed as a number between 0 and 1, where 1 represents a 100% free float. The free float factor for each security is published by FTSE/JSE.

d = Divisor: A figure that represents the total issued share capital of the Index at the base date. The divisor can be adjusted to allow changes in the issued share capital of individual securities without distorting the Index.

The formula represents a free float adjusted market capitalisation platform. The JSE ALSI is rebased each quarter. This means that each quarter the constituents representing the index universe are re-evaluated and changed.

The method used by the Research Affiliates for creating the Research Affiliates Fundamental Index (RAFI) is based on the following formula (FTSE/RAFI, 2007):

$$\frac{\sum_{i=1}^{n}((p_i \bullet e) \bullet s_i \bullet f_i \bullet c_i)}{d}$$

Where: ci = FTSE RAFI adjustment factor

The calculation is exactly the same except for the factor above the line denoted by *ci.* This factor is called the FTSE RAFI adjustment factor and adjusts the cap-weighted index to form the Fundamental Index.

The value *ci* is calculated by dividing a company's RAFI fundamental value by its free float adjusted market capitalisation. *ci* can mathematically be written as follows:

$$c_i = \frac{r_i}{(p_i \bullet e) \bullet s_i \bullet f_i}$$

Where: *ri* = RAFI fundamental value of Company i.

The RAFI fundamental value used for each company is calculated by multiplying each company's fundamental percentage weighting in the Fundamental Index by 10,000,000.

Therefore, *ci* in the FTSE/RAFI index formula results in the following formula:

$$\frac{\sum_{i=1}^{n} \left((p_i \bullet e) \bullet s_i \bullet f_i \bullet \frac{r_i}{((p_i \bullet e) \bullet s_i \bullet f_i)}\right)}{d}$$

If the RAFI index methodology is simplified by eliminating the identical numerator and denominator terms, the index calculation will appear as follows:

$$\frac{\sum_{i=1}^{n} r_i}{d}$$

This is the sum of all the RAFI fundamental values of all the companies representing the population of index constituents divided by the index divisor.

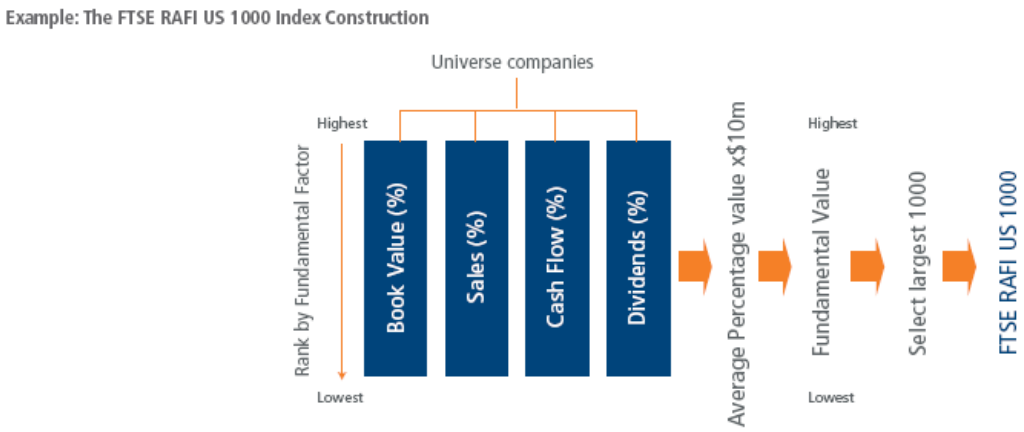
Even though the formula could have been written as above it was set up in the same way as the normal FTSE cap-weighted index calculation times the *ci* factor. This allows for a consistent index not influenced by rights issues, stock splits and companies being deleted or added to the index.

Calculating the value of *ri* according to the FTSE/RAFI manual the following six-step process has to be followed:

- Choose an index universe.
- Calculate each stock's percentage representation of the universe using only sales values.
- Calculate each stock's percentage representation of the universe using only cash flow values.
- Calculate each stock's percentage representation of the universe using only book values.
- Calculate each stock's percentage representation of the universe using only dividend values.
- A company's RAFI fundamental value is defined as the average of the four percentage values multiplied by 10,000,000. Where a company pays a zero dividend the RAFI fundamental value is the average of the three remaining percentage values multiplied by 10,000,000.

The figure below shows how the FTSE RAFI US 1000 is created.

Graph 3.1: Fundamental Index Construction



Source: Adapted from FTSE/RAFI (2006).

After applying the above-mentioned six steps, all the companies are ranked according to their RAFI fundamental values and the top 1000 are used for the creation of the RAFI US 1000 index, which is the main RAFI index used in research.

The FTSE/RAFI indices are rebased annually. The rebasing takes place in March. The reason why the rebasing takes place annually rather than quarterly as in the case of most market cap indices is that the financial statements required to calculate the RAFI fundamental factors of the companies in the index are only published annually.

The methodology in this research report varies from the methodology used to calculate the FTSE/RAFI US 1000 in several ways.

The Fundamental Index created in this research will also be rebalanced annually. However, the rebalancing will take place on 31 December instead of 31 March. December has been chosen because of the simplicity to compare companies at the end of the year. Databases provide annual values for companies but do not necessarily state when the values were released during the year. The annual figures represented in the databases cover the period from 1 January to 31 December each year.

This research will use the FTSE/JSE ALSI constituents at the end of each year as the universe of stocks for the Fundamental Index.

The formulation of a Fundamental Index based on historical data from the JSE Securities Exchange created a few complications.

To calculate a Fundamental Index on the USA stock market Rob Arnott decided to create a RAFI US 1000 with the idea of comparing it to the relevant Russell 1000. In South Africa the only market index represented by a fixed number of South African companies is the JSE Top 40. It was decided that conducting research on only 40 companies would not be representative of the

whole South African stock market. It was decided that the index best representing the entire stock market is the JSE ALSI.

The RAFI 1000 represents the top 1000 companies in the USA based on their RAFI fundamental values. The benchmark used for the measurement of the RAFI 1000 is the Russell 1000. The Russell 1000 represents the top 1 000 companies in the USA based on their market capitalisation values. The constituents of the Russell 1000 index and the RAFI 1000 are therefore different.

The constituents of the Fundamental Index used in this study are the same as the constituents of the comparable benchmark, namely the FTSE/JSE ALSI.

Using the ALSI constituents rather than calculating new constituents created an advantage in terms of the calculation of the divisor. The methodology was created in such a way that the calculation of the divisor for a RAFI and cap-weighted FTSE/JSE ALSI index would be the same. This eliminates the need to recalculate the divisor each year based on company deletions, additions and stock splits. This is also the main reason why the *ci* factor is added to normal index methodology rather than creating a new calculation methodology altogether.

The ALSI divisor can be calculated for each year by using the index values and historical market capitalisation values. The divisor for the Fundamental Index was calculated by simply adjusting it proportionally based on the divisor of the ALSI. The following simplified example using fictional values shows how the divisor will be adjusted:

Table 3.3: Fundamental Index example using ALSI methodology								
	Market Cap 2000	Fundamental Value 2000	Divisor 2000	Index Value 2000	Market Cap 2001	Fundamental Value 2001	Divisor 2001	Index Value 2001
ALSI	1000	-	1	1000	2200	-	2	1100
Fundamental Index	-	1000	2	500	-	1000	**4**	250

The 2001divisor for the Fundamental Index is calculated as:

$$\text{FundamentalIndexDivisor2001} = \text{FundamentalIndexDivisor2000} \bullet \frac{\text{ALSIDivisor2001}}{\text{ALSIDivisor2000}}$$

$$\text{FundamentalIndexDivisor2001} = 2 \bullet \frac{2}{1} = 4$$

After analysing the simplified FTSE/RAFI formula $\frac{\sum_{i=1}^{n} r_i}{d}$ it was found that it does not incorporate any price changes. This provided grounds for rejecting the methodology. As stated above *ri* (RAFI Fundamental Value) is the fundamental percentage of each company in the index multiplied by 10,000,000. Closer inspection of this definition resulted in the belief that the methodology explained above will always result in 10,000,000 divided by the divisor. The reasoning behind this is explained below: The percentage weightings of any index should always add up to 100%. An index should always show the movement of the stock universe as a whole. The table below assumes a five-stock universe with the following fundamental weightings in Year 1 and Year 2:

Table 3.4: Example for rejecting normal stated RAFI methodology				
	Stock A	Stock B	Stock C	Stock D
Year 1	25%	25%	25%	25%
Year 2	10%	20%	30%	40%

The $\sum_{i=1}^{n} r_i$ term for Year 1 and Year 2 would be calculated as follows:

Year 1:

$$\sum_{i=1}^{n} r_i = (0.25 \bullet 10{,}000{,}000) + (0.25 \bullet 10{,}000{,}000) + (0.25 \bullet 10{,}000{,}000) + (0.25 \bullet 10{,}000{,}000)$$
$$= 10{,}000{,}000$$

Year 2:

$$\sum_{i=1}^{n} r_i = (0.1 \bullet 10{,}000{,}000) + (0.2 \bullet 10{,}000{,}000) + (0.3 \bullet 10{,}000{,}000) + (0.4 \bullet 10{,}000{,}000)$$
$$= 10{,}000{,}000$$

It is obvious that it will always result in the same value. The methodology therefore had to be reassessed. The above-mentioned methodology will incorporate the necessary changes in the market but not growth in the market.

The calculation was re-evaluated and a method that incorporates price changes was considered.

Brandhorst (2005a) created an easy example to show how the cap-weight and fundamental weight of a company is related. The example assumes the market consists of three companies with the same fundamental weight. The fundamental weight represents the RAFI fundamental weight of a company. The three companies have fundamental weightings of 33.33% each. The companies have PE ratios of 10, 20 and 30 respectively giving them cap weights of 16.67%, 33.33% and 50%. This is calculated as

$$\left(\frac{10}{10+20+30}\right) = 16.67\%$$

$$\left(\frac{20}{10+20+30}\right) = 33.33\%$$ and

$$\left(\frac{30}{10+20+30}\right) = 50\%\ .$$

Now, with a market PE of 20 calculated as follows

$$\left(\frac{10+20+30}{3}\right) = 20$$ the following is observed:

16.67 X $\frac{20}{10}$ = 33.33

33.33 x $\frac{20}{20}$ = 33.33 and

$50 \times \frac{20}{30} = 33.33$

These equations all represent the same equation namely:

$$\text{FundamentalWeight} = \text{CapWeight} \bullet \frac{\text{PricetoFundamentalMarket}}{\text{PricetoFundamental}}$$

The equation above was used to evaluate if the normal index could simply be modified by changing the cap weight of a company to its fundamental weight. This was unsuccessful. The reason for the failure was the difficulty in calculating the ratios “price to the fundamental market” and “price to fundamental” as no proxies for these values were found.

After a thorough analysis of previous models it was realised that a model which would be suitable for this research would require an in-depth analysis of the available data as well as an analysis of exactly what needs to be calculated.

The following data was available when the new methodology had to be formulated:

Firstly, the RAFI fundamental value of each company was calculated as explained by the FTSE/RAFI methodology, using all four factors from the relevant databases.

Secondly, the market capitalisation values of all the companies in the ALSI were obtained from the JSE dating back to 1995. These values were added together to obtain the total market capitalisation represented by the ALSI. The total market capitalisation was needed for the calculation of the divisor.

The exact value required was the market value of a portfolio weighted by RAFI weights rather than market caps. This value would have to be calculated at the end of each period, i.e. annually. The following hypothetical stock market was created in search of an acceptable methodology:

Table 3.5: Example explaining Fundamental index methodology				
Market cap for period	A	B	C	Total market cap
1	20	30	50	100
Market cap %	20%	30%	50%	100%
2	15	50	85	150
Market cap %	10%	33.33%	56.67%	100%

The table above contains the data of three stocks for Period 1 and Period 2. The total market cap is the sum of all the stock market cap values (20 + 30 + 50 = 100).

The market moved from a total market cap of 100 in Period 1 to a total market cap of 150 in Period 2. This represents a return of 50% $\left(\left(\left(\frac{150}{100}\right)-1\right)\bullet 100 = 50\%\right)$ from Period 1 to Period 2.

This return can also be calculated using a more thorough method explaining which stocks contributes to the total return.

$$\mathrm{ReturnContributionStock}i = \mathrm{MarketCap\%}i \bullet \frac{\mathrm{MarketCap}T - \mathrm{MarketCap}S}{\mathrm{MarketCap}S}$$

Where: MarketCap*i* = MarketCap percentage stock *i* at time S

MarketCap*T* = MarketCap at time *T*

MarketCap*S* = MarketCap at time *S*

T = *S*+1

$$StockA = 0.2 \bullet \frac{15-20}{20}$$

$$= -5\%$$

$$StockB = 0.3 \bullet \frac{50-30}{30}$$
$$= 20\%$$
$$StockC = 0.5 \bullet \frac{85-50}{50}$$
$$= 35\%$$

Total Return Market Cap Index = Return Stock A + Return Stock B + Return Stock C
= -5% + 20% + 35%
= 50%

Fundamental weights for period	A	B	C	
1	30%	40%	30%	
2	20%	50%	30%	

Let us assume that we have already calculated the RAFI fundamental values for the three stocks given above. The second method will be used to calculate the returns. The only difference is that the market cap percentage figures will be changed to the RAFI fundamental weights given above. The returns per stock then change to:

$$\text{ReturnContributionStock}_i = \text{RAFI\%}_i \bullet \frac{\text{MarketCap}T \text{ - MarketCap}S}{\text{MarketCap}S}$$

Where: RAFI %*i* = RAFI percentage stock *i* at time S

$$StockA = 0.3 \bullet \frac{15-20}{20}$$
$$= -7.5\%$$

$$StockB = 0.4 \bullet \frac{50-30}{30}$$
$$= 26.67\%$$
$$StockC = 0.3 \bullet \frac{85-50}{50}$$
$$= 21\%$$

Total Return Fundamental Index = Return Stock A + Return Stock B + Return Stock C
= -5% + 26.67% + 21%
= 40.17%

This can be formulised into an equation which will be used in the following Fundamental Index Return calculation between Period 1 and Period 2:

$$= \mathrm{RAFI1} \bullet \frac{(\mathrm{MC21} - \mathrm{MC11})}{\mathrm{MC11}} + \mathrm{RAFI2} \bullet \frac{(\mathrm{MC22} - \mathrm{MC21})}{\mathrm{MC21}} + \ldots\ldots + \mathrm{RAFIn} \bullet \frac{(\mathrm{MCn2} - \mathrm{MCn1})}{\mathrm{MCn1}}$$

$$= \sum_{i=1}^{n} \mathrm{RAFI}_i \bullet \frac{(\mathrm{MC2}_i - \mathrm{MC1}_i)}{\mathrm{MC1}_i}$$
$$i = 1,2,3.....n$$

Where:

RAFIi = The RAFI Fundamental Weight of stock i

MC2i = Market cap value of stock i at the beginning of Period 2

MC1i = Market cap value of stock I at the beginning of Period 1

This can be simplified even more:

Fundamental return between Period p and Period q

$$= \sum_{i=1}^{n} \mathrm{RAFI}_i \bullet \frac{(\mathrm{MCq}_i - \mathrm{MCp}_i)}{\mathrm{MCp}_i}$$
$$i = 1,2,3.....n$$

Where

$$q = p + 1$$

This formula will give the return per period for the Fundamental Index.

It was decided to use 31 December 1995 as the base date for the calculation of the index in this research report. Thus on 31 December 1995 the index value was chosen as 1000. The fundamental value used instead of the free float adjusted market value in the index calculation was 100,000,000 and the divisor was 100,000. On 31 December 1995 the Fundamental Index calculation was as follows:

$$\text{IndexValue} = \frac{\text{FundamentalValue}}{\text{Divisor}}$$

$$\text{IndexValue} = \frac{100{,}000{,}000}{100{,}000} = 1000$$

The fundamental value increases each year by the fundamental return calculated.

Example: If the Fundamental Index return was 20% in 1996 the fundamental value would be $100{,}000{,}000 \bullet (1 + 0.2) = 1200{,}000{,}000$. Dividing the return-adjusted fundamental value by the proportionally adjusted divisor will give the correct index value each year.

The universe of stocks used in the creation of the Fundamental Index is based on the JSE All Share stock universe. The universe of stocks used in the Fundamental Index ranging from 31 December 2002 to 31 December 2006 is based on the exact stock universe of the JSE ALSI. The JSE ALSI uses the biggest companies based on market capitalisation, which together represent 99% of the total market capitalisation of the market.

The JSE changed the methodology of index calculation on 24 June 2002 (Immelman, 2002) from the JSE Actuaries Index Series to the FTSE/JSE Index series. There are two main differences in the methodologies of the two series. Firstly, FTSE incorporates free float factors into its calculation while

the Actuaries Index does not. Secondly, the Actuaries Index used 100% of the market cap to calculate the ALSI and the FTSE used 99% of the market cap to calculate the ALSI.

Investment professionals always require a benchmark to measure returns. This need for a historical benchmark forced the JSE to work backwards to recalculate the index according to the new FTSE methodology.

The JSE recalculated the index back to July 1995. In order to have a consistent index for the measurement of the Fundamental Index it was decided that the research would start on 1 January 1996. The JSE Indices Department supplied the recalculated index values dating back to 1995. These recalculated index values were used to select the universe of stocks for the Fundamental Index. The database containing the recalculated ALSI data included all the listed companies per period as well as their free float factors.

The recalculated values provided by the JSE for the period 1995 to 2001 contained 100% of the companies listed at any specific time. This large number of companies necessitated the creation of rules for the exclusion of companies from the stock universe. A set of rules was decided on for the selection or exclusion of companies from the stock universe for the index. The rules were applied consistently for the index data from 1995 to 2006.

- Companies with a free float factor of 15% or less per period were excluded from the stock universe, which complies with the FTSE/JSE ground rules (Immelman, 2006).
- Only companies that represented at least 0.05% of the market or more were selected.
- If more than 170 companies had a market percentage of at least 0.05% only the top 170 were chosen.
- If the top 99% of the companies forming part of the market were less than 170 and represented less than 0.05% of the market only the top 99% were chosen.

It has to be stated that the rules were applied to the specific data obtained from the JSE. The dataset used from 2002 to 2006 already excluded companies with free float factors below 15%.

The results of the stocks selected and excluded are summarised in Appendix A. The main results are shown in Table 3.2. The selection process was based on year-end data.

Table 3.6: Summary of companies used in the Fundamental Index construction

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Number of companies	167	153	166	170	146	125	122	165	163	163	162	165
% of market excluding free float excluded companies	96.55 %	98.52 %	97.40 %	96.57 %	97.11 %	98.12 %	97.99 %	99.00 %	99.00 %	99.00 %	99.00 %	99.00 %
No. of companies excluded due to free float constraint	2	3	3	2	0	0	0	0	0	0	0	0

After the stocks were selected the calculation formula explained earlier was applied to each stock per period in the following manner.

$$= \sum_{i=1}^{n} RAFI_i \bullet \frac{(MCq_i - MCp_i)}{MCp_i}$$

$$i = 1,2,3.....n$$

Where

$$q = p + 1$$

The *MCqi* and *MCpi* values were obtained for each stock by multiplying their cap weighted percentage with the total market value of the shares. The reason for this is the fact that the index calculation sheets received from the JSE Indices Department only provide the percentage of each company's

market value relative to the whole market. The total market value for each year over which the research was conducted was obtained from I-Net Bridge.

The above-mentioned method would result in the RAFI composite index being calculated as previously stated. This is the average of the four fundamental factors' percentage weighting. However, where dividends are zero the average of the remaining three fundamental values is taken.

The methodology explained so far in this research is based on the exact methodology used by Research Affiliates. The methodology explains how to compose an index based purely on price movement of shares. This methodology does not take dividend income into consideration. Thus a price index as explained above does not represent the complete return an investor would receive if he invests in a portfolio replicating the index.

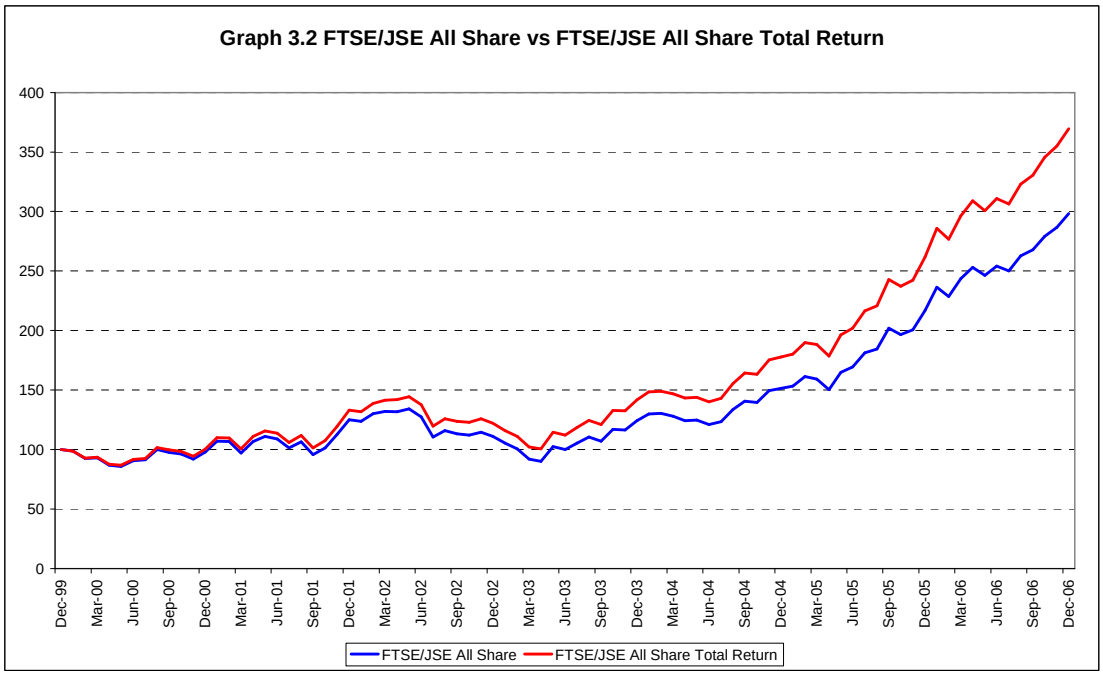
The way normal capital indices counter this problem is by calculating a total return index for each normal market capitalization index. For instance, the FTSE/JSE All Share index is calculated in a FTSE/JSE All Share Index and FTSE/JSE All Share Total return Index simultaneously. The results can be observed in Table 3.7.

The Total Return Index delivered an annual return of 29.88% per annum relative to an annual return of 24.42% per annum if dividends are excluded. This represents a difference of 5.46% per annum. This outperformance can clearly be seen in Graph 3.2.

Table 3.7: FTSE/JSE All Share Returns vs FTSE/JSE All Share Total Return Returns from 2000 - 2006

	FTSE/JSE All Share	FTSE/JSE All Share Total Return
Total Return	**198.13%**	**269.52%**
Annual Return	**24.42%**	**29.88%**

Graph 3.2: FTSE/JSE All Share vs FTSE/JSE All Share Total Return



The total return index provides investors with the opportunity to see what their complete return including dividends would have been. It is clear that a total return performance is more reflective of what investors will earn on a portfolio replicating an index.

One of the main objectives of this research is to observe what excess returns investors would have gained,if any, relative to the FTSE/JSE All Share Index. To meet this objective as thoroughly as possible the RAFI Composite will also be calculated on a total return basis.

The methodology used by the JSE Indices department to calculate the total return index of its indices is formulated below (Immelman 2004):

$$\text{Total Return Index (TRI)} = TRI_n \bullet \frac{CI_n}{(CI_{n-1} - XD)}$$

Where: TRI_n = Total return Index value at the end of period n

CI_n = The Market Cap Index value at the end of period n

CI_{n-1} = The Market Cap Index value at the end of period n-1

XD = Ex-dividend adjustment factor

The formula for the XD Factor is shown below:

$$XD = \frac{\sum_{i=1}^{n} Dividend_i \bullet FreeFloat_i}{LatestIndexDivisor}$$

Where: Dividend $_i$ = The total dividends in rand value declared by company $_i$.

Free Float $_i$ = The free float factor of share i at the time of the dividend declarartion

The methodology for a total return index will now be explained by continuing the example used in Table 3.8:

Table 3.8: A practical example of a Total Return Index

Index Value at start of day 1 = 100

Index value at start of day 2 = 106.16

Divisor = 73000

Assume TRI value at start = 100

	Dividend Declared	Free Float Factor	XD Adjustment points
Stock A	R20,000	1	$\frac{20,000 \bullet 1}{73,000} = 0.27$
Stock B	R80,000	0.75	$\frac{80,000 \bullet 0.75}{73,000} = 0.82$
Stock C	R50,000	1	$\frac{50,000 \bullet 1}{73,000} = 0.68$
Total XD adjustment for index			1.77

$$TRIday2 = 100 \bullet \frac{106.16}{100 - 1.77}$$
$$= 108.07$$

Thus from day one to day two the market cap index increased from 100 to 106.16 and the total return index increased from 100 to 108.07.

The exact same methodology will be used for creating the Fundamental total return indices. The dividend data will already be available because it is needed for the creation of one of the fundamental factors.

The only change that will have to implemented in the methodology is to adjust the XD factors to reflect a share's fundamental index holding rather than its market capitalization holding. This will be done as follows:

Table 3.9: A practical example of a Total Return Fundamental Index

Fundamental Index Value at start of day 1 = 100

Fundamental Index value at start of day 2 = 108

Divisor = 73000

Assume TRI value at start = 100

	Dividend Declared	Free Float Factor	Market Cap Weighting	RAFI Weighting	XD Adjustment points
Stock A	R20,000	1	2%	3%	$\left(\frac{20,000 \bullet 1}{73,000}\right) \bullet \left(\frac{0.03}{0.02}\right) = 0.41$
Stock B	R80,000	0.75	5%	6%	$\left(\frac{80,000 \bullet 0.75}{73,000}\right) \bullet \left(\frac{0.06}{0.05}\right) = 0.99$
Stock C	R50,000	1	4%	2%	$\left(\frac{50,000 \bullet 1}{73,000}\right) \bullet \left(\frac{0.02}{0.04}\right) = 0.34$
Total XD adjustment for index					1.74

$$TRIday2 = 100 \bullet \frac{108}{100 - 1.74}$$
$$= 109.91$$

The dividend values are only available yearly as explained earlier. Due to this reason the Fundamental total return index will only be calculated yearly as with the normal price index.

The methodology presented by Arnott *et al.* (2005) was also used to create four separate fundamental indices where the weighting percentage of each fundamental factor would be 100%. These were referred to as the Fundamental Sales Index, the Fundamental Cash Flow Index, the Fundamental Book Value Index and the Fundamental Dividend Index. A separate index was therefore created for sales, cash flows, book values and dividends where the weight of a company in the specific index would be directly related to the percentage that the company represents of the economic market represented by the specific fundamental factor. These Fundamental Indices will be calculated on a price and total return basis. The reason is that, when looking at specific fundamental indices, the Fundamental Dividend Index will possibly lag the other indices due to it being dominated by companies who pay large dividends. The total return indices will provide a basis from which all these single Fundamental indices could be analysed and compared relative to each other. The price index will provide insight into whether the price creates a negative bias towards the dividend index.

The weights covered by the five indices explained in the above-mentioned section are provided in the tables below.

Table 3.10: Weightings for companies with a non-zero dividend payout

Index	Fundamental factor weightings			
	Sales	Book value	Cash flow	Divi-dend
RAFI Composite Index	25%	25%	25%	25%
Fundamental Sales Index	100%	0%	0%	0%
Fundamental Book Value Index	0%	100%	0%	0%
Fundamental Cash Flow Index	0%	0%	100%	0%
Fundamental Dividend Index	0%	0%	0%	100%

Table 3.11: Weightings for companies with a zero dividend payout

Index	Fundamental factor weightings			
	Sales	Book value	Cash flow	Divi-dend
RAFI Composite Index	33.33 %	33.33%	33.33%	0%
Fundamental Sales Index	100%	0%	0%	0%
Fundamental Book value Index	0%	100%	0%	0%
Fundamental Cash Flow Index	0%	0%	100%	0%
Fundamental Dividend Index	0%	0%	0%	0%

It was decided to add a few alternative weighting schemes to the research to compare their performance to the five indices above. The weightings were chosen with the idea to eliminate factors from the composite index to see if any of the specific fundamental factors influence the RAFI composite in a negative way. These alternative indices will only be calculated and analysed

on a total return basis. The weighting schemes chosen are shown below for companies with a zero and non-zero dividend payout.

The schemes are named according to their weightings. For example: ⅓ Sales, Book Value, Cash Flow Index represents index weightings of one-third in Sales, one-third in Book Value and one-third in Cash Flow.

Table 3.12: Alternative weighting schemes for companies with a non-zero dividend payout.

S = Sales, BV = Book Value, CF = Cash Flow, D = Dividend.

Index	**Fundamental factor weightings**			
	Sales	Book Value	Cash Flow	Divi-dend
⅓ S, BV, CF	33.33%	33.33%	33.33%	0%
⅓ S, BV, D	33.33%	33.33%	0%	33.33%
⅓ S, CF, D	33.33%	0%	33.33%	33.33%
⅓ BV ,CF, D	0%	33.33%	33.33%	33.33%
½ S, BV	50%	50%	0%	0%
½ S, CF	50%	0%	50%	0%
½ S, D	50%	0%	0%	50%
½ BV, CF	0%	50%	50%	0%
½ BV, D	0%	50%	0%	50%
½ CF, D	0%	0%	50%	50%

Table 3.13: Alternative weighting schemes for companies with a zero dividend payout.

S = Sales, BV = Book Value, CF = Cash Flow, D = Dividend.

Index	**Fundamental factor weightings**			
	Sales	Book Value	Cash Flow	Divi-dend
⅓ S, BV, CF	33.33%	33.33%	33.33%	0%
⅓ S, BV, D	50%	50%	0%	0%
⅓ S, CF, D	50%	0%	50%	0%
⅓ BV ,CF, D	0%	50%	50%	0%
½ S, BV	50%	50%	0%	0%
½ S, CF	50%	0%	50%	0%
½ S, D	100%	0%	0%	0%
½ BV, CF	0%	50%	50%	0%
½ BV, D	0%	100%	0%	0%
½ CF, D	0%	0%	100%	0%

3.3 Performance measures

After the returns in respect of all the above indices had been calculated the specific indices were rigorously analysed using a range of well-known financial ratios and formulas. This will only be done using the total return indices calculated.

The reason for using a variety of these measures was to provide in-depth insight into which fundamental factor performed best, as well as to provide a comprehensive comparison between the fundamental indices created and the benchmark portfolio represented by the FTSE/JSE ALSI.

The methods used to compare the different fundamental indices were:

- Compounded annual return over the specific period
- Standard deviation
- Beta
- Sharpe Ratio
- Tracking Error
- Information Ratio
- Sortino Ratio
- Omega Ratio
- Kappa Ratio
- Treynor Ratio
- Alpha
- Relative Performance Indices.

These performance measures can broadly be divided into the following subcategories:

- **Returns**: Compounded returns
- **Risk measures**: Standard deviation, Beta and Tracking error
- **Risk-adjusted Returns**: Sharpe Ratio, Sortino Ratio, Treynor Ratio and Information Ratio
- **Gains/Losses Measures**: Omega and Kappa
- **Value Added Measures**: Alpha and Relative Performance Indices.

The above subcategories and the subsequent performance measures will be explained in the following section.

3.3.1. Returns

3.3.1.1 Compounded yearly return

This return is calculated by using a geometric mean approach. This approach assumes that returns are reinvested to create the compounding effect. The formula is:

$$\left(\prod_{i=1}^{n}(1+i_n)\right)^{\frac{1}{n}}-1$$

Where: n = The number of years over which the analysis was applied

i_n = The return for each year from 1 to n.

3.3.2 Risk Measures

3.3.2.1 Standard deviation

This is a globally used measure of total risk and it measures the extent to which the returns deviate from the mean or average.

3.3.2.2 Beta

Where standard deviation measures total risk, beta measures a portfolio's risk relative to market risk. Beta calculates which percentage of a portfolio's return is due to market risk and which is due to firm-specific risks. Beta (β) is calculated as the covariance of the portfolio with the market portfolio divided by the variance of the market (Elton, Gruber, Brown, and Goetzmann, 2003).This can be written as:

$$\beta = \frac{cov(r,m)}{\sigma m^2}$$

In this study it is always assumed that the FTSE/JSE ALSI is the proxy which is used for the market portfolio.

3.3.2.3 Tracking error

Tracking error is calculated as the standard deviation of the difference in returns between the portfolio's returns and the returns of the specific benchmark of a portfolio. Tracking error measures how closely a portfolio's returns match the benchmark's returns.

3.3.3 Risk-adjusted Returns

3.3.3.1 Sharpe Ratio

This measure, created by William Sharpe, incorporates risk and returns into a single ratio. The ratio is calculated by taking the average return of a portfolio minus the risk-free rate and dividing it by the standard deviation. It therefore represents the unit of excess return of a portfolio for each unit of total risk that is represented by the standard deviation of a portfolio's returns. The Sharpe Ratio can be written as:

$$\text{SharpeRatio} = \frac{Rp - rf}{\sigma p}$$

Where: *Rp* = the average portfolio returns

rf = the risk-free rate, and

σ_p = the portfolio's standard deviation (Sharpe, 1966).

3.3.3.2 Sortino Ratio

Although the Sharpe Ratio is a widely used method for measuring a portfolio, it has its drawbacks. One point of criticism against the Sharpe Ratio is that it penalises large positive excess returns unnecessarily. This refers to the fact that when calculating a portfolio's standard deviation a large positive deviation from the mean will increase the standard deviation just as much as an equally large negative deviation from the mean.

This resulted in the creation of a ratio where risk is measured only as the semi-deviation of downside losses relative to a certain minimum acceptable return. The ratio therefore represents the unit of excess return per unit of downside risk. The downside risk is measured as:

$$\text{DownisdeRisk} = \sqrt{\int_{\infty}^{MAR} (MAR - R)^2 \, dF(R)}$$

Where: MAR = The minimum acceptable return as defined by the manager or investor.

The Sortino Ratio (SR) can be defined as:

$$SR = \frac{Rp - MAR}{\text{Downsiderisk}}$$

Where *Rp* = The average portfolio return (Kaplan and Knowles, 2003).

3.*3.3.3 Treynor Ratio*

The Treynor Ratio is a risk-return measure created by Jack Treynor. Where the Sharpe Ratio's denominator is represented by standard deviation, the Treynor Ratio's denominator is represented by beta. The ratio therefore represents the unit of excess return per unit of systematic risk, represented by beta. The Treynor Ratio (TR) is calculated as:

$$TR = \frac{Rp - rf}{\beta}$$

Where: *Rp* = The average portfolio return

rf = The risk free rate, and

β = The beta of the portfolio (Treynor, 1965).

3.3.3.4 Information Ratio

The Information Ratio is probably one of the most important ratios. It measures how much excess return any investment manager generates above its benchmark as well as the consistency with which this excess return is

generated. Where Sharpe and Sortino use different types of risks to create the risk-return profile of a fund, the Information Ratio uses tracking error as the risk. The Information Ratio therefore tries to identify whether a manager generates any excess returns if he takes risk by deviating from the benchmark. The Information Ratio (IR) is defined as:

$$IR = \frac{Rp - Rb}{TE}$$

Where *Rp* = Portfolio returns

Rb = Benchmark return

TE = Tracking error (Pomerantz, 2005).

3.3.4 Gains/Losses Measures

3.3.4.1 Omega

Omega is the universal performance measure developed by Keating and Shadwick (2002). Performance measures started with the use of the Sharpe Ratio and developed into an academic field of its own. Each newly designed performance measure endeavoured to overcome the shortcomings of the previous ones.

Omega was designed in a framework where the academically accepted mean-variance analysis of portfolios was discarded. The reason for the shift is that the mean-variance approach to portfolio construction and analysis immediately accepts all returns to be distributed normally. This is why Keating and Shadwick created a performance measure that does not assume that returns are normally distributed but rather allows for the measure to incorporate the specific return's own distribution. It is widely acknowledged that very few if indeed any investment returns are normally distributed. The formula for

$$\text{Omega}(r) = \frac{\int_{r}^{b}((1 - F(x))dx}{\int_{a}^{r} F(x)dx} = \frac{G}{L}$$

Omega is basically the probability weighted gains over losses of any returns (Winton Capital Management, 2003).

It has also been proven that in theory Omega is the ratio of the price of a correctly priced call option divided by the price of a correctly priced put option (Mewasingh, 2006).

3.3.4.2 Kappa

Kappa refers to a generalised version of some of the performance measurements mentioned above. Kappa (K) is calculated as:

$$K = \frac{Rp - MAR}{\sqrt{\int_{\infty}^{MAR} (MAR - R)^{n} dF(R)}}$$

Where: *Rp* = The average portfolio return,

MAR = The minimum acceptable return as defined by the investor or the manager (Kaplan and Knowles, 2003).

It is obvious that if *n* is substituted by 2 in the above equation the Kappa Ratio will equal the Sortino Ratio. Also, if *n* is changed to 1 then Kappa equals the Omega Ratio minus 1 (Mewasingh, 2006).

Omega and Sortino are therefore specialised cases of a more generalised equation namely Kappa. In this study Kappa refers to the specialised case where *n* equals 3 and therefore refers to the third moment.

3.3.5 Value Added Measures

3.3.5.1 Jensen's Alpha

Jensen's Alpha is calculated using the CAPM model created in modern portfolio theory. Jensen's Alpha represents the excess return that a portfolio achieves above the return it should have achieved according to the CAPM model. This is represented by α_i in the following equation:

$$\alpha_i = R_p - (R_f + \beta(Rm - R_f))$$

Where: R_f = The risk-free rate

β = The portfolio beta, and

R_m = The market return (Jensen, 1968).

3.3.5.2 Relative Performance Indices

Relative Performance Indices indicate how one security or portfolio performed relative to another on an indexing basis. The following table explains the calculation of such an index:

Table 3.14: Example of relative performance indices						
		Year 1	Year 2	Year 3	Year 4	Year 5
Returns A		5%	7%	4%	8%	2%
Returns B		3%	6%	6%	9%	1%
Excess returns A relative to B		2%	1%	-2%	-1%	1%
Index	100	102	103.02	100.96	99.95	100.95

The index values for each year are calculated as follows:

Year 1: $100 \times (1 + 0.02) = 102$

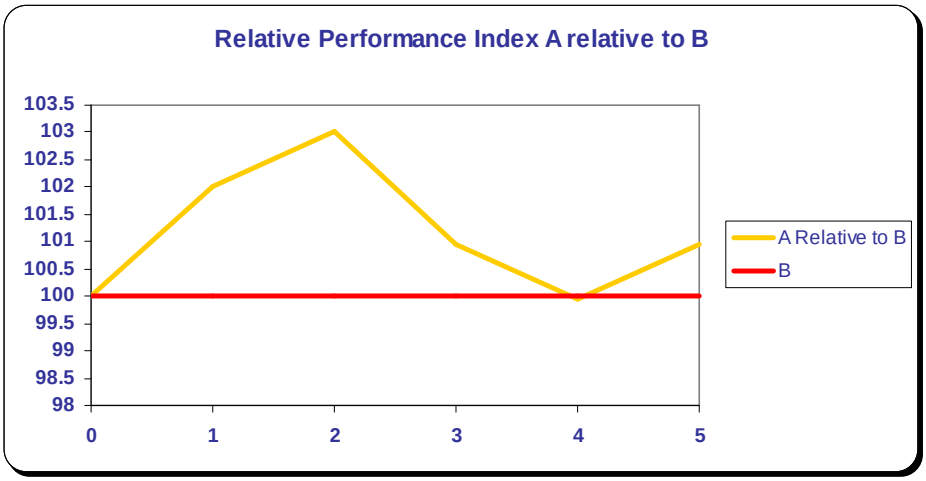
Year 2: $102 \times (1 + 0.01) = 103.02$

Year 3: $103.02 \times (1 + (-0.02)) = 100.96$

Year 4: $100.96 \times (1 + (-0.01)) = 99.95$

Year 5: $99.95 \times (1 + 0.01) = 100.95$

Graphically, this can be shown as follows:



This shows how an investment in A would have performed versus an equal investment in B. It is clear that an investment in A would have outperformed a similar investment in B over the 5-year period, but that an investment in B would have outperformed a similar investment in A over a 4-year period.

3.4 Sectoral analysis

To replicate the Arnott *et al.* (2005) Fundamental Indexation article as fully as possible, is was necessary to construct a sectoral analysis of the results.

After a thorough analysis of the *FTSE / JSE End of Day Indices Dissemination User Manual* it was decided to divide the universe of stocks in the research into four sectors, namely resources, industrials, financial and technology (JSE Information Products Sales Division, 2005).

The South African market is largely dominated by the resources sector as mining creates a huge economic boost for this sector. The large resources component of the FTSE/JSE ALSI clearly indicates that a sectoral analysis will add value and provide important insight into this research.

The reason why technology is added as a separate category is to analyse whether the effects of the technology bubble which created crashes in world markets is visible. In the original Fundamental Indexation article the effect of the tech bubble can clearly be seen. When the relevant market cap-weighted portfolio's sectoral analysis was conducted a clear spike can be seen in the technology sector in 1998. This spike was not visible in the Fundamental Index's sectoral analysis. The technology bubble created a big question mark over the robustness of finance theories in the world market place (Arnott, 2006).

The sectoral analysis will be conducted as follows: At each measurement interval all the shares will be placed into one of four categories:

- Resources
- Industrials
- Financials
- Technology.

Data pertaining to the relevant sector of each share were obtained from the FTSE/JSE Indices department. The sector layout for the period after the JSE adopted the FTSE classification system in 2002 is given in Appendix B. In Appendix B it can clearly be seen that resources range from Code 0001 to 1999, industrials range from Code 2000 to 7999, financials range from Code 8000 to 8999 and technology shares range from Code 9000 to 9999.

The recalculated adjusted ALSI data were used for the period before 2002. This data set automatically divided the shares into sectors. This was assumed to be correct.

3.5 Turnover (transaction costs)

All market cap indices, as well as fundamental indices, are seen as passive (buy and hold) investment strategies. These indices are regarded as passive

due to the fact that the portfolios are rebalanced only a few times a year and are not consistently monitored.

The debate on passive versus active investing is largely based on the theory that over a long period of time the average active and passive investor should earn the same performance before transaction costs. The theory also suggests that after transaction costs the average passive investor will earn a higher return than the average active investor (Arnott, Sauter, and Siegel, 2007). The theory clearly places a large emphasis on the benefits of not trading continuously. It can therefore add value to the research if the Fundamental Index's transaction costs are lower relative to the market cap index's transaction costs. Measuring the correct transaction costs is extremely difficult, if possible at all. The turnover of the two portfolios relative to each other will therefore be based on an approximation of the level of transaction costs paid.

The turnover of the two funds will be determined by calculating which percentage of each year's holdings has to be replaced with new holdings and which percentage is maintained in the portfolio. The turnover is calculated as the percentage of the portfolio that has to be changed. At the end of each year the percentage represented by each share in the portfolio is compared to the percentage of the share needed to rebalance the portfolio. If a share has a percentage that is too low it has to be bought whereas if a percentage of a share is too high it has to be sold. Because a market capitalisation index replaces certain shares each year it has a turnover that is not zero.

3.6 Alternative research

Research has also been conducted beyond the scope of Rob Arnott's article.

3.6.1 Concentration

The South African market, possibly more than many other world markets, has a high concentration of shares based on historical market cap indices. As a result, research conducted on the concentration differences between the fundamental market index and the FTSE/JSE ALSI is deemed necessary. The research will measure the total market cap percentage of the top three, five and ten shares in the index. This will be compared with the total fundamental percentage of the top three, five and ten shares.

4. RESULTS

4.1 Performance

The research conducted on the Fundamental Index in South Africa provided interesting results. When the research was started it was hoped that the results would come close to replicating the results achieved by Rob Arnott in the USA as well as the results achieved by research conducted by Hsu and Campollo (2006) on a selection of world markets.

South Africa is seen as an emerging market. It is therefore assumed that South Africa will provide higher risk investments compared to developed counterparts like the USA, UK, Germany and Japan. In taking higher risks in South Africa investors hope to earn higher returns. It was therefore expected that the performance results for the South African Fundamental Index would outperform the USA on a returns basis to compensate for a similar risk-return trade-off as in the USA and other global economies. This proved to be the case.

4.1.1 RAFI Composite Index

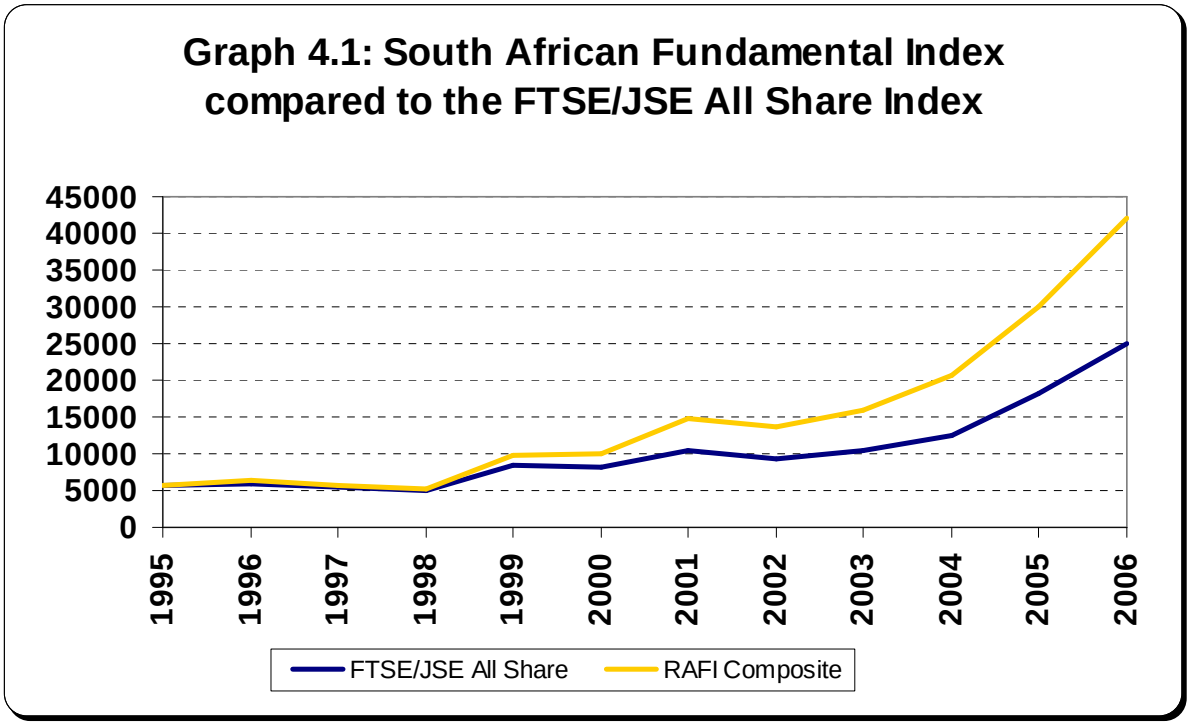
4.1.1.1 RAFI Composite Price Index

The result of the RAFI South African Index (the RAFI Composite Index) compared to its benchmark can be seen in the graph 4.1

This graph plots the RAFI Composite Index against the FTSE/JSE All Share Index from 1995 to 2006. The graph clearly shows that the RAFI Composite Index consistently added alpha in terms of the FTSE/JSE All Share Index. The graph was plotted in such a way that both indices had the same starting value at the end of 1995. The starting value was taken as 5598.73 as this was the value of the FTSE/JSE All Share Index on 31 December 1995. The All Share Index increased to a value of 24932.27 at the end of 2006 whereas the

Fundamental Index increased to a value of 41966.17. Over this period, the All Share Index had a total return of 345.32% compared to the Fundamental Index which had a total return of 649.57%.

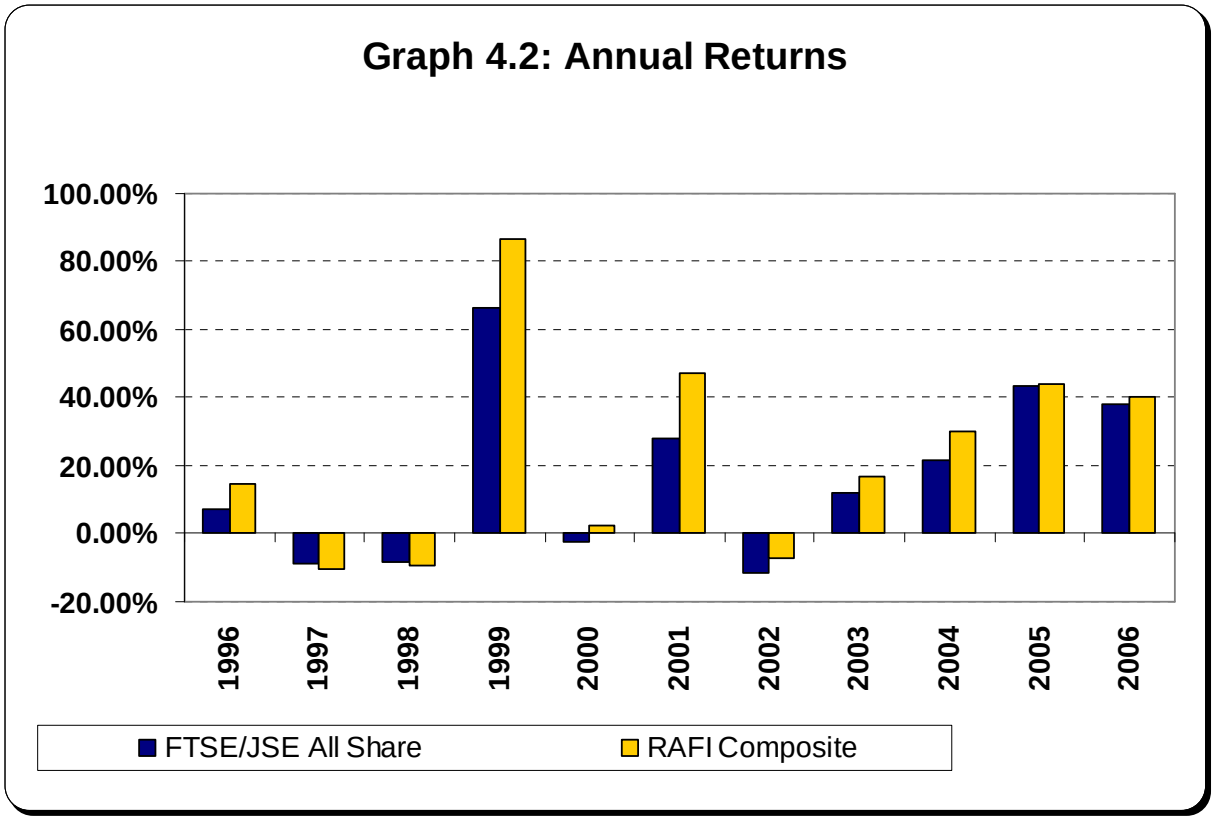
Graph 4.1: South African Fundamental Index compared to the FTSE/JSE All Share Index



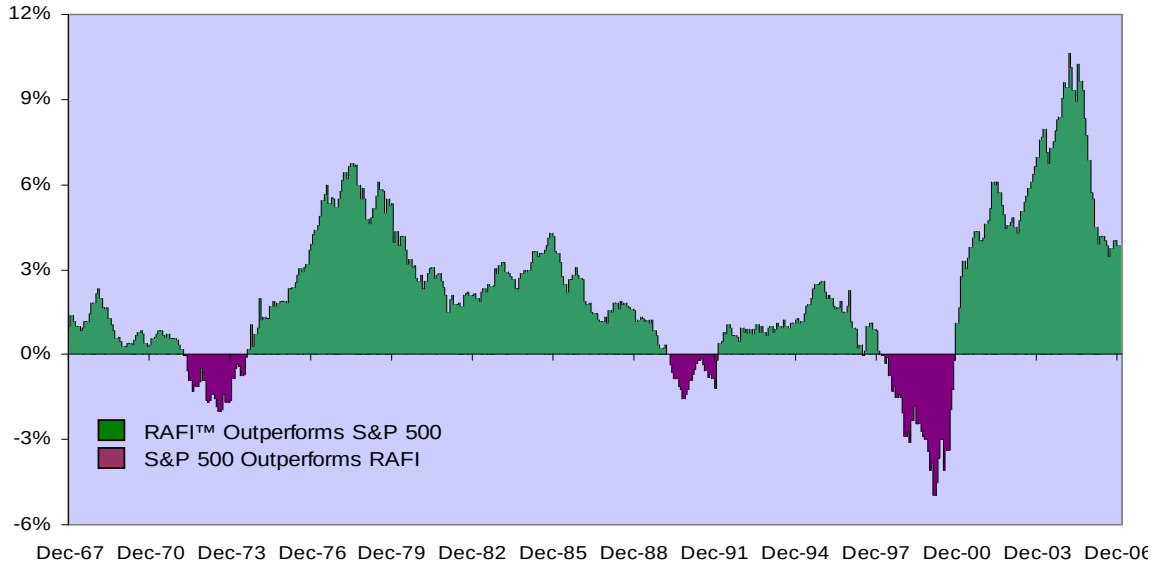
Graph 4.2 below shows the breakdown of annual returns for both indices:

The RAFI Composite Index outperformed the FTSE/ALL Share Index in 9 of the 11 years with the only underperforming years being 1997 and 1998. Table 4.1 shows the underperformance to be 1.51% in 1997 and 1.19% in 1998. Underperformance in the period 1997 to 1998 was consistent with results obtained from the USA market, as can be seen in Graph 4.3 below. The asian crisis created markets where stocks were priced purely on growth prospects rather than fundamental values.

Graph 4.2: Annual returns



Graph 4.3: Rolling Average Outperformance USA RAFI 1000 versus S&P 500, 1962-2004



Source: Adapted from Hsu and Campollo (2006).

The RAFI Composite performance results versus the FTSE/JSE can be seen in the table below:

TABLE: 4.1. Annual Returns RAFI Composite Index versus FTSE/JSE All Share Index, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FTSE/JSE All Share											
Return per year	7.09%	-8.84%	-8.23%	66.62%	-2.31%	28.08%	-11.28%	11.89%	21.49%	43.35%	37.91%
Compounded Yearly Return since 1995	7.09%	-1.20%	-3.60%	10.53%	7.84%	10.97%	7.48%	8.02%	9.44%	12.44%	**14.54%**
RAFI Composite											
Return per year	14.55%	-10.35%	-9.42%	86.90%	2.51%	47.17%	-7.18%	16.88%	30.35%	44.12%	40.22%
Compounded Yearly Return since 1995	14.55%	1.34%	-2.38%	14.83%	12.25%	17.43%	13.55%	13.96%	15.68%	18.25%	**20.10%**
Excess yearly return	**7.46%**	**-1.51%**	**-1.19%**	**20.28%**	**4.82%**	**19.10%**	**4.09%**	**4.98%**	**8.87%**	**0.77%**	**2.31%**
Excess Compounded Return	**7.46%**	**2.53%**	**1.22%**	**4.29%**	**4.41%**	**6.46%**	**6.07%**	**5.94%**	**6.24%**	**5.81%**	**5.55%**

Even though the RAFI Composite Index underperformed in certain years, it always had positive excess compounded returns. This means that if an investor invested R1 in the RAFI Composite Index at the end of 1995 he would always have had more money compared to an initial investment of R1 in the FTSE/JSE All Share Index at the end of 1995.

The RAFI Composite outperformed the FTSE/JSE All Share Index by 5,55% on a compounded yearly basis for the 11-year period over which the study was conducted. This outperformance is significant.

While this study was conducted it came to light that Plexus Asset Management obtained the licence to trade the RAFI Enhanced (e-RAFI) Top 40 Index in South Africa (Du Plessis, 2007). Although the index traded by Plexus is also based on the fundamental index methodology, there are a few differences between the index managed by Plexus and the index created in this research.

Firstly, whereas the index in this study contains all the shares in the market index, the Plexus index only consists of 40 shares. These 40 shares are the

40 shares with the highest RAFI values. Secondly, whereas this study is based on the so-called "plain vanilla-flavoured" RAFI, Plexus uses an enhanced strategy. The enhanced strategy differs from the plain strategy in the following ways:

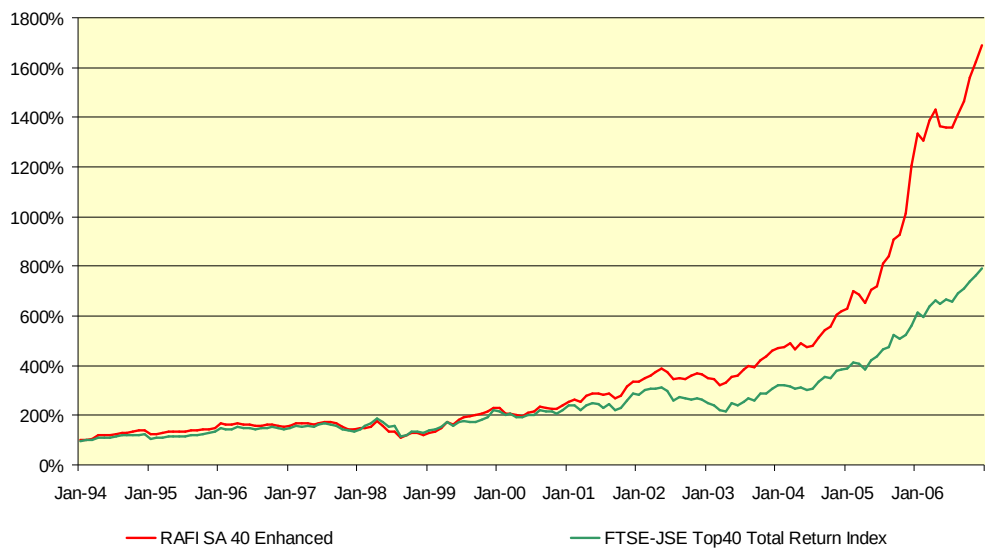
- The enhanced strategy rebalances the index quarterly rather than annually.
- The enhanced strategy modifies the weights of the four factors. The weights are therefore not 25% for each of the four fundamental factors.
- The enhanced strategy looks at a company's NOA (net operating assets) as well as debt-coverage ratio to remove low-quality companies from the index.

The back-tested data received from Plexus is therefore not directly comparable to the results from this study. The results of the back-tested e-RAFI results are can be seen in Graph 4.4 and Table 4.2.

Table 4.2: Performance of Plexus e-RAFI versus FTSE/JSE Share Index, 1996-2006

1994-2006	Ending value of R1	Annual return	Volatility	Sharpe ratio	Excess return vs FTSE/JSE All Share Index
RAFI® Enhanced South African Strategy	16.92	24.3%	18.9%	0.66	7.0%
FTSE/JSE All Share Index	7.93	17.3%	20.4%	0.33	n/a

Graph 4.4: Performance of Plexus e-RAFI versus FTSE/JSE Top 40, 1994-2006



Source: Adapted from Plexus RAFI (2007).

The RAFI South African Enhanced Strategy delivered a compounded annual return of 24.3%, which is 7% higher than its benchmark index – the FTSE/JSE Top 40 Index. The results are based on total return calculations. Another observation of the e-RAFI is that the Sharpe Ratio is two times higher than the Sharpe Ratio of the FTSE/JSE All Share Index.

The research conducted by Arnott showed that the US RAFI outperformed the S&P 500 by an average of 1.97% p.a. from 1962 to 2004. Although the measurement periods of the USA study and this study differ significantly, it is clear that indices based on the fundamental indexing concept yield superior results relevant to market capitalisation benchmarks.

Hsu and Campollo (2006) conducted research based on the creation of fundamental indices in 23 countries. Comparing the results in this paper to the research conducted in the 23 countries delivered consistent results. This also proves that the methodology to create an alternative index based on economic footprints rather than market capitalisation added value during the last few decades on a global basis. There is a good chance that this trend will continue.

Outperformance differs for the 23 countries, ranging from 8.78% p.a. in Ireland to only 0.52% p.a. in Switzerland. One of the most significant results was obtained for the Japanese stock market. Whereas the Japanese stock market produced a negative return of 1.32% p.a. over the measurement period, the comparable fundamental index would have delivered a positive return of 2.35% p.a.

One possible explanation for the varying degrees of outperformance could be the use of different stock valuation techniques in different countries. Another possible reason for the difference could be the varying degrees of so-called market efficiency in countries.

Table 4.3: Annualised Return of Fundamental versus MSCI Indexes, 1984-2004

Country	Fundamental Index	MSCI Benchmark	Excess return
World	12.36%	8.81%	3.55%
Australia	14.53%	11.64%	2.89%
Austria	16.67%	11.07%	5.60%
Belgium	14.25%	12.76%	1.49%
Canada	14.15%	10.39%	3.76%
Denmark	15.94%	14.40%	1.54%
Finland	16.41%	14.82%	1.59%
France	14.39%	11.94%	2.45%
Germany	12.22%	9.89%	2.33%
Greece	19.32%	16.08%	3.24%
Hong Kong	15.69%	13.74%	1.95%
Ireland	17.18%	8.40%	8.78%
Italy	13.14%	10.08%	3.06%
Japan	2.35%	-1.32%	3.67%
Netherlands	13.49%	11.45%	2.04%
New Zealand	8.07%	7.43%	0.64%
Norway	15.50%	10.86%	4.64%
Portugal	12.63%	10.34%	2.29%
Singapore	8.93%	5.76%	3.17%
Spain	15.90%	12.40%	3.50%
Sweden	16.45%	14.25%	2.20%
Switzerland	13.00%	12.48%	0.52%
UK	12.96%	10.20%	2.76%
US	14.74%	12.35%	2.39%

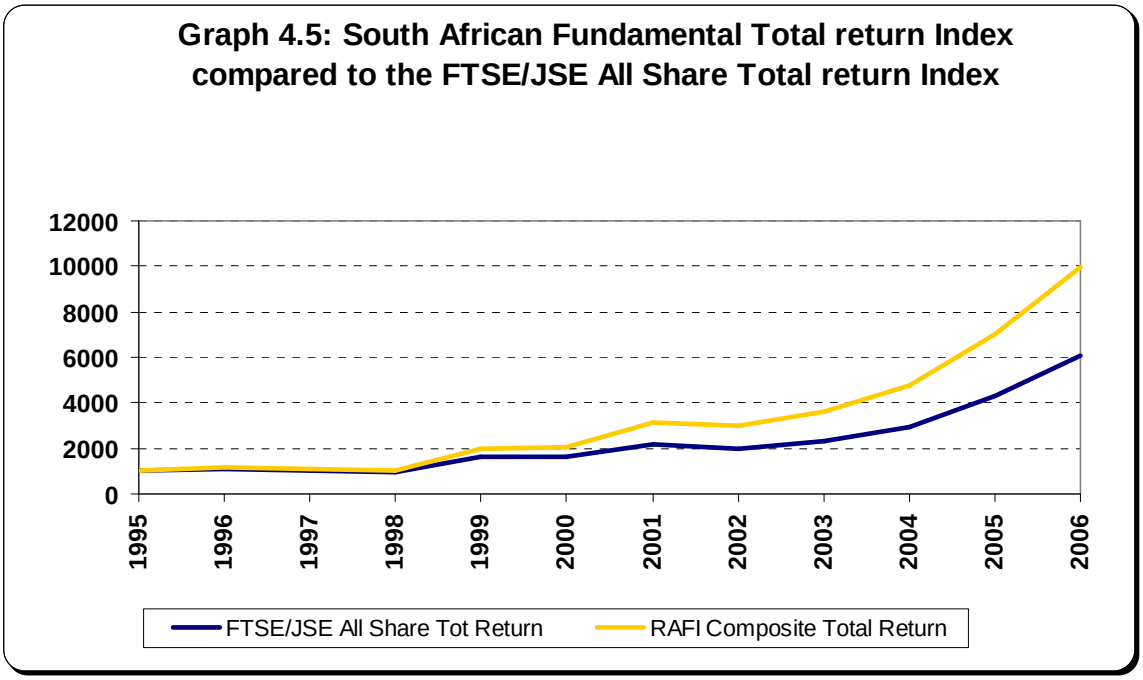
Source: Adapted from Hsu and Campollo (2006).

4.1.1.2 RAFI Composite Total Return Index

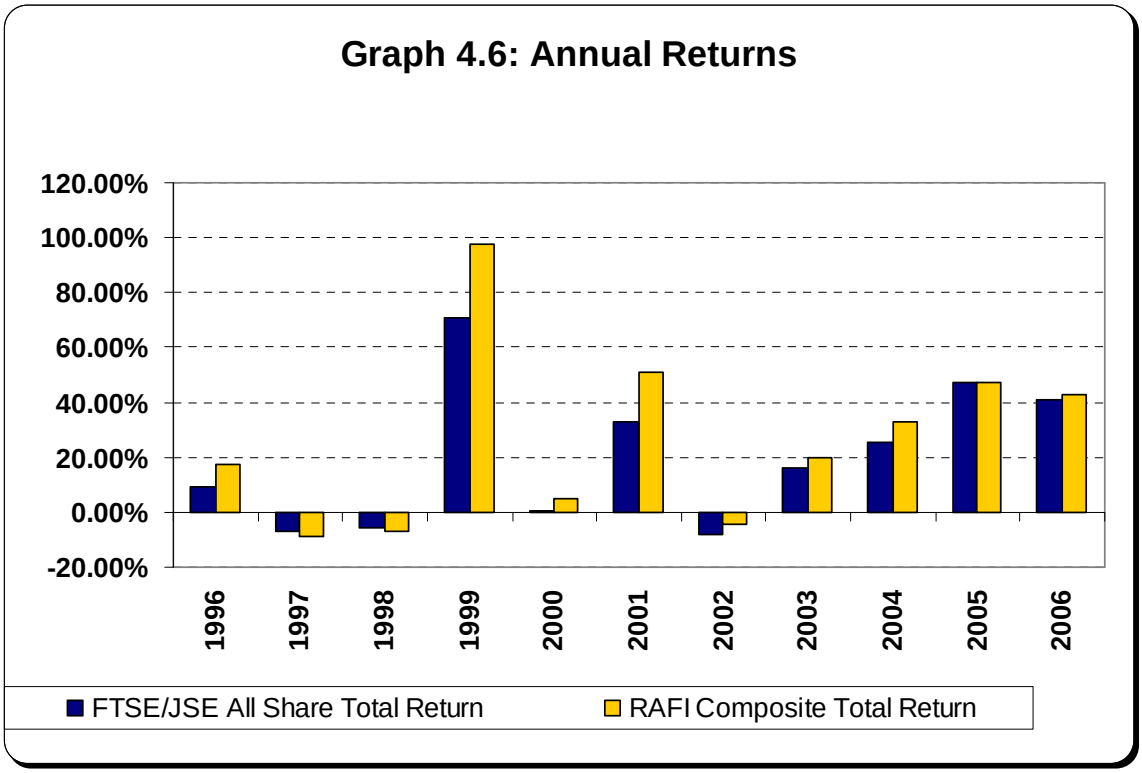
The result of the RAFI South African Total return Index (the RAFI Composite Total return Index) compared to its benchmark, the FTSE/JSE All Share Total Return Index can be seen in the graph below:

The FTSE/JSE Total Return Index delivered a total return of 505.58% for the period from 1995 to 2006. The RAFI Composite Total return Index delivered 898.27%. This is equal to a return of 17.79% compounded annually for the FTSE/JSE All Share Total Return index and 23.27% p.a. for the RAFI Composite Total Return Index. This is an outperformance of 5.48% compounded annually over the 11 year period.

Graph 4.5: South African Fundamental Total return Index compared to the FTSE/JSE All Share Total return Index



Graph 4.6: Annual Returns:



The RAFI Composite Total Index outperformed the FTSE/ALL Share Total return Index in eight of the 11 years with the only underperforming years being 1997, 1998 and 2005. This is similar to the yearly performance figures

of the price indices. Table 4.4 shows the underperformance to be 2.09% in 1997, 0.94% in 1998, and 0.11% in 2005.

TABLE: 4.4. Annual Returns RAFI Composite Total return Index versus FTSE/JSE All Share Total return Index, 1996-2006

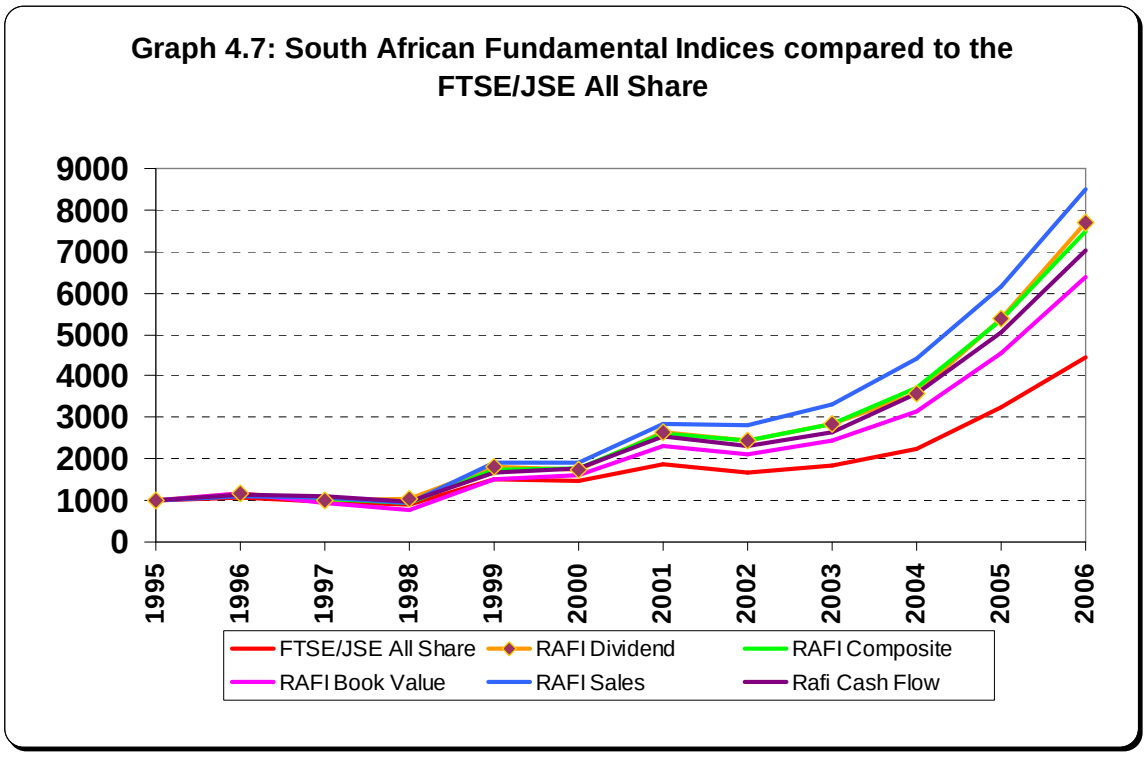
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FTSE/JSE All Share											
Return per year	9.53%	-6.91%	-5.91%	70.82%	0.35%	32.61%	-8.31%	16.08%	25.44%	47.25%	41.23%
Compounded Yearly Return since 1995	9.53%	0.98%	-1.37%	13.14%	10.46%	13.88%	10.41%	11.10%	12.61%	15.67%	**17.79%**
RAFI Composite											
Return per year	17.20%	-9.00%	-6.85%	97.81%	5.01%	51.13%	-4.36%	20.11%	32.68%	47.14%	42.74%
Compounded Yearly Return since 1995	17.20%	3.27%	-0.22%	18.40%	15.59%	20.87%	16.90%	17.29%	18.91%	21.47%	**23.27%**
Excess yearly return	**7.67%**	**-2.09%**	**-0.94%**	**26.99%**	**4.65%**	**18.52%**	**3.94%**	**4.02%**	**7.24%**	**-0.11%**	**1.51%**
Excess Compounded Return	**7.67%**	**2.30%**	**1.15%**	**5.26%**	**5.13%**	**7.00%**	**6.49%**	**6.19%**	**6.30%**	**5.80%**	**5.48%**

4.1.2 Single Fundamental Indices

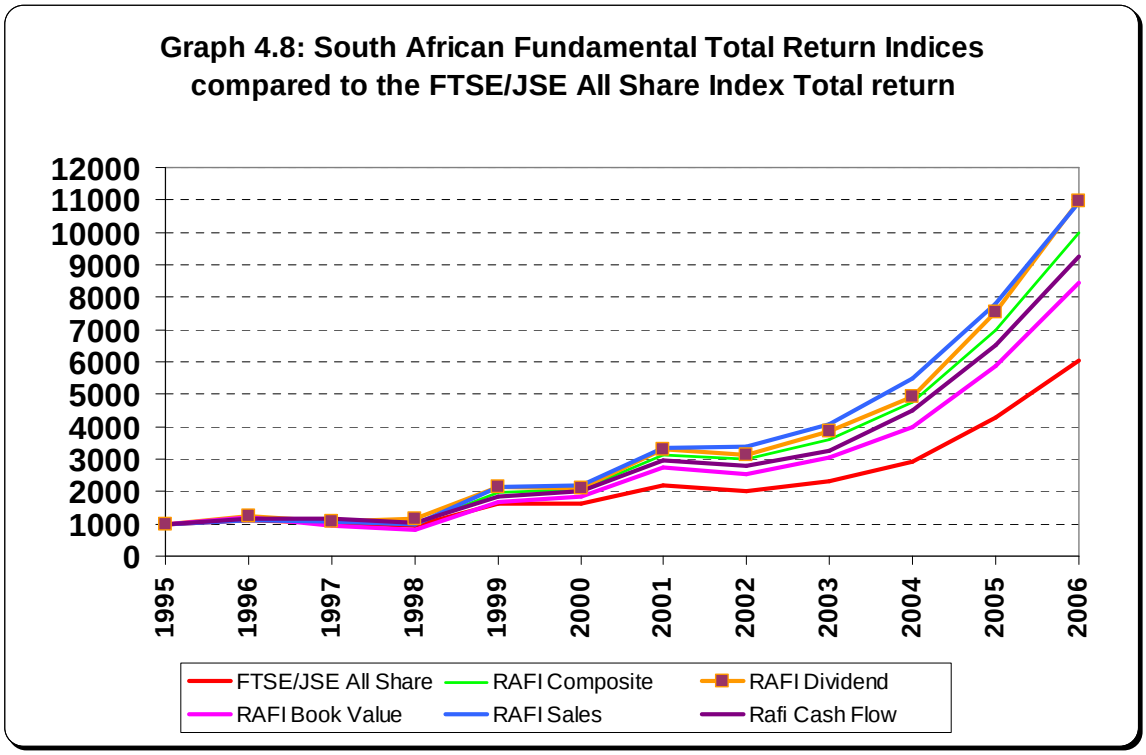
Four different fundamental indices were also created to represent each of the variables combined to form the RAFI Composite Index. The sales, dividend, book value and cash flow metrics were use to form their own indices. The results can be seen in the graphs below:

Comparing the graph of fundamental price indices in graph 4.7 with the fundamental total return indices in graph 4.8 it can clearly be seen that the Dividend Index does perform better on a total return basis. Due to this reason the rest of the fundamental indices covered will be on a total return basis and not a price basis.

Graph 4.7: South African Fundamental Indices compared to the FTSE/JSE All Share Index



Graph 4.8: South African Fundamental Total return Indices compared to the FTSE/JSE All Share Total Return Index



In graph 4.8 it can clearly be seen that all four fundamental indices outperformed the FTSE/JSE All Share Index for the 11-year period from 1995 to 2006. The Dividend Index outperformed by the biggest margin followed by the Sales Index, Composite Index, Cash Flow Index and Book Value Index..

Only the Sales Index and the Dividend Index outperformed the RAFI Composite Index. The Book Value was the worst performing Fundamental index.

Worldwide, one of the biggest criticisms against the RAFI Index is that it is only a value index in disguise (Fama and French, 2007). Rob Arnott (2006) states that fundamental indices are only value-biased relative to cap-weighted indices if cap-weighted indices are overweight large growth stocks. Arnott also stated that the Russell 1000 Value Index outperformed the Russell 1000 Index by 1% p.a. since inception in 1979 whereas the FTSE RAFI 1000 Index outperformed the Russell 1000 by 2.3% p.a. over the same measurement period.

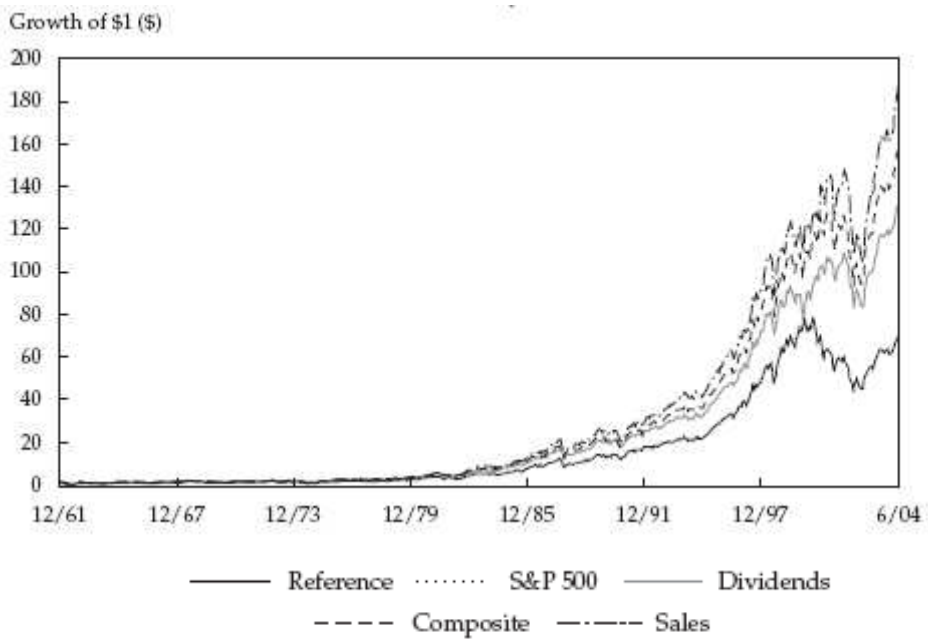
The results obtained from analysing the four fundamental indices disprove the criticism regarding the value bias of fundamental indices. The reason for this is that value shares are most commonly referred to as the shares with the lowest price-to-book value, and in this research the RAFI Composite Index outperformed the Book Value Index by some margin. A portfolio based only on book values would therefore have underperformed the RAFI Composite Index from 1995 to 2006.

This study was based on annual data and does not include enough data points to do an in-depth correlation between the Book value Index and RAFI Composite Index. These findings therefore provide scope for further research on comparisons between value and fundamentally created portfolios.

The other conclusion that could possibly be drawn by analysing the correlation between the RAFI Composite Index and the Book value Index is that the four metrics used to create the RAFI Composite Index are a good

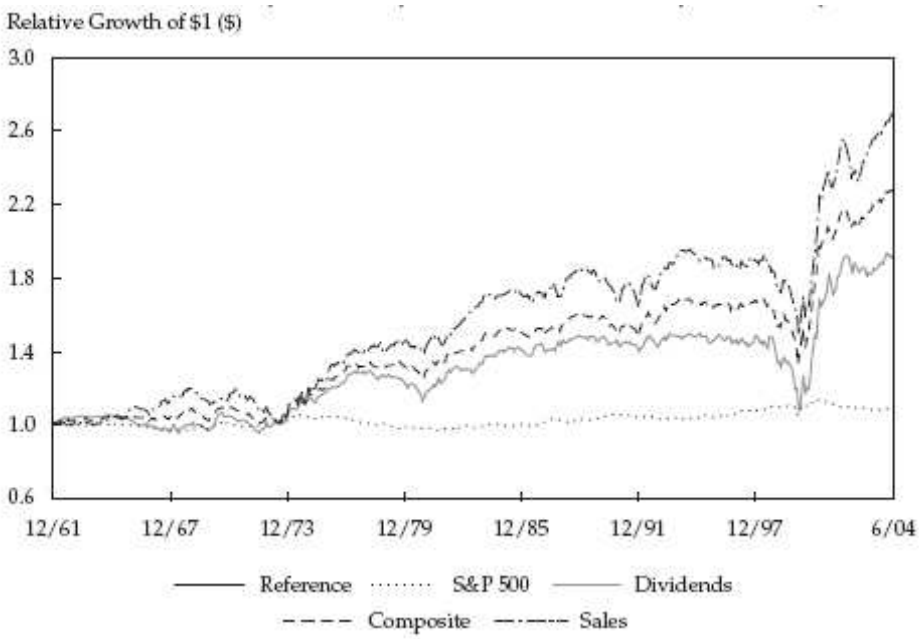
representation of the value of any company. Even though the fundamental index methodology makes sense, it is still bounded by the uncertainty of how a company's economic footprint should actually be measured.

Graph 4.9: Growth of $1.00



Source: Adapted from Arnott *et al.* (2005).

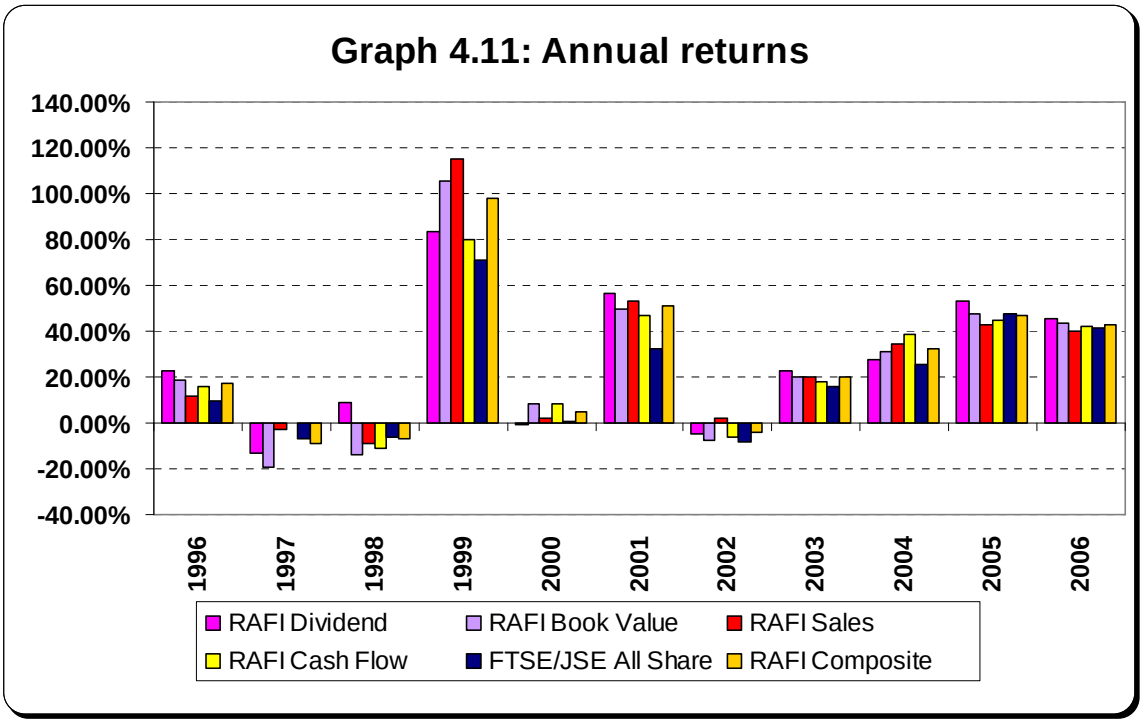
Graph 4.10: Cumulative performance of Indices relative to reference Portfolio



Source: Adapted from Arnott *et al.* (2005).

As can be seen from Graph 4.9 and Graph 4.10, which were created in the original fundamental index research, the individually created indices are not in exactly the same order as the results obtained for the South African market. The international results above are based on price data. When compared to the fundamental price indices created locally it can be seen that the Sales Index was the best performer of the four indices in both cases. Locally the Dividend index outperformed the Composite Index whereas internationally the Dividend index underperformed the Composite Index. This analysis places further emphasis on the importance of conducting this research on a total return basis.

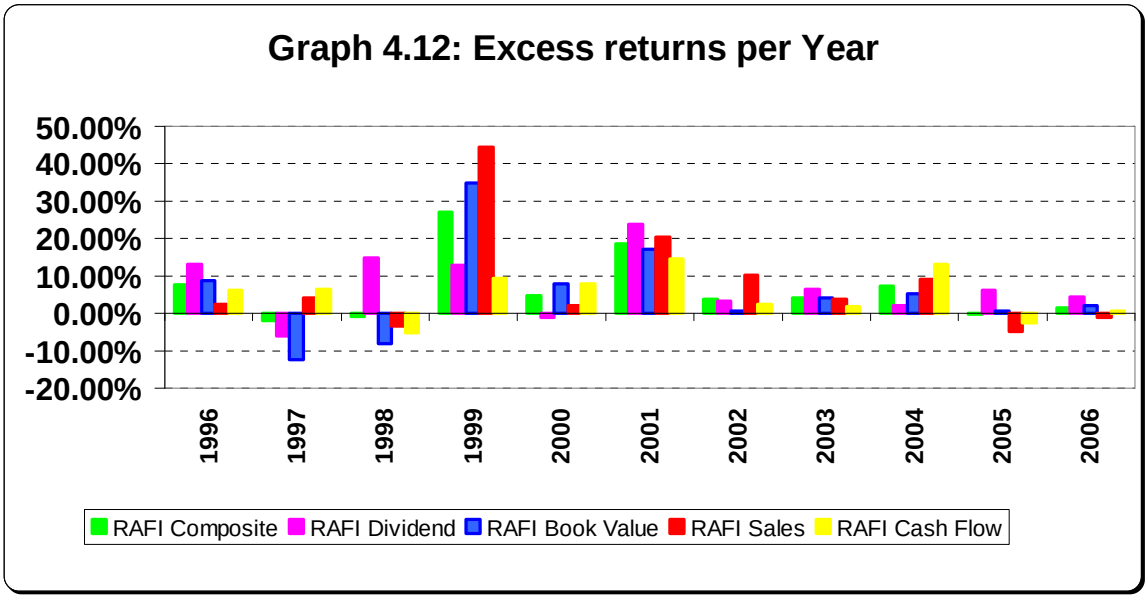
Graph 4.11: Annual returns



When comparing the annual performances of the four individual total return indices with each other as well as with the composite total return index and benchmark total return index in Graph 4.11, various results are obtained. On average all the fundamental indices outperformed the FTSE/JSE All Share Index. The years which were especially good were 1996, 1999, 2001, 2003 and 2004 when all the individual indices outperformed the benchmark index.

Every one of the four individual fundamental indices had years in which it was the best performing index. The Sales Index was the best performing index in 1999. The Book Value Index was the best performing index in 2000. The Cash Flow Index was the best performing index in 1997 and 2004. The Dividend Index was the index with the most inconsistent performance. The Dividend Index was the best performing index in 1996, 1998, 2001, 2003, 2005 and 2006. It was also the worst performing index in 2000.

Graph 4.12: Excess returns per year



Graph 4.12 shows the excess returns of the five fundamental indices versus the FTSE/JSE All Share Index. A clear pattern can be seen, except for the period between 1998 and 1999 when the Dividend Index and Cash Flow Index deviated from the other three.

This data spike was evaluated immediately to see if it was the result of a possible data error. No problems were found with the data; it is therefore clearly due to underperformance of the shares that were over-weighted in terms of the dividend metric. In a study done by Wolmarans (2000) it was found that in South Africa earnings yields predicted stock prices better than dividend yields. This was contrary to developed countries like the USA. The study done by Wolmarans (2000) and the results obtained in this analysis are not consistent. The Dividend Index is the best performer in the results obtained in this study.

The specific annual performance as well as the compounded annual performance is shown in Table 4.5 below.

TABLE: 4.5. Annual Returns RAFI Composite Total return Index versus FTSE/JSE All Share Total return Index, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FTSE/JSE All Share											
Return per year	9.53%	-6.91%	-5.91%	70.82%	0.35%	32.61%	-8.31%	16.08%	25.44%	47.25%	41.23%
Compounded Yearly Return since 1995	9.53%	0.98%	-1.37%	13.14%	10.46%	13.88%	10.41%	11.10%	12.61%	15.67%	**17.79%**
RAFI Composite											
Return per year	17.20%	-9.00%	-6.85%	97.81%	5.01%	51.13%	-4.36%	20.11%	32.68%	47.14%	42.74%
Compounded Yearly Return since 1995	17.20%	3.27%	-0.22%	18.40%	15.59%	20.87%	16.90%	17.29%	18.91%	21.47%	**23.27%**
Excess yearly return	**7.67%**	**-2.09%**	**-0.94%**	**26.99%**	**4.65%**	**18.52%**	**3.94%**	**4.02%**	**7.24%**	**-0.11%**	**1.51%**
Excess Compounded Return	**7.67%**	**2.30%**	**1.15%**	**5.26%**	**5.13%**	**7.00%**	**6.49%**	**6.19%**	**6.30%**	**5.80%**	**5.48%**
RAFI Dividend											
Return per year	22.57%	-12.84%	8.88%	83.68%	-0.86%	56.52%	-5.11%	22.51%	27.37%	53.40%	45.50%
Compounded Yearly Return since 1995	22.57%	3.36%	5.17%	20.90%	16.20%	22.11%	17.79%	18.37%	19.34%	22.37%	**24.31%**
Excess yearly return	**13.04%**	**-5.93%**	**14.79%**	**12.86%**	**-1.22%**	**23.91%**	**3.20%**	**6.42%**	**1.93%**	**6.15%**	**4.27%**
Excess Compounded Return	**13.04%**	**2.38%**	**6.54%**	**7.76%**	**5.73%**	**8.23%**	**7.38%**	**7.27%**	**6.73%**	**6.70%**	**6.52%**
RAFI Book Value											
Return per year	18.28%	-19.35%	-13.91%	105.81%	8.25%	49.75%	-7.62%	20.07%	30.79%	47.90%	43.29%
Compounded Yearly Return since 1995	18.28%	-2.33%	-6.35%	14.02%	12.84%	18.29%	14.19%	14.91%	16.57%	19.38%	**21.38%**
Excess yearly return	**8.75%**	**-12.44%**	**-8.00%**	**34.99%**	**7.89%**	**17.14%**	**0.69%**	**3.98%**	**5.35%**	**0.65%**	**2.06%**
Excess Compounded Return	**8.75%**	**-3.31%**	**-4.98%**	**0.88%**	**2.38%**	**4.41%**	**3.78%**	**3.80%**	**3.96%**	**3.71%**	**3.59%**
RAFI Sales											
Return per year	12.03%	-2.83%	-9.30%	115.44%	2.34%	53.01%	1.84%	20.03%	34.51%	42.50%	40.02%
Compounded Yearly Return since 1995	12.03%	4.34%	-0.42%	20.77%	16.84%	22.21%	19.07%	19.19%	20.80%	22.81%	**24.28%**
Excess yearly return	**2.50%**	**4.08%**	**-3.39%**	**44.62%**	**1.99%**	**20.40%**	**10.14%**	**3.94%**	**9.07%**	**-4.76%**	**-1.21%**
Excess Compounded Return	**2.50%**	**3.36%**	**0.95%**	**7.62%**	**6.37%**	**8.33%**	**8.66%**	**8.08%**	**8.19%**	**7.14%**	**6.49%**
Rafi Cash Flow											
Return per year	15.55%	-0.34%	-10.95%	80.21%	8.18%	47.20%	-6.04%	17.84%	38.42%	44.74%	41.78%
Compounded Yearly Return since 1995	15.55%	7.31%	0.84%	16.59%	14.86%	19.71%	15.64%	15.91%	18.22%	20.64%	**22.42%**
Excess yearly return	**6.02%**	**6.57%**	**-5.04%**	**9.39%**	**7.82%**	**14.59%**	**2.27%**	**1.76%**	**12.98%**	**-2.51%**	**0.55%**
Excess Compounded Return	**6.02%**	**6.33%**	**2.21%**	**3.45%**	**4.40%**	**5.83%**	**5.23%**	**4.81%**	**5.61%**	**4.97%**	**4.63%**

The Dividend Index was the top-performing index over the period delivering an astonishing return of 24.31% compounded. This was an outperformance of

6.52% p.a. relative to the FTSE/JSE All Share Total Return Index. The second-best performing index was the Sales Index, which delivered a return of 24.28% annually and outperformed the FTSE/JSE All Share Index by 6.49% p.a. The Cash Flow Index delivered 22.42% p.a. and the the Book Value Index performed worst with an annual return of 21.38% p.a., which still outperformed the FTSE/JSE All Share Total return Index by a significant margin of 2.06% p.a.

The Book Value Index was the only index which had periods where the cumulative compounded excess return was negative. The Book Value Index's negative excess returns occurred in 1997 and 1998.

The over- and underperformance of all the indices in different time periods are a clear indication of the positive impact created by the diversification aspects of using four fundamental factors rather than one fundamental factor. Using four metrics lowers the risk by covering all aspects of the earnings cycle.

4.1.3 Alternative fundamental indices

After the fundamental indices created in the original fundamental index research had been replicated and analysed a few alternative indices were created. The main idea behind the alternative indices is to see whether the equal weighting of the four fundamental factors used to create the Composite Index is the most optimal weighting. The above results have already created doubts as to whether the dividend metric is a viable fundamental factor to measure the economic footprint of a company in the South African market. The same methodology as above was used to analyse the alternative fundamental indices.

Ten alternative indices were created. The RAFI Composite Index assigned the same weight, namely 25%, to each of the four metrics while the alternative indices are also based on equal weightings but consist of three or two fundamental factors rather than four. Table 4.6 shows a summary of the

indices, whereas the results of the different indices are summarized in Table 4.7.

Table 4.6: Weightings of alternative fundamental indices

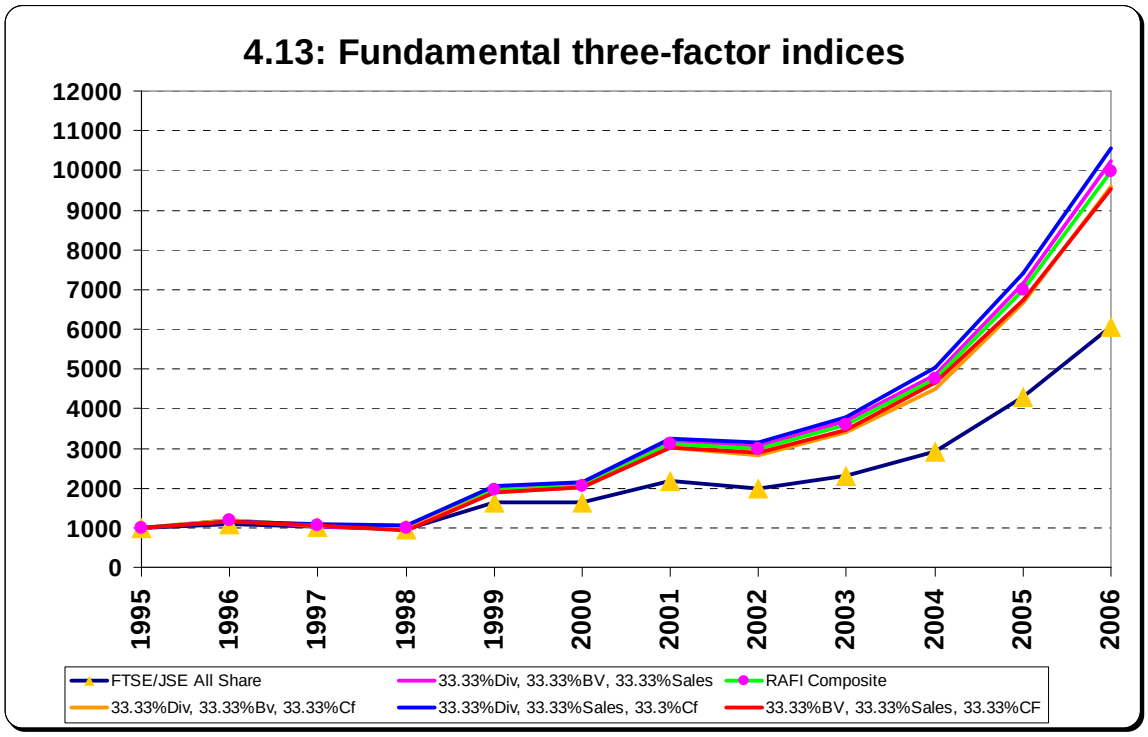
S =Sales
BV = Book value
CF = Cash flow
D = Dividends

Index	**Fundamental factor weightings**			
	Sales	Book value	Cash flow	Dividend
⅓ S, BV, CF	33.33%	33.33%	33.33%	0%
⅓ S, BV, D	33.33%	33.33%	0%	33.33%
⅓ S, CF, D	33.33%	0%	33.33%	33.33%
⅓ BV, CF, D	0%	33.33%	33.33%	33.33%
½ S, BV	50%	50%	0%	0%
½ S, CF	50%	0%	50%	0%
½ S, D	50%	0%	0%	50%
½ BV, CF	0%	50%	50%	0%
½ BV, D	0%	50%	0%	50%
½ CF, D	0%	0%	50%	50%

The indices are named according to their weightings. For example: 1/3 S, BV, D is an index consisting of three factors – sales, book value and dividends – which are equally weighted at 33.33% each.

Where a company has a dividend of zero, exactly the same rules apply as in the RAFI Composite Index. This means that if a company has a dividend with a fundamental value of zero, the remaining factor(s) in the index are equally weighted. The 1/3 S, BV, D index would weigh a company with zero dividends with a 50% sales weighting and a 50% book value rating.

Graph 4.13: Fundamental three-factor indices



When looking at indices with three factors it is clear from Graph 4.13 that the indices move exceptionally close to each other. The composite index can also be observed as the third best index.

No clear trend is visible with regards to which factor influences the indices the best or the worst. This shows that using four rather three factors does not add significant value.

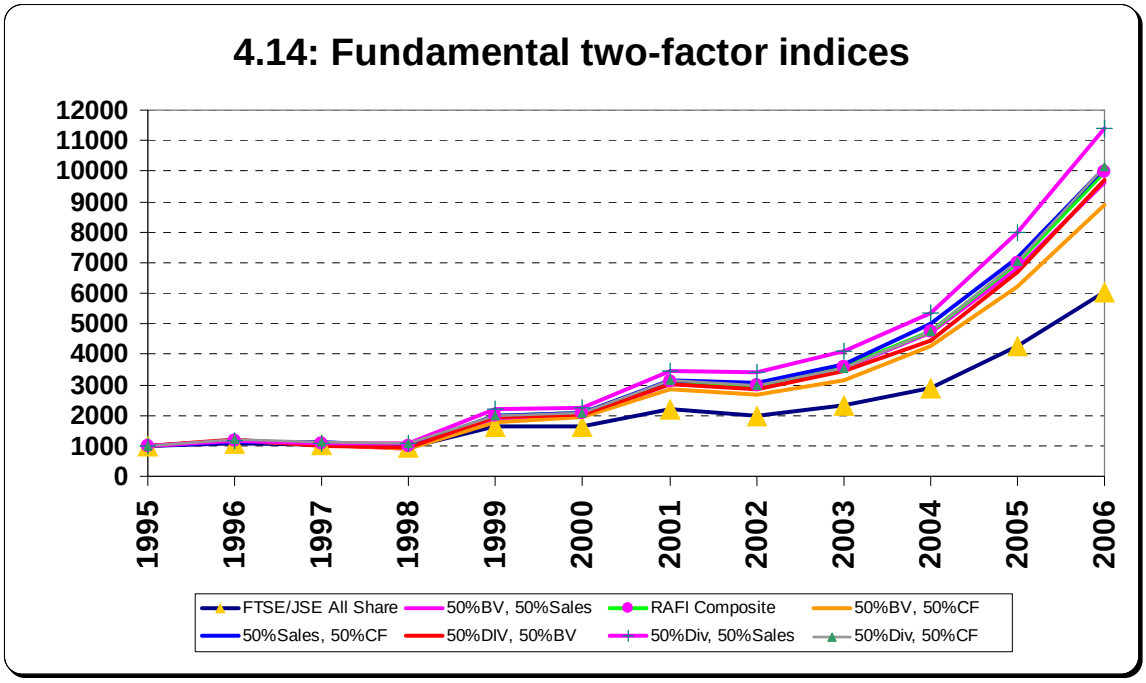
TABLE: 4.7. Annual Returns Alternative Fundamental Indices versus FTSE/JSE All Share Index, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FTSE/JSE All Share											
Return per year	9.53%	-6.91%	-5.91%	70.82%	0.35%	32.61%	-8.31%	16.08%	25.44%	47.25%	41.23%
Compounded Yearly Return since 1995	9.53%	0.98%	-1.37%	13.14%	10.46%	13.88%	10.41%	11.10%	12.61%	15.67%	**17.79%**
RAFI Composite											
Return per year	17.20%	-9.00%	-6.85%	97.81%	5.01%	51.13%	-4.36%	20.11%	32.68%	47.14%	42.74%
Compounded Yearly Return since 1995	17.20%	3.27%	-0.22%	18.40%	15.59%	20.87%	16.90%	17.29%	18.91%	21.47%	**23.27%**

Excess yearly return	**7.67%**	**-2.09%**	**-0.94%**	**26.99%**	**4.65%**	**18.52%**	**3.94%**	**4.02%**	**7.24%**	**-0.11%**	**1.51%**
Excess Compounded Return	**7.67%**	**2.30%**	**1.15%**	**5.26%**	**5.13%**	**7.00%**	**6.49%**	**6.19%**	**6.30%**	**5.80%**	**5.48%**
33.33%Div, 33.33%BV, 33.33%Sales											
Return per year	17.76%	-11.91%	-5.54%	104.90%	4.10%	52.23%	-3.81%	20.87%	30.75%	48.01%	43.10%
Compounded Yearly Return since 1995	17.76%	1.85%	-0.67%	19.04%	15.89%	21.28%	17.33%	17.77%	19.14%	21.75%	**23.56%**
Excess yearly return	**8.23%**	**-5.00%**	**0.37%**	**34.08%**	**3.75%**	**19.62%**	**4.50%**	**4.79%**	**5.30%**	**0.75%**	**1.87%**
Excess Compounded Return	**8.23%**	**0.88%**	**0.70%**	**5.89%**	**5.43%**	**7.40%**	**6.92%**	**6.66%**	**6.53%**	**6.08%**	**5.77%**
33.33%Div, 33.33%Bv, 33.33%Cf											
Return per year	19.02%	-11.21%	-5.92%	91.02%	5.71%	50.44%	-6.42%	20.25%	32.12%	48.61%	43.66%
Compounded Yearly Return since 1995	19.02%	2.80%	-0.19%	17.39%	14.96%	20.23%	16.00%	16.52%	18.16%	20.90%	**22.81%**
Excess yearly return	**9.49%**	**-4.30%**	**-0.02%**	**20.20%**	**5.36%**	**17.83%**	**1.89%**	**4.16%**	**6.68%**	**1.35%**	**2.43%**
Excess Compounded Return	**9.49%**	**1.82%**	**1.18%**	**4.25%**	**4.49%**	**6.35%**	**5.59%**	**5.42%**	**5.55%**	**5.23%**	**5.02%**
33.33%Div, 33.33%Sales, 33.3%Cf											
Return per year	16.74%	-5.38%	-4.51%	95.03%	4.01%	51.94%	-3.27%	20.06%	33.32%	47.00%	42.58%
Compounded Yearly Return since 1995	16.74%	5.10%	1.79%	19.76%	16.43%	21.71%	17.78%	18.07%	19.67%	22.16%	**23.89%**
Excess yearly return	**7.21%**	**1.53%**	**1.40%**	**24.21%**	**3.66%**	**19.33%**	**5.04%**	**3.98%**	**7.88%**	**-0.25%**	**1.35%**
Excess Compounded Return	**7.21%**	**4.12%**	**3.17%**	**6.62%**	**5.97%**	**7.83%**	**7.38%**	**6.96%**	**7.06%**	**6.49%**	**6.10%**
33.33%BV, 33.33%Sales, 33.33%CF											
Return per year	15.28%	-7.50%	-11.40%	100.32%	6.22%	49.94%	-3.94%	19.27%	34.54%	44.99%	41.63%
Compounded Yearly Return since 1995	15.28%	3.27%	-1.88%	17.29%	14.99%	20.19%	16.40%	16.76%	18.61%	21.02%	**22.76%**
Excess yearly return	**5.75%**	**-0.59%**	**-5.50%**	**29.51%**	**5.86%**	**17.34%**	**4.37%**	**3.18%**	**9.10%**	**-2.27%**	**0.41%**
Excess Compounded Return	**5.75%**	**2.29%**	**-0.50%**	**4.15%**	**4.53%**	**6.31%**	**6.00%**	**5.66%**	**6.00%**	**5.34%**	**4.97%**
50%BV, 50%Sales											
Return per year	15.15%	-11.08%	-11.62%	110.71%	5.25%	51.34%	-2.88%	20.00%	32.62%	45.13%	41.59%
Compounded Yearly Return since 1995	15.15%	1.19%	-3.27%	17.51%	14.95%	20.34%	16.71%	17.12%	18.75%	21.15%	**22.88%**
Excess yearly return	**5.62%**	**-4.17%**	**-5.71%**	**39.89%**	**4.90%**	**18.73%**	**5.42%**	**3.92%**	**7.18%**	**-2.12%**	**0.36%**
Excess Compounded Return	**5.62%**	**0.21%**	**-1.90%**	**4.37%**	**4.49%**	**6.46%**	**6.30%**	**6.02%**	**6.14%**	**5.48%**	**5.09%**
50%BV, 50%CF											
Return per year	16.92%	-9.84%	-12.46%	92.82%	8.18%	48.43%	-6.81%	18.94%	34.59%	46.29%	42.51%

Compounded Yearly Return since 1995	16.92%	2.67%	-2.64%	15.50%	14.00%	19.12%	15.02%	15.50%	17.48%	20.08%	**21.97%**
Excess yearly return	**7.39%**	**-2.93%**	**-6.55%**	**22.01%**	**7.83%**	**15.82%**	**1.49%**	**2.86%**	**9.15%**	**-0.96%**	**1.28%**
Excess Compounded Return	**7.39%**	**1.69%**	**-1.27%**	**2.35%**	**3.53%**	**5.24%**	**4.61%**	**4.40%**	**4.87%**	**4.41%**	**4.18%**
50%Sales, 50%CF											
Return per year	13.79%	-1.58%	-10.13%	97.57%	5.24%	50.09%	-2.12%	18.89%	36.44%	43.58%	40.85%
Compounded Yearly Return since 1995	13.79%	5.82%	0.21%	18.75%	15.92%	21.02%	17.40%	17.59%	19.55%	21.76%	**23.38%**
Excess yearly return	**4.26%**	**5.33%**	**-4.22%**	**26.75%**	**4.89%**	**17.49%**	**6.19%**	**2.81%**	**10.99%**	**-3.67%**	**-0.37%**
Excess Compounded Return	**4.26%**	**4.85%**	**1.59%**	**5.60%**	**5.45%**	**7.14%**	**7.00%**	**6.49%**	**6.94%**	**6.09%**	**5.59%**
50%DIV, 50%BV											
Return per year	20.95%	-16.94%	-3.43%	98.20%	4.61%	51.28%	-6.65%	21.55%	28.95%	50.52%	44.66%
Compounded Yearly Return since 1995	20.95%	0.23%	-1.01%	17.75%	15.00%	20.38%	16.08%	16.75%	18.05%	20.95%	**22.94%**
Excess yearly return	**11.42%**	**-10.03%**	**2.47%**	**27.38%**	**4.26%**	**18.67%**	**1.66%**	**5.47%**	**3.51%**	**3.27%**	**3.44%**
Excess Compounded Return	**11.42%**	**-0.75%**	**0.36%**	**4.61%**	**4.54%**	**6.50%**	**5.68%**	**5.65%**	**5.44%**	**5.28%**	**5.15%**
50%Div, 50%Sales											
Return per year	17.23%	-7.71%	-1.53%	105.65%	2.46%	54.10%	-1.87%	21.12%	30.71%	48.43%	43.11%
Compounded Yearly Return since 1995	17.23%	4.02%	2.13%	21.66%	17.55%	22.98%	19.08%	19.33%	20.54%	23.08%	**24.78%**
Excess yearly return	**7.70%**	**-0.80%**	**4.38%**	**34.83%**	**2.10%**	**21.50%**	**6.43%**	**5.03%**	**5.26%**	**1.18%**	**1.88%**
Excess Compounded Return	**7.70%**	**3.04%**	**3.51%**	**8.52%**	**7.09%**	**9.10%**	**8.67%**	**8.23%**	**7.93%**	**7.41%**	**6.99%**
50%Div, 50%CF											
Return per year	19.24%	-6.87%	-1.83%	82.02%	4.35%	51.66%	-5.76%	20.25%	32.86%	49.04%	43.84%
Compounded Yearly Return since 1995	19.24%	5.38%	2.92%	18.68%	15.67%	21.01%	16.76%	17.19%	18.84%	21.56%	**23.43%**
Excess yearly return	**9.71%**	**0.04%**	**4.07%**	**11.20%**	**3.99%**	**19.06%**	**2.54%**	**4.16%**	**7.42%**	**1.78%**	**2.61%**
Excess Compounded Return	**9.71%**	**4.40%**	**4.29%**	**5.54%**	**5.21%**	**7.13%**	**6.36%**	**6.09%**	**6.23%**	**5.89%**	**5.64%**

Graph 4.14: Fundamental two-factor indices



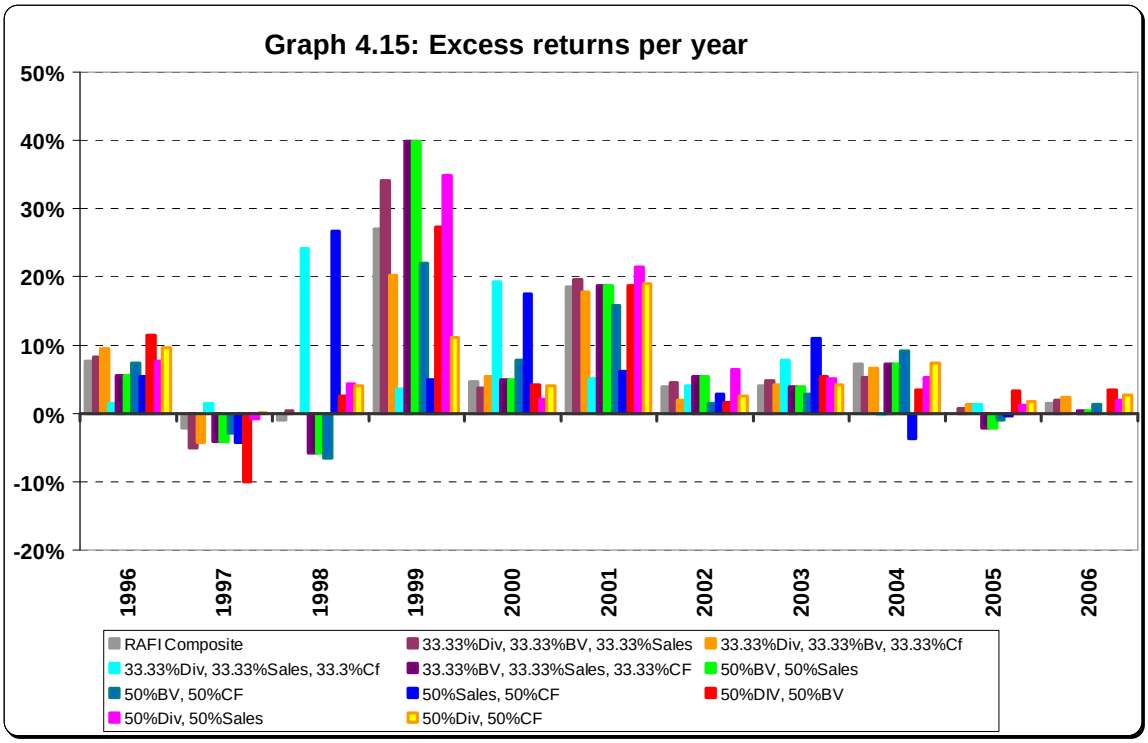
The above graph, which plots all the two-factor alternative fundamental indices against the RAFI Composite and FTSE/JSE All Share Index, provides useful insights into the RAFI design. In this graph, as in the previous graph, it can clearly be seen that most of the indices move close together. The index consisting of the Sales and the Dividend metrics outperforms by the largest margin as would be expected, because these are the top two single indices.

The index consisting of book value and the cash flow metric was the worst performing index. This clearly shows that the dividend metric and the sales metric add the most value.

Graph 4.15 plots the excess return of each fundamental index relative to the FTSE/JSE All Share Index. These annual excess returns form a clear pattern. This graph shows that volatility decreases when metrics are combined.

In Graph 4.15 as well as in Table 4.7 it can be seen that the only index which always outperformed the FTSE/JSE All Share index is the 50% Dividend and 50% CF Index. The 50% Div, 50% BV index seems to be the most volatile index with this index either being the best or close to the worst

Graph 4.15: Excess returns per year



4.1.4 Top indices

TABLE: 4.8. Annual returns of top fundamental indices versus FTSE/JSE All Share Index, 1996-2006

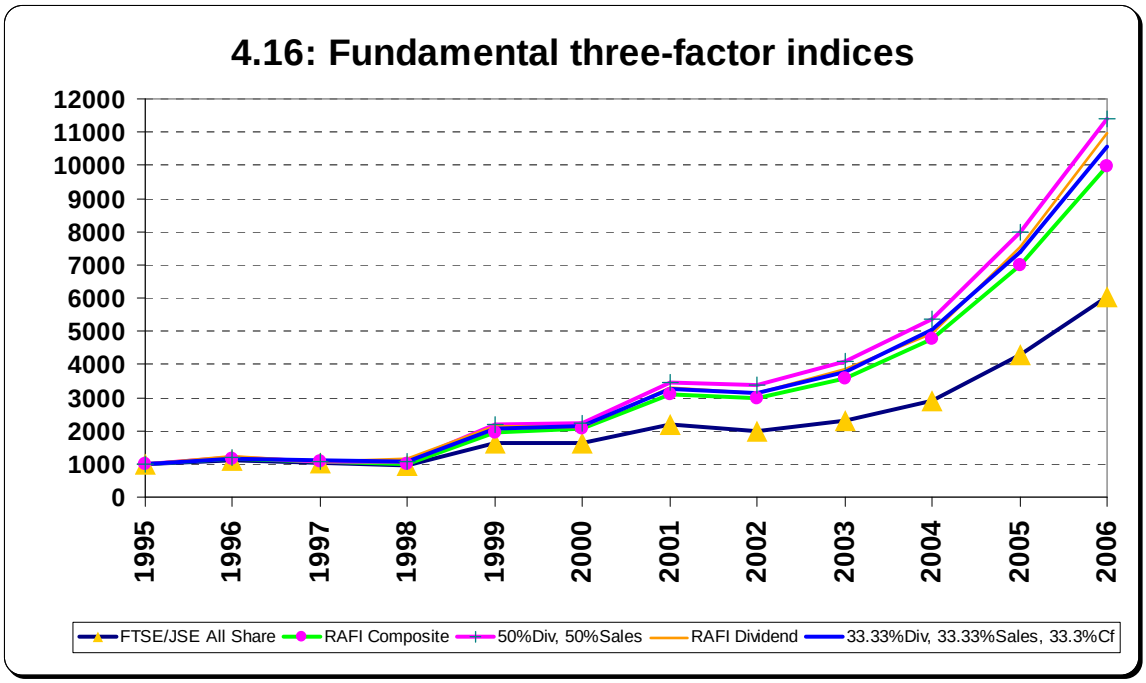
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FTSE/JSE All Share											
Return per year	9.53%	-6.91%	-5.91%	70.82%	0.35%	32.61%	-8.31%	16.08%	25.44%	47.25%	41.23%
Compounded Yearly Return since 1995	9.53%	0.98%	-1.37%	13.14%	10.46%	13.88%	10.41%	11.10%	12.61%	15.67%	**17.79%**
RAFI Composite											
Return per year	17.20%	-9.00%	-6.85%	97.81%	5.01%	51.13%	-4.36%	20.11%	32.68%	47.14%	42.74%
Compounded Yearly Return since 1995	17.20%	3.27%	-0.22%	18.40%	15.59%	20.87%	16.90%	17.29%	18.91%	21.47%	**23.27%**
Excess yearly return	**7.67%**	**-2.09%**	**-0.94%**	**26.99%**	**4.65%**	**18.52%**	**3.94%**	**4.02%**	**7.24%**	**-0.11%**	**1.51%**
Excess Compounded Return	**7.67%**	**2.30%**	**1.15%**	**5.26%**	**5.13%**	**7.00%**	**6.49%**	**6.19%**	**6.30%**	**5.80%**	**5.48%**
RAFI Dividend											
Return per year	22.57%	-12.84%	8.88%	83.68%	-0.86%	56.52%	-5.11%	22.51%	27.37%	53.40%	45.50%
Compounded Yearly Return since 1995	22.57%	3.36%	5.17%	20.90%	16.20%	22.11%	17.79%	18.37%	19.34%	22.37%	**24.31%**
Excess yearly return	**13.04%**	**-5.93%**	**14.79%**	**12.86%**	**-1.22%**	**23.91%**	**3.20%**	**6.42%**	**1.93%**	**6.15%**	**4.27%**

Excess Compounded Return	**13.04%**	**2.38%**	**6.54%**	**7.76%**	**5.73%**	**8.23%**	**7.38%**	**7.27%**	**6.73%**	**6.70%**	**6.52%**
33.33%Div, 33.33%Sales, 33.3%Cf											
Return per year	16.74%	-5.38%	-4.51%	95.03%	4.01%	51.94%	-3.27%	20.06%	33.32%	47.00%	42.58%
Compounded Yearly Return since 1995	16.74%	5.10%	1.79%	19.76%	16.43%	21.71%	17.78%	18.07%	19.67%	22.16%	**23.89%**
Excess yearly return	**7.21%**	**1.53%**	**1.40%**	**24.21%**	**3.66%**	**19.33%**	**5.04%**	**3.98%**	**7.88%**	**-0.25%**	**1.35%**
Excess Compounded Return	**7.21%**	**4.12%**	**3.17%**	**6.62%**	**5.97%**	**7.83%**	**7.38%**	**6.96%**	**7.06%**	**6.49%**	**6.10%**
50%Div, 50%Sales											
Return per year	17.23%	-7.71%	-1.53%	105.65%	2.46%	54.10%	-1.87%	21.12%	30.71%	48.43%	43.11%
Compounded Yearly Return since 1995	17.23%	4.02%	2.13%	21.66%	17.55%	22.98%	19.08%	19.33%	20.54%	23.08%	**24.78%**
Excess yearly return	**7.70%**	**-0.80%**	**4.38%**	**34.83%**	**2.10%**	**21.50%**	**6.43%**	**5.03%**	**5.26%**	**1.18%**	**1.88%**
Excess Compounded Return	**7.70%**	**3.04%**	**3.51%**	**8.52%**	**7.09%**	**9.10%**	**8.67%**	**8.23%**	**7.93%**	**7.41%**	**6.99%**

The return figures in Table 4.8 only show the top-performing indices in each category, namely single-factor, two-factor and three-factor models. It can clearly be seen that the single-factor, two-factor and three-factor models outperformed the Composite Index. The 50% Dividend, 50% Sales Index realised a compounded annual return of 24.78% which is 6.99% p.a. higher than the FTSE/JSE All Share and 1.51% p.a. higher than the RAFI Composite Index . Likewise, the 33% Dividend, 33% Sales, 33% Cash Flow Index realised historical returns of 23.89% compounded annually which is 6.10% p.a. higher than the FTSE/JSE All Share and 0.62% p.a. higher than the Composite Index.

Graph 4.16 shows the best performing three-factor index and the best performing two-factor index relative to the individual indices as well as the RAFI Composite Index. As already stated, the two-factor index consisting of the Sales and Dividend metrics is the best performing index of all indices created in this research report. The two-factor index outperformed the top-performing three-factor model.

Graph 4.16: Top fundamental indices



4.2 Performance measures

4.2.1 Risk-adjusted returns

TABLE: 4.9 Performance Measures: Core Fundamental Indices
CR=Compounded return, SD= Standard Deviation, TE=Tracking Error, IR=Information ratio, TR = Treynor Ratio

Portfolio	Total Return	CR	Excess Return	CAPM Alpha	SD	Beta vs Ref	TE	IR	Sharpe Ratio	Sortino Ratio	TR	Kappa	Omega	p-value of Alpha
FTSE/JSE All Share	505.58%	17.79%			25.83%	1.00			31.7%	35.39%		0.6121	3.1905	
RAFI Composite	898.27%	23.27%	5.48%	4.81%	32.15%	1.22	8.83%	0.62	45.1%	72.20%	12.69%	1.0650	4.8421	0.07
RAFI Dividend	995.64%	24.31%	6.52%	6.41%	29.81%	1.13	8.37%	0.78	50.9%	81.68%	14.52%	1.1666	5.4706	0.04
RAFI Book Value	742.35%	21.38%	3.59%	2.77%	35.95%	1.35	12.59%	0.28	38.1%	54.42%	10.74%	0.7483	3.7200	0.38
RAFI Sales	992.76%	24.28%	6.49%	5.62%	35.60%	1.30	14.06%	0.46	45.1%	81.80%	12.97%	1.2541	5.8125	0.20
RAFI Cash Flow	825.59%	22.42%	4.63%	4.51%	27.77%	1.05	6.18%	0.75	46.1%	69.62%	13.23%	0.9574	5.0625	0.05

Table 4.9 above shows all the performance measures that were applied to the fundamental indices. The risk-free rate used in all the performance measurement calculations in this research, where needed, is the monthly bankers' acceptance rate at the end of each year.

The p-values for the CAPM alphas of the different indices are also shown in Table 4.9 with only the p-value of the Dividend index being below the confidendce level of 5%. The other p-values are relatively low with the p-value of the Book-Value Index being the highest. Another strange observation is that although the Sales Index outperforms the Cash Flow Index by some margin it's p-value is much higher.

Table 4.10: Performance of USA RAFI 1000

Portfolio/Index	Ending Value of $1	Geometric Return	Volatility	Sharpe Ratio	Excess Return vs. Reference	Tracking Error vs. Reference	Information Ratio	*t*-Statistic for Excess Return
S&P 500	$ 73.98	10.53%	15.1%	0.315	0.18 pps	1.52%	0.12	0.76
Reference	68.95	10.35	15.2	0.301	—	—	—	—
Book	136.22	12.11	14.9	0.426	1.76	3.54	0.50	3.22
Income	165.21	12.61	14.9	0.459	2.26	3.94	0.57	3.72
Revenue	182.05	12.87	15.9	0.448	2.52	5.03	0.50	3.25
Sales	184.95	12.91	15.8	0.452	2.56	4.93	0.52	3.36
Dividends	131.37	12.01	13.6	0.458	1.66	5.33	0.31	2.02
Employment	156.83	12.48	15.9	0.423	2.13	4.64	0.46	2.98
Composite	156.54	12.47	14.7	0.455	2.12	4.21	0.50	3.26
Average (ex Composite)	$159.44	12.50%	15.2%	0.444	2.15 pps	4.57%	0.47	3.09

Source: Adapted from Arnott *et al.* (2005).

When comparing the South African results in Table 4.9 with the USA results in Table 4.10 it has to be stated that performance measures only have value when they are compared with similar portfolios or indices, as in this case. Therefore, the only way to compare the performance measures of the original fundamental index article with the performance measures of this research is to compare the rankings of the indices in both studies.

The rankings of the indices based on performance measures differ significantly between the two tables. This is mostly due to the risks being measured on monthly data in the USA article and on annual data in South Africa.

The Information Ratio delivers the most inconsistent results where the Dividend Index is the best ranked in local research and the worst ranked in the USA research. This is mostly due to the fact that the Dividend Index

delivered the highest tracking error in the USA research and second best tracking error locally.

The only consistency that can be found by looking at the Sharpe Ratio is that all the fundamental indices have higher Sharpe Ratios than the benchmark indices in both tables.

Table 4.9 shows that the different performance measures for this research deliver relatively consistent results. Based on the Sharpe Ratio, Sortino Ratio, Treynor Ratio, Kappa and Omega, the worst performing index is always the benchmark index and the best performing index is always represented by the Sales Index or the Dividend Index.

The beta values calculated for each index should be analysed carefully. The reason is the fact that the use of annual performance data leads to a shortage of data points. This in turn leads to inconsistent results compared to using monthly performance data.

Table 4.11 on the next page is simply an extension of Table 4.9 showing the performance of the different indices. Table 4.11 includes all the alternative two-factor and three-factor indices. The cells highlighted in blue represent the best overall Fundamental index looking at the different performance measures. The red cells represent the worst performing Fundamental index.

It can clearly be seen that the blue cells are concentrated around the two-factor models representing the 50% Sales, 50% Dividend Index, and the 50% Dividend, 50% Cash Flow Index and the single factor Dividend index

The Book Value Index is the worst fundamental index based on all the ratios covered in this research.

The p-values in the table also show that the CAPM alpha is more significant for the indices not containing the Sales and Book Value metrics.

TABLE: 4.11 Performance Measures: All Fundamental Indices

Portfolio	Total Return	Compounded Return	Excess Return	CAPM Alpha	Standard Deviation	Beta vs Reference	Tracking Error	Info Ratio	Sharpe Ratio	Sortino Ratio	Treynor Ratio	Kappa	Omega	p-value of Alpha
FTSE/JSE All Share	505.58%	17.79%			25.83%	1.0000			31.74%	35.39%		0.6121	3.1905	
RAFI Composite	898.27%	23.27%	5.48%	4.81%	32.15%	1.2160	8.83%	0.6199	45.10%	72.20%	12.69%	1.0650	4.8421	0.07
RAFI Dividend	995.64%	24.31%	6.52%	6.41%	29.81%	1.1134	8.37%	0.7794	50.92%	81.68%	14.52%	1.1666	5.4706	0.04
RAFI Book Value	742.35%	21.38%	3.59%	2.77%	35.95%	1.3496	12.59%	0.2848	38.11%	54.42%	10.74%	0.7483	3.7200	0.38
RAFI Sales	992.76%	24.28%	6.49%	5.62%	35.60%	1.3015	14.06%	0.4619	45.06%	81.80%	12.97%	1.2541	5.8125	0.20
RAFI Cash Flow	825.59%	22.42%	4.63%	4.51%	27.77%	1.0496	6.18%	0.7499	46.07%	69.62%	13.23%	0.9574	5.0625	0.05
33.33%Div, 33.33%BV, 33.33%Sales	924.47%	23.56%	5.77%	4.94%	34.04%	1.2806	10.82%	0.5327	44.60%	73.11%	12.54%	1.0769	4.7000	0.11
33.33%Div, 33.33%Bv, 33.33%Cf	858.63%	22.81%	5.02%	4.50%	31.04%	1.1806	7.43%	0.6763	44.79%	67.02%	12.58%	0.9822	4.5000	0.05
33.33%Div, 33.33%Sales, 33.3%Cf	955.05%	23.89%	6.10%	5.53%	30.94%	1.1710	7.87%	0.7750	47.84%	80.62%	13.48%	1.2248	5.2941	0.04
33.33%BV, 33.33%Sales, 33.33%CF	854.10%	22.76%	4.97%	4.27%	32.78%	1.2320	9.88%	0.5029	43.13%	67.54%	12.21%	0.9756	4.4500	0.15
50%BV, 50%Sales	864.61%	22.88%	5.09%	4.17%	35.60%	1.3258	12.85%	0.3963	41.70%	66.86%	11.82%	0.9700	4.7000	0.24
50%BV, 50%CF	788.63%	21.97%	4.18%	3.62%	31.64%	1.1980	8.36%	0.4998	41.81%	61.29%	11.82%	0.8555	4.2381	0.14
50%Sales, 50%CF	908.59%	23.38%	5.59%	5.04%	31.34%	1.1734	9.16%	0.6102	45.86%	75.56%	13.08%	1.1077	5.5625	0.10
50%DIV, 50%BV	869.40%	22.94%	5.15%	4.49%	33.29%	1.2590	9.78%	0.5264	43.75%	65.57%	12.26%	0.9374	4.0435	0.11
50%Div, 50%Sales	1041.50%	24.78%	6.99%	6.19%	33.49%	1.2561	10.63%	0.6573	48.26%	88.03%	13.60%	1.3513	6.0625	0.06
50%Div, 50%CF	913.44%	23.43%	5.64%	5.40%	28.47%	1.0848	5.49%	1.0287	48.92%	75.57%	13.82%	1.1503	5.1765	0.01

Table 4.12 shows the relative rankings of the indices based on the Sharpe Ratio, Sortino Ratio, Treynor Ratio, Kappa and Omega. The Information Ratio is excluded because the tracking error leads to inconsistent results due to the fact that it is calculated annually and not monthly.

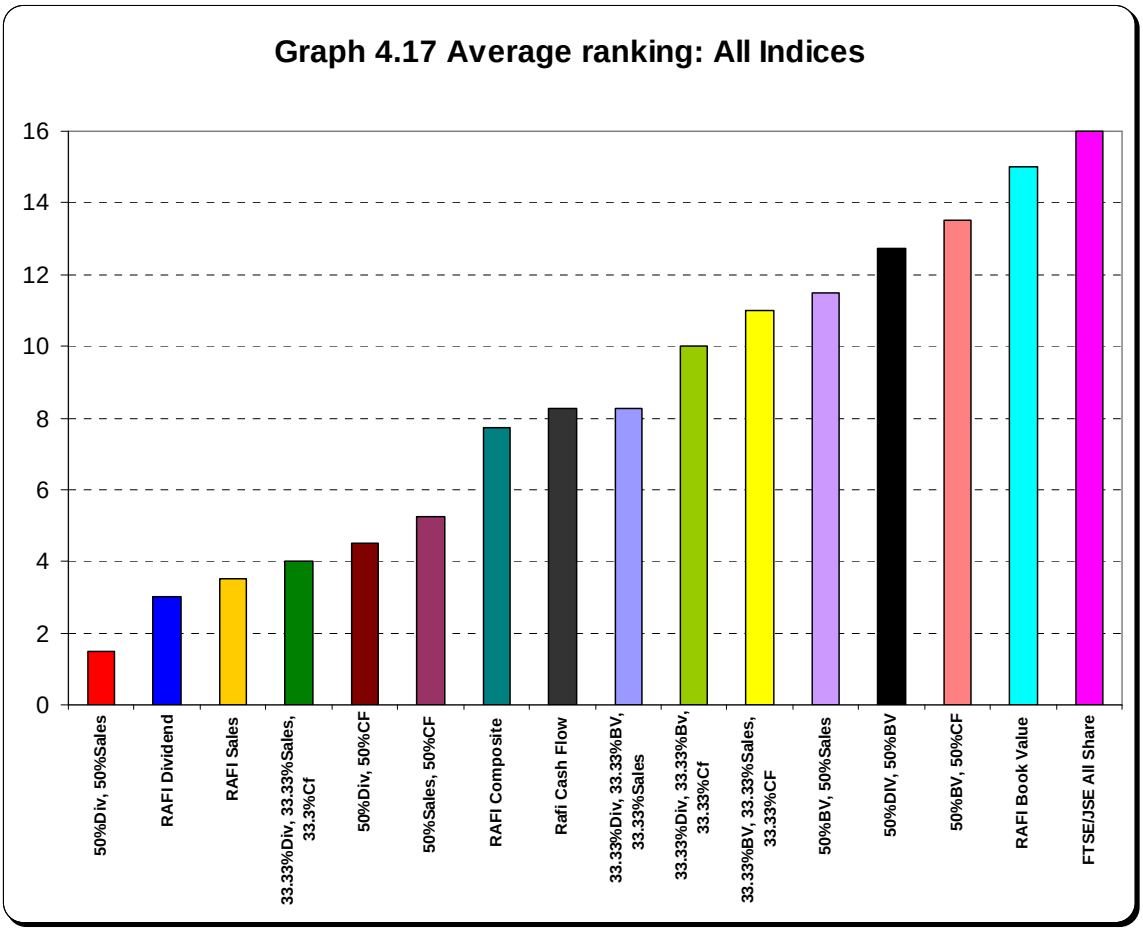
Graph 4.17 shows the average rankings of the indices. Indices are first ranked from 1 to 16 where 1 is the best and 16 is the worst. Next, the average ranking is calculated for each index.

Table 4.12 the ranking of performance measures

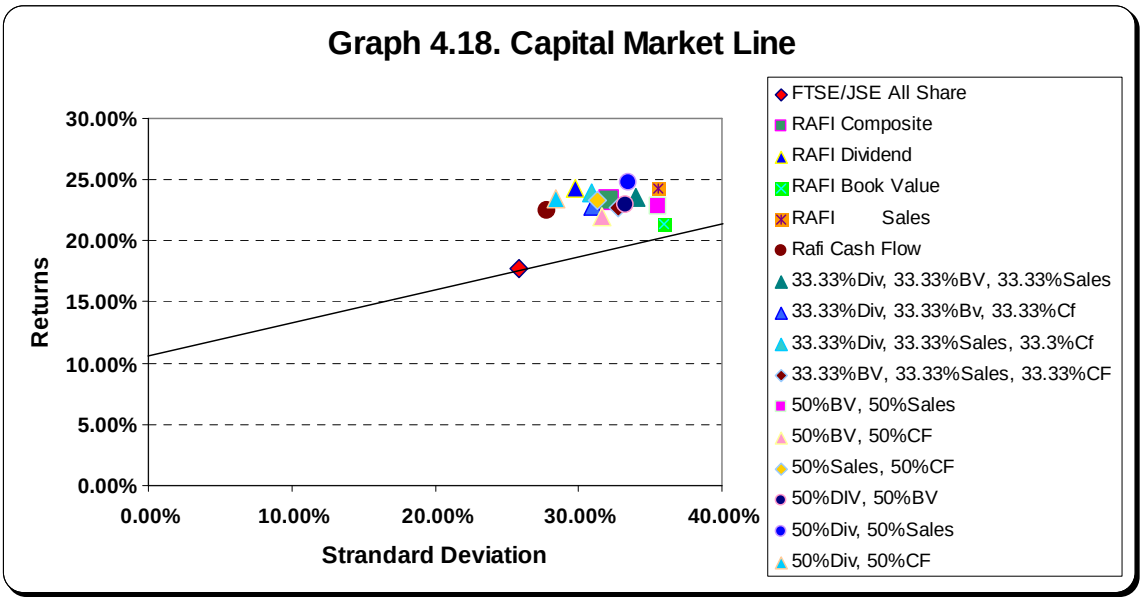
	Sharpe Ratio	Rank	Sortino Ratio	Rank	Omega	Rank	Kappa	Rank	Average ranking
FTSE/JSE All Share	31.74%	16	35.39%	16	3.19	16	0.61	16	16
RAFI Composite	45.10%	7	72.20%	8	4.84	8	1.06	8	7.75
RAFI Dividend	50.92%	1	81.68%	3	5.47	4	1.17	4	3
RAFI Book Value	38.11%	15	54.42%	15	3.72	15	0.75	15	15
RAFI Sales	45.06%	8	81.80%	2	5.81	2	1.25	2	3.5
Rafi Cash Flow	46.07%	5	69.62%	9	5.06	7	0.96	12	8.25
33.33%Div, 33.33%BV, 33.33%Sales	44.60%	10	73.11%	7	4.70	9	1.08	7	8.25
33.33%Div, 33.33%Bv, 33.33%Cf	44.79%	9	67.02%	11	4.50	11	0.98	9	10
33.33%Div, 33.33%Sales, 33.3%Cf	47.84%	4	80.62%	4	5.29	5	1.22	3	4
33.33%BV, 33.33%Sales, 33.33%CF	43.13%	12	67.54%	10	4.45	12	0.98	10	11
50%BV, 50%Sales	41.70%	14	66.86%	12	4.70	9	0.97	11	11.5
50%BV, 50%CF	41.81%	13	61.29%	14	4.24	13	0.86	14	13.5
50%Sales, 50%CF	45.86%	6	75.56%	6	5.56	3	1.11	6	5.25
50%DIV, 50%BV	43.75%	11	65.57%	13	4.04	14	0.94	13	12.75
50%Div, 50%Sales	48.26%	3	88.03%	1	6.06	1	1.35	1	1.5
50%Div, 50%CF	48.92%	2	75.57%	5	5.18	6	1.15	5	4.5

A clear trend can be seen. All the indices with exposure to the book value metric are to the right of the graph. The RAFI Composite Index is almost exactly in the middle, while the FTSE/JSE All Share is the ranked the worst.

Graph 4.17: Average ranking of all indices



Graph 4.18: Capital market line

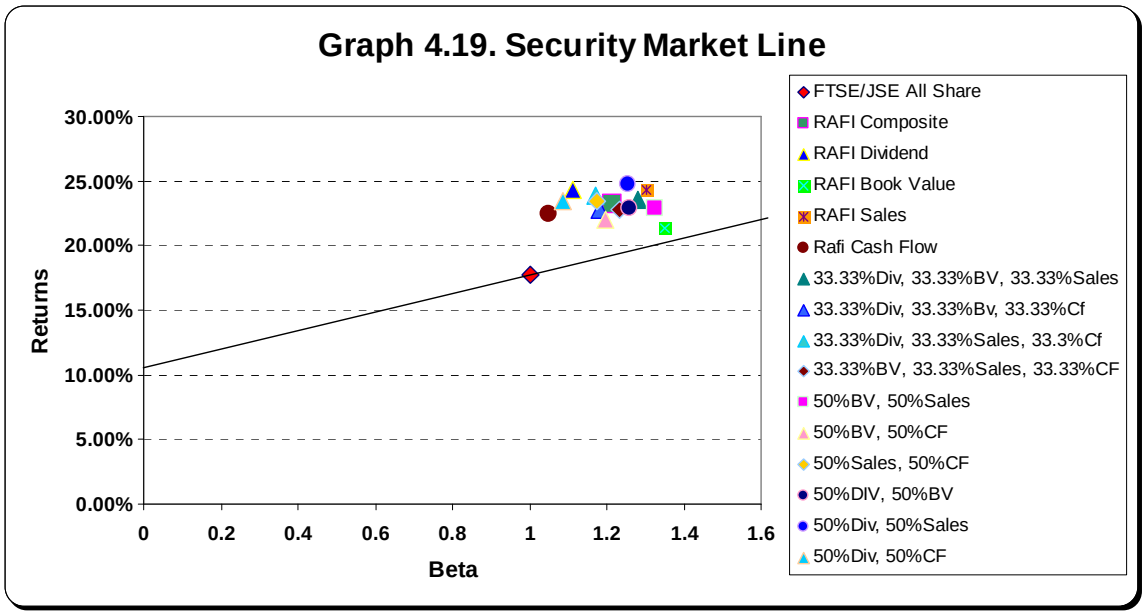


The capital market line depicted above shows the risk return trade-off of the indices. This is just another way of graphically looking at the results of the Sharpe Ratios for each index. As can be seen, all the fundamental indices deliver higher returns per unit of risk than the FTSE/JSE All Share Index. As in the rankings graph above, all the fundamental indices that contain the dividend metric are shaded in blue. The Dividend Index, Sales Index and 50%Dividend, 50% Sales occupy the best positions on this graph and show a superior return per unit of risk relative to the other indices.

The security market line shown below also measures the indices based on a risk return trade-off. The measure used to quantify risk in this graph is beta, which represents a share's market risk as opposed to standard deviation, which measures total risk and is used as the risk measure in the capital market line.

The security market line basically shows the Treynor Ratio results in graphical form. The Dividend Index delivers the best return per unit of market risk.

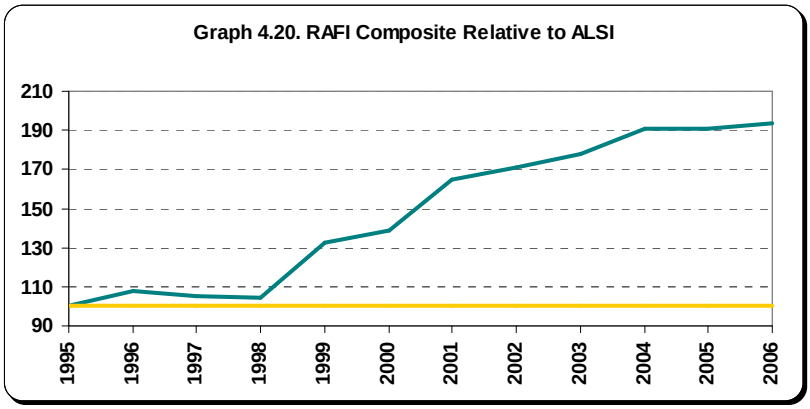
4.19: Security market line



4.2.2 Relative performance indices

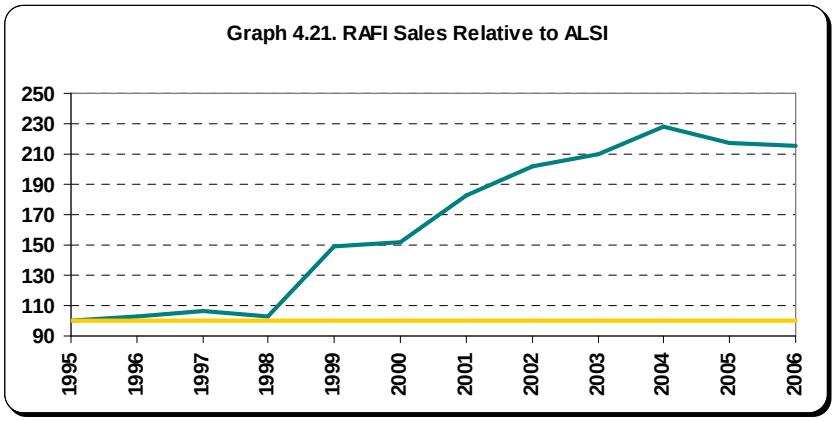
Relative performance indices (RPIs) were created to provide deeper insight into the performance of different fundamental indices relative to the benchmark index. The RPIs are always created by indexing one index to another. The RPIs show during which period which index performed best.

Graph 4.20: RAFI Composite relative to ALSI

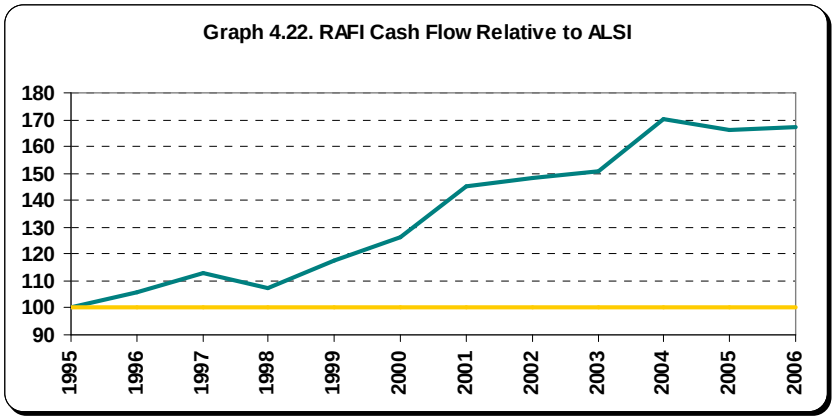


The RAFI Composite Index would have been a superior investment vehicle relative to the FTSE/JSE All Share for any period starting in 1995 and shows a steady upward trend.

Graph 4.21: RAFI Sales relative to ALSI

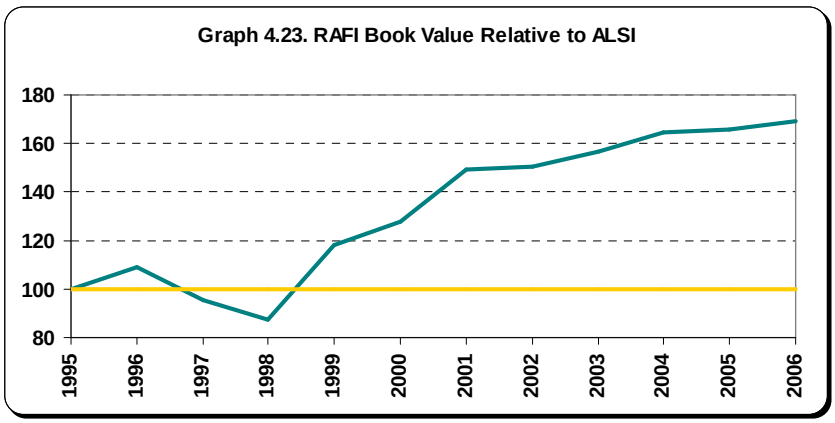


Graph 4.22: RAFI Cash Flow relative to ALSI



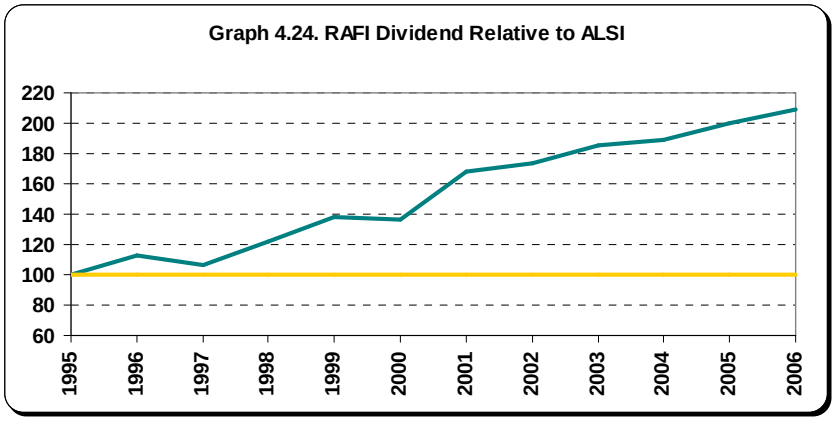
The Cash Flow Index and the Sales Index would also have delivered better investment returns for any period starting in 1995. The Cash Flow Index seems to be a more stable index than the RAFI Composite Index and Sales Index. The Cash Flow Index only had a downward trend between the periods 1997 to1998 and 2004 to 2005.

Graph 4.23: RAFI Book Value relative to ALSI



The Book Value Index followed a downward trend between 1996 and 1998 which would have resulted in the FTSE/JSE All Share Index delivering a superior return relative to the Book Value Index for the period from 1995 to 1998. Even when taking into account the period from 1995 to 1998, the Book Value Index still outperformed the FTSE/JSE All Share Index by a significant percentage for the period between 1995 and 2006.

Graph 4.24: RAFI Dividend relative to ALSI



The RAFI Dividend Index is by far the least volatile index relative to the FTSE/JSE All Share Index for the period from 2001 to 2008. The Dividend Index only underperformed the FTSE/JSE All Share Index for the period form 1996 to 1997 and 1999 to 2000. This shows that, going forward, the Dividend Index will probably deliver the lowest volatility of the Fundamental Indices

4.3 Sectoral analysis

Sectoral analysis is important in the South African market. The South African economy is largely influenced by its mining activities. This has created an economy, which on average, behaves differently to the global economies. The South African market is seen as a broad three-sector market consisting of resources, financial and industrial sectors. When analysing the two correlation tables below, it can be seen that the South African market acts more like a two-sector market than a three-sector market. The resources sector contains all the mining shares listed in South Africa. Investors in South Africa are heavily focused on asset allocation decisions based on whether resources or financials and industrials are the best investments at any given time.

Table 4.13: Sector correlation 1998-2006

Correlation between indices: Feb 1998 – Dec 2006

	Industrials	*Financials*	*Banking*	*All share*	*Mining*	*Resources*
Industrials	1					
Financials	0.79903	1				
Banking	0.713915	0.95793	1			
All share	0.896034	0.805125	0.715602	1		
Mining	0.595013	0.436137	0.347069	0.848526	1	
Resources	0.592698	0.441335	0.35352	0.850493	0.995887	1

The correlations between the different sectoral indices from February 1998 to December 2006 are shown above. Data are only provided from 1998 onwards as no data could be found for the resources index prior to 1998.

The correlation between mining and resources is almost one. The correlation between financials and industrials is 80%%, and between financials and resources 44%%. The correlation between industrials and resources is also relatively low at 59%.

Table 4.14: Sector correlation 1995-2006					
Correlation between indices: Jun 1995 – Dec 2006					
	Industrials	*Financials*	*Banking*	*All share*	*Mining*
Industrials	1				
Financials	0.766721	1			
Banking	0.686692	0.954708	1		
All share	0.894849	0.786383	0.692532	1	
Mining	0.601572	0.395036	0.299818	0.841237	1

The correlations above apply from June 1995 to December 2006, which covers the entire period of this research. In the above table mining is seen as a proxy for resources. This is regarded as viable when looking at the historical correlation between mining and resources.

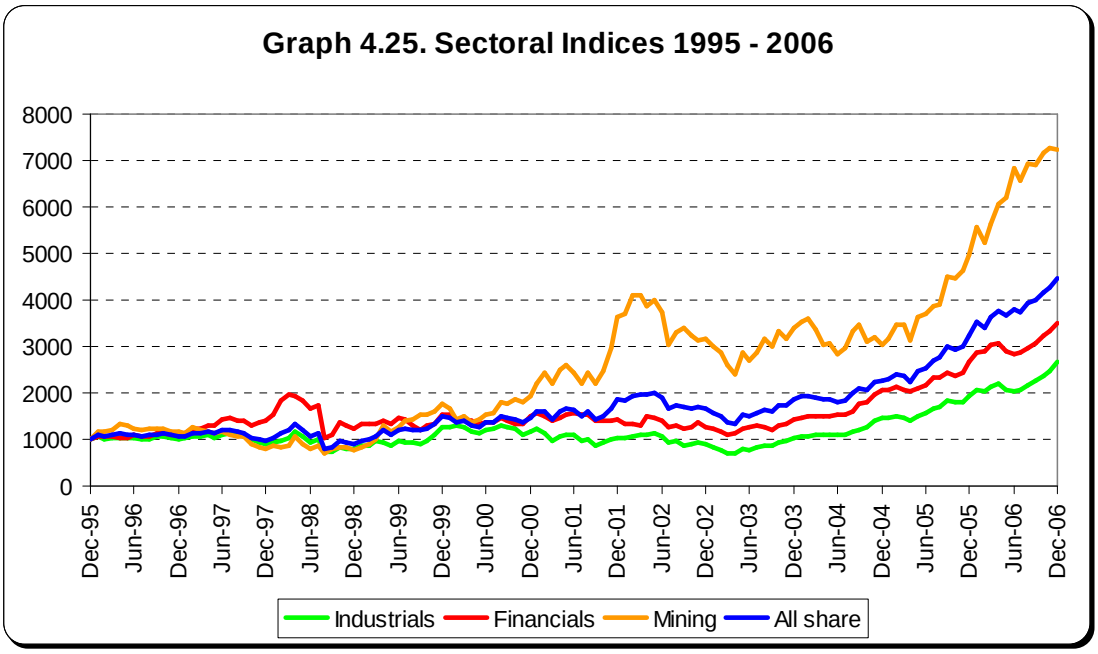
Correlations between the sectoral indices are lower over the longer term. The correlation between the financial and industrial indices is 77%. The correlation between the mining index and the financial and industrial indices are 40% and 60% respectively.

The above correlations clearly show that financials and industrials moved in a narrower band than either resources and financials, or resources and industrials. This clearly shows that in the South African market it is essential to look at the sectoral weightings of any index or portfolio – especially the weighting of resources in these portfolios.

The fundamental indices were divided into four sectors consisting of financials, resources, industrials and technology. The use of the technology

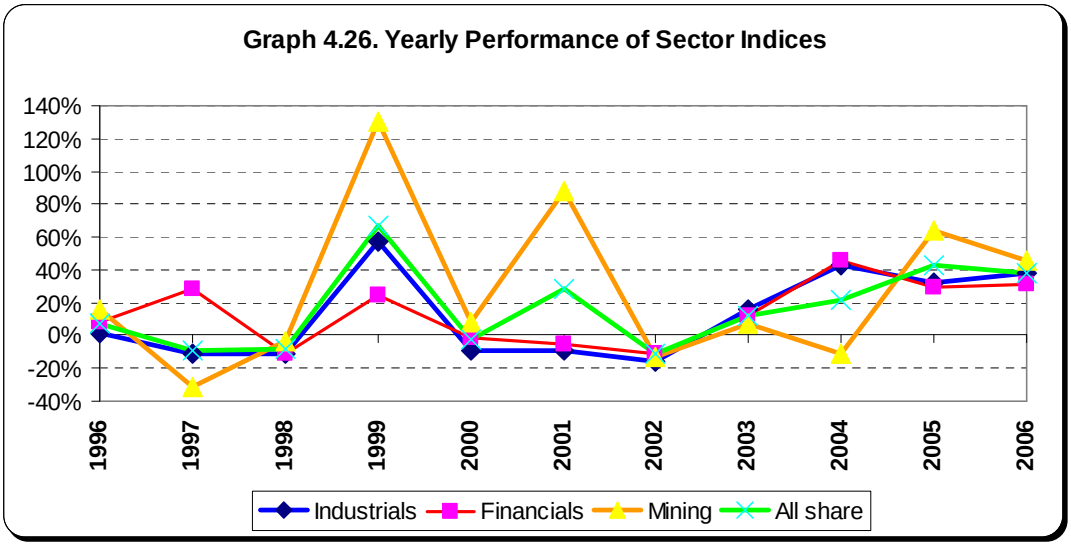
sector is explained in the methodology. The weightings per sector were then analysed for each period over which the study was conducted.

Graph 4.25: Sectoral indices, 1995 - 2006

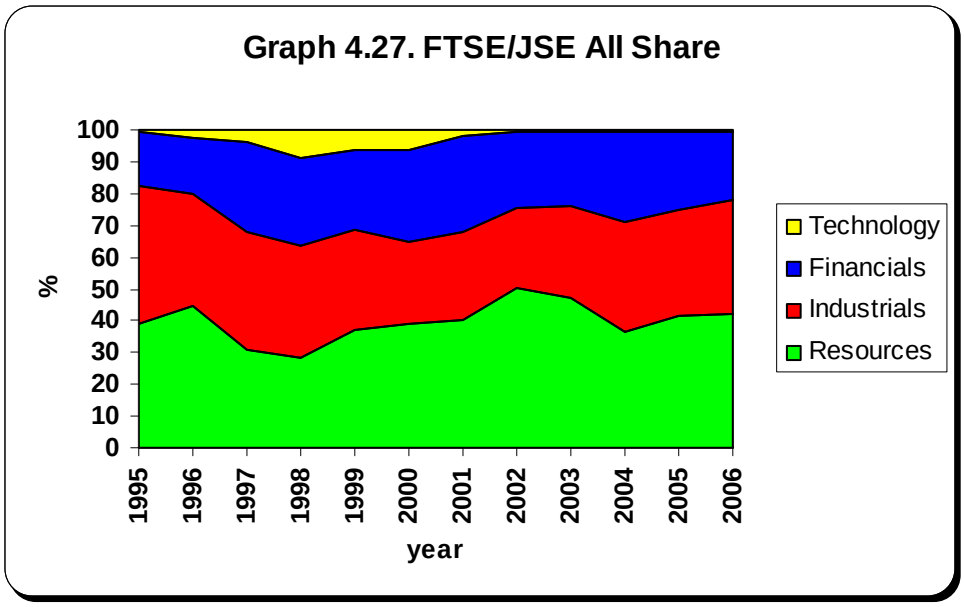


The above graph is added here to see if a connection exists between the performance of each sectoral index and the weighting of these sectors in each Fundamental Index as well as the FTSE/JSE All Share Index.

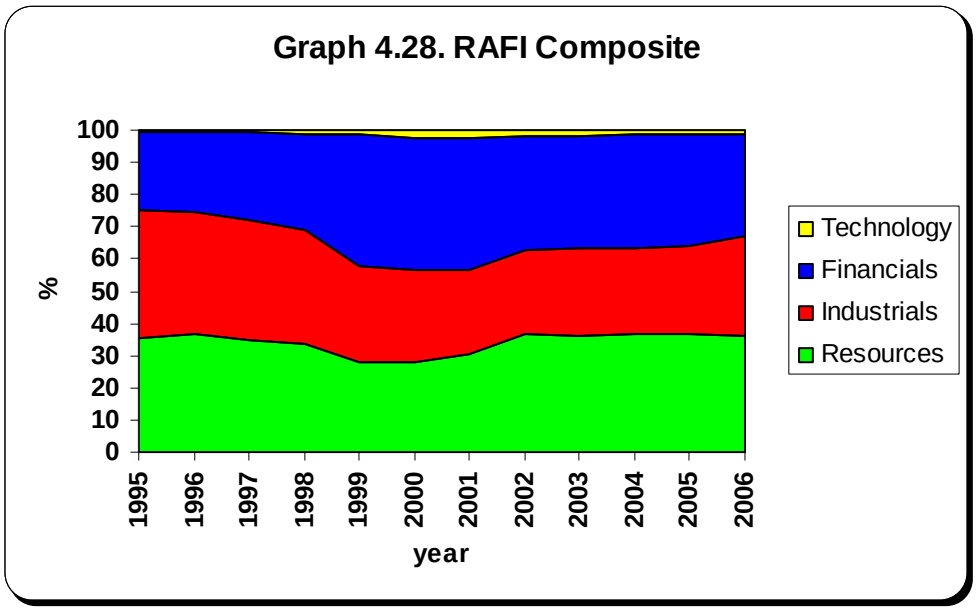
Graph 4.26: Yearly Performance of Sector Indices



Graph 4.27: FTSE/JSE All Share weightings

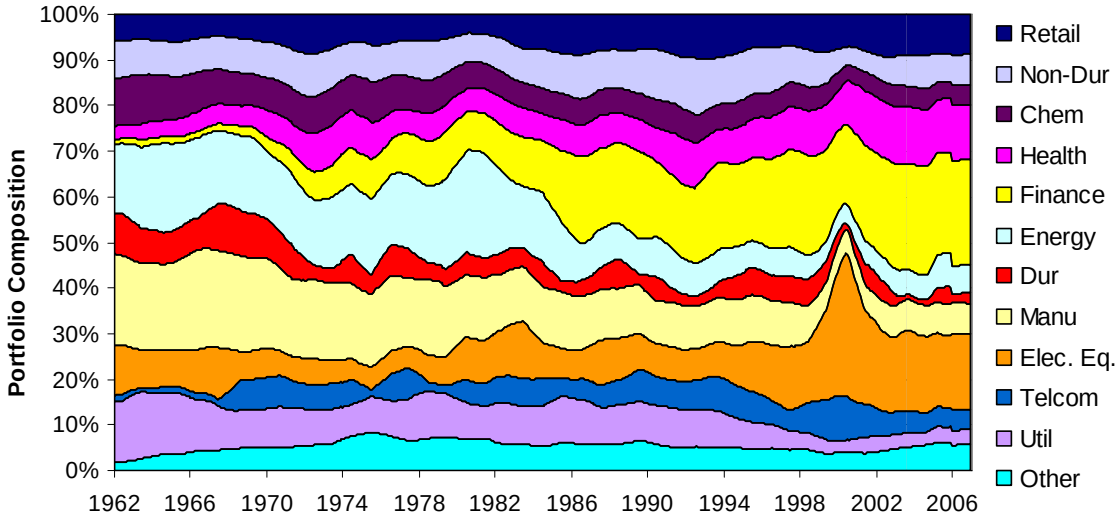


Graph 4.28: RAFI Composite weightings

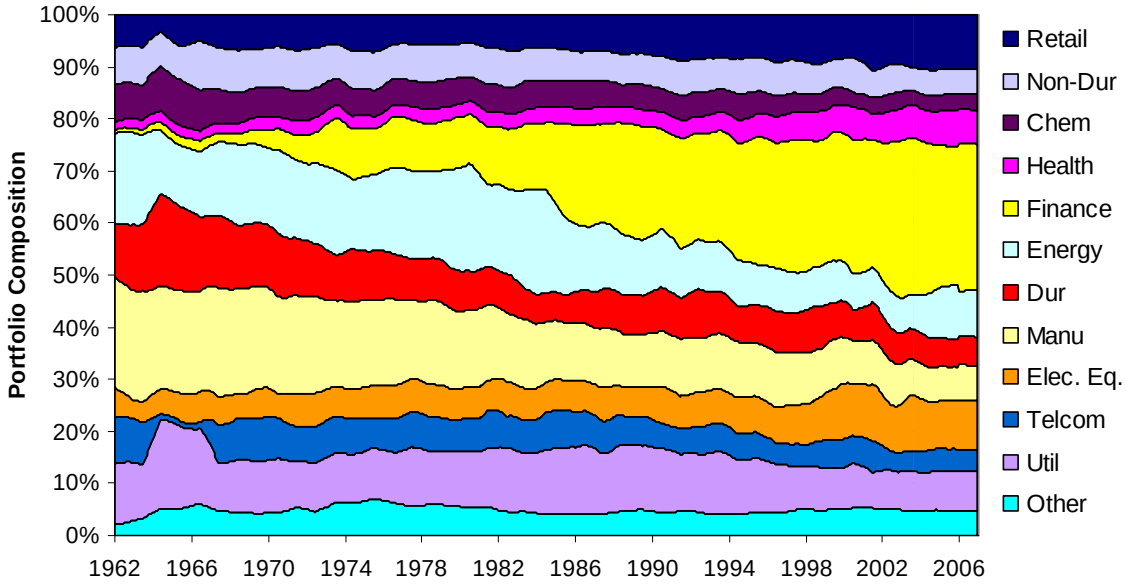


Firstly, the FTSE/JSE All Share sector weightings are compared with the RAFI Composite sector weightings. It is very important to note that the RAFI Composite sector weightings are much more stable than the FTSE/JSE All Share weightings over time. This can be seen in Graph 4.27 and Graph 4.28. This is consistent with the USA Fundamental Index results shown in Graph 4.29 and Graph 4.30.

Graph 4.29: USA market cap index weighting over time, 1962-2004



Graph 4.30: USA RAFI 1000 Index weighting over time, 1962-2004



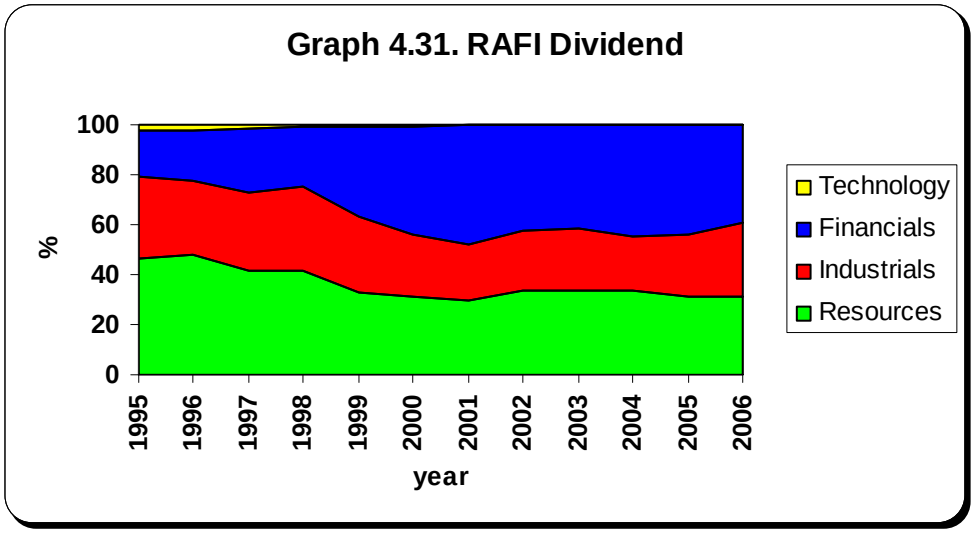
Although the USA study focuses on more sectors, the trend is clearly the same as in this study, namely that the fundamental index sector weightings are much less volatile than the reference index. The higher stability of the RAFI indices can be attributed to the RAFI methodology, which uses five-year average fundamental values rather than annual values.

Another clear observation is that the FTSE/JSE All Share Index had a much higher technology component than the RAFI Composite in the 1990s. This

helped the RAFI Composite Index to outperform the FTSE/JSE All Share Index by 26.99% in 1999, 4.65% in 2000 and 18.52 % in 2001.

The RAFI Composite Index on average also had a higher financial exposure than the FTSE/JSE All Share Index. Relative to the FTSE/JSE All Share the RAFI Composite therefore had an overall financial bias while the FTSE/JSE All Share had a resource bias relative to the RAFI Composite Index.

Graph 4.31: RAFI Dividend



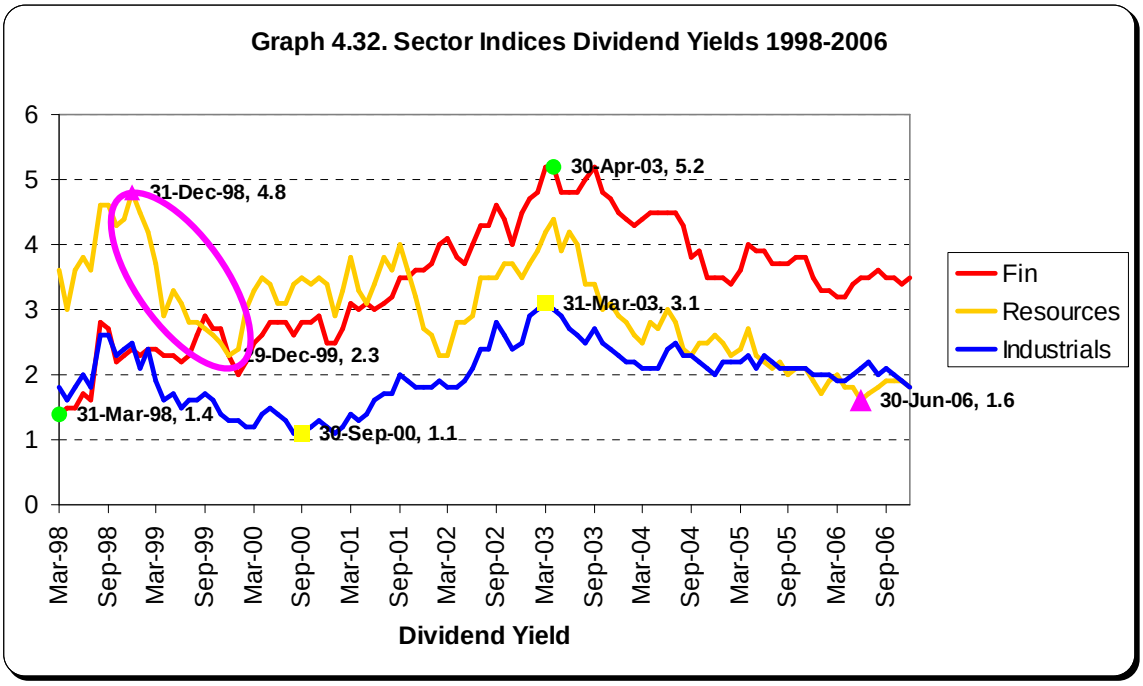
The Dividend Index's sector weightings in Graph 4.31 provide valuable insight into why the Dividend Index outperformed the other fundamental indices, especially during 1998. The Dividend Index clearly experienced a sectoral shift between 1998 and 2000 as it moved from a resource biased index to a financial biased index.

Graph 4.32 shows the historical dividend yields between February 1998 and December 2006 of the industrial, resources and financial indices. It clearly shows how the dividend yield of the Resources Index dropped in 1999 when the dividend yields of financials and industrials increased slightly.

The historical dividend yields of industrials have remained between 1.1% and 3.1% while the resources dividend yields have dropped from a high of 4.8% to

below 1.6%, and financials have moved from a low of 1.4% to a high of 5.2%. The pink oval indicates that the dividend yield of resources moved from 4.8% in December 1998 to 2.3% in December 1999. This decrease of 2.5% in a one-year period is a bigger percentage move than experienced by industrials over the whole period.

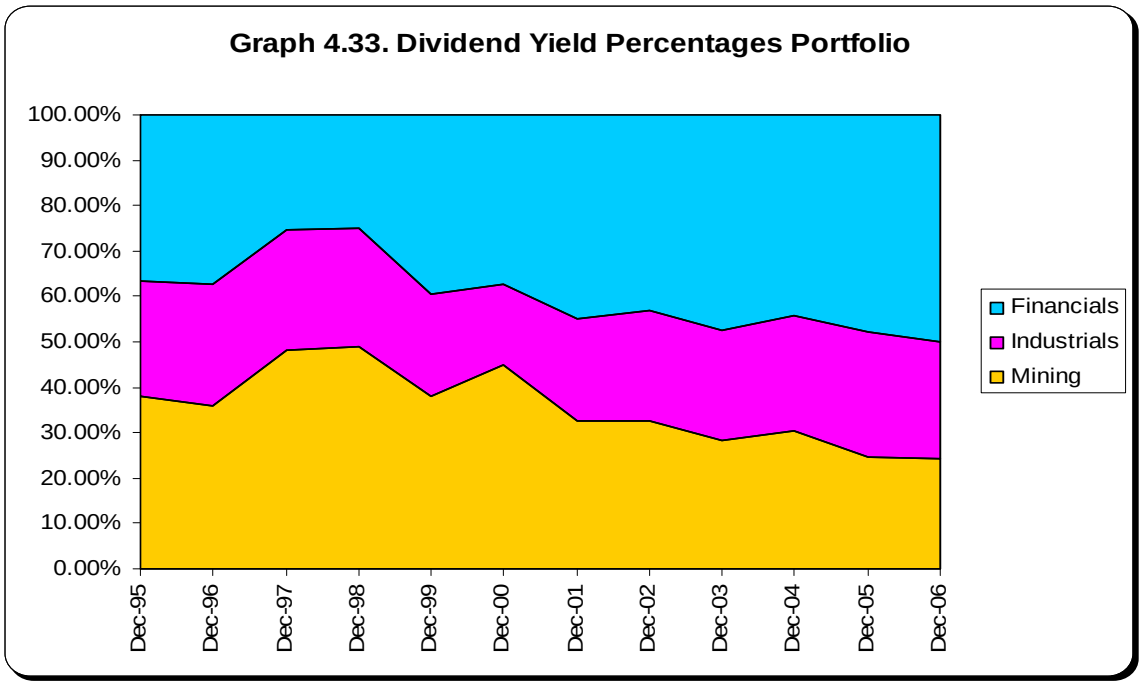
Graph 4.32: Sector indices' dividend yields, 1998-2006



This sudden drop in the dividend yields of resources explains the sectoral shift of the Dividend Index.

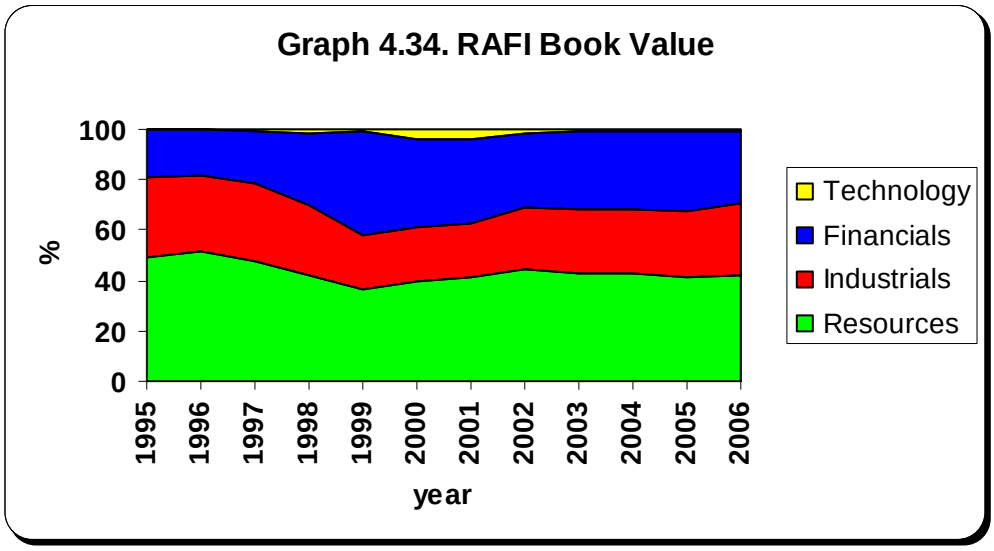
To check if the construction of the Dividend Index compares to the movements of dividend yields, a simulation portfolio was created by weighting each sector based on the size of its dividend yield at the end of each year from 1995 to 2006. Graph 4.33 shows the same trend, namely an increase in financials and a decrease in resources.

Graph 4.33: Dividend yield percentages portfolio



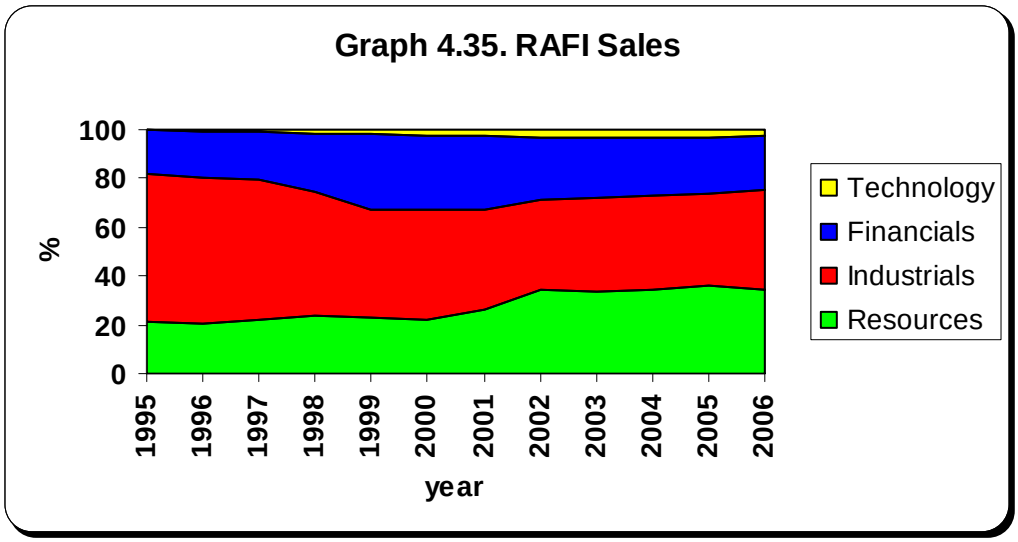
It has been shown that the Dividend Index increased its financials exposure in 1999. The relative outperformance of the Dividend Index in 1998 and underperformance in 1999 can be explained by the Financial Index underperforming the mining, industrial and All Share indices between 1998 and 1999. The dividend index had a low percentage financials in 1998 which helped its performance and had a high financial weighting in 1999 which influenced its performance negatively.

Graph 4.34: RAFI Book Value



The Book Values Index shows a clear resources bias and a low industrial bias.

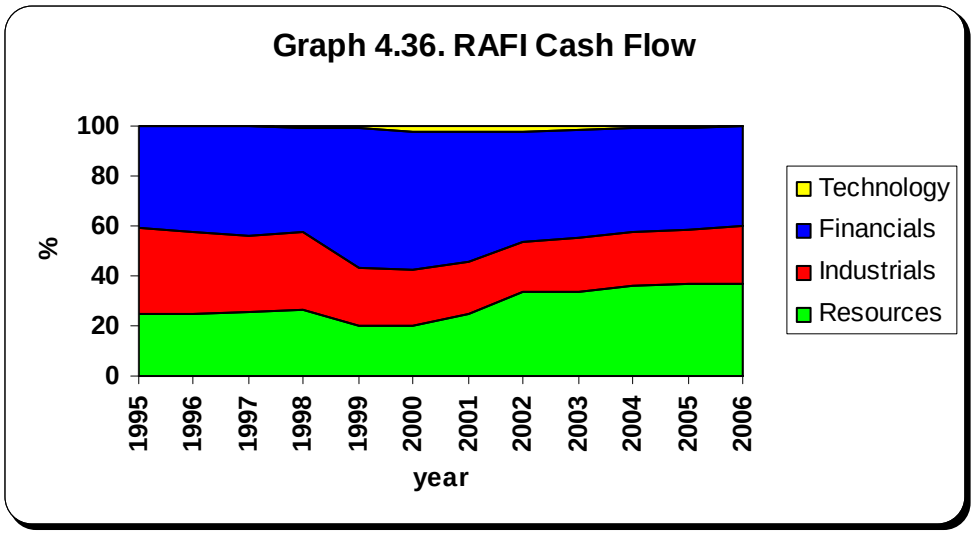
Graph 4.35: RAFI Sales



The Sales Index, which is the second best performing index, has a large industrial bias. It is also one of the most consistent indices with regard to sectoral weightings. The industrial weighting decreased slightly over the period and the resources weighting increased. The Sales Index is the index with the lowest financial bias and almost no technology exposure. As in the case of the Dividend Index and Book Value Index the financial exposure was the highest between 1998 and 2001.

An interesting observation is that the Sales Index had the highest industrial exposure. Graph 4.25 clearly shows that the industrial index was the worst performing sectoral index over the same period. These contradictory results possibly give insight into whether fundamental indices' outperformances are due to sector selection or stock picking. The results obtained for the Sales Index suggest that it outperformed due to superior stock picking and not to superior sector selection.

Graph 4.36: RAFI Cash Flow



The Cash Flow Index is the one index that delivered unexpected results. The Cash Flow Index has a large financial bias, which was not expected. The definition used to calculate a company's cash flows in this research is possibly inferior. This provides research opportunities to find the optimal method of defining cash flow for fundamental index calculations.

Although the Cash Flow Index's sector weightings deliver inconclusive results, the same trend regarding high financial exposure between 1998 and 2001 can be observed.

4.4 Turnover

Table 4.15: Turnover per year for RAFI Composite Index and FTSE/JSE All Share Index

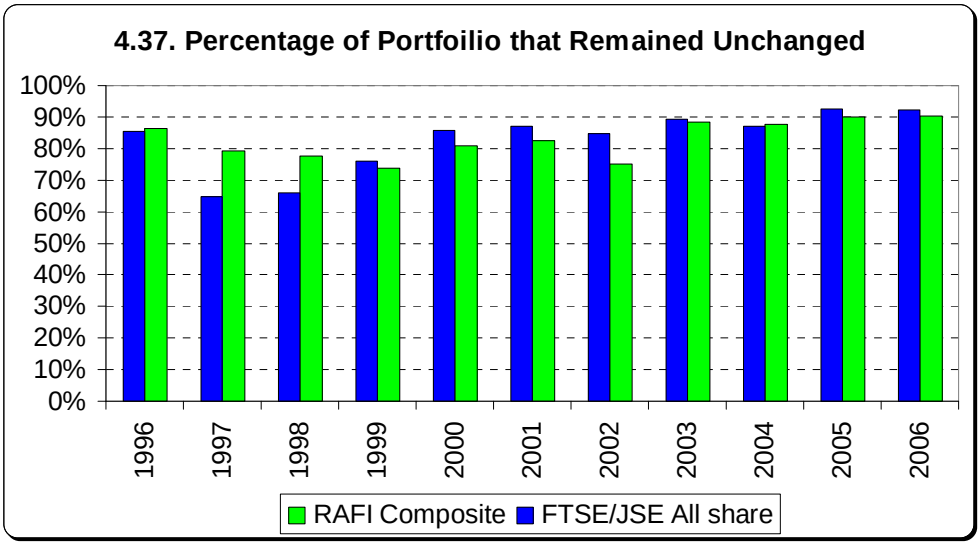
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average
RAFI Composite	13.28%	21.17%	21.44%	31.48%	18.62%	16.99%	19.85%	11.37%	12.23%	9.99%	11.04	17.04%
FTSE/JSE All Share	14.32%	35.21%	33.87%	23.83%	14.23%	12.83%	15.23%	10.69%	12.95%	7.45%	7.78%	17.13%
Difference	-1.03%	-14.04%	-12.43%	7.64%	4.39%	4.16%	4.62%	0.68%	-0.72%	2.55%	3.25%	-0.08%

The turnover analysis shows that the RAFI Composite on average had a turnover of 17.04% in respect of its portfolio holdings whereas the FTSE/JSE All Share on average had to change 17.13% of its holdings per year. As would

be expected, the RAFI had higher turnover rates in most years relative to the FTSE/JSE All Share index. During the past five years the turnover rates on RAFI and the FTSE/JSE All Share index have been fairly similar.

When investing in a passive investment strategy transaction costs are important. The RAFI Composite would have required marginally higher transaction costs than the FTSE/JSE All Share Index for the past few years.

Graph 4.37: Percentage of portfolio that remained unchanged



The graph clearly shows that the green bars representing the RAFI Composite Index have higher values than the blue bars representing the FTSE/JSE All Share Index at the start of the measurement period. The FTSE/JSE All share index had significantly lower turnover rates than the RAFI portfolio for the period from 1999 to 2002. From 2003 the turnover difference between RAFI and the FTSE/JSE All Share index has been marginal.

Since 2003 the turnover of the RAFI Composite has on average been 11.16% p.a. versus 9.72% p.a. for the FTSE/JSE All Share. This clearly shows that RAFI is a passive investment vehicle with low transaction costs that are not significantly higher than the FTSE/JSE All Share index, which represents the benchmark passive strategy.

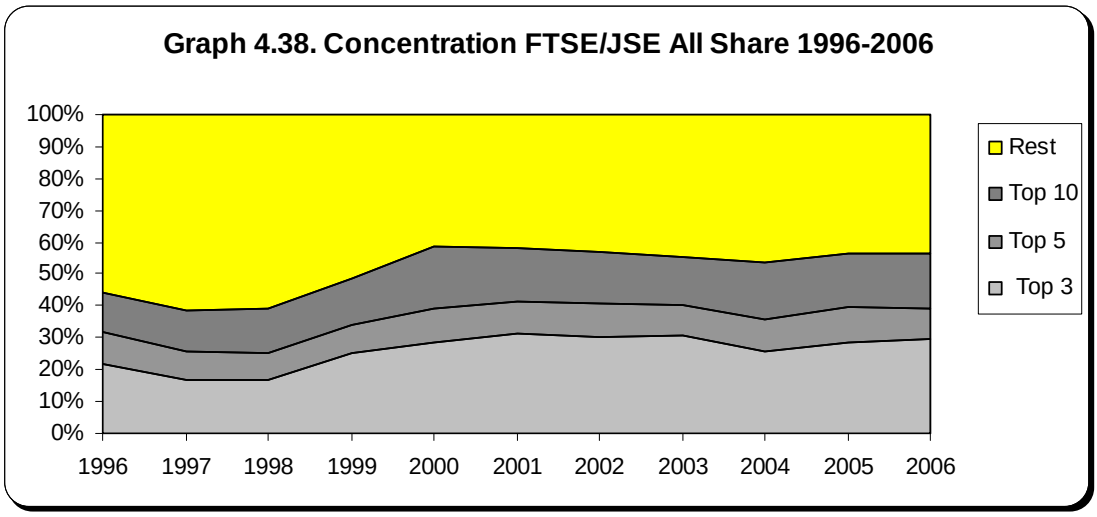
4.5 Concentration

Table 4.16: Top share weightings

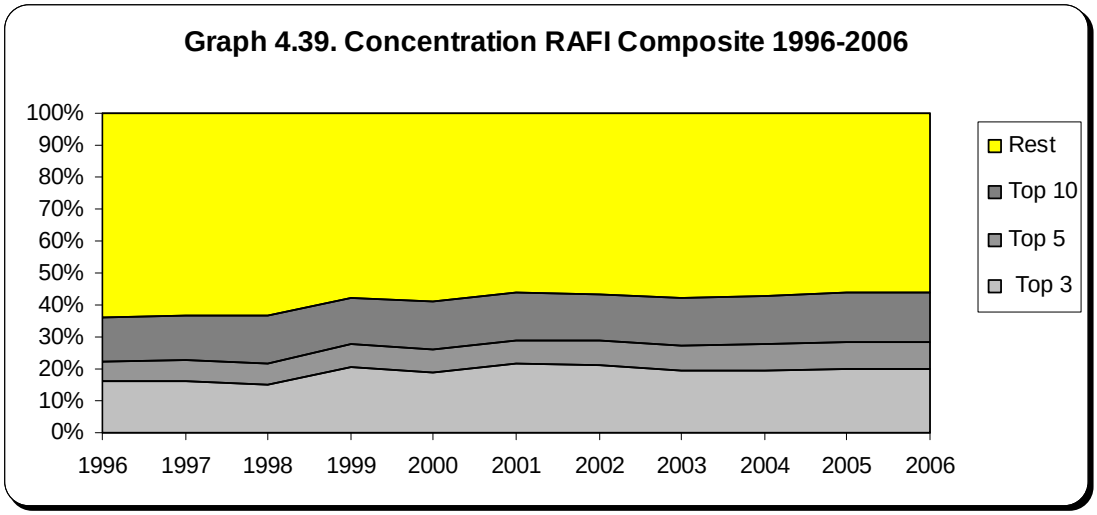
FTSE/JSE All Share	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Top 3	21.87%	16.60%	16.77%	25.06%	28.31%	31.53%	30.39%	30.87%	25.70%	28.60%	29.48%
Top 5	31.81%	25.55%	25.39%	34.32%	38.94%	41.23%	40.83%	40.22%	36.01%	39.51%	39.18%
Top 10	44.05%	38.37%	39.33%	48.55%	58.81%	57.93%	57.16%	55.45%	53.49%	56.22%	56.64%
RAFI											
Top 3	16.39%	16.05%	14.85%	20.35%	18.82%	21.92%	21.07%	19.62%	19.44%	20.28%	20.00%
Top 5	22.40%	22.81%	21.76%	27.55%	26.17%	28.70%	28.82%	27.24%	27.58%	28.44%	28.23%
Top 10	35.95%	36.70%	36.63%	42.44%	41.25%	43.66%	43.33%	42.17%	42.87%	43.83%	43.67%
Difference											
Top 3	5.48%	0.55%	1.92%	4.71%	9.49%	9.61%	9.32%	11.25%	6.26%	8.32%	9.48%
Top 5	9.41%	2.74%	3.63%	6.77%	12.77%	12.53%	12.01%	12.98%	8.43%	11.07%	10.95%
Top 10	8.10%	1.67%	2.70%	6.11%	17.56%	14.27%	13.83%	13.28%	10.62%	12.39%	12.97%

Table 4.16 above shows the weighting of the Top 3, Top 5 and Top 10 shares in the RAFI Composite Index as well as the FTSE/JSE All Share Index. It can be seen that the Top 3, Top 5 and Top 10 shares' weightings have been considerably lower than the weighting of the Top 3, Top 5 and Top 10 shares in the FTSE/JSE All Share. In addition, the RAFI Composite has especially been less concentrated than the FTSE/JSE All Share since 2000. The concentration of the RAFI Composite was lower than the concentration of the FTSE/JSE All Share during the whole measurement period.

Graph 4.38: Concentration of FTSE/JSE All Share, 1996-2006

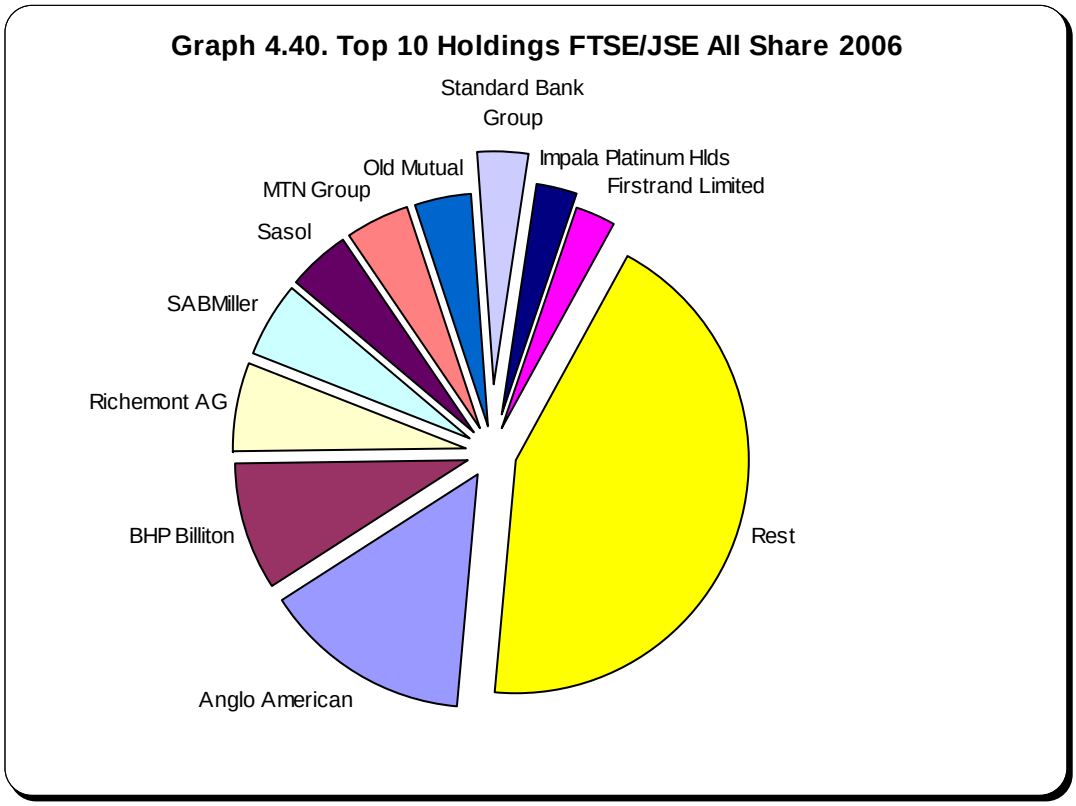


Graph 4.39: Concentration of RAFI Composite, 1996-2006

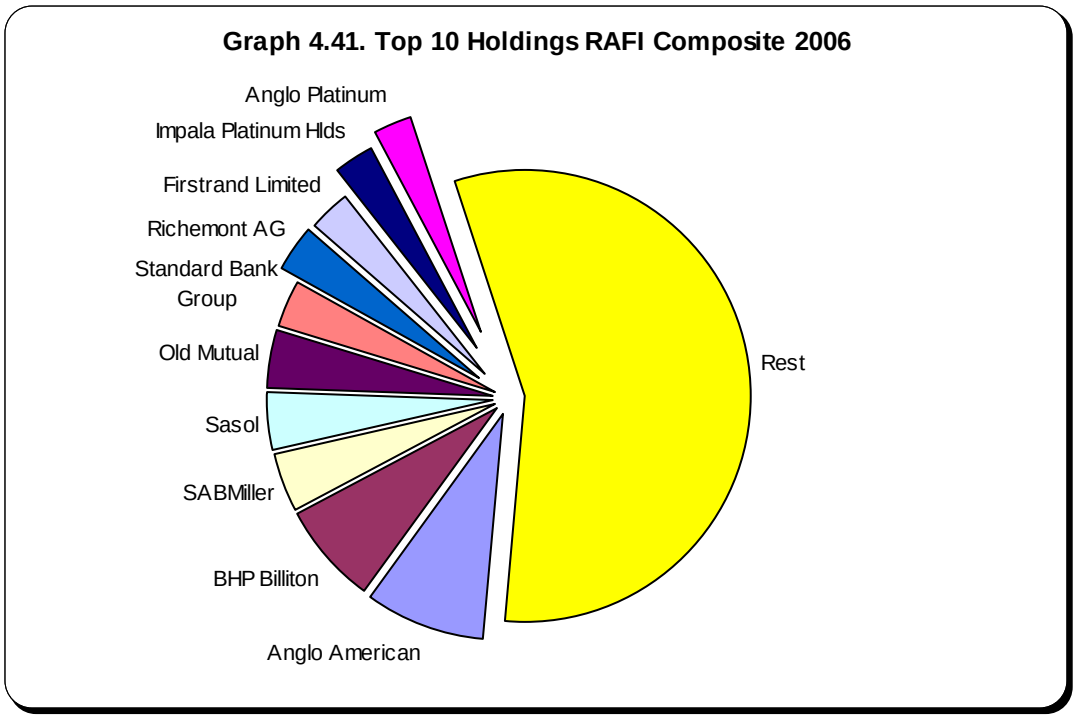


The graphs show that the combined weightings of the Top 10, Top 5 and Top 3 shares in the RAFI Composite have been exceptionally consistent since 2000. The Top 10 has had an average weighting of about 47.5%. Since 2000 the FTSE/JSE All Share showed less consistency as well as a higher average Top 10 concentration of about 56.5%.

Graph 4.40: Top 10 holdings in FTSE/JSE All Share, 2006



Graph 4.41: Top 10 holdings in RAFI Composite, 2006



The Top 10 holdings of both indices at the end of 2006 can be seen in Graph 4.40 and Graph 4.41 respectively. The part of the index not in the Top 10 is represented by the yellow section. The yellow section represents more than half of the RAFI Composite Index and less than half of the FTSE/JSE All Share Index. This shows that, at the end of 2006, the concentration of shares was much higher in the case of the FTSE/JSE All Share Index than in the case of the RAFI Composite Index.

Nine of the Top 10 holdings are the same for both indices. The difference is that the FTSE/JSE All Share included MTN in the Top 10 while the RAFI Index had Anglo Platinum in its Top 10.

The top two holdings in both indices are BHP Billiton and Anglo American, but they hold a considerably larger weight in the FTSE/JSE All Share Index than in the RAFI Composite Index.

Appendix C provides a detailed view of the Top 10 holdings for both the FTSE/JSE All Share Index and the RAFI Composite Index.

5. CONCLUSION

The concept known as Fundamental Indexation has taken the financial industry by storm. Although the creation of a market-tracking instrument that is not based on market capitalisation is not a new concept, there has never been a non-market capitalisation strategy that has challenged modern portfolio theory in such a big way.

The Fundamental Index is a concept that was created by Research Affiliates to design an index where shares are weighted according to their economic footprint rather than their market capitalisation. Normal indices, such as the FTSE/JSE ALSI, base their stock weightings on the market capitalisation of each company in the index. Research Affiliates believes this creates a natural return drag because of the overweighting of overvalued stocks and the underweighting of undervalued stocks. Because of this return drag RAFI created a fundamental approach to weight stocks in an index in order to replicate the economic footprint of each share in the index. The fundamental approach RAFI uses is based on four metrics, namely sales, book values, dividends and cash flows. These four values are used to fundamentally weight a company in the appropriate index.

The Research Affiliates' concept was used as basis to create a Fundamental Index based on the FTSE/JSE All Share Index as benchmark.

This research report used exactly the same methodology created by Research Affiliates and reweighted all the shares in FTSE/JSE All Share Index based on their fundamental values rather than their market capitalisation values.

The results are consistent with global results in that the RAFI Fundamental Index significantly outperformed its benchmark.

The RAFI Index outperformed the FTSE/JSE All Share Index by 5.55% p.a. compounded annually during the period 1995 to 2006. This return was achieved with a similar risk profile as the FTSE/JSE All Share Index. The

RAFI Total return Index also outperformed the FTSE/JSE All Share Index by 5.48% p.a. .

The RAFI Index had a lower average turnover rate than the benchmark index and also had a significantly lower concentration of shares.

The Book value Index was the worst performing fundamental factor.

The index based purely on companies' dividends outperformed all the other fundamental indices.

The Fundamental Index outperformance clearly disproves the efficient market hypothesis. Selecting a portfolio of stocks based on their financial values outperforms a portfolio replicating the normal market-cap index which according to the "EMH" should not be possible. According to modern portfolio theory it is impossible to earn abnormal profits in excess of a market capitalisation index. The success of Fundamental Indices proves that market capitalisation indices are not optimal and deliver sub-optimal returns.

Fundamental Indices are not necessarily optimal but are more optimal than traditional indices.

6. AREAS FOR FURTHER RESEARCH

The concept of when and why Fundamental Indices do outperform their benchmarks is still an unanswered question. Research can be done to help find answers to this question.

The scope of the research in this paper could be expanded by creating more data points, for example monthly performance numbers, and by analysing the correlations between the relevant fundamental indices, their benchmarks and possibly other variables such as interest rates and economic growth. Analysing the underperformance of Fundamental Indices in certain periods can possibly show under which circumstances investors deviate from pricing securities based on fundamentals, and when pricing is influenced mainly by sentiment.

A South African-specific expansion would be to investigate fundamental sector indices like a RAFI resources index or a RAFI financial index, and to compare these indices with the current FTSE/JSE resources and financial indices. This can provide insight into whether fundamental indexation outperforms the benchmarks due to good stock picks or due to good asset allocation decisions.

The so-called small cap and momentum effects can be tested on RAFI indices to see whether the South African RAFI has a momentum or small cap bias as well.

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8. Appendix A: Yearly share weightings in ALSI and RAFI

		1996	
NAME	Alpha	% Within ALSI	% Within RAFI
ANGLO	AGL	8.42%	8.88%
DEBEERS	DBR	7.12%	3.02%
RICHEMONT	RCH	6.33%	3.29%
SAB	SAB	5.25%	4.21%
SASOL	SOL	4.69%	3.00%
MINORCO	MNR	3.10%	0.67%
LIBERTY	LGL	2.73%	2.51%
GENCOR LIMITED	GMF	2.37%	1.44%
REMBRANDT GROUP LIMITED	RMT	2.03%	0.00%
CGSMITH	CGS	2.01%	0.79%
ABSA	ASA	2.00%	2.78%
STANBANK	SBK	1.65%	2.14%
LONMIN	LON	1.45%	2.35%
FIRST NATIONAL BANK HOLDINGS LIMITED	FSB	1.39%	2.08%
NEDCOR	NED	1.30%	2.38%
GOLD FIELDS OF SOUTH AFRICA LIMITED	GFS	1.22%	0.76%
BARWORLD	BAW	1.20%	2.98%
ANGLOPLAT	AMS	1.18%	1.58%
KUMBA	KMB	1.17%	0.00%
IMPERIAL	IPL	1.07%	0.65%
PREMIER	PML	1.07%	0.37%
COMPAREX	CPX	0.98%	0.21%
INVEGO INVESTMENTS LIMITED	IVG	0.98%	0.47%
ANGLO AMERICAN INDUSTRIAL CORPORATION LIMITED	AMI	0.97%	1.67%
MALBAK LIMITED	MLB	0.97%	0.61%
SAPPI	SAP	0.93%	2.34%
TIGBRANDS	TBS	0.91%	1.70%
ANGLO AMERICAN COAL CORPORATION LIMITED	AMC	0.86%	0.69%
DIDATA PLC	DDT	0.85%	0.58%
W AREAS	WAR	0.83%	0.51%
ANGGOLD	ANG	0.80%	1.13%
KLOOF GOLD MINING COMPANY LIMITED	KLO	0.74%	0.45%
AVMIN LIMITED	AVM	0.73%	1.66%
JOHNNIC	JNC	0.73%	1.64%
TRANS NATAL COAL CORPORATION LIMITED	TNC	0.71%	0.39%
NAMPAK	NPK	0.70%	1.18%
NASPERS -N	NPN	0.68%	0.26%
SOUTHVAAL HOLDINGS LIMITED	SVL	0.66%	0.32%
INVESTEC LTD	INL	0.65%	0.45%
AMGOLD	AMG	0.64%	0.79%
AVI	AVI	0.63%	1.21%
ANGLOVAAL LIMITED -N-	ANN	0.59%	0.00%
FREE STATE	FRG	0.57%	0.99%
CONSOLIDATED GOLD MINES LIMITED			
GFIELDS	GFI	0.56%	2.90%
WESTERN DEEP LEVELS LIMITED	WDL	0.55%	0.31%
SAFMARINE & RENNIES HOLDINGS LIMITED	SFR	0.54%	0.67%
WOOLTRU - N	WLN	0.52%	0.00%
M&R HOLD	MUR	0.51%	1.46%
TONGAAT	TNT	0.50%	0.80%
GENSEC	GSC	0.49%	0.16%
RMB HOLDINGS	RMH	0.48%	0.22%
NORWICH HOLDINGS LIMITED	NWH	0.44%	0.15%
REUNERT	RLO	0.43%	0.56%
FEDSURE	FDS	0.42%	0.20%
INGWE COAL CORPORATION	IGEx	0.42%	0.53%
MIHH	MHH	0.42%	0.29%
NAC	NAC	0.42%	0.09%
SOUTHERN LIFE ASSOCIATION LIMITED	SON	0.42%	0.51%
ANGLO AMERICAN PLATINUM CORP LTD	APS	0.37%	1.58%
FIT	FIT	0.36%	0.49%
CHROMECORP HOLDINGS LIMITED	COM	0.35%	0.00%
ENGEN LIMITED	EGN	0.34%	0.81%
LIBSIL	LBS	0.33%	1.42%
SAGE	SGG	0.33%	0.27%
BIDVEST	BVT	0.32%	0.57%
EDCON	ECO	0.32%	0.69%
JD GROUP	JDG	0.32%	0.31%
FOSCHINI	FOS	0.31%	0.39%
H J JOEL GOLD MINING COMPANY LIMITED	JOE	0.31%	0.17%
AECI	AFE	0.30%	1.09%
HARMONY	HAR	0.30%	0.26%
FIRSTRAND	FSR	0.29%	0.52%
WOOLTRU	WLO	0.29%	0.29%
PEPKOR	PEP	0.28%	1.24%
AFROX	AFX	0.27%	0.45%
IBM SOUTH AFRICA GROUP LTD	IBM	0.27%	0.10%
IMPALA PLATINUM	IMP	0.27%	0.50%
BEATRIX MINES LIMITED	BET	0.26%	0.23%
EVANDER GOLD MINES LTD	EVR	0.26%	0.09%
TRENCOR	TRE	0.26%	0.29%
MCCARTHY GROUP LIMITED	MCR	0.25%	0.75%
AVGOLD	AVG	0.24%	0.00%
CORONATION HLDGS -N-	CRN	0.24%	0.00%
PRIME-N	PRN	0.22%	0.00%
SUN INTERNATIONAL SA	SIS	0.22%	0.60%
ALPHA LIMITED	AAL	0.21%	0.33%
BOLAND BANK HOLDINGS LIMITED	BLA	0.21%	0.11%

HARTEBEESTFONTEIN GOLD MINING COMPANY LIMITED	HBN	0.21%	0.40%
METCASH	MTC	0.21%	0.76%
NSA INVESTMENTS LIMITED	NSA	0.21%	0.06%
PPC	PPC	0.21%	0.16%
RANDFONTN	RFN	0.21%	0.24%
KERSAF	KER	0.20%	0.87%
CONSOLIDATED METALLURGICAL INDUSTRIES LIMITED	CMI	0.19%	0.09%
CAPITAL ALLIANCE	CPT	0.18%	0.02%
SANTAM	SNT	0.17%	0.46%
CORONATION HLDGS	CRH	0.16%	0.05%
EDUCATION AND INVESTMENT CORP	EDC	0.16%	0.03%
PALAMIN	PAM	0.16%	1.04%
PRIME	PRI	0.16%	0.04%
CADSWEP	CAS	0.15%	0.12%
DELFOOD	DLF	0.15%	0.42%
M-CELL	MCE	0.15%	0.11%
SHOPRITE	SHP	0.14%	0.64%
SUPER GROUP	SPG	0.14%	0.03%
AFRICAN LIFE	AFI	0.13%	0.06%
ENERGY AFRICA	ENR	0.12%	0.13%
GENBEL SA	GBL	0.12%	0.83%
VOLTEX	VLX	0.12%	0.09%
WALTONS STATIONERY	WAL	0.12%	0.16%
HIVELD	HVL	0.11%	0.50%
OZZ	OZZ	0.11%	0.06%
CNA GALLO LIMITED	CNG	0.10%	0.09%
DORBYL	DLV	0.10%	0.39%
GRIFFIN SHIPPING HOLDINGS	GFN	0.10%	0.05%
HUDACO	HDC	0.10%	0.14%
ILLOVO	ILV	0.10%	0.32%
MEDI-CLINIC	MDC	0.10%	0.12%
I-&-J	IRV	0.09%	0.12%
TEMPORA	TEM	0.09%	0.12%
AFGRI	AFR	0.08%	0.00%
AUTOMAKERS LIMITED	ATK	0.08%	0.15%
BARNEX	BNX	0.08%	0.01%
DATATEC	DTC	0.08%	0.02%
EAST RAND GOLD AND URANIUM COMPANY LIMITED	ERG	0.08%	0.15%
FASHAF	FSH	0.08%	0.02%
GRINAKER HOLDINGS LIMITED	GRK	0.08%	0.00%
LEISURENET	LST	0.08%	0.03%
PROFURN	PON	0.08%	0.06%
UNITRAN	UTR	0.08%	0.12%
CLINICS	CLC	0.07%	0.06%
DUIKERS	DUK	0.07%	0.12%
GOLD FIELDS COAL LIMITED	GFC	0.07%	0.07%
LEBOWA PLATINUM MINES LIMITED	LPT	0.07%	0.06%
MNET/SS	MNS	0.07%	0.14%

PIKNPAY	PIK	0.07%	0.88%
POWERTECH	POW	0.07%	0.09%
CONTROL INSTR	CNL	0.06%	0.01%
DEELKRAAL GOLD MINE COMPANY LIMITED	DLK	0.06%	0.04%
DUNLOP	DNL	0.06%	0.15%
MCCAR	MCT	0.06%	0.75%
TOYOTA	TOY	0.06%	0.24%
BENCO	BNC	0.05%	0.01%
CENPROP	CEN	0.05%	0.00%
CITY LODGE HOTELS	CLH	0.05%	0.55%
FINTECH	FIN	0.05%	0.04%
HIGATE PROPERTY FUND	HGT	0.05%	0.09%
HLH	HLH	0.05%	0.17%
INDNEWS	IDW	0.05%	0.14%
IPROP	IPR	0.05%	0.06%
MGX	MGX	0.05%	0.04%
OMNIA	OMN	0.05%	0.14%
PIONEER	PNR	0.05%	0.00%

		1997	
NAME	Alpha	% Within ALSI	% Within RAFI
ANGLO	AGL	6.08%	7.97%
SAB	SAB	5.54%	4.36%
DEBEERS	DBR	4.98%	3.27%
RICHEMONT	RCH	4.88%	3.49%
SASOL	SOL	4.07%	3.03%
LIBERTY	LGL	2.90%	2.81%
NBS BOLAND GROUP LIMITED	NBB	2.61%	0.17%
FIRST NATIONAL BANK HOLDINGS LIMITED	FSB	2.49%	2.13%
MINORCO	MNR	2.46%	0.64%
BHPBILL	BIL	2.36%	0.72%
ABSA	ASA	2.34%	2.89%
NEDCOR	NED	2.19%	2.55%
ANGLOPLAT	AMS	1.84%	1.54%
STANBANK	SBK	1.82%	2.23%
INVESTEC LTD	INL	1.77%	0.62%
CGSMITH	CGS	1.72%	0.82%
BIDVEST	BVT	1.64%	0.73%
REMBRANDT GROUP LIMITED	RMT	1.63%	0.00%
DIDATA PLC	DDT	1.54%	0.37%
BARWORLD	BAW	1.52%	2.23%
IMPERIAL	IPL	1.36%	0.79%
ORION SELECTIONS LTD	ORS	1.36%	0.56%
COMPAREX	CPX	1.17%	0.22%
JOHNNIC	JNC	1.07%	1.51%
LONMIN	LON	1.03%	2.20%
FEDSURE	FDS	0.99%	0.32%
PREMIER	PML	0.90%	0.43%
RMB HOLDINGS	RMH	0.90%	0.37%
TIGBRANDS	TBS	0.89%	1.62%
NAC	NAC	0.82%	0.12%
NASPERS -N	NPN	0.79%	0.28%
NAIL-N	NAN	0.69%	0.24%
ANGLO AMERICAN INDUSTRIAL CORPORATION LIMITED	AMI	0.66%	1.69%
SAPPI	SAP	0.66%	2.16%
CORONATION HLDGS -N-	CRN	0.58%	0.00%
FIRSTRAND	FSR	0.56%	0.62%
ANGLO AMERICAN COAL CORPORATION LIMITED	AMC	0.55%	0.79%
TONGAAT	TNT	0.53%	0.76%
NAMPAK	NPK	0.52%	1.17%
WOOLTRU - N	WLN	0.50%	0.00%
KUMBA	KMB	0.49%	0.00%
PEPKOR	PEP	0.48%	1.28%
FREE STATE CONSOLIDATED GOLD MINES LIMITED	FRG	0.46%	0.89%
INVEGO INVESTMENTS LIMITED	IVG	0.45%	0.47%
WOOLIES	WHL	0.45%	0.68%
GENSEC	GSC	0.43%	0.31%
SOUTHERN LIFE ASSOCIATION LIMITED	SON	0.43%	0.59%
JD GROUP	JDG	0.42%	0.34%
RAHOLD	RAH	0.39%	0.10%
ABIL	ABL	0.38%	0.02%
NORWICH HOLDINGS LIMITED	NWH	0.38%	0.18%
SUPER GROUP	SPG	0.38%	0.09%
SAGE	SGG	0.37%	0.28%
GFIELDS	GFI	0.36%	2.61%
LIBSIL	LBS	0.36%	1.37%
AFRICAN LIFE	AFI	0.35%	0.06%
SAFMARINE & RENNIES HOLDINGS LIMITED	SFR	0.35%	0.68%
M&R HOLD	MUR	0.34%	1.31%
SOUTHVAAL HOLDINGS LIMITED	SVL	0.34%	0.37%
SUNCRUSH LIMITED	SUN	0.34%	0.30%
TRANS NATAL COAL CORPORATION LIMITED	TNC	0.34%	0.42%
W AREAS	WAR	0.33%	0.48%
WESTERN DEEP LEVELS LIMITED	WDL	0.33%	0.34%
FIT	FIT	0.32%	0.55%
AMGOLD	AMG	0.31%	0.80%
EDUCATION AND INVESTMENT CORP	EDC	0.31%	0.08%
ELLERINE	ELH	0.31%	0.26%
ENGEN LIMITED	EGN	0.31%	0.76%
MILLENNIUM ENTERTAINMENT GROUP AFRICA LTD	MEG	0.31%	0.09%
KLOOF GOLD MINING COMPANY LIMITED	KLO	0.30%	0.41%
PRIME-N	PRN	0.29%	0.08%
CAPITAL ALLIANCE	CPT	0.28%	0.12%
METCASH	MTC	0.28%	0.74%
PROFURN	PON	0.28%	0.11%
REUNERT	RLO	0.28%	0.54%
ANGGOLD	ANG	0.27%	1.10%
AVI	AVI	0.27%	1.09%
PRIME	PRI	0.27%	0.08%
SA-DRUG	SDG	0.27%	0.14%
DATATEC	DTC	0.26%	0.04%
IMPALA PLATINUM	IMP	0.26%	0.43%
WOOLTRU	WLO	0.26%	0.28%
EDCON	ECO	0.24%	0.79%
GENCOR LIMITED	GMF	0.00%	3.72%
AVMIN LIMITED	AVM	0.23%	1.60%
CHROMECORP HOLDINGS LIMITED	COM	0.23%	0.05%
FOSCHINI	FOS	0.23%	0.37%
KOHLER LIMITED	KOH	0.23%	0.38%
MIHH	MHH	0.23%	0.20%
SHOPRITE	SHP	0.23%	0.70%
ANGLOVAAL LIMITED -N-	ANN	0.22%	0.00%
M-CELL	MCE	0.22%	0.11%
AFROX	AFX	0.21%	0.44%
MALBAK	MLB	0.00%	0.33%
TRENCOR	TRE	0.21%	0.30%

INGWE COAL CORPORATION	IGEX	0.20%	0.00%
NUCLICKS	NCL	0.20%	0.17%
PPC	PPC	0.20%	0.16%
CORONATION HLDGS	CRH	0.19%	0.23%
SANTAM	SNT	0.18%	0.47%
AECI	AFE	0.17%	1.02%
ALEXFBS	AFB	0.17%	0.14%
CADSWEP	CAS	0.17%	0.14%
ENERGY AFRICA	ENR	0.17%	0.13%
ILLOVO	ILV	0.17%	0.35%
MCCARTHY GROUP LIMITED	MCR	0.17%	0.79%
H J JOEL GOLD MINING COMPANY LIMITED	JOE	0.15%	0.11%
ALPHA LIMITED	AAL	0.14%	0.27%
BEATRIX MINES LIMITED	BET	0.14%	0.25%
GENBEL SA	GBL	0.14%	0.88%
PSG	PSG	0.14%	0.01%
FASHAF	FSH	0.13%	0.03%
VOLTEX	VLX	0.13%	0.09%
ALTECH	ALT	0.12%	0.20%
CNA GALLO LIMITED	CNG	0.12%	0.09%
TEMPORA	TEM	0.12%	0.11%
KERSAF	KER	0.11%	0.84%
LEISURENET	LST	0.11%	0.04%
MEDI-CLINIC	MDC	0.11%	0.15%
SUN INTERNATIONAL SA	SIS	0.11%	0.55%
AFRICAN HARVEST	AHV	0.10%	0.15%
AMB	AMB	0.10%	0.00%
AVGOLD	AVG	0.10%	0.41%
DELFOOD	DLF	0.10%	0.25%
HARMONY	HAR	0.10%	0.24%
MUSTEK	MST	0.10%	0.09%
PALAMIN	PAM	0.10%	1.00%
PIKNPAY	PIK	0.10%	0.82%
SOFTLINE	SFT	0.10%	0.03%
BTG	USK	0.09%	0.17%
CHARIOT HOLDINGS LTD	CHT	0.09%	0.02%
CONSOL LIMITED	CGW	0.09%	0.00%
IBM SOUTH AFRICA GROUP LTD	IBM	0.09%	0.08%
MGX	MGX	0.09%	0.02%
NETCARE	NTC	0.09%	0.16%
POWERTECH	POW	0.09%	0.09%
TELJOY	TLJ	0.09%	0.02%
HOECHST SOUTH AFRICA LIMITED	HCT	0.08%	0.06%
HUDACO	HDC	0.08%	0.14%
AFGRI	AFR	0.07%	0.33%
AVIS	AVS	0.07%	0.04%
DELTA ELECTRICAL	DEL	0.07%	0.09%
ERM	OUS	0.07%	0.00%
FOODCORP LIMITED	FDC	0.07%	0.16%
HIVELD	HVL	0.07%	0.46%
INVICTA	IVT	0.07%	0.01%

MONEX	MNX	0.07%	0.01%
NU-WORLD	NWL	0.07%	0.03%
OZZ	OZZ	0.07%	0.06%
REBSERVE	RBV	0.07%	0.09%
ADCORP	ADR	0.06%	0.03%
DORBYL	DLV	0.06%	0.35%
EVANDER GOLD MINES LTD	EVR	0.06%	0.19%
FINTECH	FIN	0.06%	0.05%
HIGATE PROPERTY FUND	HGT	0.06%	0.09%
HOMECHOICE	HCH	0.06%	0.02%
INDNEWS	IDW	0.06%	0.19%
MNET/SS	MNS	0.06%	0.14%
OMEGA	OMA	0.06%	0.04%
RANDFONTN	RFN	0.06%	0.21%
SYCOM	SYC	0.06%	0.29%
AFBRAND	ABR	0.05%	0.00%
APLITEC	APL	0.05%	0.00%
ASTRAPAK	APK	0.05%	0.00%
EAST RAND GOLD AND URANIUM COMPANY LIMITED	ERG	0.05%	0.16%
MCCAR	MCT	0.05%	0.79%

		1998	
NAME	Alpha	% Within ALSI	% Within RAFI
RICHEMONT	RCH	7.30%	3.62%
ANGLO	AGL	4.99%	6.44%
SAB	SAB	4.48%	4.26%
FIRSTRAND	FSR	4.41%	1.59%
BHPBILL	BIL	4.21%	2.90%
DEBEERS	DBR	3.65%	3.29%
DIDATA PLC	DDT	2.75%	0.27%
COMPAREX	CPX	2.66%	0.43%
MINORCO	MNR	2.61%	0.62%
SASOL	SOL	2.27%	3.06%
ABSA	ASA	2.24%	2.92%
ANGLOPLAT	AMS	2.19%	1.60%
INVESTEC LTD	INL	2.02%	0.87%
BIDVEST	BVT	2.01%	0.92%
NEDCOR	NED	1.96%	2.65%
ANGGOLD	ANG	1.89%	2.20%
LIBERTY	LGL	1.83%	2.79%
STANBANK	SBK	1.83%	3.20%
REMBRANDT GROUP LIMITED	RMT	1.58%	0.00%
FEDSURE	FDS	1.23%	0.34%
DATATEC	DTC	1.15%	0.14%
IMPERIAL	IPL	1.14%	0.87%
RMB HOLDINGS	RMH	1.10%	0.58%
BOE	BOE	0.89%	1.14%
NAIL-N	NAN	0.88%	0.73%
LONMIN	LON	0.86%	1.69%
CORONATION HLDGS -N-	CRN	0.84%	0.00%
CGSMITH	CGS	0.82%	0.84%
BARWORLD	BAW	0.81%	1.65%
TIGBRANDS	TBS	0.81%	1.57%
SANLAM	SLM	0.78%	4.15%
JOHNNIC	JNC	0.75%	1.35%
AFRICAN LIFE	AFI	0.74%	0.12%
ABIL	ABL	0.73%	0.06%
ADCOCK-N	AND	0.70%	0.30%
GOLDFIELDS LIMITED	GFL	0.67%	2.37%
IMPALA PLATINUM	IMP	0.65%	0.45%
SAPPI	SAP	0.64%	2.44%
BRAIT	BAT	0.53%	0.06%
SUPER GROUP	SPG	0.52%	0.16%
GENSEC	GSC	0.51%	0.61%
RAHOLD	RAH	0.50%	0.17%
EDUCATION AND INVESTMENT CORP	EDC	0.49%	0.14%
ANGLO AMERICAN INDUSTRIAL CORPORATION LIMITED	AMI	0.48%	0.59%
METCASH	MTC	0.47%	0.75%
NASPERS -N	NPN	0.47%	0.27%
KUMBA	KMB	0.46%	0.00%
AMGOLD	AMG	0.45%	1.18%
PEPKOR	PEP	0.45%	1.32%
GENCOR LIMITED	GMF	0.00%	0.39%
NAC	NAC	0.43%	0.14%
PROFURN	PON	0.42%	0.21%
SA-DRUG	SDG	0.37%	0.16%
SAFREN	SFR	0.00%	0.60%
JD GROUP	JDG	0.36%	0.38%
CCH	CCH	0.34%	0.01%
HARMONY	HAR	0.34%	0.25%
SOFTLINE	SFT	0.33%	0.06%
TONGAAT	TNT	0.33%	0.85%
GFIELDS	GFI	0.32%	2.37%
FIT	FIT	0.31%	0.66%
NAMPAK	NPK	0.31%	1.15%
WOOLIES	WHL	0.31%	0.58%
WOOLTRU - N	WLN	0.31%	0.00%
CORONATION HLDGS	CRH	0.30%	0.24%
LIBSIL	LBS	0.29%	1.20%
M-CELL	MCE	0.29%	0.14%
SAGE	SGG	0.28%	0.35%
SHOPRITE	SHP	0.28%	0.79%
NUCLICKS	NCL	0.27%	0.19%
TIWHEEL	TIW	0.27%	0.07%
CAPITAL ALLIANCE	CPT	0.26%	0.19%
W AREAS	WAR	0.25%	0.40%
AFRICAN HARVEST	AHV	0.24%	0.19%
PRIME-N	PRN	0.23%	0.00%
REBSERVE	RBV	0.23%	0.12%
ANGLOVAAL MINING LIMITED	AIN	0.21%	1.76%
AVI	AVI	0.21%	0.95%
ERM	OUS	0.21%	0.01%
REUNERT	RLO	0.21%	0.53%
AVIHOLD	AIH	0.20%	0.00%
KERSAF	KER	0.20%	0.90%
ABI	ABI	0.19%	0.31%
ALEXFBS	AFB	0.19%	0.19%
AMB	AMB	0.19%	0.09%
BTG	USK	0.19%	0.41%
NETCARE	NTC	0.19%	0.19%
FRONTRNGE	XCH	0.18%	0.02%
AFGRI	AFR	0.17%	0.35%
CORPCAP	CPG	0.17%	0.08%
DURBAN DEEP	DUR	0.17%	0.11%
HEDGE	HDG	0.17%	0.00%
MGX	MGX	0.17%	0.02%
WOOLTRU	WLO	0.17%	0.55%
MUTUAL & FEDERAL	MAF	0.16%	0.43%
AFROX	AFX	0.15%	0.44%
CADSWEP	CAS	0.15%	0.15%
FOSCHINI	FOS	0.15%	0.36%
GENBEL SA	GBL	0.15%	0.78%
ILLOVO	ILV	0.15%	0.40%

PEREGRINE	PGR	0.15%	0.00%
PRIME	PRI	0.15%	0.12%
RAD	RAD	0.15%	0.08%
AVIS	AVS	0.14%	0.07%
M&R HOLD	MUR	0.14%	1.23%
MIHH	MHH	0.14%	0.29%
RANDFONTN	RFN	0.14%	0.19%
LONAFRIC	LAF	0.13%	0.03%
MERCANTILE	MTL	0.13%	0.09%
MUSTEK	MST	0.13%	0.12%
TEMPORA	TEM	0.13%	0.11%
ELLERINE	ELH	0.12%	0.27%
GLOBAL CAPITAL LIMITED	GLO	0.12%	0.01%
MALBAK	MLB	0.12%	0.39%
PPC	PPC	0.12%	0.15%
SETHOLD	STO	0.12%	0.01%
TRUWTHS	TRU	0.12%	0.23%
BJM	BJM	0.11%	0.01%
LEISURENET	LST	0.11%	0.04%
MONEX	MNX	0.11%	0.04%
SANTAM	SNT	0.11%	0.40%
TOURVST	TRT	0.11%	0.07%
TRENCOR	TRE	0.11%	0.31%
ADCORP	ADR	0.10%	0.05%
AECI	AFE	0.10%	0.93%
ALTECH	ALT	0.10%	0.24%
SPESCOM	SPS	0.10%	0.01%
AST GROUP	AAA	0.09%	0.00%
AVGOLD	AVG	0.09%	0.35%
DUIKERS	DUK	0.09%	0.24%
SPICER	SPI	0.09%	0.00%
CREDITSURE HOLDINGS LIMITED	CDS	0.08%	0.00%
CTP	CTP	0.08%	0.12%
DELTA ELECTRICAL	DEL	0.08%	0.10%
ENERGY AFRICA	ENR	0.08%	0.14%
GOLD FIELDS OF SOUTH AFRICA LIMITED	GFS	0.00%	0.82%
PIKNPAY	PIK	0.08%	0.78%
POWERTECH	POW	0.08%	0.10%
TELJOY	TLJ	0.08%	0.02%
TMX	TMX	0.08%	0.01%
BRYANT	BRY	0.07%	0.00%
CONSOLIDATED AFRICAN MINES	CAM	0.07%	0.08%
EDCON	ECO	0.07%	0.74%
HAGGIE LIMITED	HAG	0.07%	0.05%
HIVELD	HVL	0.07%	0.46%
MEDI-CLINIC	MDC	0.07%	0.20%
METTLE	GRW	0.07%	0.00%
WHETSTONE	WTS	0.07%	0.00%
ABRAXAS	ARX	0.06%	0.01%
ADCOCK	ADC	0.06%	0.30%
COMAIR	COM	0.06%	0.06%

CONNECT	CCT	0.06%	0.01%
I-&-J	IRV	0.06%	0.12%
JCI GOLD	JCG	0.06%	0.00%
PLANIT TECHNOLOGY	PTH	0.06%	0.00%
TRIDELTA	TDL	0.06%	0.03%
ADVANCED	ADT	0.05%	0.02%
AFBRAND	ABR	0.05%	0.03%
AFRICAN MEDIA	AME	0.05%	0.01%
APLITEC	APL	0.05%	0.01%
BRAINWARE	BRW	0.05%	0.00%
CORPCAP	CPC	0.05%	0.08%
GLENMIB	GMB	0.05%	0.04%
JASCO	JSC	0.05%	0.01%
MOLOPE	MOL	0.05%	0.01%
NU-WORLD	NWL	0.05%	0.04%
PALAMIN	PAM	0.05%	0.89%
SYCOM	SYC	0.05%	0.28%
UNITRAN	UTR	0.05%	0.17%
ADVTECH	ADH	0.04%	0.04%

		1999	
NAME	Alpha	% Within ALSI	% Within RAFI
ANGLO	AGL	11.01%	8.24%
RICHEMONT	RCH	7.20%	3.50%
BHPBILL	BIL	6.85%	2.77%
DEBEERS	DBR	4.87%	3.27%
SAB	SAB	4.39%	3.70%
OLD MUTUAL PLC	OML	3.78%	8.31%
SASOL	SOL	2.81%	2.89%
ANGLOPLAT	AMS	2.75%	1.75%
DIDATA PLC	DDT	2.50%	0.34%
STANBANK	SBK	2.39%	3.11%
FIRSTRAND	FSR	2.17%	2.16%
BIDVEST	BVT	1.58%	0.93%
SANLAM	SLM	1.55%	3.81%
INVESTEC LTD	INL	1.49%	0.82%
NEDCOR	NED	1.47%	2.75%
ANGGOLD	ANG	1.41%	2.29%
REMBRANDT GROUP LIMITED	RMT	1.39%	0.00%
LIB-INT	LBT	1.37%	2.62%
SAPPI	SAP	1.32%	2.12%
COMPAREX	CPX	1.29%	0.44%
M-CELL	MCE	1.26%	0.21%
ABSA	ASA	1.21%	2.84%
IMPERIAL	IPL	1.18%	0.85%
DATATEC	DTC	1.14%	0.18%
IMPALA PLATINUM	IMP	1.12%	0.60%
JOHNNIC	JNC	1.05%	0.68%
GFIELDS	GFI	0.92%	2.44%
LONMIN	LON	0.90%	1.37%
LIBERTY	LGL	0.87%	2.54%
BARWORLD	BAW	0.86%	1.49%
CGSMITH	CGS	0.86%	0.81%
CORONATION HLDGS -N-	CRN	0.81%	0.00%
RMB HOLDINGS	RMH	0.81%	0.61%
FEDSURE	FDS	0.77%	0.42%
METCASH	MTC	0.77%	0.91%
BOE	BOE	0.76%	1.17%
PROFURN	PON	0.67%	0.24%
NASPERS -N	NPN	0.65%	0.25%
GENCOR LIMITED	GMF	0.00%	0.32%
KUMBA	KMB	0.54%	0.00%
JD GROUP	JDG	0.53%	0.37%
TIGBRANDS	TBS	0.53%	1.39%
NAIL-N	NAN	0.45%	0.68%
EDCON	ECO	0.41%	0.62%
ANGLOVAAL MINING LIMITED	AIN	0.39%	1.21%
ALEXFBS	AFB	0.38%	0.17%
FOSCHINI	FOS	0.36%	0.30%
GENSEC	GSC	0.36%	0.60%
FRONTRNGE	XCH	0.35%	0.02%
NAMPAK	NPK	0.34%	1.06%
ABIL	ABL	0.33%	0.13%
NAC	NAC	0.33%	0.17%
AFRICAN LIFE	AFI	0.32%	0.15%
SUPER GROUP	SPG	0.32%	0.20%
SOFTLINE	SFT	0.31%	0.08%
CORONATION HLDGS	CRH	0.29%	0.22%
HARMONY	HAR	0.29%	0.40%
WOOLTRU - N	WLN	0.29%	0.00%
MIHH	MHH	0.25%	0.16%
NUCLICKS	NCL	0.25%	0.20%
WOOLIES	WHL	0.25%	0.54%
AVENG	AEG	0.24%	0.57%
PIKNPAY	PIK	0.24%	0.75%
TONGAAT	TNT	0.24%	0.74%
ELLERINE	ELH	0.22%	0.26%
SAGE	SGG	0.22%	0.41%
CAPITAL ALLIANCE	CPT	0.21%	0.09%
CCH	CCH	0.21%	0.02%
EDUCATION AND INVESTMENT CORP	EDC	0.21%	0.10%
REBSERVE	RBV	0.21%	0.15%
AVI	AVI	0.18%	0.77%
BRAIT	BAT	0.17%	0.08%
SHOPRITE	SHP	0.17%	0.79%
REUNERT	RLO	0.16%	0.63%
W AREAS	WAR	0.16%	0.48%
WOOLTRU	WLO	0.16%	0.45%
AFROX	AFX	0.15%	0.43%
KERSAF	KER	0.15%	0.75%
M&R HOLD	MUR	0.15%	1.04%
RAHOLD	RAH	0.15%	0.25%
ABI	ABI	0.14%	0.41%
TIWHEEL	TIW	0.14%	0.09%
TRUWTHS	TRU	0.14%	0.23%
AST GROUP	AAA	0.13%	0.01%
AVIS	AVS	0.13%	0.06%
MGX	MGX	0.13%	0.02%
NORTHAM PLATINUM	NHM	0.13%	0.15%
SAAMBOU	SBO	0.13%	0.12%
SAFREN	SFR	0.00%	0.59%
AFRICAN HARVEST	AHV	0.12%	0.18%
CADSWEP	CAS	0.12%	0.25%
DISCOVERY	DSY	0.12%	0.09%
NETCARE	NTC	0.12%	0.19%
TEMPORA	TEM	0.12%	0.12%
AFGRI	AFR	0.11%	0.27%
BJM	BJM	0.11%	0.03%
GENBEL SA	GBL	0.11%	0.70%
ILLOVO	ILV	0.11%	0.42%
MALBAK	MLB	0.00%	0.37%
MARPROP	MTP	0.11%	0.35%
PSG	PSG	0.11%	0.06%

ERM	OUS	0.10%	0.01%
GRAYPROP	GRY	0.10%	0.23%
MUTUAL & FEDERAL	MAF	0.10%	0.94%
PPC	PPC	0.10%	0.13%
TOURVST	TRT	0.10%	0.07%
AECI	AFE	0.09%	0.76%
DURBAN DEEP	DUR	0.09%	0.13%
PSGBANKH	PGH	0.09%	0.00%
ADCORP	ADR	0.08%	0.03%
CTP	CTP	0.08%	0.13%
DELFOOD	DLF	0.08%	0.19%
HEDGE	HDG	0.08%	0.00%
HOMECHOICE	HCH	0.08%	0.03%
IDION	IDI	0.08%	0.00%
LEISURENET	LST	0.08%	0.05%
PRIME-N	PRN	0.08%	0.00%
SANTAM	SNT	0.08%	0.41%
SPICER	SPI	0.08%	0.02%
UNIFER	UNF	0.08%	0.06%
ASPEN	APN	0.07%	0.03%
CORPCAP	CPG	0.07%	0.08%
ENERGY AFRICA	ENR	0.07%	0.09%
GLOBAL CAPITAL LIMITED	GLO	0.07%	0.01%
MUSTEK	MST	0.07%	0.11%
ALTECH	ALT	0.06%	0.23%
COMAIR	COM	0.00%	0.07%
DELTA ELECTRICAL	DEL	0.06%	0.10%
MEDI-CLINIC	MDC	0.06%	0.20%
NIBH	NIB	0.06%	0.44%
POWERTECH	POW	0.06%	0.13%
PRIME	PRI	0.06%	0.07%
PRISM	PIM	0.06%	0.00%
REGAL	RGL	0.06%	0.03%
SYCOM	SYC	0.06%	0.28%
TELJOY	TLJ	0.06%	0.02%
UNITRAN	UTR	0.06%	0.19%
AVGOLD	AVG	0.05%	0.26%
CONSOLIDATED AFRICAN MINES	CAM	0.05%	0.05%
CREDCOR	CDR	0.05%	0.02%
DUIKERS	DUK	0.05%	0.21%
HIVELD	HVL	0.05%	0.39%
PEREGRINE	PGR	0.05%	0.02%
RANDFONTN	RFN	0.05%	0.08%
SPESCOM	SPS	0.05%	0.01%
WIPHOLD	WPH	0.05%	0.08%

		2000	
NAME	Alpha	% Within ALSI	% Within RAFI
ANGLO	AGL	14.06%	9.46%
RICHEMONT	RCH	8.68%	3.86%
OLD MUTUAL PLC	OML	5.57%	5.40%
BHPBILL	BIL	5.51%	3.16%
DIDATA PLC	DDT	5.12%	1.79%
DEBEERS	DBR	5.06%	3.96%
ANGLOPLAT	AMS	4.83%	2.35%
STANBANK	SBK	3.62%	3.13%
SAB	SAB	3.47%	3.49%
FIRSTRAND	FSR	2.89%	2.45%
SASOL	SOL	2.74%	3.12%
REMGRO	REM	2.12%	0.97%
NEDCOR	NED	1.75%	2.94%
IMPALA PLATINUM	IMP	1.61%	0.71%
SANLAM	SLM	1.60%	2.72%
LIB-INT	LBT	1.31%	2.70%
INVESTEC LTD	INL	1.29%	0.83%
ABSA	ASA	1.17%	2.64%
JOHNNIC	JNC	1.14%	0.56%
BIDVEST	BVT	1.13%	1.08%
SAPPI	SAP	1.09%	2.05%
IMPERIAL	IPL	1.08%	0.90%
M-CELL	MCE	1.04%	0.31%
ANGGOLD	ANG	1.00%	2.44%
GFIELDS	GFI	0.98%	1.41%
TIGBRANDS	TBS	0.91%	1.15%
BOE	BOE	0.87%	0.93%
BARWORLD	BAW	0.86%	1.39%
VENFIN	VNF	0.83%	2.13%
LIBERTY	LGL	0.77%	2.21%
RMB HOLDINGS	RMH	0.68%	0.67%
CORONATION HLDGS -N-	CRN	0.56%	0.00%
NAMPAK	NPK	0.48%	0.93%
ALEXFBS	AFB	0.47%	0.18%
FEDSURE	FDS	0.46%	0.52%
DATATEC	DTC	0.39%	0.29%
JD GROUP	JDG	0.38%	0.36%
NASPERS -N	NPN	0.38%	0.31%
STEINHOFF	SHF	0.34%	0.38%
HARMONY	HAR	0.29%	0.49%
NAC	NAC	0.29%	0.17%
PIKNPAY	PIK	0.29%	0.71%
NUCLICKS	NCL	0.28%	0.22%
KUMBA	KMB	0.27%	0.00%
PROFURN	PON	0.27%	0.29%
AVI	AVI	0.26%	0.61%
SHOPRITE	SHP	0.26%	0.83%
AVENG	AEG	0.24%	0.41%
COMPAREX	CPX	0.23%	0.51%

NORTHAM PLATINUM	NHM	0.23%	0.25%
REUNERT	RLO	0.22%	0.55%
SANTAM	SNT	0.22%	0.43%
ABIL	ABL	0.21%	0.29%
KERSAF	KER	0.18%	0.60%
WOOLIES	WHL	0.17%	0.49%
ABI	ABI	0.16%	0.42%
AVMIN	AIN	0.00%	0.86%
TONGAAT	TNT	0.16%	0.67%
AFROX	AFX	0.15%	0.41%
DISCOVERY	DSY	0.15%	0.14%
REBSERVE	RBV	0.15%	0.16%
SUPER GROUP	SPG	0.15%	0.21%
CORONATION HLDGS	CRH	0.14%	0.28%
ILLOVO	ILV	0.14%	0.43%
WOOLTRU - N	WLN	0.14%	0.00%
BRAIT	BAT	0.13%	0.09%
FOSCHINI	FOS	0.13%	0.25%
TEMPORA	TEM	0.13%	0.11%
CAPITAL ALLIANCE	CPT	0.12%	0.11%
EDCON	ECO	0.12%	0.54%
GRAYPROP	GRY	0.12%	0.23%
MIHH	MHH	0.12%	0.19%
W AREAS	WAR	0.12%	0.39%
AFGRI	AFR	0.11%	0.23%
AFRICAN LIFE	AFI	0.11%	0.16%
ELLERINE	ELH	0.11%	0.25%
METCASH	MTC	0.11%	1.02%
NETCARE	NTC	0.11%	0.18%
SUN INTERNATIONAL SA	SIS	0.11%	0.34%
ALTECH	ALT	0.10%	0.21%
AST GROUP	AAA	0.10%	0.03%
MUTUAL & FEDERAL	MAF	0.10%	1.01%
UNITRAN	UTR	0.10%	0.22%
AECI	AFE	0.09%	0.65%
M&R HOLD	MUR	0.09%	0.87%
MARPROP	MTP	0.09%	0.30%
PPC	PPC	0.09%	0.12%
SAGE	SGG	0.09%	0.40%
DELTA ELECTRICAL	DEL	0.08%	0.11%
KPM	KPM	0.08%	0.03%
MEDI-CLINIC	MDC	0.08%	0.18%
PSG	PSG	0.08%	0.08%
DELFOOD	DLF	0.07%	0.03%
DURBAN DEEP	DUR	0.07%	0.10%
ENERGY AFRICA	ENR	0.07%	0.09%
IDION	IDI	0.07%	0.04%
RAHOLD	RAH	0.07%	0.21%
SYCOM	SYC	0.07%	0.26%
TRUWTHS	TRU	0.07%	0.20%
UNISERV	USV	0.07%	0.02%
WOOLTRU	WLO	0.07%	0.43%

ASPEN	APN	0.06%	0.04%
AVIS	AVS	0.06%	0.07%
FRONTRNGE	XCH	0.06%	0.08%
LOGOPT	LOG	0.06%	0.25%
PEPKOR	PEP	0.00%	1.28%
PRISM	PIM	0.06%	0.00%
SAAMBOU	SBO	0.06%	0.13%
SOFTLINE	SFT	0.06%	0.07%
TRANS HEX	TSX	0.06%	0.07%
ADCORP	ADR	0.05%	0.05%
AMB	AMB	0.05%	0.08%
COMAIR	COM	0.00%	0.07%
CTP	CTP	0.05%	0.12%
DORBYL	DLV	0.05%	0.31%
GENBEL SA	GBL	0.05%	0.55%
GRAYVEST	GRV	0.05%	0.23%
MASSMART	MSM	0.05%	0.54%
MR PRICE	MPC	0.05%	0.12%
NIBH	NIB	0.05%	0.50%
PRIME	PRI	0.05%	0.08%
PRIME-N	PRN	0.05%	0.00%
PSGBANKH	PGH	0.05%	0.22%
SOLUTIONS	SLU	0.05%	0.03%
TIWHEEL	TIW	0.05%	0.09%

		2001	
NAME	Alpha	% Within ALSI	% Within RAFI
ANGLO	AGL	14.98%	10.65%
RICHEMONT	RCH	8.68%	3.43%
BHPBILL	BIL	7.87%	5.94%
OLD MUTUAL PLC	OML	5.05%	5.33%
SASOL	SOL	4.65%	3.35%
SAB	SAB	4.08%	3.08%
STANBANK	SBK	3.88%	3.14%
ANGLOPLAT	AMS	3.10%	3.16%
FIRSTRAND	FSR	2.89%	2.58%
REMGRO	REM	2.75%	1.74%
SANLAM	SLM	2.37%	2.80%
GFIELDS	GFI	1.76%	1.11%
SAPPI	SAP	1.76%	1.97%
ABSA	ASA	1.72%	2.39%
LIB-INT	LBT	1.67%	2.78%
NEDCOR	NED	1.53%	2.71%
IMPALA PLATINUM	IMP	1.50%	1.29%
ANGGOLD	ANG	1.49%	2.53%
BIDVEST	BVT	1.21%	1.17%
DIDATA PLC	DDT	1.15%	2.12%
IMPERIAL	IPL	1.12%	0.91%
M-CELL	MCE	1.03%	0.86%
BARWORLD	BAW	1.00%	1.27%
TIGBRANDS	TBS	0.92%	1.02%
RMB HOLDINGS	RMH	0.91%	0.76%
BOE	BOE	0.82%	0.88%
INVESTEC LTD	INL	0.82%	0.83%
VENFIN	VNF	0.80%	1.20%
JOHNNIC	JNC	0.71%	0.58%
HARMONY	HAR	0.67%	0.62%
LIBERTY	LGL	0.67%	1.96%
KUMBA	KMB	0.65%	0.00%
STEINHOFF	SHF	0.58%	0.39%
NAC	NAC	0.55%	0.78%
NAMPAK	NPK	0.52%	0.82%
ALEXFBS	AFB	0.48%	0.20%
ABIL	ABL	0.38%	0.17%
JD GROUP	JDG	0.37%	0.33%
AVI	AVI	0.35%	0.44%
COMPAREX	CPX	0.35%	0.43%
CORONATION HLDGS -N-	CRN	0.31%	0.00%
REUNERT	RLO	0.31%	0.47%
SHOPRITE	SHP	0.31%	0.80%
SUPER GROUP	SPG	0.29%	0.24%
AVENG	AEG	0.27%	0.42%
AVMIN	AIN	0.00%	0.63%
NETCARE	NTC	0.26%	0.17%
METCASH	MTC	0.25%	1.04%
WOOLIES	WHL	0.24%	0.43%
ILLOVO	ILV	0.23%	0.39%
KERSAF	KER	0.22%	0.43%
M&R HOLD	MUR	0.22%	0.67%
NASPERS -N	NPN	0.22%	0.36%
PIKNPAY	PIK	0.22%	0.68%
GRAYPROP	GRY	0.21%	0.26%
NUCLICKS	NCL	0.21%	0.21%
NORTHAM PLATINUM	NHM	0.20%	0.33%
TONGAAT	TNT	0.20%	0.58%
WOOLTRU - N	WLN	0.20%	0.00%
ABI	ABI	0.18%	0.40%
SANTAM	SNT	0.18%	0.40%
W AREAS	WAR	0.18%	0.29%
ASPEN	APN	0.17%	0.05%
AECI	AFE	0.16%	0.50%
AFGRI	AFR	0.16%	0.21%
DURBAN DEEP	DUR	0.16%	0.10%
AFROX	AFX	0.15%	0.39%
EDCON	ECO	0.15%	0.44%
ELLERINE	ELH	0.14%	0.22%
WOOLTRU	WLO	0.14%	0.34%
DATATEC	DTC	0.13%	0.46%
MUTUAL & FEDERAL	MAF	0.13%	1.04%
BRAIT	BAT	0.12%	0.10%
ENERGY AFRICA	ENR	0.12%	0.11%
FOSCHINI	FOS	0.12%	0.22%
MEDI-CLINIC	MDC	0.12%	0.16%
PPC	PPC	0.12%	0.10%
SYCOM	SYC	0.12%	0.25%
AFRICAN LIFE	AFI	0.11%	0.15%
ALTECH	ALT	0.11%	0.21%
AMB	AMB	0.11%	0.07%
DISCOVERY	DSY	0.11%	0.15%
MARPROP	MTP	0.11%	0.25%
SAAMBOU	SBO	0.11%	0.14%
TRUWTHS	TRU	0.11%	0.17%
AVGOLD	AVG	0.10%	0.19%
DELTA ELECTRICAL	DEL	0.10%	0.11%
MR PRICE	MPC	0.10%	0.12%
PEPKOR	PEP	0.00%	0.88%
CAPITAL ALLIANCE	CPT	0.09%	0.11%
NIBH	NIB	0.09%	0.45%
SAGE	SGG	0.09%	0.35%
APLITEC	APL	0.08%	0.02%
GROWTHPOINT	GRT	0.08%	1.52%
MGX	MGX	0.08%	0.02%
PSG	PSG	0.08%	0.08%
CORONATION HLDGS	CRH	0.07%	0.30%
MALBAK	MLB	0.00%	0.21%
MASSMART	MSM	0.07%	0.52%
SUN INTERNATIONAL SA	SIS	0.07%	0.23%
TRANS HEX	TSX	0.07%	0.07%

UNISERV	USV	0.07%	0.03%
UNITRAN	UTR	0.07%	0.22%
AST GROUP	AAA	0.06%	0.02%
AVIS	AVS	0.06%	0.09%
GRAYVEST	GRV	0.06%	0.26%
PSGBANKH	PGH	0.06%	0.25%
REBSERVE	RBV	0.06%	0.17%
ADCORP	ADR	0.05%	0.05%
CORPCAP	CPG	0.05%	0.11%
CTP	CTP	0.05%	0.13%
GENBEL SA	GBL	0.05%	0.18%
GRINTEK	GNK	0.05%	0.16%
HLH	HLH	0.05%	0.09%
JCI GOLD	JCG	0.05%	0.11%
METPROP	MPL	0.05%	0.01%
MIHH	MHH	0.05%	0.19%
PANPROP	PAP	0.05%	0.21%
PROFURN	PON	0.05%	0.23%
RAHOLD	RAH	0.05%	0.12%
REDEFINE	RDF	0.05%	0.29%
TIWHEEL	TIW	0.05%	0.09%

		2002	
NAME	Alpha	% Within ALSI	*% Within RAFI*
Anglo American	AGL	14.85%	9.17%
BHP Billiton	BIL	8.90%	7.29%
Compagnie Financiere Richemont AG	RCH	6.64%	4.15%
Sasol	SOL	5.58%	3.60%
SABMiller	SAB	4.86%	2.91%
Gold Fields	GFI	4.50%	1.28%
Old Mutual	OML	3.65%	4.61%
Standard Bank Group	SBK	3.19%	2.82%
Anglogold	ANG	2.58%	2.71%
Firstrand Limited	FSR	2.41%	2.57%
Remgro	REM	2.41%	1.68%
Anglo American Platinum Corp.	AMS	2.19%	3.50%
Sappi	SAP	2.19%	1.95%
Impala Platinum Hlds	IMP	2.16%	1.49%
Harmony	HAR	2.05%	0.76%
Liberty International	LBT	1.97%	2.23%
Sanlam	SLM	1.61%	2.44%
Absa Group	ASA	1.23%	2.05%
Nedcor	NED	1.20%	2.51%
Bidvest Group	BVT	1.12%	1.28%
Barloworld	BAW	1.04%	1.19%
Imperial Holdings	IPL	0.95%	0.95%
Tiger Brands	TBS	0.95%	0.89%
MTN Group	MTN	0.80%	0.84%
Kumba	KMB	0.77%	0.00%
RMB Holdings	RMH	0.73%	0.72%
Nampak	NPK	0.72%	0.77%
Venfin	VNF	0.69%	0.91%
Investec PLC	INP	0.67%	1.96%
Johnnic Holding Limited	JNC	0.60%	0.75%
Liberty Group	LGL	0.60%	1.58%
ISCOR	ISC	0.57%	0.86%
Naspers	NPN	0.55%	0.37%
Durban Roodepoort Deep	DUR	0.48%	0.10%
Alexander Forbes	AFB	0.44%	0.22%
Dimension Data Holdings	DDT	0.41%	0.98%
Anglovaal Inds.	AVI	0.40%	0.33%
Steinhoff International Holdings	SHF	0.40%	0.41%
Network Healthcare Holdings	NTC	0.38%	0.21%
Woolworths Holdings	WHL	0.38%	0.40%
Investec Ltd	INL	0.35%	0.84%
Murray & Roberts	MUR	0.34%	0.53%
New Africa Capital	NAC	0.33%	0.55%
Aveng	AEG	0.32%	0.41%
Metro Cash & Carry	MTC	0.32%	1.02%
Reunert	RLO	0.32%	0.39%
Shoprite	SHP	0.31%	0.69%
Western Areas	WAR	0.28%	0.20%

Northam Platinum	NHM	0.27%	0.37%
Anglovaal Mining	AIN	0.26%	0.33%
Pick N Pay Stores	PIK	0.26%	0.63%
African Rainbow Minerals Gold	AOD	0.24%	0.33%
Aspen Pharmacare Holdings	APN	0.23%	0.06%
Coronation Holdings N	CRN	0.23%	0.00%
Edgars Consolidated Stores	ECO	0.23%	0.34%
African Bank Invest	ABL	0.22%	0.20%
Massmart Holdings	MSM	0.22%	0.50%
AECI	AFE	0.21%	0.39%
Illovo Sugar	ILV	0.21%	0.35%
New Clicks Holdings	NCL	0.20%	0.21%
African Oxygen	AFX	0.19%	0.36%
JD Group	JDG	0.19%	0.28%
Kersaf Investments	KER	0.19%	0.30%
Tongaat-Hulett Group	TNT	0.19%	0.49%
Amalgamated Beverage Industries	ABI	0.18%	0.37%
Allan Gray Property Trust	GRY	0.18%	0.25%
Avgold	AVG	0.17%	0.15%
Pretoria Portland Cement	PPC	0.17%	0.09%
Super Group	SPG	0.17%	0.23%
Afgri Ltd	AFR	0.16%	0.20%
Foschini	FOS	0.16%	0.20%
Energy Africa	ENR	0.15%	0.03%
Santam	SNT	0.14%	0.37%
Truworths International	TRU	0.13%	0.15%
Comparex Holdings	CPX	0.12%	0.33%
Sycom Property Fund	SYC	0.12%	0.21%
Capital Alliance Holdings	CPT	0.11%	0.21%
Ellerine Holdings	ELH	0.11%	0.19%
Medi-Clinicrp	MDC	0.11%	0.14%
Mr Price Group	MPC	0.11%	0.12%
Mvelaphanda Resources Ltd	MVL	0.11%	0.41%
African Life Assur	AFI	0.10%	0.15%
Allied Technologies	ALT	0.10%	0.19%
Delta Electrical Industries	DEL	0.10%	0.11%
Pepkor	PEP	0.10%	0.64%
Trans HEX Group	TSX	0.10%	0.07%
Avis Southern Africa	AVS	0.09%	0.09%
Martprop Property Fund	MTP	0.09%	0.19%
Pangbourne Prop Ltd	PAP	0.09%	0.18%
Rebserve Holdings	RBV	0.09%	0.16%
United Service Technologies	USV	0.09%	0.03%
JCI Limited	JCD	0.08%	0.02%
Tradehold	TDH	0.08%	0.28%
Discovery Holdings	DSY	0.07%	0.15%
Datatec	DTC	0.07%	0.50%
Hoskens Cons Invest	HCI	0.07%	0.32%
Sun International South Africa	SIS	0.07%	0.14%
Apexhi Properties -A-	APA	0.06%	0.23%
Net 1 Applied Tech Holdings	APL	0.06%	0.03%

Brait SA	BAT	0.06%	0.09%
Caxton & CTP	CAT	0.06%	0.19%
Coronation Holdings	CRH	0.06%	0.30%
Dorbyl	DLV	0.06%	0.22%
Palabora Mining	PAM	0.06%	0.20%
Randgold and Exploration	RNG	0.06%	0.05%
AMB Holdings	AMB	0.05%	0.06%
Chemical Services	CHE	0.05%	0.11%
Ceramic Industries	CRM	0.05%	0.04%
Johnnic Communications	JCM	0.05%	0.23%
New Africa Investment N	NAN	0.05%	2.00%
Oceana Group	OCE	0.05%	0.13%
PSG Group	PSG	0.05%	0.08%
Real Africa Holdings	RAH	0.05%	0.09%
Redefine Income Find	RDF	0.05%	0.23%
Tiger Wheels	TIW	0.05%	0.09%
Tourism Investment Corp	TRT	0.05%	0.06%
Unitrans	UTR	0.05%	0.22%
Afrikander Lease.	AFL	0.04%	0.02%
Apexhi Properties -B-	APB	0.04%	0.23%
Astral Foods Ltd	ARL	0.04%	0.14%
Corpcapital	CPA	0.04%	0.09%
Group Five/South Africa	GRF	0.04%	0.13%
Highveld Steel	HVL	0.04%	0.23%
Metboard Properties	MPL	0.04%	0.01%
Mustek	MST	0.04%	0.10%
Primedia Limited N	PMN	0.04%	0.11%
Allied Electronics Corp	ATN	0.03%	0.28%
Bytes Technology Group	BTG	0.03%	0.07%
Centrecity Property Fund	CEN	0.03%	0.17%
Glenrand MIB	GMB	0.03%	0.04%
Grindrod N	GNN	0.03%	0.08%
Omnia Holdings Ltd	OMN	0.03%	0.08%
OZZ	OZZ	0.03%	0.05%
PSG Investment Bank Holdings	PGH	0.03%	0.36%
Profurn	PON	0.03%	0.12%
Rainbow Chicken	RBW	0.03%	0.11%
South African Chrome & Alloys	SCE	0.03%	0.02%
Softline.	SFT	0.03%	0.05%
Spur Corp	SUR	0.03%	0.02%
Wilson Bayly Holmes-Ovcon	WBO	0.03%	0.06%
Acucap Properties Limited	ACP	0.02%	0.00%
Adcorp Holdings	ADR	0.02%	0.05%
African Harvest	AHV	0.02%	0.08%
Arnold Property Fund	ARP	0.02%	0.01%
Bell Equipment	BEL	0.02%	0.08%
Barnard Jacobs Mellet Holdings	BJM	0.02%	0.03%
Barplats Investments.	BPL	0.02%	0.01%
City Lodge Hotels	CLH	0.02%	0.04%
Capital Property Fund	CPL	0.02%	0.14%
Gold Reef Casino Resorts	GDF	0.02%	0.03%

Grintek	GNK	0.02%	0.12%
Hudaco Industries	HDC	0.02%	0.06%
Nu-World Holdings	NWL	0.02%	0.05%
Peregrine Holdings	PGR	0.02%	0.03%
Sage Group	SGG	0.02%	0.29%
Sa Retail Properties	SRL	0.02%	0.00%
AG Industries	AGI	0.01%	0.04%
Bridgestone Firestone Maxiprest	BDS	0.01%	0.05%
Cadiz Holdings	CDZ	0.01%	0.03%
Clientele Life Assurance.	CLE	0.01%	0.05%
Comair	COM	0.01%	0.06%
Grindrod	GND	0.01%	0.06%
Mettle Ltd	MEL	0.01%	0.03%
Primedia Limited	PMA	0.01%	0.07%
Wetherlys Investment Holdings	WET	0.01%	0.02%

		2003	
NAME	Alpha	% Within ALSI	*% Within RAFI*
Anglo American	AGL	14.90%	9.12%
BHP Billiton	BIL	10.10%	6.42%
Compagnie Financiere Richemont AG	RCH	5.87%	3.05%
SABMiller	SAB	4.85%	3.43%
Sasol	SOL	4.50%	4.08%
Standard Bank Group	SBK	3.68%	3.03%
Gold Fields	GFI	3.25%	1.43%
Old Mutual	OML	3.02%	4.08%
Impala Platinum Hlds	IMP	2.72%	1.62%
Firstrand Limited	FSR	2.56%	2.81%
Anglogold	ANG	2.47%	2.44%
MTN Group	MTN	2.47%	0.97%
Remgro	REM	2.43%	1.88%
Harmony	HAR	1.98%	1.09%
Liberty International	LBT	1.80%	2.01%
Anglo American Platinum Corp.	AMS	1.79%	3.55%
Sanlam	SLM	1.64%	2.61%
Sappi	SAP	1.54%	1.80%
Absa Group	ASA	1.43%	2.08%
Bidvest Group	BVT	1.10%	1.39%
Barloworld	BAW	1.05%	1.15%
Imperial Holdings	IPL	1.04%	1.09%
Tiger Brands	TBS	0.93%	0.87%
Naspers	NPN	0.87%	0.44%
Telkom	TKG	0.84%	1.63%
RMB Holdings	RMH	0.82%	0.81%
Venfin	VNF	0.72%	0.72%
Investec PLC	INP	0.68%	2.26%
Nedcor	NED	0.60%	2.46%
Nampak	NPK	0.60%	0.79%
Network Healthcare Holdings	NTC	0.58%	0.30%
Liberty Group	LGL	0.52%	1.53%
JD Group	JDG	0.51%	0.35%
Woolworths Holdings	WHL	0.48%	0.39%
ISCOR	ISC	0.46%	1.06%
Steinhoff International Holdings	SHF	0.45%	0.50%
Dimension Data Holdings	DDT	0.42%	0.74%
AVI	AVI	0.41%	0.31%
Edgars Consolidated Stores	ECO	0.35%	0.33%
Investec Ltd	INL	0.35%	0.86%
Shoprite	SHP	0.35%	0.69%
African Bank Invest	ABL	0.33%	0.26%
Aspen Pharmacare Holdings	APN	0.33%	0.09%
Metropolitan Holdings	MET	0.33%	0.60%
Durban Roodepoort Deep	DUR	0.32%	0.10%
Massmart Holdings	MSM	0.32%	0.52%
Metro Cash & Carry	MTC	0.32%	1.13%
Murray & Roberts	MUR	0.32%	0.47%

Reunert	RLO	0.32%	0.38%
Truworths International	TRU	0.32%	0.18%
Pick N Pay Stores	PIK	0.30%	0.66%
Alexander Forbes	AFB	0.29%	0.27%
Avgold	AVG	0.26%	0.16%
Aveng	AEG	0.25%	0.42%
Anglovaal Mining	AIN	0.25%	0.20%
Foschini	FOS	0.25%	0.23%
AECI	AFE	0.24%	0.37%
Kersaf Investments	KER	0.24%	0.24%
African Oxygen	AFX	0.23%	0.39%
Super Group	SPG	0.23%	0.23%
Western Areas	WAR	0.23%	0.15%
Amalgamated Beverage Industries	ABI	0.22%	0.41%
Pretoria Portland Cement	PPC	0.22%	0.09%
Santam	SNT	0.21%	0.40%
Comparex Holdings	CPX	0.20%	0.29%
Allan Gray Property Trust	GRY	0.20%	0.27%
New Clicks Holdings	NCL	0.20%	0.24%
Pepkor	PEP	0.18%	0.48%
Ellerine Holdings	ELH	0.17%	0.19%
Illovo Sugar	ILV	0.16%	0.34%
Kumba	KMB	0.16%	0.16%
Medi-Clinicrp	MDC	0.16%	0.14%
Afgri Ltd	AFR	0.14%	0.22%
Discovery Holdings	DSY	0.13%	0.18%
Datatec	DTC	0.13%	0.53%
Sycom Property Fund	SYC	0.13%	0.21%
Trans HEX Group	TSX	0.13%	0.08%
Allied Technologies	ALT	0.12%	0.22%
Allied Electronics Corp Part Prf	ATNP	0.12%	0.35%
Avis Southern Africa	AVS	0.12%	0.10%
Mr Price Group	MPC	0.12%	0.13%
Northam Platinum	NHM	0.12%	0.36%
Tongaat-Hulett Group	TNT	0.12%	0.42%
Capital Alliance Holdings	CPT	0.11%	0.25%
Martprop Property Fund	MTP	0.11%	0.19%
African Life Assur	AFI	0.10%	0.18%
Pangbourne Prop Ltd	PAP	0.10%	0.17%
Randgold and Exploration	RNG	0.10%	0.07%
Sun International South Africa	SIS	0.10%	0.01%
United Service Technologies	USV	0.10%	0.04%
Apexhi Properties -A-	APA	0.09%	0.23%
Net 1 Applied Tech Holdings	APL	0.09%	0.04%
Hyprop Investments Ltd	HYP	0.09%	0.18%
Mvelaphanda Resources Ltd	MVL	0.09%	0.39%
New Africa Investment N	NAN	0.09%	1.96%
Caxton & CTP	CAT	0.08%	0.18%
Trencor Ltd	TRE	0.08%	0.13%
Afrox Healthcare Ltd	AHH	0.07%	0.20%
Astral Foods Ltd	ARL	0.07%	0.15%

Coronation Fund Managers	CML	0.07%	0.04%
Delta Electrical Industries	DEL	0.07%	0.12%
Real Africa Holdings	RAH	0.07%	0.10%
Rebserve Holdings	RBV	0.07%	0.17%
Redefine Income Find	RDF	0.07%	0.22%
Apexhi Properties -B-	APB	0.06%	0.23%
Grindrod N	GNN	0.06%	0.09%
Iliad Africa	ILA	0.06%	0.04%
JCI Limited	JCD	0.06%	0.05%
Palabora Mining	PAM	0.06%	0.16%
Primedia Limited N	PMN	0.06%	0.09%
Tiger Wheels	TIW	0.06%	0.10%
Unitrans	UTR	0.06%	0.23%
Brait SA	BAT	0.05%	0.08%
Group Five/South Africa	GRF	0.05%	0.13%
Johnnic Communications	JCM	0.05%	0.23%
Metboard Properties	MPL	0.05%	0.01%
Mustek	MST	0.05%	0.11%
Metair Investments Ord	MTA	0.05%	0.04%
Oceana Group	OCE	0.05%	0.14%
Wilson Bayly Holmes-Ovcon	WBO	0.05%	0.07%
Acucap Properties Limited	ACP	0.04%	0.12%
City Lodge Hotels	CLH	0.04%	0.04%
Corpcapital	CPA	0.04%	0.18%
Glenrand MIB	GMB	0.04%	0.05%
Omnia Holdings Ltd	OMN	0.04%	0.09%
Rainbow Chicken	RBW	0.04%	0.13%
Tourism Investment Corp	TRT	0.04%	0.08%
Adcorp Holdings	ADR	0.03%	0.05%
Allied Electronics Corp	ATN	0.03%	0.29%
Bytes Technology Group	BTG	0.03%	0.07%
Capital Property Fund	CPL	0.03%	0.11%
Ceramic Industries	CRM	0.03%	0.04%
Cashbuild Ltd	CSB	0.03%	0.04%
Highveld Steel	HVL	0.03%	0.21%
iFour Properties	IFR	0.03%	0.07%
Metorex Ltd	MTX	0.03%	0.05%
PSG Group	PSG	0.03%	0.08%
Resilient Prop Inc Fd	RES	0.03%	0.03%
South African Chrome & Alloys	SCE	0.03%	0.02%
Spur Corp	SUR	0.03%	0.02%
Afrikander Lease.	AFL	0.02%	0.01%
Amalgamated Appliance Holding	AMA	0.02%	0.03%
Astrapak Ltd	APK	0.02%	0.04%
Brandcorp Holdings	BRC	0.02%	0.03%
FrontRange	FRO	0.02%	0.03%
Gold Reef Casino Resorts	GDF	0.02%	0.05%
Hudaco Industries	HDC	0.02%	0.06%
Nu-World Holdings	NWL	0.02%	0.05%
Octodec Investments	OCT	0.02%	0.04%
Peregrine Holdings	PGR	0.02%	0.03%
Premium Properties	PMM	0.02%	0.03%

Sage Group	SGG	0.02%	0.23%
AG Industries	AGI	0.01%	0.04%
Cadiz Holdings	CDZ	0.01%	0.03%
Comair	COM	0.01%	0.06%
Capitec Bank Hldgs Ltd	CPI	0.01%	0.04%
Distribution and Warehousing Network	DAW	0.01%	0.04%
Grintek	GNK	0.01%	0.06%
Primedia Limited	PMA	0.01%	0.06%
Spearhead Property Holdings	SPE	0.01%	0.00%
Barplats Investments.	BPL	0.00%	0.01%
Combined Motor Hldgs Ltd	CMH	0.00%	0.06%
Idion Technology Holdings	IDI	0.00%	0.01%

		2004	
NAME	Alpha	% Within ALSI	*% Within RAFI*
Anglo American	AGL	11.11%	8.88%
BHP Billiton	BIL	9.12%	6.33%
Compagnie Financiere Richemont AG	RCH	5.47%	2.81%
SABMiller	SAB	5.26%	3.99%
Standard Bank Group	SBK	5.05%	3.05%
Sasol	SOL	4.48%	4.23%
MTN Group	MTN	4.09%	1.17%
Firstrand Limited	FSR	3.18%	2.88%
Old Mutual	OML	3.14%	4.14%
Remgro	REM	2.59%	1.95%
Absa Group	ASA	2.10%	2.11%
Sanlam	SLM	2.03%	2.96%
Gold Fields	GFI	1.93%	1.42%
Liberty International	LBT	1.91%	1.95%
Impala Platinum Hlds	IMP	1.75%	1.66%
Anglogold Ashanti	ANG	1.54%	2.34%
Telkom	TKG	1.52%	1.72%
Bidvest Group	BVT	1.43%	1.48%
Barloworld	BAW	1.33%	1.18%
Naspers	NPN	1.32%	0.44%
Imperial Holdings	IPL	1.24%	1.21%
RMB Holdings	RMH	1.10%	0.88%
Sappi	SAP	1.09%	1.67%
Anglo American Platinum Corp.	AMS	1.00%	3.59%
Edgars Consolidated Stores	ECO	0.94%	0.39%
Harmony	HAR	0.94%	1.46%
Tiger Brands	TBS	0.92%	0.89%
Nedcor	NED	0.87%	2.41%
Ispat Iscor	IIS	0.83%	1.35%
Steinhoff International Holdings	SHF	0.80%	0.54%
Investec PLC	INP	0.76%	2.59%
JD Group	JDG	0.66%	0.41%
Venfin	VNF	0.64%	0.43%
Woolworths Holdings	WHL	0.60%	0.42%
Nampak	NPK	0.55%	0.81%
Foschini	FOS	0.54%	0.27%
Liberty Group	LGL	0.52%	1.36%
African Bank Invest	ABL	0.50%	0.30%
Massmart Holdings	MSM	0.50%	0.52%
Network Healthcare Holdings	NTC	0.48%	0.33%
Truworths International	TRU	0.47%	0.20%
Investec Ltd	INL	0.45%	0.79%
AVI	AVI	0.44%	0.28%
Reunert	RLO	0.41%	0.30%
Shoprite	SHP	0.40%	0.69%
Aspen Pharmacare Holdings	APN	0.39%	0.12%
Metropolitan Holdings	MET	0.39%	0.63%
Sun International Ltd	SUI	0.37%	0.26%

Pretoria Portland Cement	PPC	0.34%	0.09%
Pick N Pay Stores	PIK	0.32%	0.72%
Dimension Data Holdings	DDT	0.31%	0.71%
Super Group	SPG	0.29%	0.25%
Alexander Forbes	AFB	0.28%	0.28%
Growthpoint Prop Ltd	GRT	0.28%	0.67%
Aveng	AEG	0.27%	0.40%
AECI	AFE	0.26%	0.35%
Metoz Holdings	MOZ	0.26%	1.14%
Murray & Roberts	MUR	0.26%	0.41%
Ellerine Holdings	ELH	0.25%	0.19%
African Oxygen	AFX	0.24%	0.40%
African Rainbow Minerals	ARI	0.23%	0.47%
Allan Gray Property Trust	GRY	0.23%	0.30%
Santam	SNT	0.23%	0.45%
Lewis Group	LEW	0.22%	0.14%
The Spar Group	SPP	0.20%	0.40%
New Clicks Holdings	NCL	0.19%	0.24%
Discovery Holdings	DSY	0.17%	0.23%
Tongaat-Hulett Group	TNT	0.16%	0.38%
Illovo Sugar	ILV	0.15%	0.31%
Kumba	KMB	0.15%	0.14%
Mr Price Group	MPC	0.15%	0.14%
Afgri Ltd	AFR	0.14%	0.24%
Allied Technologies	ALT	0.14%	0.22%
Allied Electronics Corp Part Prf	ATNP	0.14%	0.34%
Capital Alliance Holdings	CPT	0.14%	0.27%
Grindrod	GND	0.14%	0.08%
Medi-Clinicrp	MDC	0.14%	0.21%
Sycom Property Fund	SYC	0.14%	0.21%
United Service Technologies	USV	0.13%	0.03%
Western Areas	WAR	0.13%	0.06%
DRD Gold	DRD	0.12%	0.10%
Martprop Property Fund	MTP	0.12%	0.18%
Unitrans	UTR	0.12%	0.24%
Astral Foods Ltd	ARL	0.11%	0.15%
Mvelaphanda Resources Ltd	MVL	0.11%	0.41%
Apexhi Properties -A-	APA	0.10%	0.23%
Apexhi Properties -B-	APB	0.10%	0.24%
Hyprop Investments Ltd	HYP	0.10%	0.20%
Peermont Global	PTG	0.10%	0.12%
African Life Assur	AFI	0.09%	0.17%
Iliad Africa	ILA	0.09%	0.05%
Northam Platinum	NHM	0.09%	0.37%
Pangbourne Prop Ltd	PAP	0.09%	0.16%
Trencor Ltd	TRE	0.09%	0.11%
Caxton & CTP	CAT	0.08%	0.19%
Highveld Steel	HVL	0.08%	0.23%
Primedia Limited N	PMN	0.08%	0.08%
Real Africa Holdings	RAH	0.08%	0.06%
Business Connexion Group	BCX	0.07%	0.22%

Capital Property Fund	CPL	0.07%	0.12%
Datatec	DTC	0.07%	0.75%
Redefine Income Find	RDF	0.07%	0.22%
Trans HEX Group	TSX	0.07%	0.08%
Wilson Bayly Holmes-Ovcon	WBO	0.07%	0.07%
Brait SA	BAT	0.06%	0.07%
Coronation Fund Managers	CML	0.06%	0.06%
Gold Reef Casino Resorts	GDF	0.06%	0.06%
Group Five/South Africa	GRF	0.06%	0.13%
Metboard Properties	MPL	0.06%	0.01%
Mustek	MST	0.06%	0.11%
Mvelaphanda Group	MVG	0.06%	0.24%
Omnia Holdings Ltd	OMN	0.06%	0.10%
Tiger Wheels	TIW	0.06%	0.10%
Afrox Healthcare Ltd	AHH	0.05%	0.20%
Delta Electrical Industries	DEL	0.05%	0.12%
Emira Property Fund	EMI	0.05%	0.11%
PSG Group	PSG	0.05%	0.06%
Rainbow Chicken	RBW	0.05%	0.14%
WESCO INVESTMENTS LTD	WES	0.05%	0.16%
Acucap Properties Limited	ACP	0.04%	0.11%
Adcorp Holdings	ADR	0.04%	0.05%
Allied Electronics Corp	ATN	0.04%	0.28%
Bytes Technology Group	BTG	0.04%	0.07%
City Lodge Hotels	CLH	0.04%	0.05%
Ceramic Industries	CRM	0.04%	0.05%
Cashbuild Ltd	CSB	0.04%	0.04%
Distribution and Warehousing Network	DAW	0.04%	0.04%
Glenrand MIB	GMB	0.04%	0.06%
Metair Investments Ord	MTA	0.04%	0.04%
Oceana Group	OCE	0.04%	0.14%
Resilient Prop Inc Fd	RES	0.04%	0.06%
Advtech	ADH	0.03%	0.02%
Amalgamated Appliance Holding	AMA	0.03%	0.04%
Astrapak Ltd	APK	0.03%	0.05%
Argent Industrial	ART	0.03%	0.03%
Brandcorp Holdings	BRC	0.03%	0.03%
FrontRange	FRO	0.03%	0.03%
Hudaco Industries	HDC	0.03%	0.07%
iFour Properties	IFR	0.03%	0.09%
Metorex Ltd	MTX	0.03%	0.05%
Nu-World Holdings	NWL	0.03%	0.05%
Octodec Investments	OCT	0.03%	0.05%
Peregrine Holdings	PGR	0.03%	0.03%
Premium Properties	PMM	0.03%	0.04%
Randgold and Exploration	RNG	0.03%	0.07%
Spur Corp	SUR	0.03%	0.02%
Tourism Investment Corp	TRT	0.03%	0.07%
Afrikander Lease.	AFL	0.02%	0.01%
Capitec Bank Hldgs Ltd	CPI	0.02%	0.04%
Famous Brands	FBR	0.02%	0.02%

Merafe Resources	MRF	0.02%	0.02%
Palabora Mining	PAM	0.02%	0.08%
Sage Group	SGG	0.02%	0.16%
AG Industries	AGI	0.01%	0.04%
Bell Equipment	BEL	0.01%	0.08%
Barplats Investments.	BPL	0.01%	0.01%
Cadiz Holdings	CDZ	0.01%	0.03%
Combined Motor Hldgs Ltd	CMH	0.01%	0.06%
Comair	COM	0.01%	0.05%
Grintek	GNK	0.01%	0.06%
JCI Limited	JCD	0.01%	0.04%
Phumelela Gaming & Leisure	PHM	0.01%	0.02%
Vukile Property Fund	VKE	0.01%	0.06%

		2005	
NAME	Alpha	% Within ALSI	*% Within RAFI*
Anglo American	AGL	12.60%	8.63%
BHP Billiton	BIL	10.04%	7.17%
Sasol	SOL	5.96%	4.48%
Compagnie Financiere Richemont AG	RCH	5.70%	3.12%
SABMiller	SAB	5.21%	4.07%
Standard Bank Group	SBK	4.08%	3.39%
MTN Group	MTN	4.06%	1.30%
Firstrand Limited	FSR	3.16%	3.01%
Old Mutual	OML	2.94%	4.09%
Impala Platinum Hlds	IMP	2.47%	1.61%
Remgro	REM	2.36%	2.04%
Gold Fields	GFI	2.12%	1.33%
Anglogold Ashanti	ANG	1.60%	1.89%
Anglo Platinum	AMS	1.54%	3.22%
Sanlam	SLM	1.50%	2.64%
Telkom	TKG	1.47%	2.03%
Liberty International	LBT	1.40%	1.66%
Naspers	NPN	1.40%	0.57%
Absa Group	ASA	1.33%	2.46%
Harmony	HAR	1.30%	1.14%
Bidvest Group	BVT	1.16%	1.55%
Imperial Holdings	IPL	1.14%	1.33%
RMB Holdings	RMH	1.00%	0.94%
Barloworld	BAW	0.98%	1.20%
Tiger Brands	TBS	0.96%	0.86%
Nedbank Group.	NED	0.88%	2.31%
Venfin	VNF	0.84%	0.31%
Investec PLC	INP	0.82%	2.65%
Steinhoff International Holdings	SHF	0.82%	0.62%
Edgars Consolidated Stores	ECO	0.78%	0.47%
Sappi	SAP	0.69%	1.45%
Mittal Steel South Africa	MLA	0.54%	1.54%
JD Group	JDG	0.53%	0.48%
Network Healthcare Holdings	NTC	0.53%	0.40%
Aspen Pharmacare Holdings	APN	0.51%	0.11%
Woolworths Holdings	WHL	0.50%	0.38%
African Bank Invest	ABL	0.48%	0.34%
Foschini	FOS	0.48%	0.31%
Investec Ltd	INL	0.48%	0.74%
Nampak	NPK	0.44%	0.76%
Truworths International	TRU	0.44%	0.23%
Liberty Group	LGL	0.41%	1.36%
Massmart Holdings	MSM	0.40%	0.58%
Reunert	RLO	0.40%	0.33%
Shoprite	SHP	0.40%	0.70%
Sun International Ltd	SUI	0.38%	0.26%
Ellerine Holdings	ELH	0.31%	0.27%
Growthpoint Prop Ltd	GRT	0.30%	0.63%

Aveng	AEG	0.28%	0.41%
Metropolitan Holdings	MET	0.28%	0.61%
Alexander Forbes	AFB	0.27%	0.29%
Pick N Pay Stores	PIK	0.27%	0.77%
Pretoria Portland Cement	PPC	0.27%	0.10%
Kumba	KMB	0.25%	0.16%
Murray & Roberts	MUR	0.25%	0.37%
AECI	AFE	0.24%	0.34%
Dimension Data Holdings	DDT	0.24%	0.67%
Allan Gray Property Trust	GRY	0.22%	0.32%
The Spar Group	SPP	0.20%	0.33%
AVI	AVI	0.19%	0.26%
Santam	SNT	0.19%	0.49%
Western Areas	WAR	0.18%	0.08%
African Oxygen	AFX	0.17%	0.35%
Grindrod	GND	0.17%	0.18%
Illovo Sugar	ILV	0.17%	0.26%
Super Group	SPG	0.17%	0.26%
Tongaat-Hulett Group	TNT	0.17%	0.36%
Mr Price Group	MPC	0.16%	0.15%
Consol	CSL	0.15%	0.19%
Discovery Holdings	DSY	0.15%	0.26%
African Rainbow Minerals	ARI	0.14%	0.43%
Astral Foods Ltd	ARL	0.13%	0.17%
Allied Electronics Corp Part Prf	ATNP	0.13%	0.35%
Hyprop Investments Ltd	HYP	0.13%	0.23%
New Clicks Holdings	NCL	0.13%	0.24%
Northam Platinum	NHM	0.13%	0.31%
Datatec	DTC	0.12%	0.72%
Medi-Clinicrp	MDC	0.12%	0.17%
Sycom Property Fund	SYC	0.12%	0.20%
Allied Technologies	ALT	0.11%	0.22%
Apexhi Properties -B-	APB	0.11%	0.22%
Caxton & CTP	CAT	0.11%	0.22%
DRD Gold	DRD	0.11%	0.09%
Mvelaphanda Resources Ltd	MVL	0.11%	0.31%
Apexhi Properties -A-	APA	0.10%	0.21%
Highveld Steel	HVL	0.10%	0.41%
Pangbourne Prop Ltd	PAP	0.10%	0.16%
Unitrans	UTR	0.10%	0.25%
Johnnic Communications	JCM	0.09%	0.19%
Lewis Group	LEW	0.09%	0.20%
Makalani Holdings	MKL	0.09%	0.00%
Martprop Property Fund	MTP	0.09%	0.17%
Peermont Global	PTG	0.09%	0.12%
Trencor Ltd	TRE	0.09%	0.11%
Afgri Ltd	AFR	0.08%	0.22%
Brait SA	BAT	0.08%	0.06%
Business Connexion Group	BCX	0.08%	0.13%
Group Five/South Africa	GRF	0.08%	0.14%
Metorex Ltd	MTX	0.08%	0.05%
Primedia Limited N	PMN	0.08%	0.08%

Real Africa Holdings	RAH	0.08%	0.07%
Redefine Income Find	RDF	0.08%	0.25%
Astrapak Ltd	APK	0.07%	0.06%
City Lodge Hotels	CLH	0.07%	0.05%
Iliad Africa	ILA	0.07%	0.06%
PSG Group	PSG	0.07%	0.06%
Wilson Bayly Holmes-Ovcon	WBO	0.07%	0.09%
Coronation Fund Managers	CML	0.06%	0.06%
Capital Property Fund	CPL	0.06%	0.12%
Metboard Properties	MPL	0.06%	0.01%
Resilient Prop Inc Fd	RES	0.06%	0.09%
Sa Retail Properties	SRL	0.06%	0.01%
WESCO INVESTMENTS LTD	WES	0.06%	0.12%
Acucap Properties Limited	ACP	0.05%	0.11%
Emira Property Fund	EMI	0.05%	0.14%
Gold Reef Casino Resorts	GDF	0.05%	0.07%
Kagiso Media Ltd	KGM	0.05%	0.05%
Mvelaphanda Group	MVG	0.05%	0.22%
Adcorp Holdings	ADR	0.04%	0.06%
Allied Electronics Corp	ATN	0.04%	0.28%
Cashbuild Ltd	CSB	0.04%	0.05%
Distribution and Warehousing Network	DAW	0.04%	0.04%
Mustek	MST	0.04%	0.09%
Metair Investments Ord	MTA	0.04%	0.04%
Peregrine Holdings	PGR	0.04%	0.03%
Premium Properties	PMM	0.04%	0.04%
Rainbow Chicken	RBW	0.04%	0.16%
Tiger Wheels	TIW	0.04%	0.10%
Trans HEX Group	TSX	0.04%	0.08%
Vukile Property Fund	VKE	0.04%	0.10%
Advtech	ADH	0.03%	0.02%
Argent Industrial	ART	0.03%	0.03%
Atlas Properties Ltd	ATS	0.03%	0.02%
Brandcorp Holdings	BRC	0.03%	0.03%
Brimstone Investment Corp N	BRN	0.03%	0.02%
Bytes Technology Group	BTG	0.03%	0.08%
Ceramic Industries	CRM	0.03%	0.05%
Delta Electrical Industries	DEL	0.03%	0.12%
FrontRange	FRO	0.03%	0.03%
Freestone Property Holdings	FSP	0.03%	0.00%
Hudaco Industries	HDC	0.03%	0.07%
iFour Properties	IFR	0.03%	0.09%
Invicta Holdings	IVT	0.03%	0.07%
KAP International Ltd	KAP	0.03%	0.07%
Oceana Group	OCE	0.03%	0.13%
Omnia Holdings Ltd	OMN	0.03%	0.11%
Prima Property Trust	PRM	0.03%	0.04%
Spearhead Property Holdings	SPE	0.03%	0.02%
Spur Corp	SUR	0.03%	0.02%
Amalgamated Appliance Holding	AMA	0.02%	0.05%
Barplats Investments.	BPL	0.02%	0.01%

Capitec Bank Hldgs Ltd	CPI	0.02%	0.03%
Famous Brands	FBR	0.02%	0.02%
Merafe Resources	MRF	0.02%	0.05%
Palabora Mining	PAM	0.02%	0.04%
Primedia Limited	PMA	0.02%	0.05%
SCHARRIG MINING LTD	SCN	0.02%	0.02%
Tourism Investment Corp	TRT	0.02%	0.07%
Bell Equipment	BEL	0.01%	0.08%
Cadiz Holdings	CDZ	0.01%	0.03%
Clientele Life Assurance.	CLE	0.01%	0.05%
Combined Motor Hldgs Ltd	CMH	0.01%	0.07%

		2006	
NAME	Alpha	% Within ALSI	*% Within RAFI*
Anglo American	AGL	14.55%	8.60%
BHP Billiton	BIL	8.91%	7.16%
Compagnie Financiere Richemont AG	RCH	6.02%	3.28%
SABMiller	SAB	5.13%	4.24%
Sasol	SOL	4.57%	4.18%
MTN Group	MTN	4.54%	1.58%
Old Mutual	OML	3.71%	4.05%
Standard Bank Group	SBK	3.65%	3.41%
Impala Platinum Hlds	IMP	2.88%	2.97%
Firstrand Limited	FSR	2.68%	3.04%
Remgro	REM	2.27%	1.84%
Anglo Platinum	AMS	2.13%	2.75%
Gold Fields	GFI	1.96%	1.20%
Liberty International	LBT	1.93%	1.89%
Anglogold Ashanti	ANG	1.92%	1.58%
Naspers	NPN	1.49%	0.52%
Bidvest Group	BVT	1.24%	1.65%
Harmony	HAR	1.24%	0.93%
Sanlam	SLM	1.23%	2.42%
Absa Group	ASA	1.19%	2.34%
Telkom	TKG	1.10%	2.10%
Investec PLC	INP	0.96%	2.58%
Imperial Holdings	IPL	0.96%	1.38%
Barloworld	BAW	0.93%	1.17%
Nedbank Group.	NED	0.86%	1.98%
RMB Holdings	RMH	0.86%	0.88%
Tiger Brands	TBS	0.83%	0.83%
Sappi	SAP	0.81%	1.33%
Steinhoff International Holdings	SHF	0.80%	0.63%
Network Healthcare Holdings	NTC	0.69%	0.41%
Edgars Consolidated Stores	ECO	0.64%	0.52%
Mittal Steel South Africa	MLA	0.61%	1.49%
Investec Ltd	INL	0.56%	0.83%
Reunert	RLO	0.45%	0.36%
Woolworths Holdings	WHL	0.45%	0.42%
Truworths International	TRU	0.44%	0.24%
African Bank Invest	ABL	0.41%	0.40%
JD Group	JDG	0.40%	0.50%
Nampak	NPK	0.40%	0.73%
Shoprite	SHP	0.40%	0.71%
Sun International Ltd	SUI	0.40%	0.29%
Foschini	FOS	0.39%	0.33%
Massmart Holdings	MSM	0.39%	0.62%
Murray & Roberts	MUR	0.38%	0.36%
Aveng	AEG	0.37%	0.40%
Aspen Pharmacare Holdings	APN	0.36%	0.11%
Growthpoint Prop Ltd	GRT	0.33%	0.53%
Liberty Group	LGL	0.32%	1.30%

Kumba Iron Ore	KIO	0.30%	0.16%
Dimension Data Holdings	DDT	0.26%	0.44%
Ellerine Holdings	ELH	0.26%	0.25%
Johnnic Communications	JCM	0.25%	0.17%
Metropolitan Holdings	MET	0.25%	0.59%
Northam Platinum	NHM	0.25%	0.28%
African Rainbow Minerals	ARI	0.24%	0.40%
Pretoria Portland Cement	PPC	0.24%	0.10%
AECI	AFE	0.23%	0.33%
Pick N Pay Stores	PIK	0.23%	0.78%
Alexander Forbes	AFB	0.21%	0.21%
The Spar Group	SPP	0.21%	0.33%
AVI	AVI	0.18%	0.24%
Consol	CSL	0.17%	0.18%
Allan Gray Property Trust	GRY	0.17%	0.28%
Mr Price Group	MPC	0.17%	0.14%
Tongaat-Hulett Group	TNT	0.17%	0.35%
Western Areas	WAR	0.16%	0.06%
African Oxygen	AFX	0.15%	0.33%
Datatec	DTC	0.15%	0.67%
Grindrod	GND	0.15%	0.20%
Astral Foods Ltd	ARL	0.14%	0.17%
Allied Electronics Corp Part Prf	ATNP	0.14%	0.34%
Discovery Holdings	DSY	0.14%	0.17%
Medi-Clinicrp	MDC	0.14%	0.17%
Metorex Ltd	MTX	0.14%	0.04%
Mvelaphanda Resources Ltd	MVL	0.14%	0.16%
Santam	SNT	0.14%	0.46%
Group Five/South Africa	GRF	0.13%	0.13%
PSG Group	PSG	0.13%	0.07%
Super Group	SPG	0.13%	0.25%
Apexhi Properties -B-	APB	0.12%	0.20%
Hyprop Investments Ltd	HYP	0.12%	0.19%
JSE	JSE	0.12%	0.03%
Exxaro Resources	EXX	0.11%	0.41%
New Clicks Holdings	NCL	0.11%	0.25%
Redefine Income Find	RDF	0.11%	0.21%
Apexhi Properties -A-	APA	0.10%	0.19%
Illovo Sugar	ILV	0.10%	0.25%
Pangbourne Prop Ltd	PAP	0.10%	0.14%
Trencor Ltd	TRE	0.10%	0.10%
Wilson Bayly Holmes-Ovcon	WBO	0.10%	0.10%
Allied Technologies	ALT	0.09%	0.22%
Caxton & CTP	CAT	0.09%	0.21%
Peermont Global	PTG	0.09%	0.09%
Sycom Property Fund	SYC	0.09%	0.17%
Unitrans	UTR	0.09%	0.25%
Afgri Ltd	AFR	0.08%	0.21%
Brait SA	BAT	0.08%	0.05%
City Lodge Hotels	CLH	0.08%	0.05%
Lewis Group	LEW	0.08%	0.21%
Lonmin PLC	LON	0.08%	0.76%

Omnia Holdings Ltd	OMN	0.08%	0.12%
Primedia Limited N	PMN	0.08%	0.09%
Makalani Holdings	MKL	0.07%	0.13%
SA Corporate Real Estate Fund	SAC	0.07%	0.14%
SCHARRIG MINING LTD	SCN	0.07%	0.02%
Acucap Properties Limited	ACP	0.06%	0.10%
Business Connexion Group	BCX	0.06%	0.13%
DRD Gold	DRD	0.06%	0.08%
Highveld Steel	HVL	0.06%	0.48%
Iliad Africa	ILA	0.06%	0.07%
Peregrine Holdings	PGR	0.06%	0.04%
Resilient Prop Inc Fd	RES	0.06%	0.09%
Astrapak Ltd	APK	0.05%	0.05%
Coronation Fund Managers	CML	0.05%	0.09%
Capital Property Fund	CPL	0.05%	0.09%
Distribution and Warehousing Network	DAW	0.05%	0.04%
Eland Platinum Holdings	ELD	0.05%	0.00%
Emira Property Fund	EMI	0.05%	0.16%
Enaleni Pharmaceuticals	ENL	0.05%	0.04%
Gold Reef Resorts	GDF	0.05%	0.08%
Invicta Holdings	IVT	0.05%	0.07%
Mvelaphanda Group	MVG	0.05%	0.18%
WESCO INVESTMENTS LTD	WES	0.05%	0.09%
Adcorp Holdings	ADR	0.04%	0.06%
Allied Electronics Corp	ATN	0.04%	0.27%
Brimstone Investment Corp N	BRN	0.04%	0.03%
CBS Property Portfolio	CBS	0.04%	0.01%
Cashbuild Ltd	CSB	0.04%	0.05%
Kagiso Media Ltd	KGM	0.04%	0.05%
Madison Property Fund Managers	MDN	0.04%	0.02%
Metair Investments Ord	MTA	0.04%	0.04%
Paramount Property Fund	PRA	0.04%	0.01%
Rainbow Chicken	RBW	0.04%	0.16%
Vukile Property Fund	VKE	0.04%	0.10%
Wesizwe Platinum	WEZ	0.04%	0.00%
Witwatersrand Cons Gold Resources	WGR	0.04%	0.00%
Advtech	ADH	0.03%	0.02%
Argent Industrial	ART	0.03%	0.03%
Bytes Technology Group	BTG	0.03%	0.09%
Cadiz Holdings	CDZ	0.03%	0.03%
Capitec Bank Hldgs Ltd	CPI	0.03%	0.04%
Ceramic Industries	CRM	0.03%	0.05%
Freestone Property Holdings	FSP	0.03%	0.00%
Hudaco Industries	HDC	0.03%	0.07%
iFour Properties	IFR	0.03%	0.08%
Octodec Investments	OCT	0.03%	0.04%
Premium Properties	PMM	0.03%	0.04%
Real Africa Holdings	RAH	0.03%	0.05%
Atlas Properties Ltd	ATS	0.02%	0.01%
Bell Equipment	BEL	0.02%	0.08%

Delta Electrical Industries	DEL	0.02%	0.08%
Famous Brands	FBR	0.02%	0.02%
KAP International Ltd	KAP	0.02%	0.07%
Merafe Resources	MRF	0.02%	0.04%
Oceana Group	OCE	0.02%	0.12%
Palabora Mining	PAM	0.02%	0.07%
Tiger Automotive	TAL	0.02%	0.02%
Tiger Wheels	TIW	0.02%	0.09%

Tourism Investment Corp	TRT	0.02%	0.07%
Trans HEX Group	TSX	0.02%	0.07%
Aflease Gold	AFO	0.01%	0.00%
Amalgamated Appliance Holding	AMA	0.01%	0.05%
Combined Motor Hldgs Ltd	CMH	0.01%	0.08%
Phumelela Gaming & Leisure	PHM	0.01%	0.02%
Primedia Limited	PMA	0.01%	0.05%

9. Appendix B: JSE sector codes

Industry	Supersector	Sector	Subsector
0001 Oil & Gas	0500 Oil & Gas	0530 Oil & Gas Producers	0533 Exploration & Production
			0537 Integrated Oil & Gas
		0570 Oil Equipment & Services	0573 Oil Equipment & Services
			0577 Pipelines
1000 Basic Materials	1300 Chemicals	1350 Chemicals	1353 Commodity Chemicals
			1357 Specialty Chemicals
	1700 Basic Resources	1730 Forestry & Paper	1733 Forestry
			1737 Paper
		1750 Industrial Metals	1753 Aluminium
			1755 Nonferrous Metals
			1757 Steel
		1770 Mining	1771 Coal
			1773 Diamonds & Gemstones
			1775 General Mining
			1777 Gold Mining
			1779 Platinum & Precious Metals
2000 Industrials	2300 Construction & Materials	2350 Construction & Materials	2353 Building Materials & Fixtures
			2357 Heavy Construction
	2700 Industrial Goods & Services	2710 Aerospace & Defence	2713 Aerospace
			2717 Defence
		2720 General Industrials	2723 Containers & Packaging
			2727 Diversified Industrials
		2730 Electronic & Electrical Equipment	2733 Electrical Components & Equipment
			2737 Electronic Equipment
		2750 Industrial Engineering	2753 Commercial Vehicles & Trucks
			2757 Industrial Machinery
		2770 Industrial Transportation	2771 Delivery Services
			2773 Marine Transportation
			2775 Railroads
			2777 Transportation Services
			2779 Trucking
		2790 Support Services	2791 Business Support Services
			2793 Business Training & Employment Agencies
			2795 Financial Administration
			2797 Industrial Suppliers
			2799 Waste & Disposal Services
3000 Consumer Goods	3300 Automobiles & Parts	3350 Automobiles & Parts	3353 Automobiles
			3355 Auto Parts
			3357 Tires
	3500 Food & Beverage	3530 Beverages	3533 Brewers
			3535 Distillers & Vintners
			3537 Soft Drinks
		3570 Food Producers	3573 Farming & Fishing

			3577 Food Products
	3700 Personal & Household Goods	3720 Household Goods	3722 Durable Household Products
			3724 Nondurable Household Products
			3726 Furnishings
			3728 Home Construction
		3740 Leisure Goods	3743 Consumer Electronics
			3745 Recreational Products
			3747 Toys
		3760 Personal Goods	3763 Clothing & Accessories
			3765 Footwear
			3767 Personal Products
		3780 Tobacco	3785 Tobacco
4000 Health Care	4500 Healthcare	4530 Health Care Equipment & Services	4533 Health Care Providers
			4535 Medical Equipment
			4537 Medical Supplies
		4570 Pharmaceuticals & Biotechnology	4573 Biotechnology
			4577 Pharmaceuticals
5000 Consumer Services	5300 Retail	5330 Food & Drug Retailers	5333 Drug Retailers
			5337 Food Retailers & Wholesalers
		5370 General Retailers	5371 Apparel Retailers
			5373 Broadline Retailers
			5375 Home Improvement Retailers
			5377 Specialised Consumer Services
			5379 Specialty Retailers
	5500 Media	5550 Media	5553 Broadcasting & Entertainment
			5555 Media Agencies
			5557 Publishing
	5700 Travel & Leisure	5750 Travel & Leisure	5751 Airlines
			5752 Gambling
			5753 Hotels
			5755 Recreational Services
			5757 Restaurants & Bars
			5759 Travel & Tourism
6000 Telecommunications	6500 Telecommunications	6530 Fixed Line Telecommunications	6535 Fixed Line Telecommunications
		6570 Mobile Telecommunications	6575 Mobile Telecommunications
7000 Utilities	7500 Utilities	7530 Electricity	7535 Electricity
		7570 Gas, Water & Multiutilities	7573 Gas Distribution
			7575 Multiutilities
			7577 Water
8000 Financials	8300 Banks	8350 Banks	8355 Banks
	8500 Insurance	8530 Nonlife Insurance	8532 Full Line Insurance
			8534 Insurance Brokers
			8536 Property & Casualty Insurance
			8538 Reinsurance
		8570 Life Insurance	8575 Life Insurance
	8700 Financial Services	8730 Real Estate	8733 Real Estate Holding & Development
			8737 Real Estate Investment Trusts

		8770 General Financial	8771 Asset Managers
			8773 Consumer Finance
			8775 Specialty Finance
			8777 Investment Services
			8779 Mortgage Finance
		8980 Equity Investment Instruments	8985 Equity Investment Instruments
		8990 Nonequity Investment Instruments	8995 Nonequity Investment Instruments
9000 Technology	9500 Technology	9530 Software & Computer Services	9533 Computer Services
			9535 Internet
			9537 Software
		9570 Technology Hardware & Equipment	9572 Computer Hardware
			9574 Electronic Office Equipment
			9576 Semiconductors
			9578 Telecommunications Equipment

10. Appendix C: Yearly top ten shares in ALSI and RAFI

	1996		1997		1998		1999	
FTSE/JSE All Share Index	ANGLO	8.42%	ANGLO	6.08%	RICHEMONT	7.30%	ANGLO	11.01%
	DEBEERS	7.12%	SAB	5.54%	ANGLO	4.99%	RICHEMONT	7.20%
	RICHEMONT	6.33%	DEBEERS	4.98%	SAB	4.48%	BHPBILL	6.85%
	SAB	5.25%	RICHEMONT	4.88%	FIRSTRAND	4.41%	DEBEERS	4.87%
	SASOL	4.69%	SASOL	4.07%	BHPBILL	4.21%	SAB	4.39%
	MINORCO	3.10%	LIBERTY	2.90%	DEBEERS	3.65%	OLD MUTUAL PLC	3.78%
	LIBERTY	2.73%	NBS BOLAND GROUP LIMITED	2.61%	DIDATA PLC	2.75%	SASOL	2.81%
	GENCOR LIMITED	2.37%	FIRST NATIONAL BANK HOLDINGS LIMITED	2.49%	COMPAREX	2.66%	ANGLOPLAT	2.75%
	REMBRANDT GROUP LIMITED	2.03%	MINORCO	2.46%	MINORCO	2.61%	DIDATA PLC	2.50%
	CGSMITH	2.01%	BHPBILL	2.36%	SASOL	2.27%	STANBANK	2.39%
RAFI Composite Index	ANGLO	8.88%	ANGLO	7.97%	ANGLO	6.44%	OLD MUTUAL PLC	8.31%
	SAB	4.21%	SAB	4.36%	SAB	4.26%	ANGLO	8.24%
	RICHEMONT	3.29%	GENCOR LIMITED	3.72%	SANLAM	4.15%	SANLAM	3.81%
	DEBEERS	3.02%	RICHEMONT	3.49%	RICHEMONT	3.62%	SAB	3.70%
	SASOL	3.00%	DEBEERS	3.27%	DEBEERS	3.29%	RICHEMONT	3.50%
	BARWORLD	2.98%	SASOL	3.03%	STANBANK	3.20%	DEBEERS	3.27%
	GFIELDS	2.90%	ABSA	2.89%	SASOL	3.06%	STANBANK	3.11%
	ABSA	2.78%	LIBERTY	2.81%	ABSA	2.92%	SASOL	2.89%
	LIBERTY	2.51%	GFIELDS	2.61%	BHPBILL	2.90%	ABSA	2.84%
	NEDCOR	2.38%	NEDCOR	2.55%	LIBERTY	2.79%	BHPBILL	2.77%

	2000		2001		2002		2003	
FTSE/JSE All Share Index	ANGLO	14.06%	ANGLO	14.98%	Anglo American	14.85%	Anglo American	14.90%
	RICHEMONT	8.68%	RICHEMONT	8.68%	BHP Billiton	8.90%	BHP Billiton	10.10%
	OLD MUTUAL PLC	5.57%	BHPBILL	7.87%	Richemont AG	6.64%	Richemont AG	5.87%
	BHPBILL	5.51%	OLD MUTUAL PLC	5.05%	Sasol	5.58%	SABMiller	4.85%
	DIDATA PLC	5.12%	SASOL	4.65%	SABMiller	4.86%	Sasol	4.50%
	DEBEERS	5.06%	SAB	4.08%	Gold Fields	4.50%	Standard Bank Group	3.68%
	ANGLOPLAT	4.83%	STANBANK	3.88%	Old Mutual	3.65%	Gold Fields	3.25%
	STANBANK	3.62%	ANGLOPLAT	3.10%	Standard Bank Group	3.19%	Old Mutual	3.02%
	SAB	3.47%	FIRSTRAND	2.89%	Anglogold	2.58%	Impala Platinum Hlds	2.72%
	FIRSTRAND	2.89%	REMGRO	2.75%	Firstrand Limited	2.41%	Firstrand Limited	2.56%
RAFI Composite Index	ANGLO	9.46%	ANGLO	10.65%	Anglo American	9.17%	Anglo American	9.12%
	OLD MUTUAL PLC	5.40%	BHPBILL	5.94%	BHP Billiton	7.29%	BHP Billiton	6.42%
	DEBEERS	3.96%	OLD MUTUAL PLC	5.33%	Old Mutual	4.61%	Old Mutual	4.08%
	RICHEMONT	3.86%	RICHEMONT	3.43%	Richemont AG	4.15%	Sasol	4.08%
	SAB	3.49%	SASOL	3.35%	Sasol	3.60%	Anglo American Platinum Corp.	3.55%
	BHPBILL	3.16%	ANGLOPLAT	3.16%	Anglo American Platinum Corp.	3.50%	SABMiller	3.43%
	STANBANK	3.13%	STANBANK	3.14%	SABMiller	2.91%	Richemont AG	3.05%
	SASOL	3.12%	SAB	3.08%	Standard Bank Group	2.82%	Standard Bank Group	3.03%
	NEDCOR	2.94%	SANLAM	2.80%	Anglogold	2.71%	Firstrand Limited	2.81%
	SANLAM	2.72%	LIB-INT	2.78%	Firstrand Limited	2.57%	Sanlam	2.61%

	2004		2005		2006	
FTSE/JSE Share Index	Anglo American	11.11%	Anglo American	12.60%	Anglo American	14.55%
	BHP Billiton	9.12%	BHP Billiton	10.04%	BHP Billiton	8.91%
	Richemont AG	5.47%	Sasol	5.96%	Richemont AG	6.02%
	SABMiller	5.26%	Compagnie Financiere Richemont AG	5.70%	SABMiller	5.13%
	Standard Bank Group	5.05%	SABMiller	5.21%	Sasol	4.57%
	Sasol	4.48%	Standard Bank Group	4.08%	MTN Group	4.54%
	MTN Group	4.09%	MTN Group	4.06%	Old Mutual	3.71%
	Firstrand Limited	3.18%	Firstrand Limited	3.16%	Standard Bank Group	3.65%
	Old Mutual	3.14%	Old Mutual	2.94%	Impala Platinum Hlds	2.88%
	Remgro	2.59%	Impala Platinum Hlds	2.47%	Firstrand Limited	2.68%
RAFI Composite Index	Anglo American	8.88%	Anglo American	8.63%	Anglo American	8.60%
	BHP Billiton	6.33%	BHP Billiton	7.17%	BHP Billiton	7.16%
	Sasol	4.23%	Sasol	4.48%	SABMiller	4.24%
	Old Mutual	4.14%	Old Mutual	4.09%	Sasol	4.18%
	SABMiller	3.99%	SABMiller	4.07%	Old Mutual	4.05%
	Anglo American Platinum Corp.	3.59%	Standard Bank Group	3.39%	Standard Bank Group	3.41%
	Standard Bank Group	3.05%	Anglo Platinum	3.22%	Richemont AG	3.28%
	Sanlam	2.96%	Richemont AG	3.12%	Firstrand Limited	3.04%
	Firstrand Limited	2.88%	Firstrand Limited	3.01%	Impala Platinum Hlds	2.97%
	Richemont AG	2.81%	Investec PLC	2.65%	Anglo Platinum	2.75%