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# The market impact on shares entering or leaving JSE indices

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## Abstract

This study attempts to measure the effects on the share price of companies entering and exiting four FTSE/JSE indices; the J200, J210, J213 and J260. While results showed only weak statistical significance, systematic patterns were observed during the event window. Share prices of companies entering and exiting value weighted indices responded consistently with the investor awareness hypothesis. Share prices of companies entering and exiting indices weighted by fundamental factors responded consistently with the information hypothesis. The cumulative average abnormal returns (CAARs) were permanent and did not reverse within the first 200 days after the index change for all indices.

Abnormal returns were calculated by using the market model and a one factor CAPM model. The market model was a superior benchmark in this study.

This study found that the CAARs for index changes became positive only after the date of the index change. This implies that either the effect of passive index funds on the JSE is not significant, or that passive funds are allowed to incur tracking errors in order to trade strategically to secure the best price for a reconstituted portfolio. This conclusion is supported by the fact that there was no observable change in the index premium over time.

The findings of this study may indicate market inefficiency, which means that arbitrage opportunities may exist around index changes.

**Keywords:** Index revisions; FTSE/JSE indices; Price effects; Event study

## Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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| Signed: Craig E. Miller | 9 November 2011<br>Date |

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# Dedication

This work is dedicated with love to my wife, Jodi Ann Miller, my son, Ethan Shane Miller, and our baby - expected on 11 December 2011

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# Contents

## List of Tables

## List of Figures

# 1. Introduction to Research Problem

## 1.1 Background

The Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT) and the Modigliani Miller theorem are some of the models that form the core of modern finance theory (Cha & Lee, 2001). All these models are based on the efficient market hypothesis which states that the share price of a company reflects all publicly available information (Harris & Gurel, 1986). This means that the share price of a company is an indication of the company's underlying value and any discrepancy between the share price and the value of the firm will be quickly recognised and corrected by investors (Shleifer, 1986). The demand curve of the share price of any company should therefore be horizontal as the share price is determined by the value of the firm and not by the demand for the share (Scholes, 1972).

The share price of a company may experience short-term fluctuations caused by events that are external to the company and that do not necessarily contain information affecting the company's value (Kaul, Mehrotra, & Morck, 2000). An example of this is the trading of large blocks of shares - whether initiated by the buyer or the seller (Shleifer, 1986). Another example is the inclusion or exclusion of companies into major indices such as the S&P 500 (Petajisto, 2009) or the Russel 2000 (H. L. Chen, 2006). A final example is the reweighting of the companies that make up an index (Sokulsky, Brooks, & Davidson, 2008). The implication of a horizontal demand curve is that these share price

fluctuations should reverse quickly as investors recognise the mismatch between the current share price and the ideal share price and trade accordingly (Petajisto, 2011). However, when a company is added to or deleted from an index, there is evidence that the change in its share price may not be temporary (Liu, 2011). This would imply that the demand curve for shares may not be horizontal after all.

South Africa's stock exchange, the Johannesburg Stock Exchange (JSE), has been operating for 120 years (JSE Limited, 2011f). On 24 June 2002, the JSE entered a partnership with the Financial Times Stock Exhange (FTSE) which became responsible for managing the JSE indices (JSE Limited, 2011a). This led to a complete revision of the existing indices and the establishment of, amongst others, the J203, the J200, the J260, the J210 and the J213.

The J203 comprises the top 99% of eligible listed companies on the FTSE/JSE Africa All Share Index (ALSI) when ranked by full market capitalisation (JSE Limited, 2011e). This equates to about 160 companies. The J200 comprises the top forty companies on the ALSI when ranked by full market capitalisation (JSE Limited, 2011e). The J260 is designed to reflect the top 40 companies on the ALSI ranked by fundamental factors (JSE Limited & FTSE, 2011). Companies are selected for the J260 and their weights in this index are determined by using four factors, namely total cash dividends, free cash flow, total sales and book equity value (FTSE, 2010).

The J210 and the J213 are sector specific indices of the JSE. Prior to March 2011, the J210 (Resources 20 Index) consisted of the top 20 companies which

were constituents of the resources economic group ranked by full market capitalisation. From March 2011, this index became the Resources 10 Index and it now consists of the top 10 companies from this economic group. The J213 (Financial and Industrial 30 Index) consists of the top 30 companies which are constituents of either the financial, basic industrial or general industrial economic groups ranked by full market capitalisation (JSE Limited, 2008).

The JSE listed its first Exchange Traded Fund (ETF), the Satrix 40, in 2000 (JSE Limited, 2011b). The Satrix 40 tracks the top 40 companies on the ALSI measured by market capitalisation. The Satrix 40 did this by tracking the F101 (or ALSI 40) until the establishment of the FTSE/JSE Africa Index Series in 2002. Since then the Satrix 40 has tracked the J200 (JSE Limited, 2011e). The success of the Satrix 40 has led Satrix to create new index tracking funds. In 2011 Satrix offered seven ETFs that were listed on the JSE, namely Satrix 40, Satrix FINI, Satrix INDI, Satrix RESI, Satrix SWIX, Satrix DIVI and Satrix RAFI (Satrix, 2011).

The market for passively managed investments in South Africa is increasing rapidly. The passive investment market includes both ETFs and unit trust funds. In 2010 there were 23 ETFs in South Africa with approximately R30 billion under management (Cameron, 2010). Although this amounts to less than 4% of the total amount of all collective investment schemes in the country, the popularity of ETFs is growing. There is an opinion that there could be up to 50 ETFs listed on the JSE by mid 2011 (Cameron, 2010). The rapid growth in

stock market indices and the passive funds that track them is happening all over the world (Wurgler, 2010).

In addition to the increased popularity for passively managed funds, there is also an increased practice of benchmarking actively managed funds against specific indices (Baker, Bradley, & Wurgler, 2011). This has created an increase in demand to buy shares of companies that belong to certain indices. When a company enters a major international index such as the S&P 500 or the Russel 2000, the increased demand for the company's shares can be large enough to materially change the share price (Green & Jame, 2011; Petajisto, 2009; Wurgler, 2010). The opposite is true for companies that exit major international indices. This effect has been observed in many indices all over the world, therefore it is expected that this effect will also be observable for companies that are added to or deleted from the FTSE/JSE Africa indices, although to date there has been no formal investigation.

## 1.2 Research Problem and Purpose

This study investigates the effect that a company's entry into, or exit from, a major South African index has on that company's share price. Different indices in the FTSE/JSE Africa Index Series were analysed in order to understand how the share price behaviour of companies entering or exiting an index would differ depending on the attributes of the index. Attributes that were considered included the sector that the index represents, whether the index is tracked by index funds (and other investments) to a greater or lesser degree, and whether membership in the index conveys information to the market about the

fundamental value of the firm or not. Additionally, the change in the company's share price on entry into or exit from these indices was examined over time to see if the increasing popularity of index tracking, ETFs and passive investing has had any effect on the magnitude or duration of the price change.

The majority of prior studies have focused on America's S&P 500 (Lynch & Mendenhall, 1997; Petajisto, 2011; Shleifer, 1986; Wurgler, 2010). More recently, indices from other developed markets have been analysed, for example the UK's FTSE 100 (Gregoriou & Nguyen, 2010), Tokyo's Nikkei 500 (Liu, 2000) and Australia's MSCI index (Sokulsky et al., 2008). Only recently have studies on indices in emerging markets been conducted, for example the ISE-100 and the ISE-30 in Istanbul (Bildik & Gülay, 2008) and the KOSPI 200 in Korea (Yun & Kim, 2010).

The MSCI classifies the South African stock exchange as an emerging market (MSCI, 2011). There is therefore an opportunity to deepen the theory of how the share price of companies in emerging markets are affected when these companies are added to or removed from major indices in these markets. This would result in a better understanding of the differences in the behaviour between emerging markets and developed markets.

Previous studies have examined how the share price changes when companies are added to or removed from large, medium or small cap indices (H. L. Chen, 2006). However, there has not been a prior study examining how the share price change differs for indices representing different economic sectors.

While the changes in the share price of companies that are added to or deleted from an index is common for most indices, there is debate around why these effects occur. Therefore, most of the previous work done on the effects of changes in index composition focused on developing and conducting tests that would prove what the fundamental drivers of these share price effects are (Chakrabarti, Huang, Jayaraman, & Lee, 2005; Liu, 2011). Six main hypotheses have been proposed and these hypotheses are supported or rejected by looking at attributes such as the nature of the index, (i.e. whether membership to the index provides information about the quality of the company to the public,) whether the price effects are temporary or permanent, and whether the share price of the added companies behave in the same way as the share price of the deleted companies.

This study will examine four indices of the JSE, namely the J200, the J260, the J210 and the J213. The first index is the FTSE/JSE Africa Top 40 which comprises the top 40 shares of the JSE ranked by market capitalisation. This index is tracked by the Satrix 40 which was the first ETF launched in South Africa. The second index is the FTSE/JSE RAFI 40 which comprises the top 40 shares of the JSE ranked by fundamentals such as total cash dividends, free cash flow, total sales and book equity value. The J210 represents the resources sector and the J213 represents the financial and industrial sectors of the South African economy.

The comparison between the share price effects of companies entering and exiting the J200 (which is made up of companies based solely on their market

capitalisation) and the J260 (which is made up of companies based on fundamental measures) will highlight whether the information that the index contains about the quality of its member companies has an impact on this share price effect. The comparison between the share price effects of the J210 (which comprises the 20 largest companies in the resource sector) and the J213 (which comprises the 30 largest companies in the financial and industrial sector), will highlight whether there is a different share price effect when a company is added to indices representing different economic sectors. South Africa is traditionally a resource driven economy and so the share price effects when a company is included into the J210 is expected to be larger than inclusion into the J213. Finally, the J200 is the oldest and most popular index in South Africa and is a popular benchmark index, so the comparison between this index and the J260, J210 and J213 will highlight whether the popularity of an index has an impact on the share price effect.

Analysing companies that have entered or exited these indices since the beginning of the FTSE/JSE Africa Index Series until the present will develop an understanding of how the increase in the popularity of ETFs and passive investing affects the magnitude of the share price effect. The most dramatic effect is expected for the J200 since the SATRIX 40 was the first ETF in South Africa and is the most well known. However, it is of interest to observe the change in these price effects for the other indices too.

## 1.3 Research Motivation

This study will extend the current academic literature in several ways. Firstly, the study is the first attempt to provide an analysis of the change in the share price of new or relegated companies due to index reconstitution in the JSE. This study therefore also expands the literature of index reconstitution effects in developing markets. This will serve as a valuable comparison to index reconstitution effects in developed markets.

Secondly, this study will examine the impact that different attributes of an index will have on the index reconstitution effect. Specifically, the effect of the sector that the index represents, the information that index membership communicates to the public and the use of the index for passive investing will be examined.

Finally, this study will examine how the index reconstitution effect has changed over time as passive investing, ETFs and index tracking funds have become more popular in South Africa.

From a non-academic perspective, this study may highlight potential investment opportunities. Petajisto (2011) demonstrated how even once the index constitution effect of the S&P 500 was publicised in 2000 the index reconstitution effect remained, thus there are still strategic trading opportunities in acting on upcoming S&P 500 changes. This is countered by Liu (2011), who showed that in the case of the Nikkei 225, there is no long term price effect and thus less arbitrage opportunity. A study of the JSE indices in order to discover possible arbitrage and strategic trading opportunities is therefore important to investors and fund managers who invest in the JSE stock market.

# 2. Literature Review

## 2.1 Introduction

Market indices were first introduced by Charles Dow in 1884 (Wurgler, 2010). Originally, the market index was designed to measure trends in the market. Since then the use of indices has become important to players in the investment industry for a number of reasons.

### 2.1.1 Individual Investors

Individual investors can invest in Exchange Traded Funds (ETFs) or other types of index funds in order to achieve returns equal to the performance of a particular index (Branch & Cai, 2010). Index linked funds and ETFs provide investors with a well-diversified share portfolio at low cost (Bailey, Kumar, & Ng, 2011; Kostovetsky, 2003). This is important since a diversified portfolio reduces the amount of unsystematic risk to which the portfolio is exposed (Higgins, 2009). The vast amount of resources that are invested into index funds enables the purchase of a large portfolio of shares that an individual investor would not necessarily be able to afford (Rompotis, 2009). Because of their lower operating costs, index funds perform better than more than half of the actively managed funds that use these indices as a benchmark (Boldin & Cici, 2010). Objective portfolio selection criteria, limited required portfolio management direction, low trading costs from low portfolio turnover and tax efficiency are also benefits offered by index funds (Gastineau, 2002). All these benefits have contributed to the recent interest in investing in index funds.

### 2.1.2 Fund Managers

Active fund managers often use indices as benchmarks to measure their performance (Roll, 1992). The conventional measure of how closely a fund replicates its benchmark index, i.e. the difference between the composition of the fund versus the composition of the index, is defined as the tracking error (Blume & Edelen, 2004). This measure considers the difference between the shares that comprise the index and those that are selected for the fund as well as timing differences that occur when the fund purchases or sells shares in response to a change in the index (Cremers & Petajisto, 2009). Most fund managers try to maximise the return of their fund while minimising this tracking error (Baker et al., 2011). Active fund managers focus on minimising the tracking error to ensure that the risk of their fund underperforming the benchmark index is minimised. Therefore many managers of actively managed portfolios purchase shares in companies that belong to these benchmarked indices in order to reduce their tracking error and their risk of underperformance (Kappou, Brooks, & Ward, 2010; Wurgler, 2010). This creates a rise in “closet indexers” (Cremers & Petajisto, 2009, p. 3331) where fund managers claim that they are actively investing funds yet their portfolios are not dramatically different from their benchmark indices. There is thus a growing demand from fund managers for shares of companies belonging to indices.

### 2.1.3 Other Users

Apart from fund managers and individual investors seeking a low cost, diversified portfolio, there are a number of other parties that would be interested

in purchasing index-linked funds. These include professional investors who are able to hedge their exposure to index members through index derivatives (Wurgler, 2010). Additionally, ETFs that track indices allow investors to access shares of companies that are not easily accessible, such as shares of foreign companies (Jiang, Guo, & Lan, 2010).

### 2.1.4 Importance of Indices and Index Funds

The growing importance of indices and index funds for each of the uses mentioned above means that the number of indices and index-linked funds is continually increasing. French (2008) reports that the holdings of open-end mutual funds have increased from 4.6% in 1980 to 32.4% in 2007. Trillions of dollars are currently managed worldwide with some connection to an index (Wurgler, 2010). This connection may be in the form of ETFs that are connected to an index, unit trusts that track an index, investment portfolios that are benchmarked against an index or some other connection.

Thus indices have attained an importance that they were not designed for (Gastineau, 2002) and this elevated importance has created unexpected implications on the share prices of their member companies. Since index tracking funds must minimise tracking error, the introduction of a new share into an index or the exclusion of a share from the index, will trigger mechanical purchases or sales of that share regardless of the current price of the share (Petajisto, 2009).

## 2.2 Understanding Indices and Index Funds

### 2.2.1 Market Indices

An index is a portfolio of shares designed to represent the performance of the major capital and industry segments of a chosen market. The index is designed to summarise the performance of the market that it represents into one number (Wurgler, 2010). Originally, market indices "were developed as market benchmarks or performance measurement gauges" (Gastineau, 2002, p. 56). However, with the use of market indices growing due to the introduction of ETFs, mutual funds and other passive investment vehicles, the number of indices is growing yearly (Wurgler, 2010). Additionally, as fund managers create more specialised funds, the use of indices that track the general stock market are no longer adequate (Sensoy, 2009), therefore there is a continual demand for the creation of new indices.

An index can be formulated using many different rule sets, but for the purpose of this study, two types of indices will be examined: the market capitalised index and the fundamental index.

The most common index is the index based on market capitalisation. Examples of this are the J203 and J200 (South Africa) (JSE Limited & FTSE, 2011), the Russell 1000 and Russell 2000 (H. L. Chen, 2006), the FTSE 100 (UK) (Gregoriou & Nguyen, 2010) and the ISE-100 (Turkey) (Bildik & Gülay, 2008).

A market capitalised index, or value weighted index, is made up of companies whose market capitalisation fits into a specified band. In South Africa there are

a number of these indices. The ALSI represents 99% of the full market capitalised value of the main board of the JSE. The Fledgling Index consists of all companies on the main board that are too small to qualify for the ALSI. The ALSI is then split up into the JSE/FTSE Top 40 Index, the Mid Capitalisation Index and the Small Capitalisation index. These indices represent the biggest 40 companies, the next 60 largest companies, and the remaining companies of the ALSI index respectively (JSE Limited & FTSE, 2011). Similarly, the Russel 3000 is split into the Russel 1000, which contains the largest 1000 US companies, and the Russel 2000 which contains the remaining companies of the Russel 3000 index (Biktimirov, Cowan, & Jordan, 2004). Specific indices are also created to represent different economic sectors of the stock market, for example the resources sector is represented by the J210 in South Africa and the financial and industrial sectors are represented by the J213 (JSE Limited, 2008).

Another common index composition is the fundamental index. Here shares are selected based on past performance, liquidity, trading volume, representiveness of the industry etc. Examples of a fundamental index are the J260 (JSE Limited & FTSE, 2011), the S&P 500 (Kappou, Brooks, & Ward, 2008) and the Nikkei 225 (Liu, 2011).

The fundamental index is preferred by some investors since the members of the index are “based on „Main Street’ factors rather than „Wall Street’ factors” (Droms, 2010, p. 70). This means that companies that belong to a fundamental index have earned their place in the index through succeeding in the market,

not just through sheer size. Note that some fundamental indices, such as the S&P 500, advise the public that the selection of a company into the index does not reflect an opinion on the investment merits of the company (Wurgler & Zhuravskaya, 2002). A criticism of market value indices is that funds that track these indices will overweight overvalued companies and underweight undervalued companies (Branch & Cai, 2010). Tracking a fundamental index is seen as an answer to this anomaly.

Indices are generally reconstituted once a quarter, e.g. the S&P 500 (Yun & Kim, 2010) and most FTSE/JSE indices (JSE Limited & FTSE, 2011), or once a year, e.g. Russell 2000 funds (H. L. Chen, 2006). Once the index committee has confirmed the new additions and deletions they issue an announcement stating when the index reconstitution will take place (Petajisto, 2011; Yun & Kim, 2010).

### 2.2.2 Index-Linked Funds

There are two main types of index linked funds. These are mutual index funds and ETFs. While mutual funds have been in existence for over 70 years, index funds were first introduced in 1972 (Agapova, 2011). Mutual funds are a convenient way for investors to invest in the stock market without trading individual shares (Bailey et al., 2011). Investing in mutual funds therefore offers investors the ability to purchase a diverse share portfolio at an affordable price (Kostovetsky, 2003).

An index fund assembles and maintains a portfolio of shares that are designed to replicate the performance of a benchmark index (Branch & Cai, 2010). Index

fund managers achieve this through their effort to minimise tracking error (Rudolf, Wolter, & Zimmermann, 1999). This means that an index fund is able to produce returns that are in line with the performance of the benchmark index less the fund's transaction costs (Svetina, 2010). Since active fund managers cannot persistently outperform their benchmark, the index fund is seen as a low risk investment alternative to active investing (Boldin & Cici, 2010).

ETFs were first introduced in 1993 (Agapova, 2011). Although they represent exposure to the same shares that index funds do, they are structured differently and hence appeal to a different type of investor (Agapova, 2011). ETFs were developed to enable investors to take positions in and out of an entire market (or market segment) with just one order, thereby minimising transaction costs and tax burdens, while still providing the same diversity of risk and flexibility as mutual funds (Rompotis, 2009). ETFs do not usually reinvest dividends collected from the underlying shares and must still charge some management fees, which implies that an ETF with no tracking error will always underperform when compared to its benchmark (Elton, Gruber, Comer, & Li, 2002). Since index tracking mutual funds have more flexibility in trading strategically when changes to an index occur, ETFs generally underperform when compared to these mutual index funds (Gastineau, 2004). Thus investors who prioritise superior returns will prefer mutual funds while investors who require smaller tracking errors will prefer ETFs.

In order to reduce tracking errors, index funds will generally sell shares deleted from the index and purchase those added to the index on the day that the

changes become effective (Green & Jame, 2011). This limits the ability of index tracking mutual funds and ETFs to trade strategically (Blume & Edelen, 2004). The surge in demand for the shares of companies newly included in the index causes the price of these shares to rise, and this means that the index funds are purchasing these shares at a premium (Gastineau, 2002). A similar price effect will happen to shares of companies that are deleted from an index, since all the index linked funds would sell their shares in these companies at the same time. This flooding of the market would discount the price of the shares that they are trying to sell. Returns from index tracking funds will be lower than investors realise since these funds are effectively using a buy high, sell low strategy (H. Chen, Noronha, & Singal, 2006). However, since this is a hidden cost, fund managers are not penalised for this inefficiency and therefore little effort has been invested to resolve this issue (Petajisto, 2011). Solutions to this problem include proposing a better benchmarking measurement than tracking error (Cremers & Petajisto, 2009), allowing index funds greater flexibility to trade strategically (Green & Jame, 2011), not announcing index changes to the market (H. Chen et al., 2006) and following different indices as benchmarks (Gastineau, 2002).

### 2.2.3 Active Investing

Another popular investment option is to invest in actively managed funds. The index-linked funds described above are examples of passively managed funds since the fund is expected to mirror the return and risk of the target index at the lowest possible cost. No stock-picking or timing variation by the fund manager is

expected. Thus measuring tracking error is the simplest way to control the fund managers' ability to introduce risk and variance into their portfolios (H. Chen et al., 2006). The returns from index funds will produce a performance that is close, but not exactly equal to the performance of the index (Kostovetsky, 2003).

On the other hand, active fund managers are expected to select shares for their portfolios using skill, technology and access to data that investors do not have (Gil-Bazo & Ruiz-Verdú, 2008). Investors choose to invest their money in actively managed funds in the hope that the fund managers' ability will cause these funds to produce superior returns. Additionally, marketing through the press and directly from the fund managers and stock exchanges themselves communicates the ease of active investing and the potential gains that can be made through it (French, 2008). However, Gruber (1996) has demonstrated that actively managed funds do not, in general, outperform passive index-linked investments.

Active fund performance is measured against a benchmark, usually a market index, in order to assess whether the fund is providing its investors with superior returns (Sensoy, 2009). The fund manager therefore has an incentive to differentiate the portfolio by taking informed positions when the opportunity is right, but generally they favour purchasing the same shares in the same proportion as the benchmark index (Wurgler, 2010). This strategy means that the fund will produce returns that are close to the returns of the benchmark. In the case of superior performance, the fund manager is recognised for his skill,

but the fund is protected from underperforming the index badly. This trend of closet indexing has become more popular over time (Cremers & Petajisto, 2009). The result of this closet indexing is that there is more price pressure on shares that comprise market indices.

## 2.3 The Index Reconstitution Effect

The increasing popularity of passive investing has had some surprising price effects on the share prices of the constituent companies of major market indices. This is especially true when companies are added to or deleted from the index. Closet indexing by actively managed funds that track their benchmark indices in order to minimise their risk of underperformance make these effects even more acute. Petajisto (2011) shows that the share price of companies that were added to the S&P 500 increased by an average of 8.8% during 1990 to 2005, and the share price of companies that were deleted from the index decreased by 15.1%. Wurgler (2010) shows that this effect has grown over time as the popularity of index-linked investing has grown. Similar studies with similar results have been conducted on the Nikkei 225 (Liu, 2011), the FTSE 100 (Gregoriou & Nguyen, 2010) and others.

A vast number of studies have examined the price effect of index additions and deletions. Petajisto (2011) and other studies show that there is a significant or full price reversal shortly after the index is reconstituted (Biktimirov et al., 2004; Mase, 2007; Shankar & Miller, 2006). Other authors claim that these price effects are permanent (Bhanot & Kadapakkam, 2006; Kaul et al., 2000). The price effect for index additions has been compared to index deletions in order to

see whether these effects are symmetrical or asymmetrical (H. Chen, Noronha, & Singal, 2004; Mase, 2006). Prior work has also examined whether membership to the index could inform investors of the quality of the newly added share (Bhanot & Kadapakkam, 2006; Denis, McConnell, Ovtchinnikov, & Yun, 2003). Additional factors such as liquidity (Amihud & Mendelson, 1986) and volatility implications of belonging to an index (Liu, 2011) have also been considered.

These arguments form the basis of the different hypotheses for the observed price effects during index additions and deletions. These hypotheses are now discussed.

### 2.3.1 Price Pressure Hypothesis

The price pressure hypothesis asserts that the share prices of companies that are added to or deleted from an index temporarily change when the index is reconstituted due to price pressure generated by an increase in demand from index funds (Harris & Gurel, 1986). Price pressure is therefore caused by index-linked and index-tracking funds that purchase shares of newly added companies and sell shares of the deleted companies on the effective day of the index reconstitution (Petajisto, 2009). This is done by all funds on the same day because most index linked funds have an objective to reduce tracking error (Cremers & Petajisto, 2009).

Index funds and other passive tracking funds are measured both on performance and on their tracking error (Blume & Edelen, 2004). In order to reduce tracking error, an index tracker is forced to replicate the index as closely

as possible, therefore the fund must buy shares that are added to the index and sell shares that are deleted from the index on the day that this index recomposition occurs (Gastineau, 2002). This is without consideration of the premium that they are forced to pay for trading on the same day as all the other funds (Petajisto, 2011).

At the end of 2005, just over 10% of the market value of the companies comprising the S&P 500 was directly linked to the index (Petajisto, 2011). This means that when a company is added to the S&P 500, it experiences a demand shock for 10% of its shares as fund managers purchase shares for their portfolios (Petajisto, 2009). This demand shock creates a temporary surge in price and volume for the share, which should reverse fully over time (Biktimirov et al., 2004; Shankar & Miller, 2006).

The demand shock caused by index funds buying newly added shares creates a short term demand curve that is downward sloping due to the large volumes of shares that must be purchased. However, the price pressure hypothesis assumes that the long run demand is still perfectly elastic and therefore prices will ultimately revert to their original, full information levels (Harris & Gurel, 1986).

The cause of this price pressure when firms are added to or deleted from indices is unclear. H. Chen et al. (2006) report that the price increase on the effective day is primarily driven by arbitrageurs. Most stock exchanges announce index revisions a number of days before the change is effective. This provides arbitrageurs with time to buy shares in companies that will be added to

the indices in order to sell them at a profit on the effective day. The additional demand that arbitragers place on these shares between the announcement date and the effective date causes an increase in the share price (Green & Jame, 2011; Okada, Isagawa, & Fujiwara, 2006). Thus, H. Chen et al. (2006) stated that arbitrage practices introduce an additional cost to the index funds. They suggested that index rules should be opaque and revisions should not be announced to the market.

Petajisto (2011) however found that the price pressure is primarily due to the demand shock of the index funds themselves. He states that arbitrage reduces the demand shock that is caused by the index funds on the effective day, since the arbitrageurs are able to purchase the shares in the period between the announcement date and the effective date. They are then able to provide liquidity to the index funds on the effective date, thus reducing the price pressure effect.

### 2.3.2 Imperfect Substitute Hypothesis

Shleifer (1986) stated that according to the efficient market hypothesis, supply issues should not move the share price of a company away from its fundamental value. This is because, assuming the existence of close substitutes, as soon as supply issues affect the share price investors will shift their attention to an alternative share. However, Shleifer went on to show that when shares are added to the S&P 500 index, the share price experiences a permanent increase. He attributed this to a downward sloping demand curve for shares. This finding means that the assumption of a horizontal or near-

horizontal demand curve underlying many building blocks of the efficient market hypothesis is violated.

Shleifer (1986) assumed that additions to the S&P 500 index do not convey any information to the investing community since the selection criteria for the index is based on public information that is not concerned about the future performance of the firm. Cai (2007) disagreed with this finding and stated that inclusion to the S&P 500 does convey information. This means that Shleifer's observed price increase may be a result of the information hypothesis which is discussed later. However, Sokulsky et al. (2008) examined the effect on share prices of the Australian MSCI index when the index's selection methodology changed from being full market capitalisation weighted to being weighted based on the companies' free float. They found permanent and significant price changes for both newly added shares as well as reweighted shares. They stated that, while the price increase for newly added shares may be influenced by investor awareness effects, shares that were already in the index also showed a permanent price increase after their reweighting which confirmed a downward sloping demand curve.

Kaul et al. (2000) undertook a study similar to Sokulsky et al. based on the Toronto Stock Exchange (TSE) 300. Their study also concerned a redefinition of the index although this redefinition did not cause any new companies to be included in the index. Thus Kaul et al. were able to ignore information and investor awareness effects altogether. They found abnormal trading volumes around the date of the revision, as well as a price increase of 2.34% during this

time. While trading volume returned to normal levels after two weeks, the price increase was not reversed in the seven weeks that followed.

H. L. Chen (2006) stated that stocks that are added to major indices have downward sloping demand curves since once they are part of the index, they do not have any perfect substitutes. This means that it is impossible to achieve perfect market neutral long/short trades and thus perfect arbitrage is not possible (Wurgler & Zhuravskaya, 2002). It is arbitrage that keeps the demand curve for share prices horizontal, irrespective of the demand. This hypothesis is known therefore as the imperfect substitute hypothesis.

Lynch and Mendenhall (1997) stated that index fund buying should reduce a large proportion of shares available for non-indexing investors. This should cause the market clearing price to increase and this price increase should be permanent, as the index funds will hold these shares as long as the companies are in the index. However, it is difficult to confirm statistically whether this price increase is permanent since the standard errors increase over longer intervals (Kaul et al., 2000). Therefore it is not easy to prove that the price effects are due to the imperfect substitute hypothesis.

### 2.3.3 Liquidity Hypothesis

Amihud and Mendelson (1986) found that an increase in the liquidity of a company's shares can result in an increase in the share price. Illiquidity can be measured by the difference between the purchase price and the sale price, otherwise known as the bid/ask spread. Investors must either wait to buy or sells shares at a favourable price, or insist on an immediate transaction at the

stated buying and selling rates. Those who cannot wait must therefore buy their shares at a premium (and sell them at a discount). This is defined as the liquidity premium.

The addition of a company into a prominent index implies that analysts, fund managers and investors will have an increased interest in the company's shares (Shleifer, 1986). This may lead to more institutional and private trading, larger and more frequent trading volumes and lower bid-ask spreads. Thus, the share will experience a reduction in the liquidity premium. Hedge and McDermott (2003) show that this reduction in the liquidity premium is due to a reduction in transaction costs, specifically the direct costs of trading. A reduction in transaction costs equates to a reduction in the cost of capital and therefore an increase in the value of the firm and the share price (Amihud & Mendelson, 1986).

Becker-Blease and Paul (2006) suggested that the share price of a company will improve due to an increase in liquidity since a reduction in the cost of capital allows the company to consider new investment opportunities. These growth opportunities increase the value of the firm. Gregoriou and Nguyen (2010) conducted a study on the FTSE 100, where they examined whether the decrease in liquidity caused by the deletion of a firm from an index causes a decrease in investment opportunities and thereby reduces the share price. Surprisingly, Gregoriou and Nguyen did not find a reduction in investment opportunity when a company is deleted from the FTSE 100 index. They

suggested that this may be due to the London Stock Exchange trading environment which has been designed to provide a high level of liquidity.

Hedge and McDermott (2003) found a long term increase in liquidity for shares added to the S&P 500 and in the share price. However, they also found that liquidity effects cannot account for the entire price effect. Erwin and Miller (1998) found that shares experience a permanent liquidity increase accompanied by a permanent increase in the company's share price, but only for shares that were not trading listed options. They showed that while optioned shares experience a permanent increase in share volume, the share price increase is temporary. Companies attract the attention of arbitrage traders when the company is added to an index. Arbitrageurs act to reduce informational disparities in the market, thereby ensuring that the equity prices for a firm represent a more accurate estimate of the company. Optioned stocks are already influenced by arbitrage effects and therefore the price fluctuation when these shares are added to the index is only temporary (Erwin & Miller, 1998).

Finally, while the majority of studies have shown that inclusion in an index increases liquidity, some authors suggest that liquidity may occasionally decrease (Chakrabarti et al., 2005; Wurgler & Zhuravskaya, 2002). This is due to the large number of institutional investors who have a mandate to hold the index, thus preventing a large portion of the shares in issue from being traded. The effect of the liquidity hypothesis is therefore ambiguous.

### 2.3.4 Information Hypothesis

The information hypothesis was first suggested by Jain (1987). He suggested that additions to an index such as the S&P 500 may convey information about the added company such as stability, reduced risk or improved quality of management, although he pointed out that Standard and Poor's Corporation repeatedly states that they do not consider the investment appeal of the shares in their index selection process. Cai (2007) however, notes that the S&P selection process may indeed convey information to the investing community due to two of its selection principles. Firstly, the guiding principle of S&P selection is to include "leading companies in leading US industries" (p. 114). Secondly, in order to reduce transaction costs and tracking error, the S&P seeks to reduce turnover in its indices. Therefore it selects companies that it believes will meet the index criteria for a long period of time. This includes selecting companies that have low risk of bankruptcy and possibly selecting companies from industries that it believes will have a greater representation in the US market in the future.

Dhillon and Johnson (1991) showed that not only do share prices increase when the share is included in the index, but bond and call prices also increase and put prices decrease. This cannot be due to price pressure, therefore the information hypothesis is supported. Cai (2007) tried to avoid the price pressure hypothesis altogether by examining the share price of firms that have a similar size and come from the same industry as the firms that are added to the S&P 500 index. He suggested that inclusion to the S&P indices conveys positive

information not only about the included firm, but about the entire industry. Cai found that there is a price increase for the entire industry when a firm is included in the S&P index which supports the information hypothesis. He does acknowledge, however, that the information effect will be stronger for the included firm than for its industry peers. Cai (2007) acknowledged that it is doubtful that the entire price effect of the share added to the index is due to the information hypothesis.

Some studies have examined the realised earnings and the earnings quality of companies that have been included in various indices in order to evaluate whether the index selection process can be trusted to choose quality shares. If this is the case, then these indices convey information to the investor community and support the information hypothesis. Denis et al. (2003) found that analysts revise their earnings' expectations of firms that have been added to an S&P index. Additionally, they found that these firms demonstrate better earnings per share than their peers. This effect is also shown with the Korean index, the KOSP 200 (Yun & Kim, 2010). Denis et al. (2003) did not, however, investigate whether this improvement in performance is due to superior selection ability by S&P or whether inclusion in the index leads to increased managerial focus, which in turn leads to better performance. Platikanova (2008) showed that earnings quality improves on inclusion to the S&P index. This is due to a decrease in discretionary accruals, which leads to less information risk and in turn to a higher share price. These studies therefore support the information hypothesis.

The information hypothesis should result in a permanent price increase for companies that are added to indices (Yun & Kim, 2010). The opposite should be true for index deletions. However, the index must be evaluated to see whether it in fact does convey information to the market. Selection criteria for indices like the FTSE/JSE J200, J210 and J213 are based solely on market capitalisation, therefore information effects for additions or deletions into these indices are not expected.

### 2.3.5 Investor Awareness Hypothesis

The Investor Awareness Hypothesis asserts that the inclusion of a share into an index increases the public's awareness of the share and this leads to a permanent increase in the share price (H. Chen et al., 2004). Barber and Odean (2008) showed that individual investors are overwhelmed by the thousands of shares that they could potentially buy. Because of the multitude of choice and high search costs, investors will consider buying shares that have already caught their attention.

Merton (1987) showed that investors who hold only those stocks that they are aware of demand a premium for the non-systematic risk that they are exposed to. This risk is as a result of being inadequately diversified and Merton referred to the premium as a "shadow cost" (p. 491). The addition of a company into an index increases the publicity of the firm and hence the demand for its shares. This increases the size of the investor population who owns the share. Thus the shadow cost for this share should reduce which should cause the cost of capital of the firm to fall, leading to a higher share price (H. Chen et al., 2004). Mase

(2006) added that this share will be included into many institutional portfolios that are more diversified and hence require a lower return. This further reduces the cost of capital. Finally, the increased attention of the firm by the investor community serves as an incentive for management to produce better results (Denis et al., 2003).

Increased awareness should therefore lead to a permanent price increase in the share price of companies that have been added to the index. However, firms that are deleted from the index should not experience an immediate permanent price reduction in their share price (H. Chen et al., 2004). This is because once investors are aware of a specific firm, it is not possible to make them unaware by simply removing it from an index (Elliott, Ness, Walker, & Wan, 2006). New investors, however, will not be aware of the firm and therefore as the investing community changes in time the share price may decline. This may take a number of years (Mase, 2006). Therefore asymmetric abnormal returns for additions and deletions to major indices indicate that investor awareness is influencing the share prices of these firms.

Why do some studies find evidence of an asymmetric price response for additions and deletions from major indices like the S&P 500 while others do not? Firstly, most studies ignore deletions since it is difficult to get a clean, yet reasonably sized sample (H. Chen et al., 2004). Secondly, the event window of many studies may be too small. Small windows are often used to reduce the complicating effects of standard error, however they may not capture the complete picture. H. Chen et al. (2004) found that there is a reduction in the

share price of firms deleted from the S&P 500, but the loss is reversed within the following three months. Mase (2006) found that negative returns for firms deleted from the FTSE 100 become significant only after three years. The exclusion of deletions in most studies and the preference for small event windows makes it difficult to differentiate between the investor awareness hypothesis and the imperfect substitute hypothesis.

### 2.3.6 Volatility and Risk Hypotheses

Yun and Kim (2010) suggested that there may be an increase in a share's beta if it is added to an index and a corresponding decrease if it is deleted. This finding was first noted by Vijh (1994), who showed that stock betas in the S&P 500 are overstated due to liquidity effects caused by S&P 500 index trading strategies. Similarly, non-S&P 500 stock betas are understated. Vijh attributed this beta change to a combination of the price pressure hypothesis and co-movement (non-synchronicity) of S&P share prices.

An increase in beta means that the cost of capital for the company should become cheaper, which increases the number of investment opportunities and therefore improves expected future cash flows (Higgins, 2009). Improved future cash flows imply an increase in the value of the firm, thus the share price should increase.

Barberis, Shleifer and Wurgler (2005) examined co-movement of the share prices of S&P 500 companies further. Specifically, they considered whether the increase in the beta of firms added to the index can be a result of a change in the fundamental value of the firm. They concluded that non fundamental effects

cause this change, namely that the S&P 500 is “a preferred habitat for some investors and a natural category for many more” (Barberis et al., 2005, p. 285). This cause is similar to the investor awareness hypothesis discussed earlier. Barberis et al. also suggested that co-movement may be due to “information diffusion” (p. 285), in other words, the information hypothesis.

Liu (2011) suggested that additions to an index may result in a decrease in the volatility of the company’s share price due to the buy and hold strategies of index funds. He demonstrated this for companies added to the Nikkei 225. Volatility has been shown to be inversely proportional to expected returns (Ang, Hodrick, Xing, & Zhang, 2008). Thus lower volatility should imply an increased share price. This is, however, not seen in other indices such as the S&P 500. This may be since the volume increase caused by enhanced shareholder interests may be more than the volume decrease caused by the reduction of free-floating shares as a result of index-linked investments (Liu, 2011).

While these volatility and risk hypotheses may be valid, they are not necessarily mutually exclusive to any of the previously mentioned hypotheses. In fact, reduced volatility, increased beta and co-movement between index constituents can all be explained by the other hypotheses discussed above.

### 2.3.7 Conclusions Regarding Benefits of Index Membership

Since the mid 1980s much has been published investigating the possible reasons for the observed share price behaviour of companies that are added to or deleted from indices. However, this topic is still relevant today, since there is no consensus of what the fundamental drivers of this price effect are. Although

all prior studies present evidence that is consistent with their hypotheses, wide variances in these findings can be attributed to differences in markets, sample periods and event windows (Yun & Kim, 2010). The problem is further complicated due to the availability of small sample sizes and other issues that make it difficult to disentangle the different effects from each other (Biktimirov et al., 2004). Finally, the time period of the study and the focus of additions, deletions or both will have an effect on the findings (H. Chen et al., 2004; Petajisto, 2011).

It therefore seems as though each market needs to be tested in order to understand how specific markets react to index effects. Additionally, these markets should be tested periodically in order to understand how these effects have changed over time. The outcomes of these tests will add to the growing body of knowledge that exists regarding index effects in general.

A summary of the hypotheses can be found in the table on the following page. Only the main arguments are included. Arguments against the hypotheses, causes or observations are not mentioned.

**Table 1: Summary Of Price Effect Hypotheses**

| Hypothesis: | Cause: | Observations: | Supported By: |
|---|---|---|---|
| Price Pressure Hypothesis | Index funds reducing tracking error cause a demand shock for added (deleted) shares. | Temporary price increase (decrease) for index additions (deletions). Price increase and decrease effects are symmetrical. | (Harris & Gurel, 1986) (Shankar & Miller, 2006) |
| Imperfect Substitute Hypothesis | Shares added to indices have no close substitutes. Therefore since demand curves for shares slope down, excess demand causes prices to rise. | Permanent price increase (decrease) for index additions (deletions). Price increase and decrease effects are symmetrical. | (Shleifer, 1986) (Kaul et al., 2000) (Chakrabarti et al., 2005) |
| Liquidity Hypothesis | Additional liquidity due to an increase in trading volume causes a reduction in transaction and search costs. This leads to lower cost of capital and more investment opportunities. | Permanent price increase for index additions. Uncertain if price decrease for deletions is temporary or permanent. Increase in capital expenditure and earnings quality. | (Amihud & Mendelson, 1986) (Hegde & McDermott, 2003) (Becker-Blease & Paul, 2006) |

| | | | |
|---|---|---|---|
| Information Hypothesis | Inclusion of firms in certain indices conveys information about the quality of the firm. | Permanent price increase (decrease) for additions (deletions). Price increase and decrease effects are symmetrical. | (Jain, 1987)<br>(Dhillon & Johnson, 1991)<br>(Cai, 2007) |
| Investor Awareness Hypothesis | Investors are aware of the constituents of major indices and are more likely to invest in these shares. If a company is deleted from the index, investors do not become unaware of the share. | Permanent price increase for index additions. No permanent price effect for deletions. Price increase and decrease effects are thus asymmetrical. | (H. Chen et al., 2004)<br>(Elliott et al., 2006)<br>(Mase, 2006) |
| Volatility and Risk Hypotheses | An increase in beta reduces the cost of capital which means that there are more investment opportunities. This may be due to a number of the hypotheses described above. | Beta increases (decreases) for index additions (deletions). Co-movement exists for constituents of indices. Volatility effects are uncertain. | (Vijh, 1994)<br>(Yun & Kim, 2010)<br>(Liu, 2011) |

## 2.4 Response of Index Funds

There has been a substantial amount of literature detailing the costs that index tracking funds incur due to trading on the day that the index recomposition occurs (Blume & Edelen, 2004; Gastineau, 2002; Green & Jame, 2011). The major economic benefit of investing in an index fund or EFT is the reduced transaction costs due to infrequent trading (Boldin & Cici, 2010). Therefore, it would stand to reason that fund managers would try to minimise their costs during the times that they do trade.

Petajisto (2011) defined “index turnover cost” (p. 281) as the cost that the index fund must incur due to buying shares of companies added to the index at a premium and selling shares of companies deleted from the index at a discount. He notes that this cost is borne by the actual benchmark index and thus will not be visible to most investors, who are concerned mainly with explicit costs and the fund’s performance against the benchmark. Petajisto likened the drag on returns caused by this turnover cost to the drag on returns caused by management fees, although he showed that the turnover cost may in fact be a number of multiples greater than the management fee. This is therefore a cost that investors should care about and that funds should attempt to reduce.

Green and Jame (2011) recommended that in order to reduce this turnover cost, index funds should not trade on the day of the index reconstitution but they should rather trade near to that date. They did, however, admit that the fund managers need to find a balance between superior performance and tracking errors.

Blume and Edelen (2004) investigated tracking errors and performance amongst S&P 500 index tracking funds. They showed that trading early on the day following the index reconstitution, instead of at the close of the day, would have increased S&P 500-linked fund returns by an average of 19.2 basis points a year. The use of intraday trading as a strategy for increased returns was also suggested by Kappou et al. (2010). Blume and Edelen (2004) went on to show that even though some large index funds have low tracking errors, they are able to provide enhanced returns. This would suggest that there is some strategic trading that occurs within these funds, but that it is done in a manner that does not incur tracking error.

Cremers and Petajisto (2009) suggested that tracking error is an inefficient method of measuring active portfolio management. They gave an example where a pure stock picker who is highly diversified across the entire market will have a lower tracking error than a fund that buys shares in entire sectors and industries. This implies that the active stock picker is less active than the fund, which is clearly not the case. Cremers and Petajisto therefore suggested another measure called the “active share” (p. 3330) of the portfolio. This measure can be interpreted as “the fraction of the portfolio that is different from the benchmark index” (Cremers & Petajisto, 2009, p. 3330). Using this active share measurement may provide some latitude to index fund managers to trade more strategically.

Gastineau (2002) acknowledged the phenomenal growth in the index fund industry and the effect that this growth has had on the index turnover cost over

time. He suggested that in order to reduce index turnover costs, indices and index recompositions should not be disclosed to the public. This sentiment was echoed by H. Chen et al. (2006). Petajisto (2011) argued that the public disclosure of impending changes allows investors and arbitragers to purchase shares in anticipation of the reconstitution, thus providing much needed liquidity. Arbitrage therefore allieviates the price pressure problem rather than enhancing it.

In conclusion, it is widely recognised that the popularity of index funds and other index tracking instruments is growing (Wurgler, 2010). According to Standard and Poor's, at the end of 2005 the S&P 500 index accounted for over 10% of the market value of the shares in the index (Petajisto, 2009). This figure was up from 8% in 2000 (Blume & Edelen, 2004) and this trend is expected to continue increasing (Petajisto, 2011). Petajisto (2011) quoted a newspaper article that opines that in the long run it is not unreasonable for index-linked funds to account for 50% of the market.

The rapid growth in index-linked funds has increased the price effects of index reconstitutions (Wurgler, 2010). However, this effect peaked for the S&P 500 in 2000, after which the price effects due to S&P 500 index reconstitutions began to decrease (Petajisto, 2011). This can be attributed to index funds that may have begun to trade more strategically, or to investors and arbitragers who may have realised that there was an investment opportunity that they could take advantage of.

The assumption that price effects always increase as the popularity of index-linked funds grows is therefore not strictly true. Additionally, the nature of the price effects may not be the same in different markets or for different time periods in these markets. There is thus a need to investigate the JSE since no previous study has been conducted for this market.

## 2.5 Index Attributes

This study examined four indices of the JSE, all with different attributes. A brief summary of the key attributes are listed here.

### 2.5.1 ALSI Top 40 – J200

The FTSE/JSE Top 40 was launched in 2002. It consists of the 40 largest companies of the FTSE/JSE All Share Index measured by market capitalisation (FTSE, 2009). In order to limit changes to the index, new constituents will only be added once they reach a ranking of 35 on the market capitalisation ranking. Constituents will only be deleted from the index once they fall to a ranking of 46 or below (JSE Limited & FTSE, 2011). Companies deleted from the FTSE/JSE Top 40 index will normally be included in the FTSE/JSE Mid Cap Index.

The five highest ranking non-constituents of the JSE Top 40 are published in the Quarterly Review document. These companies form a reserve list and will be added to the J200 when companies are deleted from the index (JSE Limited & FTSE, 2011).

The index is promoted as being suitable for the creation of financial products such as index funds and ETFs. Its member shares are free float weighted.

The index is reviewed quarterly in March, June, September and December.

### 2.5.2 RAFI 40 – J260

The FTSE/JSE RAFI 40 was launched in 2007 as the first non market cap weighted FTSE index for the South African market. The RAFI 40 is designed to reflect the performance of the top 40 companies of the FTSE/JSE All Share Index by fundamental values. Companies are selected and weighted according to four fundamental factors, namely dividends, cash flow, sales and book value (FTSE, 2008).

The RAFI 40 is a subset of companies that comprise the RAFI All Share Index. The index is promoted as being suitable for the creation of financial products such as index funds and ETFs.

The index is reviewed once a year in March.

### 2.5.3 Resources 20 – J210

The FTSE/JSE Resources 20 Index was established in 2002. It consisted of the 20 largest companies that are constituents of the resource sector ranked by market capitalisation (JSE Limited, 2008). In March 2011, the Resource 20 Index was changed to the Resource 10 Index and 10 shares were removed from the index. In order to limit changes to the new Resources 10 Index, new constituents will only be added once they reach a ranking of 8 on the market capitalisation ranking. Constituents will only be deleted from the index once they fall to a ranking of 13 or below (JSE Limited & FTSE, 2011). Prior to March

2011, new constituents were added once they reached a ranking of 17 and deleted once they fell to a ranking of 24 or below.

In December 2010, the total market cap of the Resources 20 Index was R1.9 billion, equating to 37.7% of the ALSI Index (JSE Limited, 2010). In December 2002 the total market cap was R661 million or 45.3% of the ALSI (JSE Limited, 2002). Thus it would seem as though the resources sector is becoming less dominant in the South African market. This may be why the index was reduced to only 10 constituents.

The index is reviewed quarterly in March, June, September and December.

### 2.5.4 Financial and Industrial 30 – J213

The FTSE/JSE Financial and Industrial 30 Index was established in 2002. It consists of the 30 largest companies that are constituents of the financial, basic industrial and general industrial economic sector ranked by market capitalisation (JSE Limited, 2008). In order to limit changes to the index, new constituents will only be added once they reach a ranking of 27 on the market capitalisation ranking. Constituents will only be deleted from the index once they fall to a ranking of 34 or below (JSE Limited & FTSE, 2011).

In December 2010, the total market cap of the Financial and Industrial 30 Index was R2.4 billion, equating to 47.3% of the ALSI Index (JSE Limited, 2010). In December 2002 the total market cap was R625 million or 42.9% of the ALSI (JSE Limited, 2002). Thus it would seem as though the financial and industrial sectors are becoming more prominent in the South African market.

The index is reviewed quarterly in March, June, September and December.

## 3. Research Questions

In line with the preceding literature review, this study aims to accept or reject the overall research question: Has there been an index premium attached to JSE/FTSE indices between 2002 and 2011, how does this premium differ between different indices and how has this premium changed over time? This question will be answered by examining the Cumulative Abnormal Average Return (CAAR) of the added/deleted companies. CAAR is defined as:

**CAAR = Cumulative Average Gross Share Return - Cumulative Benchmark Gross Return**

The CAAR will be examined along with attributes of the share price change and attributes of the index itself in order to establish which price effect hypothesis discussed in the previous section is the fundamental cause of this index premium for each index. Additionally, the change in the CAAR over time will be examined in order to see if there has been a change in the index premium.

The following research questions and hypotheses have been proposed:

**Hypothesis 1: Is there a price change between the announcement date and the effective date of the change?**

The null hypothesis states that the share price of a company does not experience a significant CAAR between the time that an index addition is announced to the time that it is effective. For the JSE, this time period is generally seven trading days. The alternative hypothesis states that a company

will experience a significant CAAR when they are added to or deleted from a FTSE/JSE index during this window.

The hypotheses can be stated as follows:

| | **Added to index** | **Deleted From Index** |
|---|---|---|
| $\mathbf{H_0}$ | $CAAR_{added\_8days} = 0$ | $CAAR_{deleted\_8days} = 0$ |
| $\mathbf{H_1}$ | $CAAR_{added\_8days} > 0$ | $CAAR_{added\_8days} < 0$ |

**Hypothesis 2: Is the price change permanent?**

The null hypothesis states that the share price of a company will revert back to its original value within 200 days of the effective date of the change. The alternative hypothesis states that CAAR observed at the effective date will persist for over 200 trading days (approximately ten months), and therefore the price change can be considered permanent.

The hypotheses can be stated as follows:

| | **Added to index** | **Deleted From Index** |
|---|---|---|
| $\mathbf{H_0}$ | $CAAR_{added\_200days} = 0$ | $CAAR_{deleted\_200days} = 0$ |
| $\mathbf{H_2}$ | $CAAR_{added\_200days} > 0$ | $CAAR_{added\_200days} < 0$ |

**Research Question 3: What are the attributes of the share price premium for different indices?**

Additional quantitative and qualitative attributes of the index or of the share price change will be analysed in order to try to determine which hypothesis described in the literature is the fundamental cause of the index premium.

**Research Question 4: Which indices have the largest index premium attached to them?**

The long term price effect of each index will be compared to each other, both in terms of additions to and deletions from the index. This research question will allow an inference to be made regarding which attributes contribute the most to the index premium

**Research Question 5: Has the index premium changed over time?**

The CAAR for each index will be examined from 2002 to 2006 and then from 2007 to 2011 in order to determine if the index premium attached to the different indices has increased or decreased over time.

# 4. Research Methodology and Design

## 4.1 Methodology

This study aimed to examine the effects that additions and deletions of companies from different indices of the JSE have on the share price of these companies. The effects of these changes to the indices were measured in terms of the cumulative average abnormal returns, (CAARs,) which is in line with most of the current literature (Liu, 2011; Petajisto, 2011). A quantitative study was therefore best suited for this type of investigation. A causal study was conducted as the objective of the study was to understand the relationship between the addition or deletion event in the index and the share price effects of the company (Blumberg, Cooper, & Schindler, 2008).

A longitudinal study was used for this study for two reasons. Firstly, longitudinal studies are used in order to track changes over time (Blumberg et al., 2008). One of the objectives of the study is to track the changes of the price effects since the inception of the JSE/FTSE All Africa Series indices. Secondly, longitudinal studies are better suited for causal studies since each event occurs over a period of time (Blumberg et al., 2008).

There was also a cross sectional component to the report. This was in order to study the difference in the price effects of the different indices (Blumberg et al., 2008).

## 4.2 Unit of Analysis

The unit of analysis was the share price of each listed company that was added to or deleted from a FTSE/JSE index between September 2002 and June 2011. Companies that were added to or deleted from these indices due to corporate actions, (for example, listings, de-listings, liquidations, etc.,) were not included.

## 4.3 Population of Relevance

The population for this study consisted of all companies that were added to or deleted from four key indices between September 2002 and June 2011. September 2002 was selected as the start date for this study since the FTSE/JSE All Share Index series was established in June 2002 (JSE Limited, 2011a) and the first quarterly review meeting of the indices took place in September 2002. The FTSE/JSE RAFI 40 was only established in 2007 and therefore data from March 2008 onwards was available for this index. June 2011 was chosen as the end date for this study since the most recent quarterly changes to the indices available for this study took place on 20 June 2011 (FTSE, 2011a). The four indices that were examined were the FTSE /JSE Top 40 Index (J200), the FTSE/JSE RAFI 40 Index (J260), the FTSE/JSE Resources 20 Index (J210) and the FTSE/JSE Financial and Industrial 30 Index (J213).

This study excluded companies that were added to or deleted from the relevant indices due to corporate actions such as listings, de-listings and liquidations. These changes are announced and implemented as they occur (Chakrabarti et al., 2005) and may not contain enough data for thorough analysis (Petajisto,

2011). These exclusions are common to most prior investigations (Liu, 2011). Companies that were added to an index as a result of another company being excluded from the index due to a corporate action, or vice versa, were included in the study.

Reweighting of companies that were already part of the index and the change of the free float of the company were not considered.

Data was required for at least 15 trading days prior to the announcement day and 15 trading days after the effective day in order for the share to be included in the study. This was to ensure that confounding events such as various corporate actions were excluded from the study. This criterion also ensured that firms experiencing sudden financial distress and that were delisted shortly after being excluded from the index, were excluded from the study. This is in line with the methodology of Petajisto (2011).

## 4.4 Sampling Frame

A sampling frame existed for all companies that were added to and deleted from any FTSE/JSE index. All index composition adjustment announcements are published on the FTSE website (FTSE, 2011b) and the JSE website (JSE Limited, 2011c). These announcements contain both the announcement date and the effective date, both of which were needed in order to study the price effects comprehensively (Petajisto, 2011).

In order to exclude all index additions and deletions that arose from corporate events, the FTSE/JSE Africa Index Series - Quarterly Review documents listed

on the FTSE website (FTSE, 2011c) and the JSE website (JSE Limited, 2011d) were used as the primary data source. However, all announcements on the FTSE website (FTSE, 2011b) from 2002 onwards were also reviewed. This was done in order to ensure that companies that were added to an index as a result of another company being excluded from the index due to a corporate action, or vice versa, were included in the study.

## 4.5 Sampling method and size

The companies that comprise the population of relevance were captured using information from the FTSE/JSE Africa Index Series – Quarterly Review documents of the FTSE and JSE websites (FTSE, 2011c; JSE Limited, 2011d) and the Index Changes announcements on the FTSE website (FTSE, 2011b).

Table 2 shows a summary of the total number of suitable additions and deletions in the J200, J210, J213 and J260 indices between September 2002 and June 2011. Note that 2002 and 2011 do not represent full calendar years.

In 2010 the J210 index was changed from the Resource 20 Index to the Resource 10 Index. The 10 companies that were removed due to this index restructure have been included in this study and can be seen in Table 2.

Note that the RAFI 40 Index was launched in October 2007 and the first quarterly review took place in March 2008. Therefore there is no data for this index between 2002 and 2007.

**Table 2: Summary of Additions and Deletions Per Index**

| | Top 40 Index (J200) | | Resource 20 Index (J210) | | Financial and Industrial 30 Index (J213) | | RAFI 40 Index (J260) | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Add** | **Del** | **Add** | **Del** | **Add** | **Del** | **Add** | **Del** |
| **2011** | 1 | 1 | 0 | 10 | 1 | 1 | 5 | 6 |
| **2010** | 4 | 3 | 2 | 2 | 4 | 3 | 5 | 4 |
| **2009** | 3 | 4 | 3 | 2 | 6 | 6 | 9 | 10 |
| **2008** | 4 | 5 | 5 | 5 | 8 | 9 | 5 | 8 |
| **2007** | 4 | 4 | 4 | 2 | 8 | 7 | 0 | 0 |
| **2006** | 4 | 4 | 5 | 6 | 6 | 5 | 0 | 0 |
| **2005** | 0 | 0 | 3 | 2 | 5 | 5 | 0 | 0 |
| **2004** | 3 | 1 | 2 | 1 | 5 | 4 | 0 | 0 |
| **2003** | 4 | 3 | 4 | 3 | 3 | 3 | 0 | 0 |
| **2002** | 1 | 2 | 2 | 2 | 2 | 2 | 0 | 0 |
| **Total** | 28 | 27 | 30 | 35 | 48 | 45 | 24 | 28 |

The number of additions and deletions in a given year were not always equal. This was because companies that were dual listed are considered as a single entity and therefore both the local and the foreign shares were inserted into or deleted from the index. (See the JSE's ICA announcement of 28 September 2007 (JSE Limited, 2011c)). Additionally, while companies that were added to or removed from an index due to a corporate event were not included in this

study, the companies that they replaced in the index, or that replaced them, were included.

## 4.6 Data Collection

Information relating to index revisions from September 2002 to June 2011 was obtained from the JSE website (JSE Limited, 2011d) and the FTSE website (FTSE, 2011b; FTSE, 2011c). These websites provided the names of the affected companies, the announcement date of the planned change and the effective date of the change.

Share price data and beta values for these companies were obtained from databases containing historical stock market records provided by Bloomberg.

## 4.7 Data Analysis

Shleifer (1986) recommended using an event study in order to investigate share inclusions and deletions since the event occurs at a known point in time and therefore the share price movements of the affected shares can be observed around this event. Event study methodologies have been used as the standard methodology for almost all subsequent studies (Bos, 2000; H. L. Chen, 2006). An advantage of using an event study approach is that it permits a smaller sample size and shorter sample period than other methodologies in order to pinpoint the effects of the event (Liu, 2009).

As discussed previously, two events must be included in the event study: the announcement date (the date that the stock exchange announces proposed revisions to the index) and the effective date (the date that the stock exchange

applies these revisions) (Petajisto, 2011). The event of interest is the effective date and therefore this date was denoted as T=0.

The daily closing share prices of companies that were added to or deleted from an index between the years 2002 and 2011 were measured. The daily share price return was measured by:

$$R_{it} = \ln [P_{it} / P_{it-1}] \qquad \text{(Formula 1)}$$

where:

$R_{it}$ = share price return for company i on day t

$P_{it}$ = closing share price for company i on day t

The residual or abnormal return was calculated by subtracting the actual return ($R_{it}$) from the expected return ($K_{it}$) generated by a specific benchmark model as shown in formula 2. $K_{it}$ was calculated using the market model and the CAPM model. These models are discussed in more detail below.

$$AR_{it} = R_{it} - K_{it} \qquad \text{(Formula 2)}$$

where:

$AR_{it}$ = abnormal return/residual for company i on day t

$K_{it}$ = expected return for company i on day t.

Formula 2 shows that $AR_{it}$ is the difference between the return as a result of the event and the return that the company would have produced if the event had not occurred (Kothari & Warner, 2004).

The average abnormal return was calculated by averaging the abnormal returns of all firms being studied in common event time as shown in formula 3:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \qquad \text{(Formula 3)}$$

where:

$AAR_t$ = average abnormal return at time t

N = number of companies

The cumulative average abnormal return (CAAR) is then calculated by adding all the average residuals from the beginning of the event window to the end of the event window (Serra, 2002). CAAR can be represented as follows:

$$CAAR = \sum_{l=1}^{L} AAR_l \qquad \text{(Formula 4)}$$

where:

CAAR = cumulative average abnormal return

L = length of the event window

Before calculating the CAARs, the individual cumulative abnormal return (CAR) of each company was calculated and plotted together with all the other individual CARs on a line graph. Some companies had cumulative abnormal returns that deviated materially from the cluster made up by the other companies. These companies were removed from the sample since the

abnormal returns were most likely influenced by a confounding event that was not part of this study.

### 4.7.1 Benchmarks

Two benchmarks were used in this study in order to calculate the abnormal returns. These benchmarks are discussed briefly here.

#### *4.7.1.1 Standard Market Model*

The simplest analysis involved using standard market returns as the benchmark. Most of the previous studies using the standard market model used a customised portfolio of shares (Kaul et al., 2000) or a simple market index (H. Chen et al., 2004; Shankar & Miller, 2006). For this study a simple market index was used. In order to use an index that behaved in a similar way to the added or deleted companies, share price movements of companies that were added to or deleted from a particular index were benchmarked against the returns of that specific index. The index return is calculated in the same way as a company return, as shown in formula 1.

The standard market model has been criticised since index changes depend on past returns and therefore this “induces a selection bias to the alpha estimates of the market model” (Petajisto, 2011, p. 274). Liu (2011) and Bildik and Gülay (2008) however are happy to use this approach.

#### *4.7.1.2 CAPM Model*

In addition to the standard market model, a more refined methodology was used where the share price movements were compared to market adjusted returns.

The CAPM methodology calculates the expected share price return by adjusting the market index by the company's beta. This methodology has been used by Amihud and Mendelson (1986), Elliot et al. (2006) and Shankar and Miller (2006). Since the standard definition of beta measures the company's total systematic risk, the JSE/FTSE ALSI (J203) was used to calculate the market returns. The market adjusted return was calculated by multiplying the return of the benchmark index by the stock's beta (Bos, 2000). Beta for each company was retrieved from the Bloomberg database at the same time as the share prices. The expected return can be represented as in formula 5.

$$K_{it} = \beta_i R_{mt} \qquad \text{(Formula 5)}$$

where:

$\beta_i$ = beta for company i

$R_{mt}$ = market return on day t

The CAPM model has been criticised by a number of authors for various reasons. Ward and Muller (2010) stated that the CAPM model is a one factor model which ignores other factors that may have a significant bearing on the expected returns. Kappou et al. (2008) showed that CAPM tends to overstate the performance of large firms and understate the performance of small firms. All these authors recommend the use of a multi factor control portfolio model.

However, previous work has been done comparing these methodologies. Shankar and Miller (2006), amongst others, found that although more complex procedures have been developed to measure abnormal returns, none have

improved on the market model. Therefore this study focused on the standard market model. In order to be comprehensive, the one factor CAPM model was also used.

### 4.7.2 Bootstrapping Procedure

Once the CAARs for all the event windows were calculated, statistical tests were conducted in order to measure whether the CAAR was statistically significant. Event studies generally have abnormal return distributions that are right skewed with heavy tails (Serra, 2002). Additionally, the sample sizes for each set of index changes were not large enough to rely on the Central Limits Theorem. Therefore a non parametric bootstrapping procedure was conducted since it does not assume normality (Ward & Muller, 2010).

The bootstrapping procedure calculated the daily abnormal returns of each of the shares in each event sample during a two year estimation period outside of the event window. A bootstrap distribution of 400 samples of these abnormal returns was constructed. The abnormal returns over the event period could then be tested against this distribution to test for significance. Statistical tests were conducted at the 10%, 5% and 1% significance levels.

Following the same methodology, bootstrap distributions were constructed for the CAARs for each measurement period that comprised the full event window. This enabled each measurement period to be tested for significance.

### 4.7.3 Event Windows

The share price movements were analysed in five distinct phases. These are described below.

#### *4.7.3.1 Pre-announcement period*

While the announcement of index changes is meant to be confidential until the announcement day, it is possible, especially with market cap weighted indices, to estimate what the additions and deletions will be. Therefore the CAAR is normalised to 0 at the announcement date but the share price movements are tracked from a period of time prior to this announcement. This ensures that possible pre-announcement drift due to information leakage, arbitrage, or other anticipation of the announcement, can be identified (Petajisto, 2011).

Since the announcement generally occurs on trading day -7 in South Africa, the pre-announcement phase was defined as being from trading day -30 to trading day -7 from the effective date. This is represented as [-30,-7].

#### *4.7.3.2 Post announcement, pre-effective period*

In South Africa, the announcements for index changes are made according to the following schedule (S. Cleary, personal communication, 27 April, 2011):

- Removal or replacement of an index stock due to corporate actions such as mergers, suspensions or unbundlings: two trading days' notification.
- Changes to the number of shares in issue and free float changes: five trading days' notification.

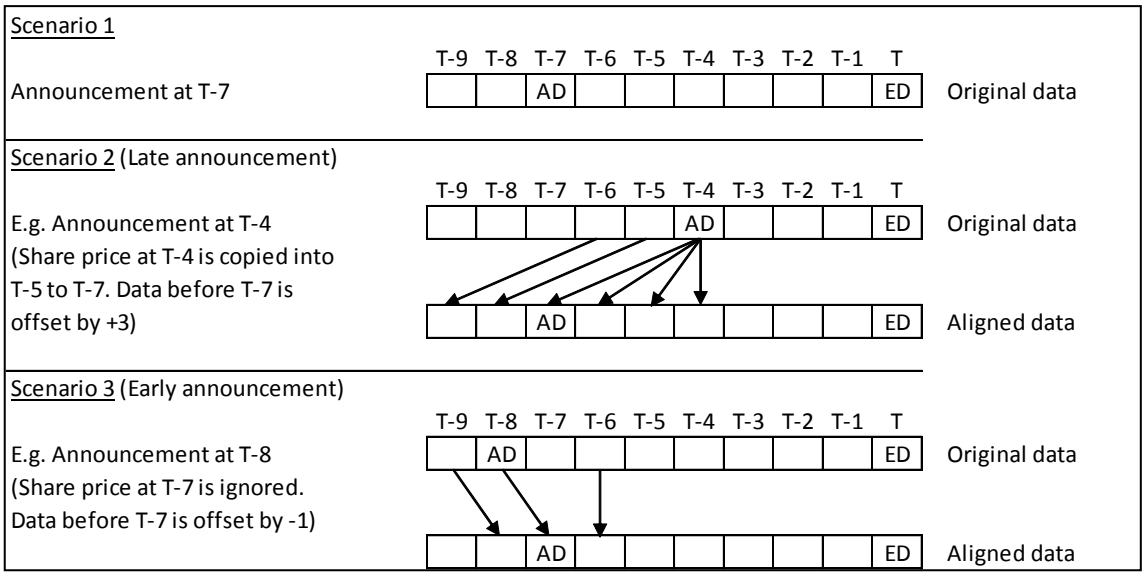
- Quarterly review changes (deletions/additions/shares, free float, sector, factor changes): changes are announced after market close on the first Wednesday after the first Friday of the review month. The changes are made effective after the third Friday of the month. This usually results in seven trading days' notification. Since the announcement is usually made after market close, the announcement date in this study is defined as the day following the announcement. Similarly, the effective date is defined as the Monday after the third Friday of the month.
- When corporate actions are deemed as complex, the JSE publishes a proposed treatment timetable to the market two weeks (10 trading days) before the effective date. However, an actual notification is released prior to the implementation date as specified above.

Individuals and arbitrageurs purchase shares of companies that will be added to the indices during the notification period, with the intention of selling them at a profit to the index-linked funds on the effective day (H. Chen et al., 2006). This results in a price increase for these shares. Thus share returns between the announcement day and the effective day were examined in this study.

For this study, corporate actions and changes in a company's weighting in the index were not in scope. Therefore quarterly review changes made up the bulk of the index changes that were considered. Since the normal time between the announcement and the effective dates for quarterly reviews is seven trading days, the duration for this phase is defined from [-7,0].

This study followed a methodology similar to that of Petajisto (2011) in order to deal with index changes that were not announced exactly seven days prior to the effective day. Petajisto aligned the announcement date and the effective date of all acceptable changes to common event time in order to be able to measure the impact of both the announcement and of the change. Similarly, all events in this study were aligned to a standard [-7,0] timing. If the announcement day was less than seven days prior to the effective date, the time between the announcement and effective date was stretched by adding the required number of additional days at the share price taken at the close of the announcement day. If the announcement date was more than seven days, the returns were shrunk to seven days by deleting the required number of additional days after the announcement date. This manipulation of the data is shown graphically in Figure 1.

**Figure 1: Aligning Announcement Dates and Effective Dates for All Index Changes**




### *4.7.3.3 Change day*

This change was measured as the share price change from the closing price of day before the change to the closing price of the effective day, i.e. [0]. The share price change on this day is strongly influenced by the presence of index funds and index tracking funds. An index that is heavily tracked by passive funds should experience a larger movement on this day, as passive tracking funds should all trade on the effective day in order to minimise their tracking error (Bildik & Gülay, 2008).

### *4.7.3.4 Post effective period*

The majority of studies use a post effective window of 10 trading days after the effective date (Bildik & Gülay, 2008; Chakrabarti et al., 2005; Petajisto, 2011).

This study will, however, use 20 trading days as the short horizon post-effective period. This period is therefore defined from [0,+20].

#### *4.7.3.5 Long horizon post-effective phase*

In order to be able to distinguish between a temporary change and a permanent change in the share price due to a company's inclusion into or exclusion from an index, the share price returns must be examined for a number of months after the effective date. In this study, the share price returns were analysed for 200 trading days after the effective date. Note that this horizon was not available for 2011 events.

Petajisto (2011) was not able to make strong inferences for a long run horizon of two months due to large standard errors. Additionally, the likelihood of confounding events increases as the horizon is lengthened. This is especially true for the JSE/FTSE indices since many companies are added to and deleted from the same index numerous times over a long horizon. A long run horizon of [0,+200] was therefore chosen to allow for comprehensive analysis, but inferences were made for a shorter horizon.

The entire study therefore uses a time frame of [-30,+200] .

### 4.7.4 Other Tests

In order to investigate how price effects have changed over time, the full sample was split into two equal time periods; 2002 to 2006 and 2007 to 2011. This ensured that the change in time could be measured using the largest possible sample. For each period, two equally weighted portfolios were created at

trading day -30. The first portfolio consists of all the companies added to the index during the period. The second portfolio consists of all companies deleted from the index. The cumulative abnormal returns of these portfolios for both the periods were then calculated and compared

Finally, once all the CAARs were calculated for each index, the results for the indices were compared to one another in order to determine the difference in price effects between these four indices.

## 4.8 Research Limitations

A limitation of this research was the small number of events that occurred in the nine years of the study. This same limitation has been stated in studies of the S&P 500 (Biktimirov et al., 2004). Note that the S&P 500 is an index of about 500 companies, while all indices used in this study consisted of 40 companies or less.

Examination of the closing share prices of companies disregards significant changes that may occur during intraday trading (Kappou et al., 2008). This omission limits the potential for strategic trading in order to take full advantage of the price effect phenomenon.

There were some discrepancies between the data available on the JSE website and that on the FTSE website. In general, the information on the JSE website was used since the data looked more complete. However, it is possible that data integrity errors existed on both websites for certain time periods.

This study attempted to examine price effects up to 200 trading days after the effective date. However, standard error limits conclusions about whether the price change is temporary or permanent.

The effect on the share price of delisting a company from an index due to corporate actions such as mergers, acquisitions, unbundlings etc was not examined in this study. This may be a topic for future research.

Reweighting of shares in an index and the change in the free float of a company was not examined in this study. This may be a topic for future research.

Only the market model and the one factor CAPM model were used as benchmarks to estimate the expected returns in this study. However, a large body of literature recommends using a multi-factor control portfolio. This may be a refinement for future research.

# 5. Results

This chapter reviews the results of the data analysis and is made up of three parts.

The first part of this chapter (sections 5.1 to 5.5) looks at the effect on the share prices of companies that were added to or deleted from the four indices mentioned above. The effect is examined according to the event windows defined in section 4.7.3. This section is used to answer hypotheses 1 and 2 and research question 3. For ease of reference the event windows are repeated in Table 3.

**Table 3: Summary of Event Windows**

| Description | Window | Duration |
|---|---|---|
| **Pre-announcement Period** | [-30; -7] | 24 trading days |
| **Announcement Day** | [-7] | 1 trading day |
| **Post-Announcement Period** | [-7; 0] | 8 trading days |
| **Effective Day** | [0] | 1 trading day |
| **Post Change Period** | [0; 20] | 21 trading days |
| **Long-horizon Post Change Period** | [-7; 200] | 209 trading days |

The second part (section 5.6) compares the effects observed in the companies entering into or exiting from each index to the companies entering/exiting the other indices. This will be used to answer research question 4.

Finally, the third part (section 5.7) looks at whether the share price effects have changed over time. This part will be used to answer research question 5.

## 5.1 FTSE/JSE Top 40 Index (J200)

### 5.1.1 Review of the Data

#### *5.1.1.1 Additions*

The initial sample for additions to the J200 index between September 2002 and June 2011 was 28 companies. No outliers were identified and data was available for all the companies. Therefore, all 28 companies were used for both the market model and the CAPM model. One addition took place in 2011 and so the sample reduced to 27 companies by the end of the long horizon window.

A valid beta value was not available for one company (MNP). This was because it was the foreign listing of a local company (MND). Therefore, for the CAPM model, the same beta was used for the two companies.

#### *5.1.1.2 Deletions*

The initial sample for deletions to the J200 index was 27 companies. Of these 27 companies, one company was excluded since no data was available for the correct share code. This was as a result of the company changing its share code and Bloomberg transferring all historic share prices to the new share code. A company may change its share code due to a corporate action such as a merger with another entity, or due to an administrative action such as a simple name change to the company. However, no distinction between these two event types was made in this study, therefore the company was omitted. The company cumulative abnormal returns (CARs) were visually examined in order to identify any outliers and a further two companies were excluded from the

data. Thus the initial sample was reduced to 24 companies for both the market model and the CAPM model. One deletion took place in 2011 and a further two companies did not have data available for the entire event window, although they did have enough data for use in the study. Therefore the sample reduced to 21 companies by the end of the long horizon window.

### 5.1.2 Abnormal Returns - J200 Additions

Figure 2 presents the cumulative average abnormal returns for both the market model and the CAPM model for companies added to the J200 for the entire event window shown in Table 3. Note that the CAARs shown in Figure 2 are normalised at T=-7 days prior to the event, i.e. on the announcement day. Table 4 shows the statistical significance for the CAAR for each event window for the market model and Table 6 shows this information for the CAPM model.

Figure 2 shows that the share prices of companies that are added to the index increase in value in the days preceding the announcement day. This increase is statistically significant for both the market model and the CAPM model at the 1% level. There seems to be an increase in the average abnormal return around T=-7, i.e. around the announcement day. This increase can also be seen in Figure 3 and Figure 4, where an abnormal return of about 0.3% and 0.6% on day T=-7 can be seen for the market model and the CAPM model respectively. This increase is not significant for the market model and only significant at the 10% level for the CAPM model. Figure 2 shows that there is some volatility between the announcement day and the effective day, although on the effective day companies that are added to the J200 experience an

increase of 1.3% in their share price for both the market and CAPM model. This increase is statistically significant at the 1% level for both models.

After the effective day, the share prices of these companies seem to appreciate steadily for the next 20 to 25 trading days, after which they seem to settle when measured against the market model. In total, the share prices of companies added to the J200 index have a cumulative abnormal long term increase of about 3%. This abnormal return appears to be permanent, although this increase is not statistically significant when measured against a 209 day window.

According to the CAPM model, however, abnormal returns do not settle, even after 200 days. This upward drift may indicate a weakness in the CAPM model which is not dealt with in this study. However, the general trend can still be measured and a permanent share price increase is observed.

**Figure 2: Cumulative Average Abnormal Returns for J200 Additions for Event Window [-30; +200]**

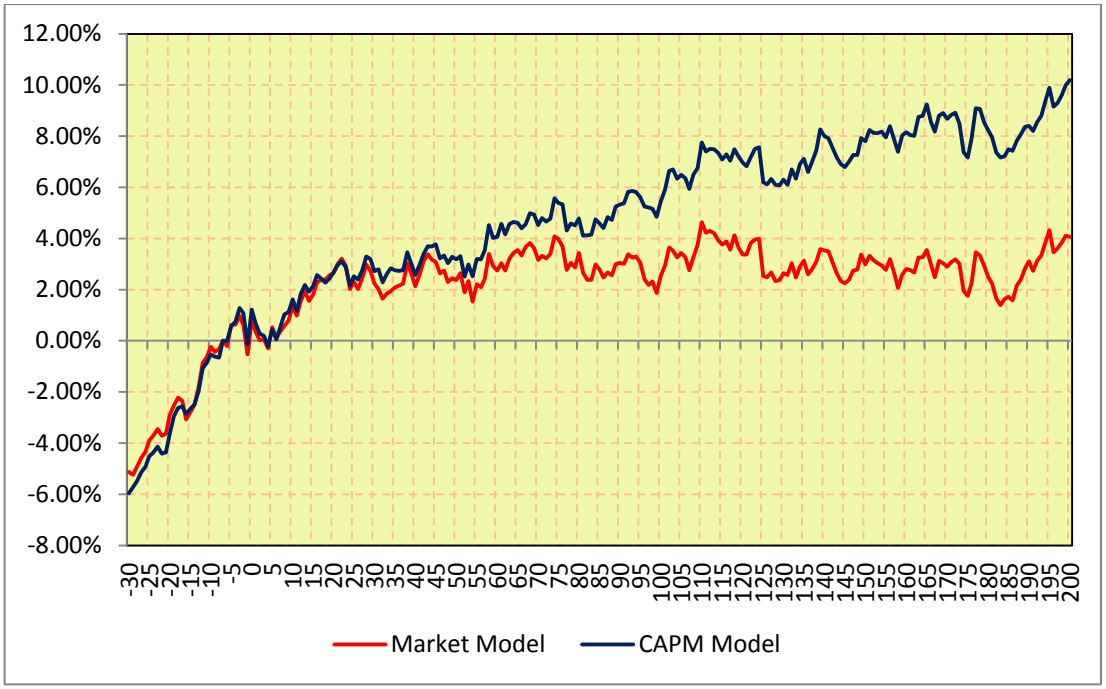
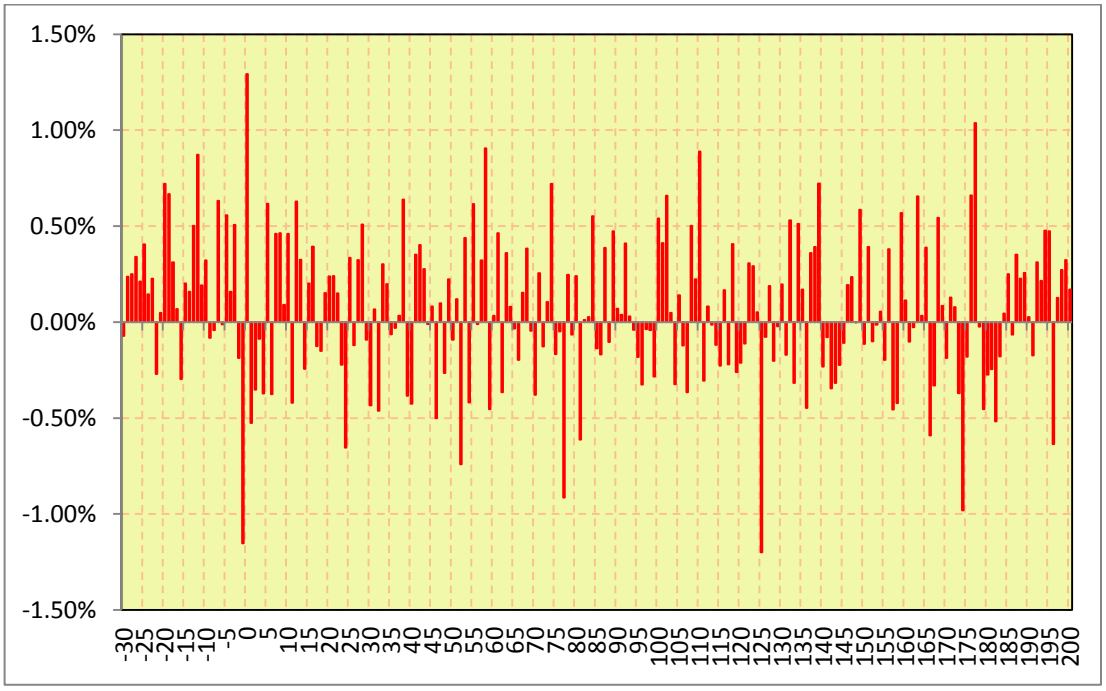



**Figure 3: Average Abnormal Returns for J200 Additions (Market Model)**

**Figure 4: Average Abnormal Returns for J200 Additions (CAPM Model)**




### 5.1.3 Abnormal Returns - J200 Deletions

Figure 5 presents the cumulative average market-adjusted abnormal returns for companies deleted from the J200 for the entire event window shown in Table 3. Once again the CAARs are normalised at the announcement day (T=-7 days prior to the event). Table 5 shows the statistical significance for the CAAR for each event window for the market model and Table 7 shows this information for the CAPM model.

Figure 5 indicates that the share prices of companies that are deleted from the index decrease in value in the days preceding the announcement day. This decrease is statistically significant. A negative average abnormal return is not observed on the announcement day for the market model, although a definite downward trend is observed during the time between the announcement day

and the effective day. Once again, there is some volatility within this event window. Figure 5 shows a positive abnormal increase for the full period directly after the effective date until 200 trading days later. As shown in Table 5 this increase is not statistically significant for the market model. Thus it cannot be shown conclusively that a company that is deleted from the index experiences any positive or negative abnormal returns after the change to the index is announced.

The CAPM model shows that the share price is subject to the same upward drift seen for the index additions. This reiterates the possibility of a weakness in the CAPM model for this study.

**Figure 5: Cumulative Average Abnormal Returns for J200 Deletions for Event Window [-30; +200]**

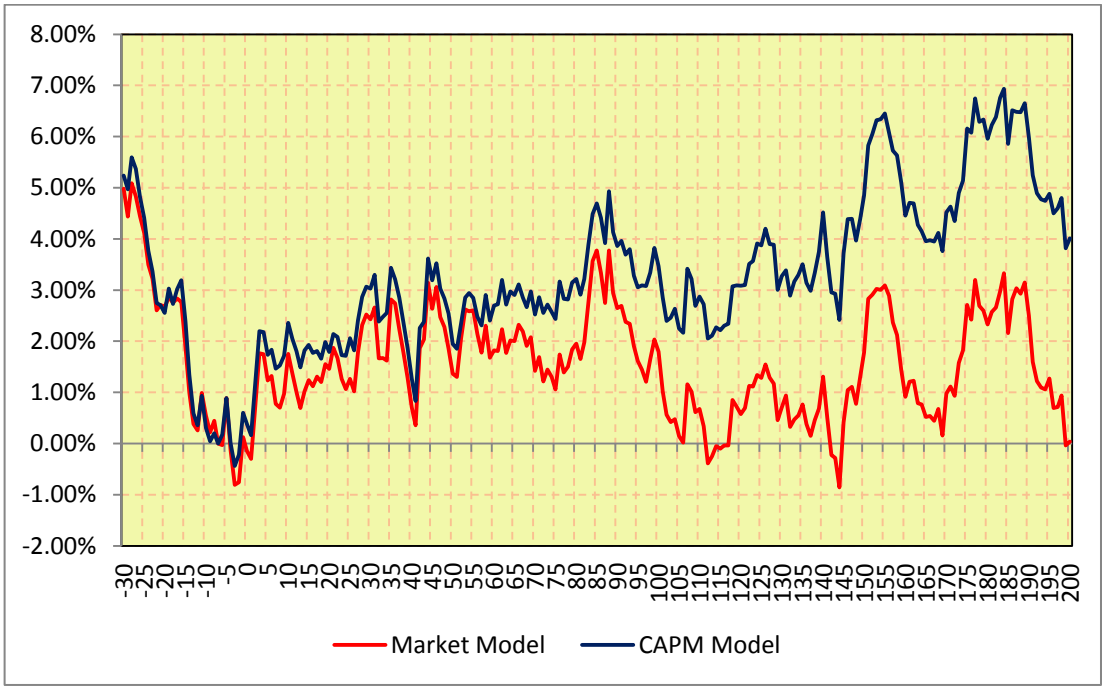


**Figure 6: Average Abnormal Returns for J200 Deletions (Market Model)**

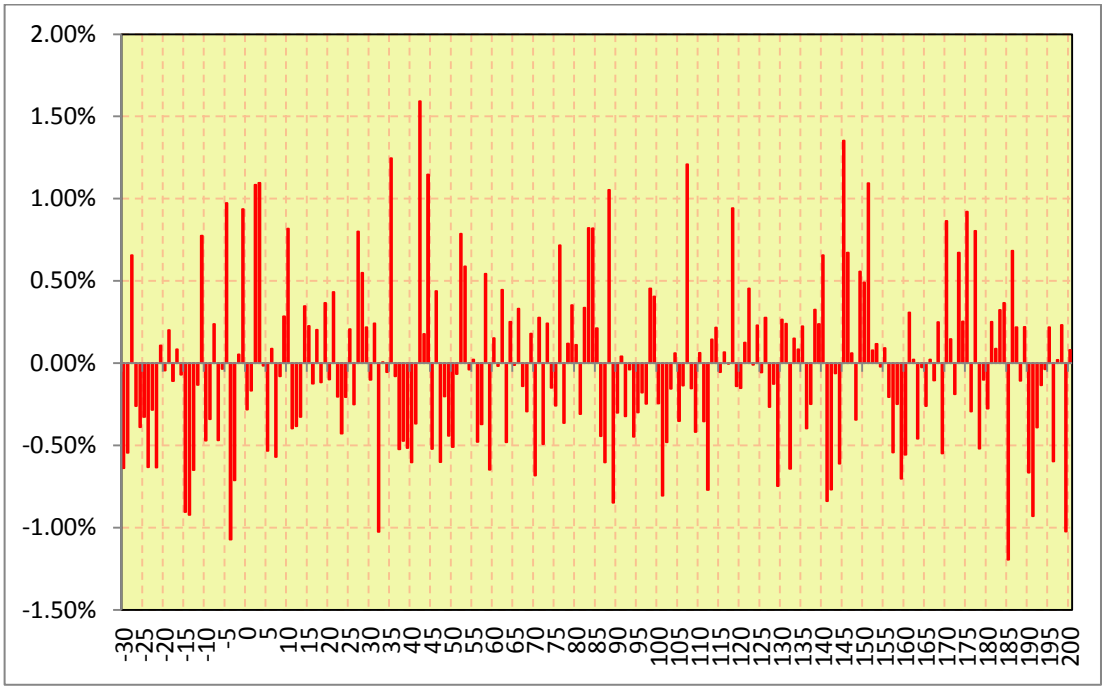
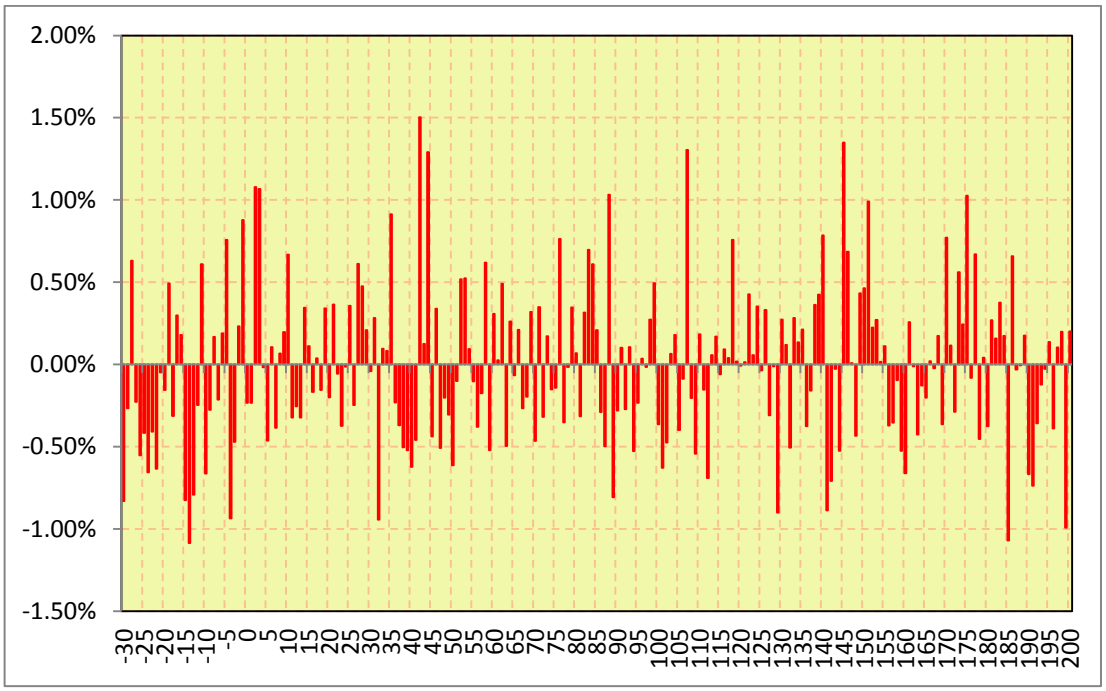



**Figure 7: Average Abnormal Returns for J200 Deletions (CAPM Model)**



## 5.2 FTSE/JSE Resource 20 Index (J210)

### 5.2.1 Review of the Data

#### *5.2.1.1 Additions*

The initial sample for additions to the J210 index between September 2002 and June 2011 was 30 companies. Of these 30 companies, four companies were excluded since no data was available for the correct share code. No outliers were identified therefore data from 26 companies was used for both the market model and the CAPM model. Two companies did not have data available for the entire event window, although they did have enough data for use in the study. Therefore, the sample reduced to 24 companies by the end of the long horizon window.

For the CAPM model, beta values had to be assumed for two companies since the beta values extracted from Bloomberg were not valid. In these cases, a beta value of 1 was used.

#### *5.2.1.2 Deletions*

The initial sample for deletions to the J210 index was 35 companies. Of these 35 companies, three companies were excluded since no data was available for the correct share code. The company cumulative abnormal returns (CARs) were visually examined in order to identify any outliers and two companies were excluded from the market model, while one company was excluded from the CAPM model. Thus the initial sample was reduced to 30 companies for the market model and 31 companies for the CAPM model. 15 additional companies

did not have data available for the entire event window although they did have enough data for use in the study. Therefore the sample was reduced to 15 and 16 companies by the end of the long horizon window for the market model and the CAPM model respectively.

For the CAPM model, beta values were valid for all companies.

### 5.2.2 Abnormal Returns - J210 Additions

Figure 8 presents the cumulative average abnormal returns for both the market model and the CAPM model for companies added to the J210 for the entire event window. CAARs are normalised at the announcement date (T-7). Table 4 shows the CAARs for each event window and their statistical significance for the market model, and this information is shown in Table 6 for the CAPM model.

Figure 8 shows that the share prices of companies that are added to the index increase in value in the days preceding the announcement day. Figure 9 and Figure 10 show negative returns for the announcement day and the effective days for both the market model and the CAPM model. However, Figure 8 shows a steady increase in the CAAR between the announcement day and the effective day. After the effective day, the average share prices of these companies seem to increase until reaching a maximum of about 5.5% between 60 and 100 trading days. After reaching this maximum CAAR, the share price loses some of these gains, dropping to a minimum of approximately 1.5% for the market model and 3% for the CAPM model after 125 trading days. The subsequent increase in share price after 125 trading days can be attributed to one company, ELD, which is considered an outlier for this period.

In summary, the share prices of companies added to the J210 index have a cumulative abnormal interim increase of approximately 5.5% according to the market model, and 6% according to the CAPM model. Conclusions about whether this increase is permanent are not possible due to the influence of outlying companies and the lack of statistical significance.

**Figure 8: Cumulative Average Abnormal Returns for J210 Additions for Event Window [-30; +200]**

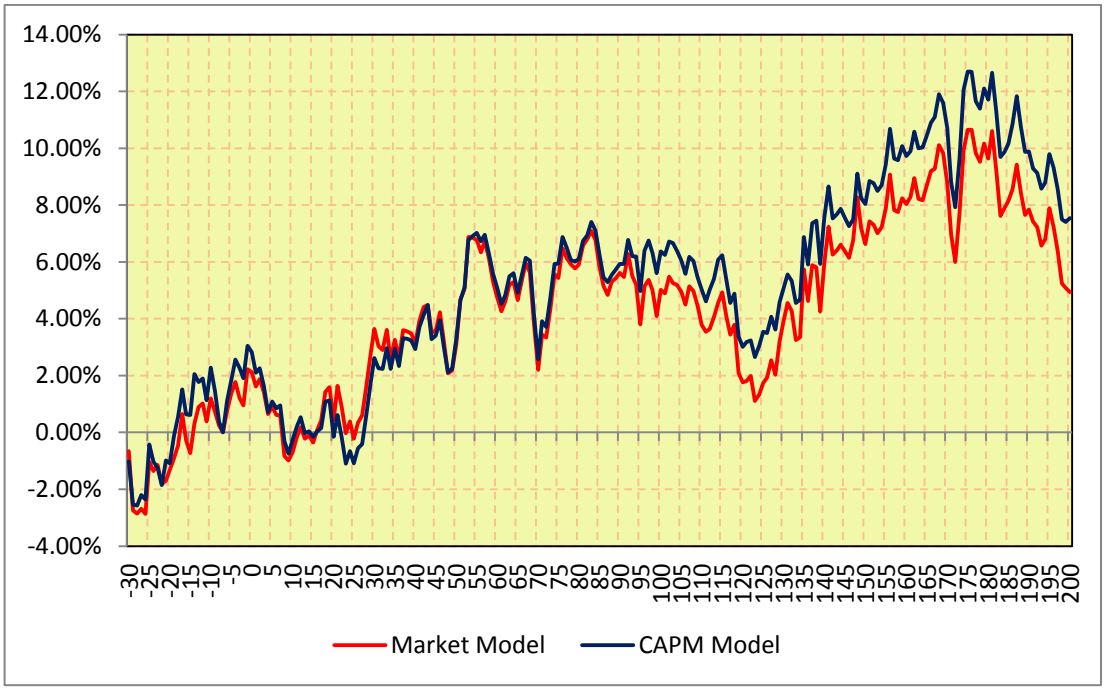


**Figure 9: Average Abnormal Returns for J210 Additions (Market Model)**

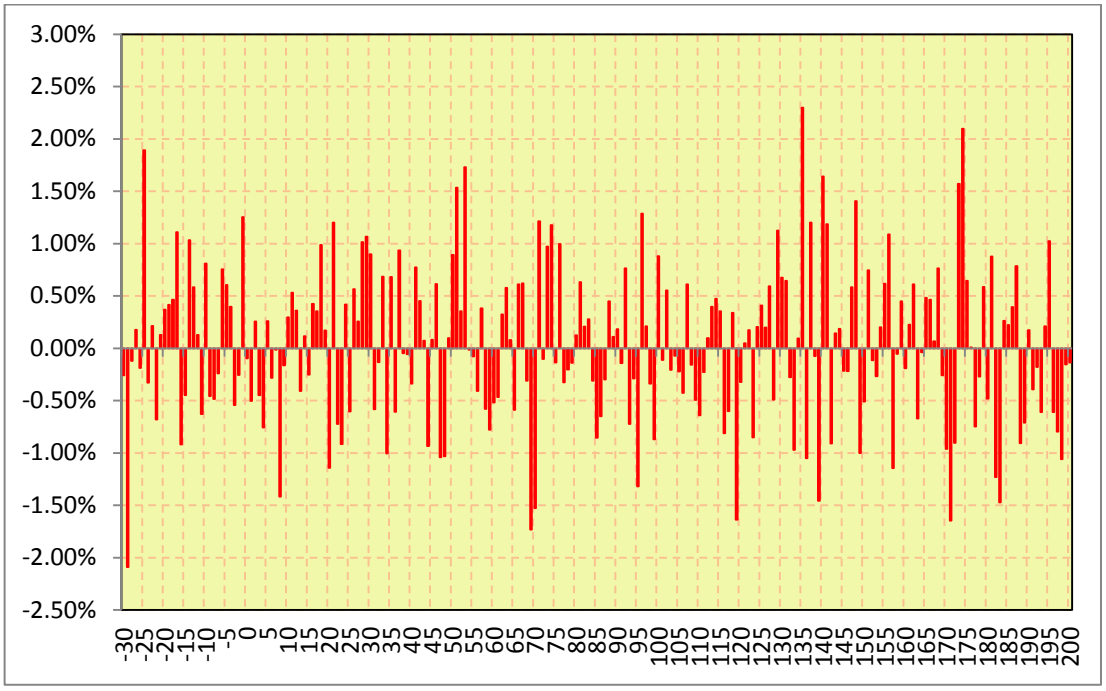
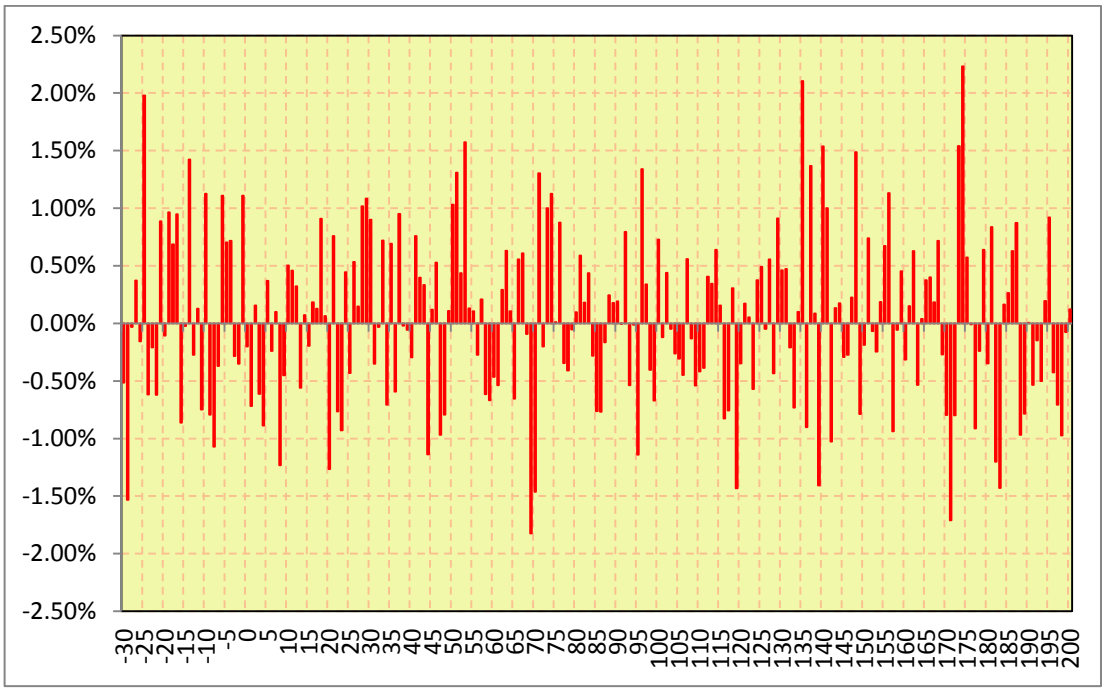



**Figure 10: Average Abnormal Returns for J210 Additions (CAPM Model)**



### 5.2.3 Abnormal Returns - J210 Deletions

Figure 11 presents the cumulative average abnormal returns for companies deleted from the J210 for the market model and the CAPM model around the previously defined event windows. All CAARs are normalised at T=-7 days prior to the event. Table 5 shows the statistical significance for the CAAR for each event window for the market model. Table 7 shows the statistical significance for the CAAR for each event window for the CAPM model.

Figure 11 shows that the share prices of companies that are deleted from the index decrease in value in the days preceding the announcement day. This decrease is statistically significant at the 1% level. Although there is no visible decrease in the average abnormal return around the announcement date, there is a definite downward trend between this day and the effective day. This decrease is significant according to the CAPM model. Companies deleted from the J210 lose approximately 3.2% of their value according to the market model, or 4.1% according to the CAPM model in this window. Figure 11 shows that the abnormal return of these companies oscillates around zero after the effective date. A CAAR of 5.8% is observed 20 trading days after the effective date, but this increase has been attributed to volatility in the data.

The average of the abnormal return for the 200 trading days after the effective date is approximately 0.5% for the market model, but this increase is not statistically significant as shown in Table 5. Thus it cannot be shown conclusively that a company that is deleted from the J210 index experiences

any positive or negative abnormal returns after the change to the index is effective.

**Figure 11 : Cumulative Average Abnormal Returns for J210 Deletions for Event Window [-30; +200]**

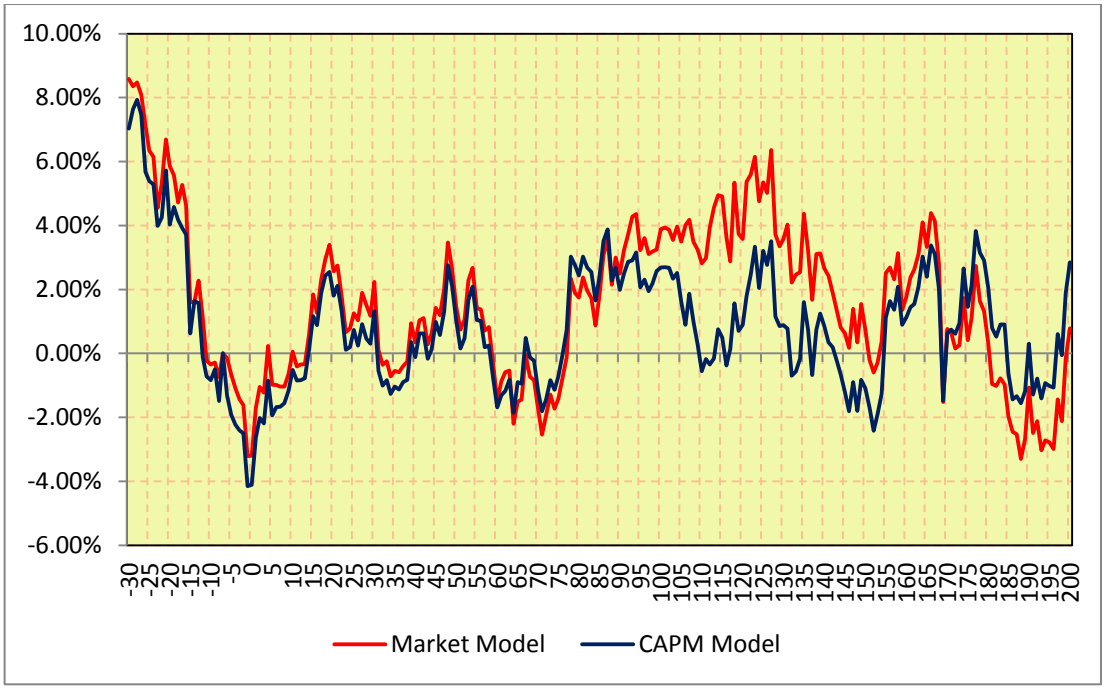


**Figure 12: Average Abnormal Returns for J210 Deletions (Market Model)**

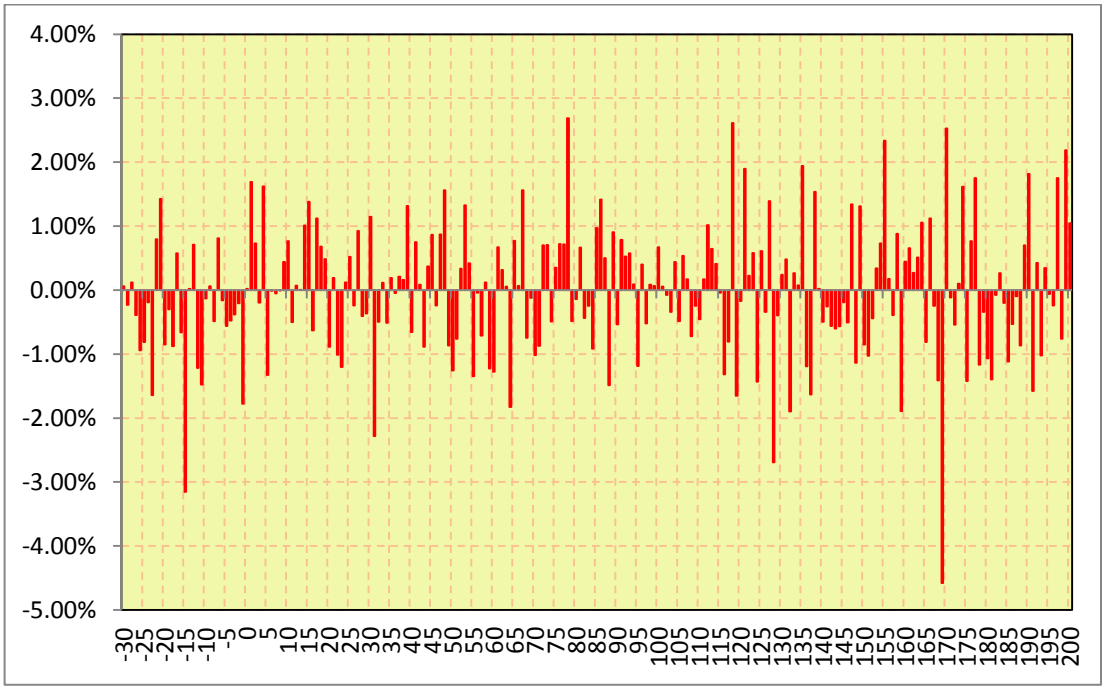
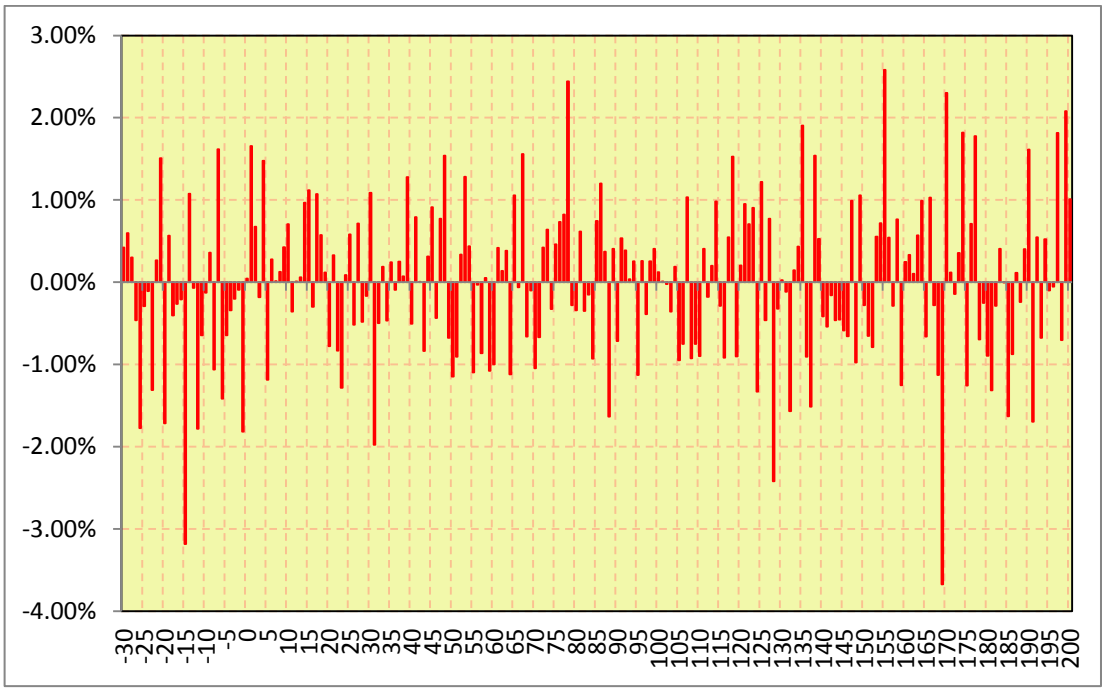



**Figure 13: Average Abnormal Returns for J210 Deletions (CAPM Model)**



## 5.3 FTSE/JSE Financial and Industrial 30 Index (J213)

### 5.3.1 Review of the Data

#### *5.3.1.1 Additions*

The initial sample for additions to the J213 index between September 2002 and June 2011 was 48 companies. Of these 48 companies, two companies were excluded since no data was available for the correct share code. No outliers were identified and so data from 46 companies was used for the market model and for the CAPM model. A further three companies did not have data for the full event window although they did have enough data for use in the study.

For the CAPM model, beta values had to be assumed for one company (MNP) since it was a foreign listing. The beta value of the local listing (MND) was used.

#### *5.3.1.2 Deletions*

The initial sample for deletions to the J213 index was 45 companies. Of these 45 companies, three companies were excluded since no data was available for the correct share code. No outliers were identified. Thus the initial sample was reduced to 42 companies for the market model and the CAPM model. A further two companies did not have data for the full event window although they did have enough data for use in the study.

Beta values for the CAPM model were valid for all companies.

### 5.3.2 Abnormal Returns - J213 Additions

Figure 14 presents the cumulative average market-adjusted abnormal returns for companies added to the J213 for the entire event window. CAARs are normalised at T=-7 days prior to the event. Table 4 shows the CAARs for each event period in the event window and the statistical significance of these CAARs for the market model. Table 6 shows this data for the CAPM model.

Figure 14 shows that the share price of companies added to the J213 index appreciate in the days preceding the announcement by about 3.4% for the market model and 4.2% for the CAPM model. This is statistically significant at the 1% level for both models. There is a small, yet significant, positive abnormal return of 0.7% at day T=-7 for both models and this can be seen in Figure 15 and Figure 16. Additionally, there is a significant increase in the share price on the effective day. However, the CAARs shown in Figure 14 show that there are two disturbances in the data. These disturbances take place between T=-5 and T=15; and between T=45 and T=80. Thus it is not possible to make strong inferences about the behaviour of the share price of companies entering the J213 during these periods.

According to the market model, the long term abnormal return appears to settle at around 2.5% after 120 trading days after the effective day. This CAAR is significant at the 10% level. This increase appears to be stable, and no reversal of these gains can be seen in the event window. The CAPM model differs to the market model for the long horizon window since the CAPM model shows an upward drift in the CAAR. This may be due to a weakness in the CAPM model.

**Figure 14: Cumulative Average Abnormal Returns for J213 Additions for Event Window [-30; +200]**

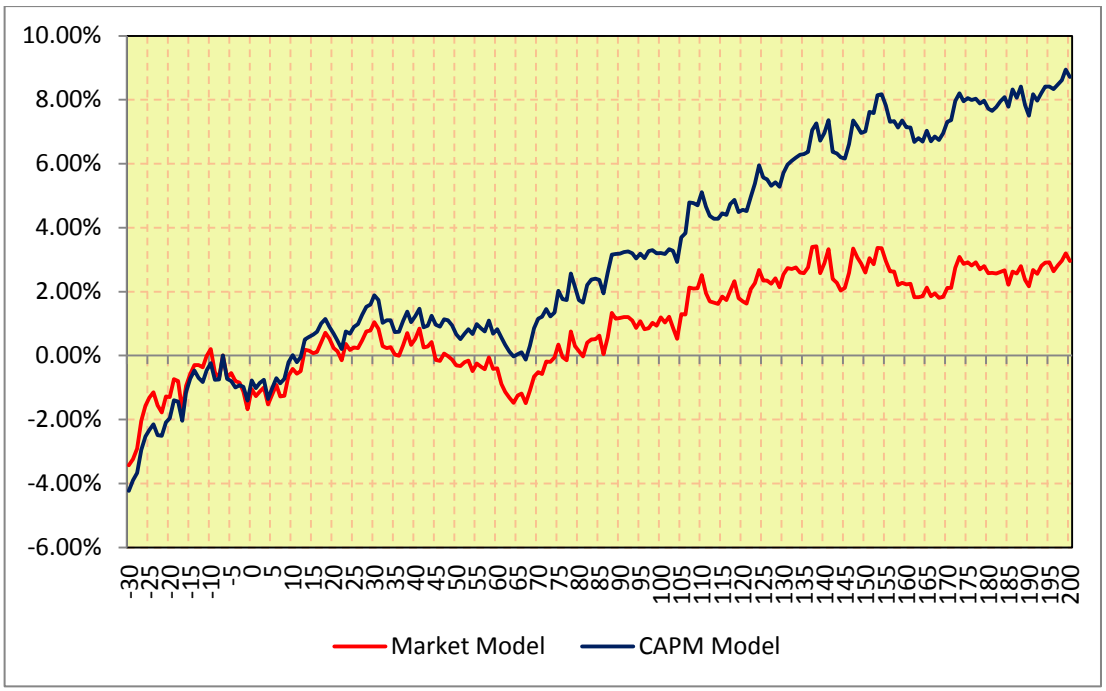



**Figure 15: Average Abnormal Returns for J213 Additions (Market Model)**

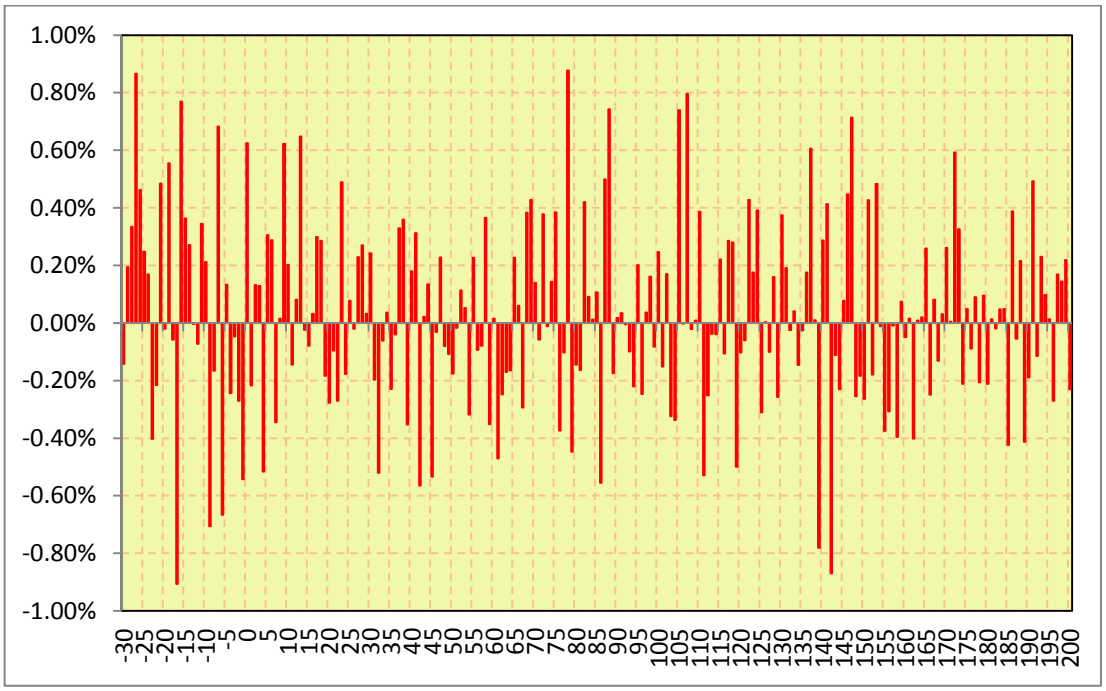
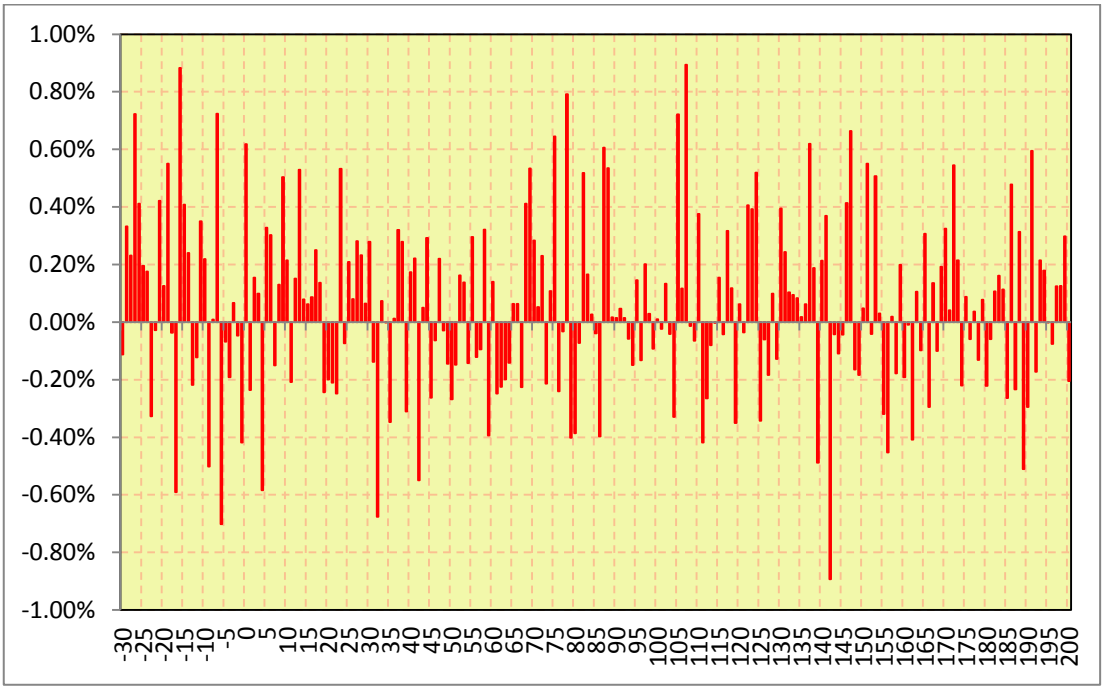


**Figure 16: Average Abnormal Returns for J213 Additions (CAPM Model)**




### 5.3.3 Abnormal Returns - J213 Deletions

Figure 17 presents the cumulative average market-adjusted abnormal returns for companies deleted from the J213 for the entire event window. All CAARs are normalised at T=-7 days prior to the event. Table 5 shows the statistical significance for the CAAR for each event window for the market model. This information is shown in Table 7 for the CAPM model.

Figure 17 shows that the share prices of companies that are deleted from the J213 index decrease in value by approximately -6.6% for the market model and -6.3% for the CAPM model in the days preceding the announcement day. This decrease is statistically significant at the 1% level. Although there is no visible decrease in the average abnormal return around T=-7 or at T=0, there is a slight downward trend between the announcement day and the effective day.

Companies deleted from the J213 lose approximately 0.9% of their value in this window for the market model and 0.7% for the CAPM model.

Figure 17 shows that, according to the market model, the CAAR of these companies reduces after the announcement date to approximately -1.6% for most of the event window, and then increases to about 0% towards the end of the event window. This increase is probably a result of a confounding event. However, these CAARs are not statistically significant as shown in Table 5. The CAPM model shows that the CAAR stabilises at around 0% after the announcement day, and then increases towards the end of the event window. As shown in Table 7, this increase is not statistically significant however, upward drift is visible between day 90 and the end of the event window. This may be due to a weakness in the CAPM model. Since there is no statistical significance for both the market model and the CAPM model it cannot be shown conclusively that a company that is deleted from the J213 index experiences any positive or negative CAARs after the change to the index is effective.

**Figure 17: Cumulative Average Abnormal Returns for J213 Deletions for Event Window [-30; +200]**

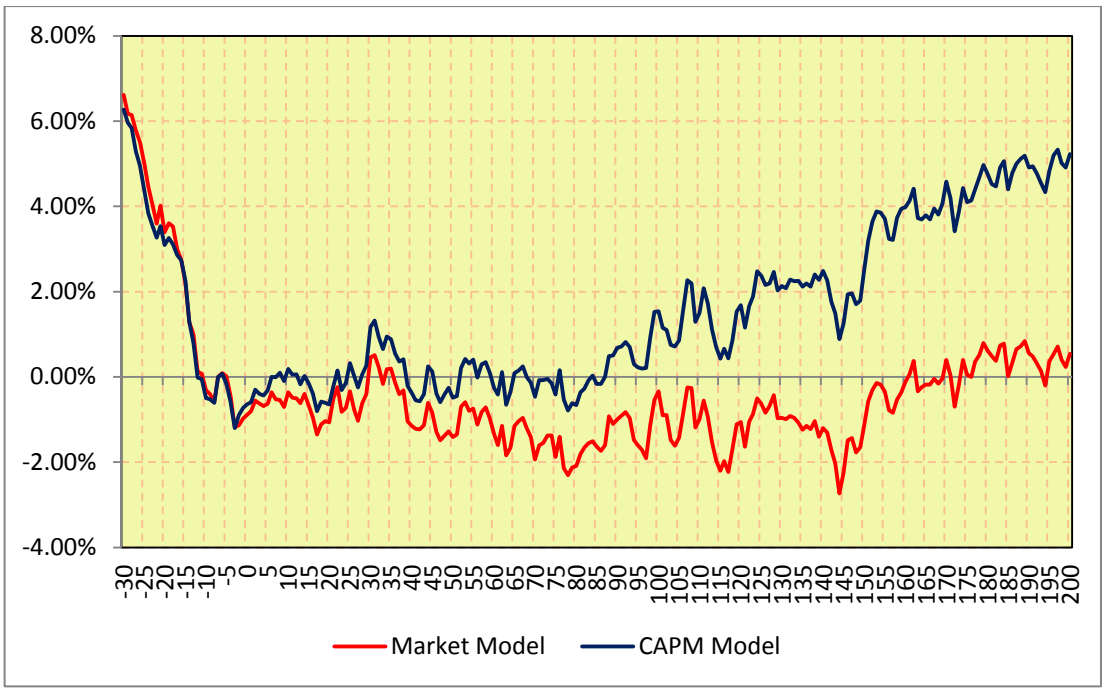



**Figure 18: Average Abnormal Returns for J213 Deletions (Market Model)**

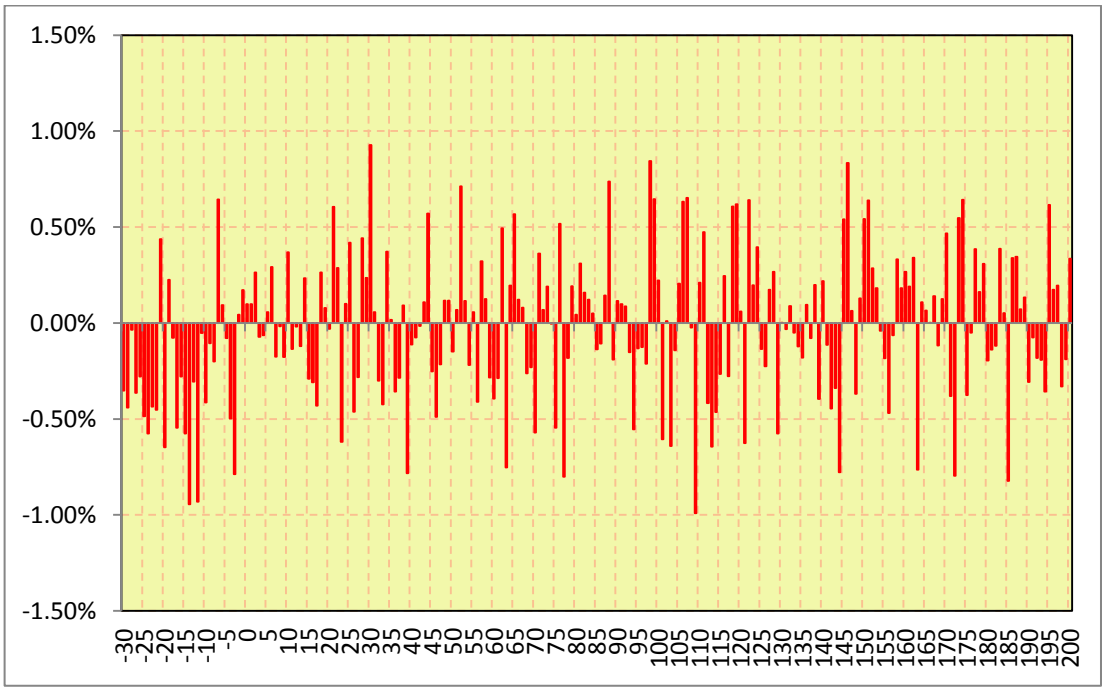
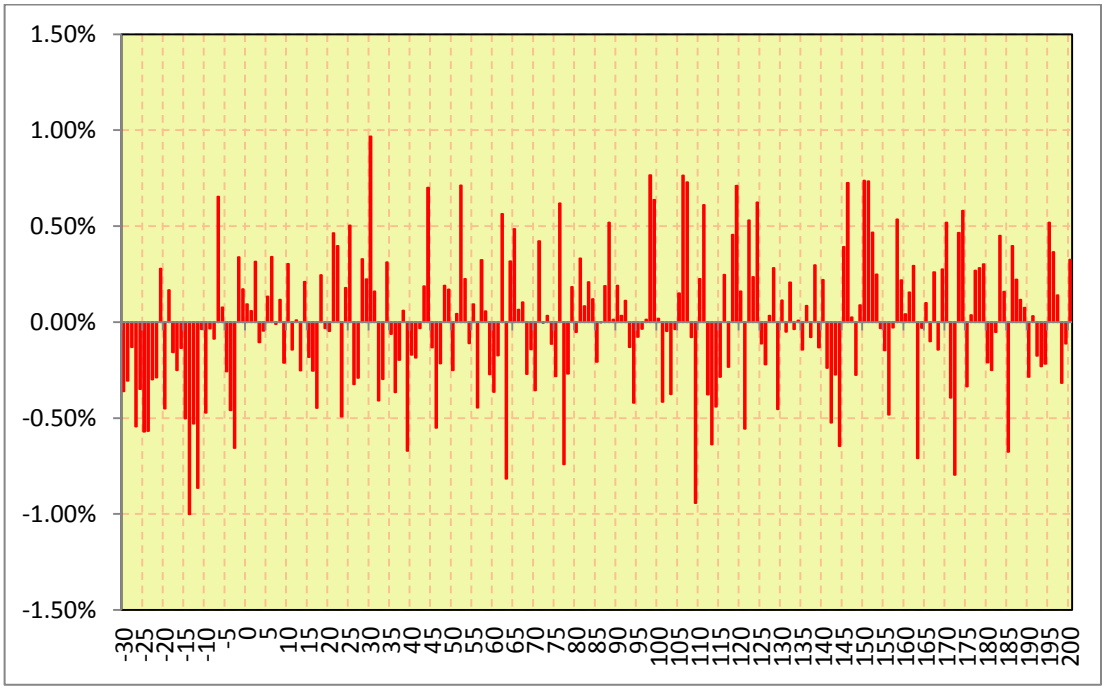


**Figure 19: Average Abnormal Returns for J213 Deletions (CAPM Model)**




## 5.4 FTSE/JSE RAFI 40 Index (J260)

### 5.4.1 Review of the Data

#### *5.4.1.1 Additions*

The initial sample for additions to the J260 index between March 2008 and June 2011 was 24 companies. Of these 24 companies, one company was excluded since no data was available for the correct share code. One outlier was identified and so data from 22 companies was used. This sample was used for both the market model and the CAPM model. The sample reduced to 14 companies by the end of the event window due to companies that did not have data for the entire window.

For the CAPM model, beta values were assumed for five companies since the beta values supplied by Bloomberg were invalid. Beta was assumed to be 1 in cases where there was no better alternative.

#### *5.4.1.2 Deletions*

The initial sample for deletions to the J260 index was 28 companies. Of these 28 companies, three companies were excluded since no data was available for the correct share code. No outliers were identified. Thus the initial sample for both the market model and the CAPM model was reduced to 25 companies. This eventually reduced to 20 companies by the end of the event window due to companies that did not have data for the entire window.

For the CAPM model, beta values were not valid for two companies. A beta value of 1 was used.

### 5.4.2 Abnormal Returns - J260 Additions

Figure 20 presents the cumulative average market-adjusted abnormal returns for the companies added to the J260 index for the entire event window. CAARs are normalised at T=-7 days prior to the event. Table 4 shows the CAARs for each event period in the event window and the statistical significance of these CAARs for the market model. This information is shown for the CAPM model in Table 6.

Figure 20 shows that the share price of companies added to the J260 index appreciate in the days preceding the announcement by approximately 4.2% for both the market model and the CAPM model. This increase is statistically

significant at the 5% level. There is a positive abnormal return of 1.8% and 1.6% for the market and CAPM models respectively at day T=-7. This is statistically significant at the 1% level and this increase can be seen in Figure 21 and Figure 22. Due to volatility in the CAARs, there is no observable increase between the announcement date and the effective date. Additionally, there seems to be a disturbance between day T=25 and day T=90. This leads to a large dip in the CAAR between these two dates. After day T-90, the CAAR appreciates rapidly to a stable return of about 7% for the market model. This increase is statistically significant at the 10% level. When measured against the CAPM model, the long horizon CAAR appreciates to about 5%. No reversal of these gains can be seen in the event window in either model.

**Figure 20: Cumulative Average Abnormal Returns for J260 Additions for Event Window [-30; +200]**

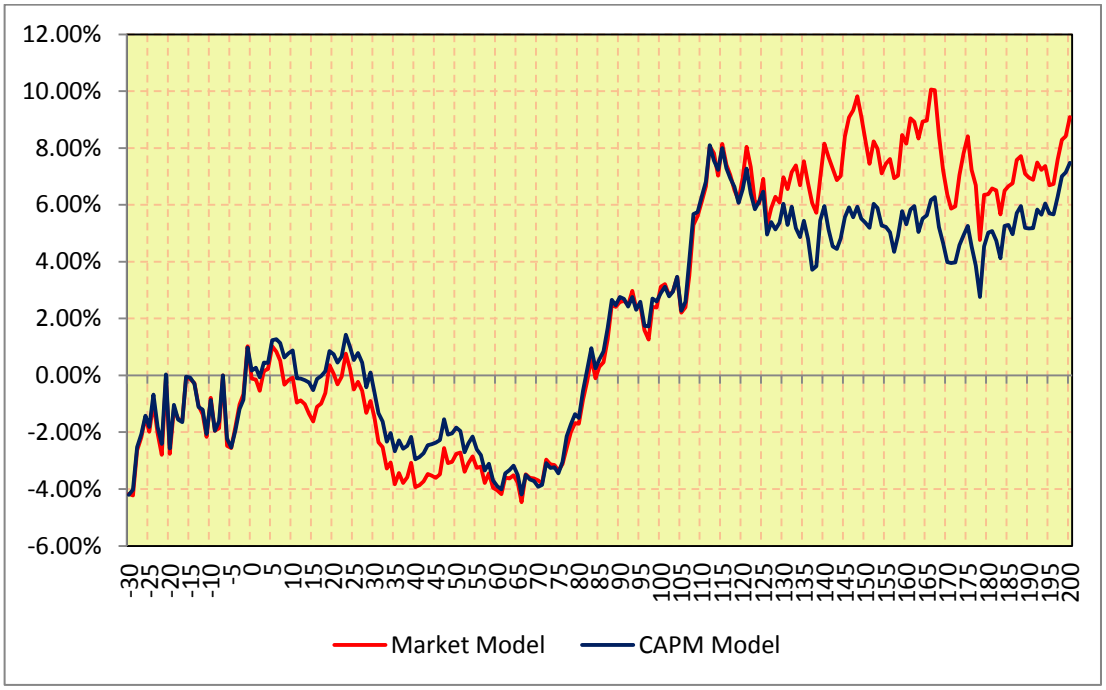


**Figure 21: Average Abnormal Returns for J260 Additions (Market Model)**

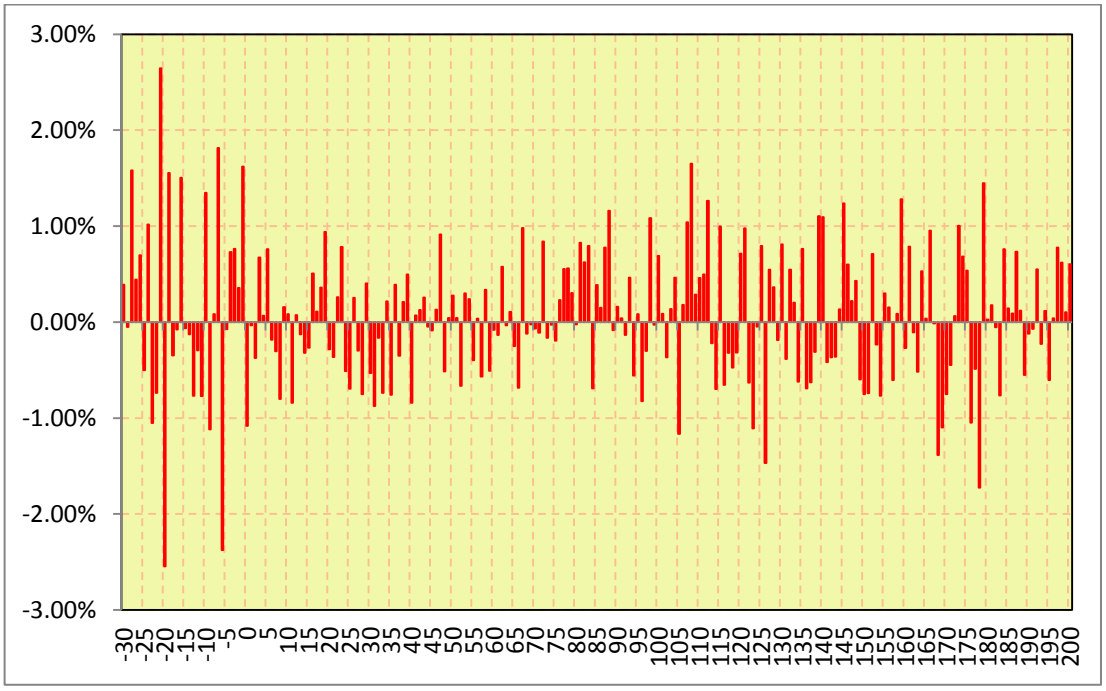



**Figure 22: Average Abnormal Returns for J260 Additions (CAPM Model)**

### 5.4.3 Abnormal Returns - J260 Deletions

Figure 23 presents the cumulative average market-adjusted abnormal returns for the companies deleted from the J260 index for the entire event window. All CAARs are normalised at T=-7 days prior to the event. Table 5 shows the CAARs for each event period in the event window and the statistical significance of these CAARs for the market model. Table 7 shows this information for the CAPM model.

Unlike the other additions and deletions included in this study, Figure 23 does not show a decrease in the share prices of companies that are deleted from the index in the days preceding the announcement day. However, the CAARs decrease by -2% on the announcement day and by -4.3% between the announcement day and the effective day according to the market model. Both of these CAARs are statistically significant at the 1% level. The CAPM model shows a decrease of 3.1% for the window between the announcement day and the effective day and this is also significant at the 1% level.

After the effective day, the CAAR continues to decrease and it settles at approximately -7% for the market model and -4% for the CAPM model. The CAAR reaches this level about 15 to 40 trading days after the effective date, which is relatively fast compared with additions to and deletions from the other indices. After 130 trading days, Figure 23 shows a further reduction in the CAAR, but it is assumed that this is due to an external event. Therefore the price effect appears to be permanent at -7% and -4% for the market model and CAPM model respectively after 200 days. This is not statistically significant and

therefore no strong conclusions about the long term behaviour of companies deleted from the J260 index can be made.

**Figure 23: Cumulative Average Abnormal Returns for J260 Deletions for Event Window [-30; +200]**

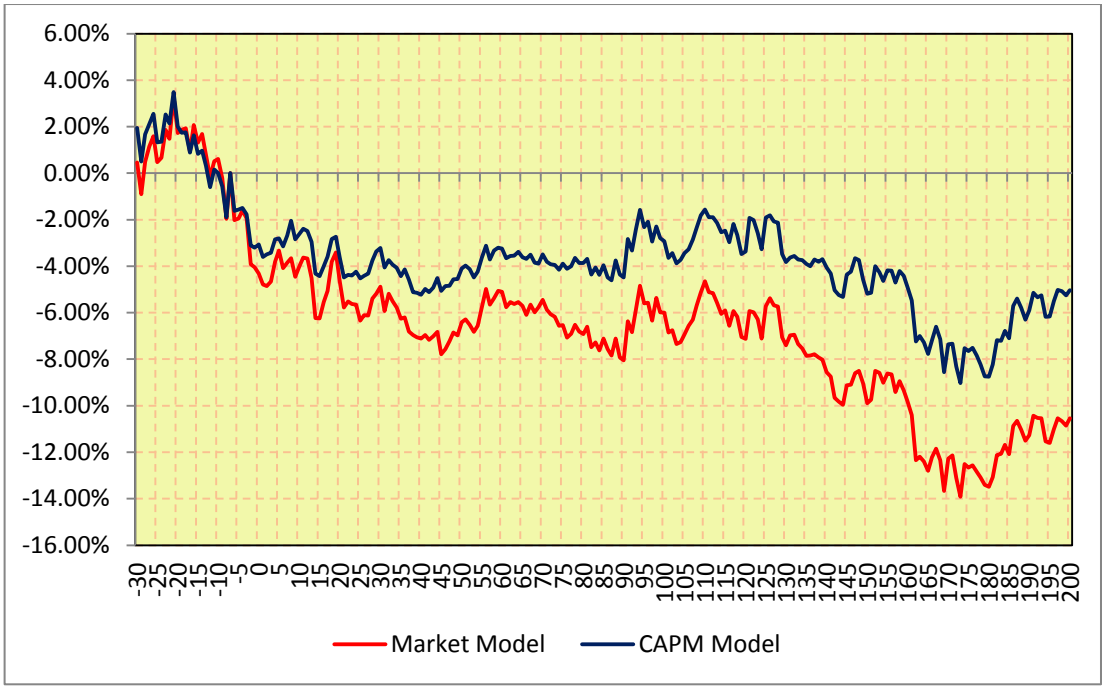


**Figure 24: Average Abnormal Returns for J260 Deletions (Market Model)**

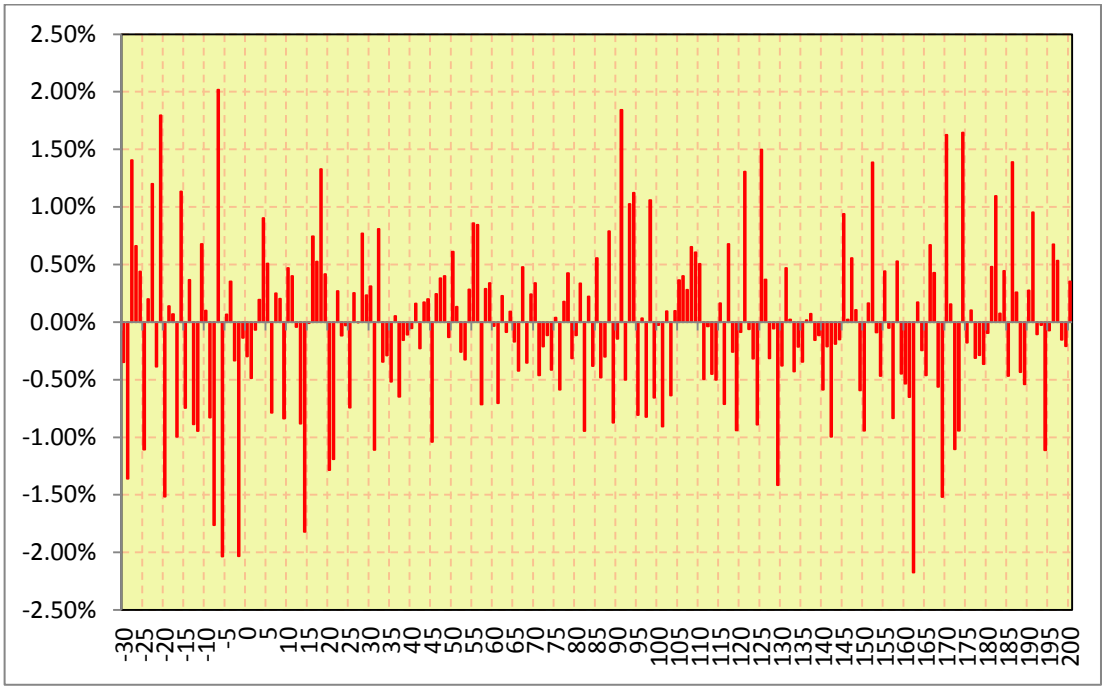
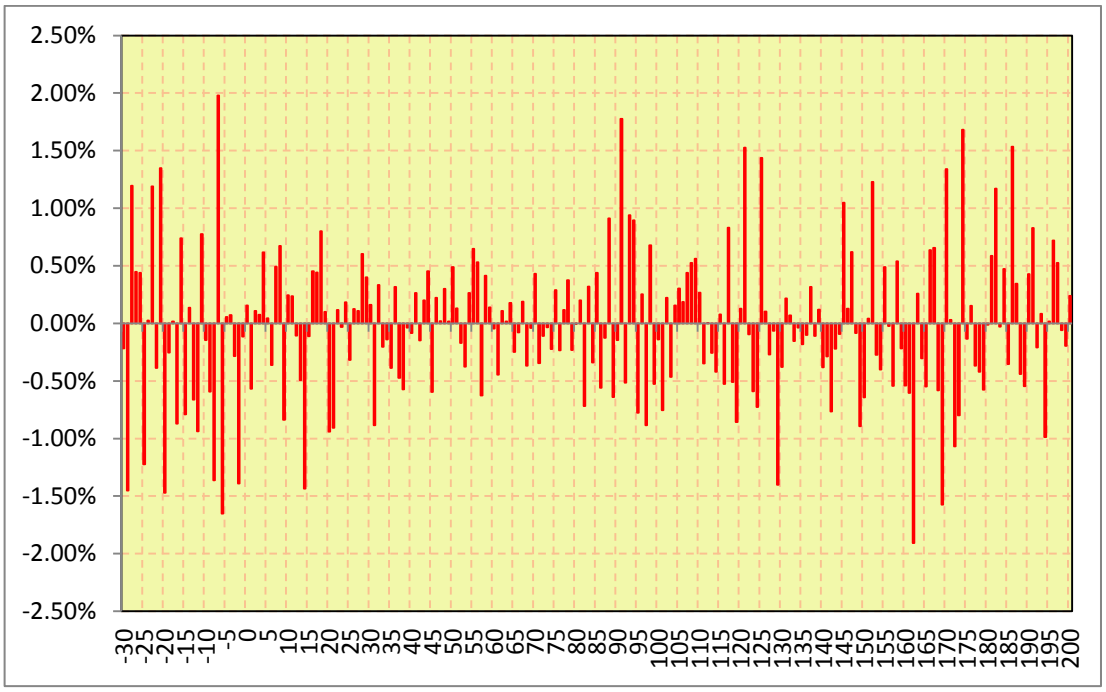



**Figure 25: Average Abnormal Returns for J260 Deletions (CAPM Model)**



## 5.5 Statistics

Table 4 shows the cumulative average abnormal return using the market model for companies that are added to the indices of this study for each event window. This table includes the estimated CAAR as well as the bootstrap statistic.

**Table 4: Statistical Results for Index Additions (Market Model)**

| | | | **J200** (n = 28) | | **J210** (n = 26) | | **J213** (n = 46) | | **J260** (n = 22) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Event Window** | **Window** | **Trading days** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** |
| Pre-announcement Period | [-30; -7] | 24 | 5.1% | 0.990*** | 2.8% | 0.725 | 3.4% | 1.000*** | 4.2% | 0.988** |
| Announcement Day | [-7] | 1 | 0.3% | 0.758 | -0.2% | 0.440 | 0.7% | 0.988** | 1.8% | 1.000*** |
| Post-Announcement Period | [-7; 0] | 8 | 0.8% | 0.738 | 2.1% | 0.780 | -1% | 0.120 | -0.1% | 0.430 |
| Effective Day | [0] | 1 | 1.3% | 0.998*** | -0.1% | 0.473 | 0.6% | 0.983** | -1.1% | 0.003*** |
| Post Change Period | [0; 20] | 21 | 1.9% | 0.875 | 1.0% | 0.543 | 1.3% | 0.873 | 0.2% | 0.503 |
| Long-horizon Post Change Period | [-7; 200] | 209 | 3.0% | 0.88 | 5.5%¥ | 0.775 | 2.5% | 0.903* | 7.0% | 0.938* |

* statistically significant at the 10% level
** statistically significant at the 5% level
*** statistically significant at the 1% level

¥ average not taken due to confounding events. Reading is taken at min/max point of graph

Table 5 shows the cumulative average abnormal return using the market model for companies that are deleted from the indices of this study for each event window. This table includes the estimated CAAR as well as the bootstrap statistic.

**Table 5: Statistical Results for Index Deletions (Market Model)**

| | | | **J200** (n = 24) | | **J210** (n = 30) | | **J213** (n = 42) | | **J260** (n = 25) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Event Window** | **Window** | **Trading days** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** |
| Pre-announcement Period | [-30; -7] | 24 | -5.0% | 0.015** | -8.6% | 0.003*** | -6.6% | 0.000*** | 0.5% | 0.638 |
| Announcement Day | [-7] | 1 | 0.0% | 0.455 | 0.8% | 0.888 | 0.6% | 0.983** | -2.0% | 0.000*** |
| Post-Announcement Period | [-7; 0] | 8 | -0.1% | 0.470 | -3.2% | 0.058 | -0.9% | 0.120 | -4.3% | 0.000*** |
| Effective Day | [0] | 1 | -0.3% | 0.255 | 0% | 0.540 | 0.1% | 0.670 | -0.3% | 0.268 |
| Post Change Period | [0; 20] | 21 | 1.6% | 0.778 | 5.8% | 0.958** | 0.2% | 0.578 | -0.3% | 0.475 |
| Long-horizon Post Change Period | [-7; 200] | 209 | 1.5% | 0.403 | 0.5% | 0.610 | -1.6%¥ | 0.515 | -7.0% | 0.143 |

* statistically significant at the 10% level
** statistically significant at the 5% level
*** statistically significant at the 1% level

¥ average not taken due to confounding events. Reading is taken at min/max point of graph

Table 6 shows the cumulative average abnormal return using the CAPM model for companies that are added to the indices of this study for each event window. This table includes the estimated CAAR as well as the bootstrap statistic.

**Table 6: Statistical Results for Index Additions (CAPM Model)**

| | | | **J200** (n = 28) | | **J210** (n = 26) | | **J213** (n = 46) | | **J260** (n = 22) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Event Window** | **Window** | **Trading days** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** |
| Pre-announcement Period | [-30; -7] | 24 | 6% | 1.000*** | 2.5% | 0.720 | 4.2% | 0.998*** | 4.2% | 0.985** |
| Announcement Day | [-7] | 1 | 0.6% | 0.925* | -0.4% | 0.310 | 0.7% | 0.993*** | 1.6% | 1.000*** |
| Post-Announcement Period | [-7; 0] | 8 | 1.2% | 0.853 | 2.8% | 0.868 | -0.8% | 0.123 | 0.2% | 0.543 |
| Effective Day | [0] | 1 | 1.3% | 0.998*** | -0.2% | 0.418 | 0.6% | 0.973** | -0.8% | 0.015** |
| Post Change Period | [0; 20] | 21 | 2.2% | 0.855 | 0% | 0.495 | 1.5% | 0.788 | 0.6% | 0.578 |
| Long-horizon Post Change Period | [-7; 200] | 209 | 5.5% | 0.813 | 6% | 0.818 | 7% | 0.800 | 5% | 0.818 |

* statistically significant at the 10% level
** statistically significant at the 5% level
*** statistically significant at the 1% level

¥ average not taken due to confounding events. Reading is taken at min/max point of graph

Table 7 shows the cumulative average abnormal return using the CAPM model for companies that are deleted from the indices of this study for each event window. This table includes the estimated CAAR as well as the bootstrap statistic.

**Table 7: Statistical Results for Index Deletions (CAPM Model)**

| | | | **J200** | (n = 24) | **J210** | (n = 30) | **J213** | (n = 42) | **J260** | (n = 25) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Event Window** | **Window** | **Trading days** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** | **CAAR** | **Ranked Statistic (Area to the left)** |
| Pre-announcement Period | [-30; -7] | 24 | -5.2% | 0.000*** | -7.9% | 0.008*** | -6.3% | 0.000*** | -1.9% | 0.123 |
| Announcement Day | [-7] | 1 | -0.2% | 0.283 | 1.62% | 0.985** | 0.7% | 0.98** | 2% | 1.000*** |
| Post-Announcement Period | [-7; 0] | 8 | 0.4% | 0.660 | -4.11% | 0.015** | -0.7% | 0.133 | -3.1% | 0.008*** |
| Effective Day | [0] | 1 | -0.2% | 0.285 | 0% | 0.48 | 0.1% | 0.438 | 0.2% | 0.690 |
| Post Change Period | [0; 20] | 21 | 1.8% | 0.83 | 5.9% | 0.983** | 0% | 0.338 | -0.6% | 0.358 |
| Long-horizon Post Change Period | [-7; 200] | 209 | 4% | 0.905* | 0% | 0.768 | 0% | 0.190 | -4% | 0.155 |

* statistically significant at the 10% level
** statistically significant at the 5% level
*** statistically significant at the 1% level

¥ average not taken due to confounding events. Reading is taken at min/max point of graph

## 5.6 Comparison between indices

Table 8 and Table 9 contain a summary of key points of similarity and difference between the different indices. These attributes have been described in detail in the preceding sections therefore no additional detail will be given here.

**Table 8: Key Characteristics of Index Attributes (Market Model)**

| **Attribute** | **J200** | **J210** | **J213** | **J260** |
|---|---|---|---|---|
| **Additions - Long term CAAR** | 3% | 5.5% | 2.5% | 7% |
| **Additions – Permanent/Temporary Price Change** | Permanent | Temporary | Permanent | Permanent |
| **Additions – Settling time (trading days)** | T=20 | T=45 | T=110* | T=110* |
| | | | | |
| **Deletions - Long term CAAR** | 1.5% | 0.5% | -1.6% | -7% |
| **Deletions – Permanent/Temporary Price Change** | Permanent | Uncertain | Permanent* | Permanent |
| **Deletions – Settling time (trading days)** | T=-7 | T=-7 | T=-7 | T=-15 |
| | | | | |
| **Symmetrical effects from additions and deletions** | No | No | No | Yes |

**Table 9: Key Characteristics of Index Attributes (CAPM Model)**

| Attribute | J200 | J210 | J213 | J260 |
|---|---|---|---|---|
| **Additions - Long term CAAR** | 4% | 6% | 7% | 5% |
| **Additions – Permanent/Temporary Price Change** | Permanent | Temporary | Permanent | Permanent |
| **Additions – Settling time (trading days)** | T=60 | T=50 | T=140 | T=110 |
| | | | | |
| **Deletions - Long term CAAR** | 1.8% | 0.5% | 0% | -4% |
| **Deletions – Permanent/Temporary Price Change** | Permanent | Permanent | Permanent* | Permanent |
| **Deletions – Settling time (trading days)** | T=5 | T=-7 | T=-7 | T=2 |
| | | | | |
| **Symmetrical effects from additions and deletions** | No | No | No | Yes |

## 5.7 Price effects over time

In order to determine how the price effects have changed with time, the data samples were split into two data sets. The first data set contained all events between 2002 and 2006. The second data set contained all events between 2007 and 2011. Note that since the J260 was only introduced in 2008, the first data set contains all events between 2008 and 2009. The second data set contains all events between 2010 and 2011.

It was not possible to use the CAARs for the [-7; 200] window since there was too much volatility in the results for both the market model and the CAPM model. This volatility may be explained by the small sample sizes, and, in the case of the CAPM model, the drift observed in many of the CAPM CAARs. Therefore, only short term CAARs (i.e. [-7; 20] window) were used. The results of the comparison are shown in Table 10.

**Table 10: Comparison Between Short Term CAARs [-7; 20]**

| | Additions | | | | | Deletions | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Market Model | | CAPM Model | | | Market Model | | CAPM Model | |
| Year | N | CAAR | Rank Stat | CAAR | Rank Stat | N | CAAR | Rank Stat | CAAR | Rank Stat |
| **J200 index** | | | | | | | | | | |
| **2007-2011** | 16 | 2.5% | 0.778 | 2.5% | 0.775 | 15 | 1% | 0.642 | 1.8% | 0.580 |
| **2002-2006** | 12 | 3% | 0.878 | 2.5% | 0.738 | 9 | 2% | 0.785 | 1.8% | 0.833 |
| **J210 index** | | | | | | | | | | |
| **2007-2011** | 13 | 4% | 0.623 | 3% | 0.595 | 20 | 3% | 0.825 | 0% | 0.600 |
| **2002-2006** | 13 | 0% | 0.565 | 3%¥ | 0.718 | 10 | -4% | 0.193 | 0%¥ | 0.340 |
| **J213 index** | | | | | | | | | | |
| **2007-2011** | 26 | 0% | 0.480 | 1.2% | 0.533 | 25 | 0% | 0.398 | 0% | 0.435 |
| **2002-2006** | 20 | 3%¥ | 0.963** | 1.4% | 0.680 | 17 | -3% | 0.093** | 0% | 0.543 |
| **J260 index** | | | | | | | | | | |
| **2010-2011** | 9 | 0% | 0.413 | 1.2%¥ | 0.344 | 9 | -9% | 0.018** | -4% | 0.272 |
| **2008-2009** | 13 | 0% | 0.495 | 1.4%¥ | 0.753 | 16 | -2% | 0.095* | -4.5% | 0.005*** |

¥ measurement taken from T=0 due to volatility

¥measurement interpolated visually

*statistically significant at 10% level

** statistically significant at 5% level

*** statistically significant at 1% level

# 6. Discussion of Results

## 6.1 Comment on Abnormal Returns

In general, the long horizon abnormal returns measured against both the market model and the CAPM model had only weak statistical significance. This may be as a result of a market that is not dominated by passive investments, or it may be a result of using the wrong benchmark in order to calculate the abnormal returns.

Bildik and Gülay (2008) also find that the CAARs of index revisions in the ISE-100 are small and statistically weak. The ISE-100 is a value weighted index on the Turkish Stock Exchange, and the fact that both the Turkish Exchange and the JSE reside in emerging markets may mean that similar results are unsurprising. Bildik and Gülay use the market model in calculating their abnormal returns.

In comparing the results between the market model and the CAPM model, the CAPM model appeared to result in CAARs with a distinct upwards drift for all value weighted indices. This may be a result of the market indices that were chosen to represent these two models. The market model used the index that the companies were entering and exiting as the benchmark portfolio. Therefore, the performance of the companies under investigation was being compared to a very small portfolio of companies, (between 10 to 40 companies). Since these companies were the largest companies on the JSE for their respective indices, their performance would be influenced by similar drivers, therefore the

benchmark may model companies that are part of this portfolio fairly accurately. However, the CAPM model used the FTSE/JSE All Share Index (J203) as the benchmark. This is an index which is made up of over 150 companies which are involved in all available industries and sectors. Thus it is not reasonable to assume that the index performance fairly reflects the performance of an individual company. In order to refine this model, beta is used, since this shows how the company's performance differs from the general market. However, the use of beta does not include industry specific events in the market which may influence a company's performance. Thus, in this instance, the use of the CAPM model would not necessarily be expected to produce a more robust result than the market model.

This reasoning may also explain the differences between the market model and the CAPM model for the J260. With the J260, an index weighted by fundamentals, the CAPM model produced abnormal returns that were less than those produced by the market model. Once again, it would appear that the market model is more sensitive and that the abnormal returns that are generated through the market model are more accurate than through the CAPM model.

Shankar and Miller (2006), amongst others, stated that there is no advantage in using multi factor control portfolio models and other more complicated models as benchmarks to calculate abnormal returns. However, Ward and Muller (2010) found that the control portfolio is a more sensitive benchmark. Thus this

study should be conducted again in future with a multi-factor model in order to determine the differences in the statistical significance.

## 6.2 J200 Behaviour

Additions to the J200 index experienced an increase in their cumulative returns on the announcement day and the effective day. 20 trading days after the effective day, these companies had CAARs of approximately 2.8%, and these returns did not decrease up to 200 trading days after the effective date.

Deletions had small negative abnormal returns on the announcement day and the effective day. While their CAARs displayed a lot of volatility after the announcement date, the CAARs were equal to about 1.8% after 20 days. This result was unexpected as companies deleted from an index should show negative abnormal returns. However, the CAARs were not statistically significant. Thus it cannot be proven that the cumulative returns were statistically different from 0.

The asymmetrical behaviour of the additions and deletions supports the investor awareness hypothesis. This hypothesis states that when a company is included into a popular index, the investing community becomes aware of the share and therefore the demand for that share increases and the cost of capital becomes less (Mase, 2006). H Chen et al. (2004) stated that a permanent increase in the price of added firms and no permanent decline for deleted firms supports the awareness hypothesis.

It is not surprising that the J200 displays this type of behaviour. The J200 contains the top 40 companies on the JSE; it is the most well known index, and is tracked by the JSE's first ETF. Thus it is likely that novice investors will make their selections from this short list before looking at the full JSE index.

### 6.3 J210 Behaviour

Additions to the J210 index did not experience an increase in their cumulative returns on the announcement day or on the effective day. The CAAR did however increase steadily from the announcement day to the effective day, at which time it had increased by 2%. After the effective day, the CAAR decreased and the added companies lost all their gains within the following seven days.

The share prices of companies that were deleted from this index showed a similar behaviour. While the deleted companies do not show a negative return on the announcement day or on the effective day, the CAAR does decrease steadily from the announcement day to the effective day, at which time these companies has lost 3% of their value. These companies begin to recoup their losses immediately after the announcement day. The deleted companies had recouped all their losses 15 days after the effective day.

Thus additions and deletions display a symmetrical behaviour, where the movement that is observed occurs in the time between the announcement date and the effective date, after which this movement is reversed. This behaviour supports the price pressure hypothesis. The price pressure hypothesis states that the additional demand of institutional and private investors causes a temporary increase in demand for shares of companies that are added to the

index (Biktimirov et al., 2004). The opposite should be true for index deletions. While the demand from additional investors may affect the share price in the short term, the price pressure hypothesis assumes that the long term demand curve remains perfectly elastic which is why the CAAR reverts back to zero for both additions and deletions (Harris & Gurel, 1986).

The long term picture is, however, slightly different, as additions seem to increase steadily until reaching a peak of 6% at 50 days after the effective day. The CAAR of additions to this index remain at this level until about 115 days after which it reduces back to approximately 3% although this reduction is not statistically significant. The long term CAAR for deletions seems to oscillate around zero. This behaviour cannot be explained by one hypothesis alone. The additions and the deletions display short term behaviour consistent with the price pressure hypothesis and long term behaviour consistent with the investor awareness hypothesis.

## 6.4 J213 Behaviour

Additions to the J213 index experienced an increase in their cumulative returns on both the announcement day and on the effective day. However, Figure 14 shows that the CAAR was a negative value during this time. This is due to a reduction of the CAAR from the announcement date to the effective date. While this result is unexpected, the negative daily abnormal returns are not statistically significant, and therefore cannot be used to make any conclusions. After the effective day, the CAAR steadily increases until reaching a positive value of 2.5%. The deletions show a behaviour that is similar to both the J200 deletions

and the J210 deletions. While there are no negative returns on the effective day and the announcement day, the CAAR drops to -1% close to the effective date and then remains at this value. Thus the J213 shows that its behaviour is largely driven by the investor awareness hypothesis which has been discussed previously.

### 6.5 J260 Behaviour

Additions to the J260 index show a positive abnormal return on the announcement day, although this was not seen on the effective day. The CAAR did however increase between the announcement day and the effective day by 2%. The volatility seen during this time makes it difficult to make firm conclusions about the behaviour of the share price of added companies during this period. After the effective day, the CAAR increased until finally settling at a positive CAAR of approximately 7%.

A cluster of negative abnormal returns can be seen in the data around days 25 to 35. A number of reasons may have caused this behaviour. Firstly, the J260 is reconstituted once a year, thus it is highly susceptible to confounding events that may have affected the general markets. The J260 was instituted for the first time in 2008 at the height of the current financial crisis. This means that while there were 14 samples for the analysis of the J260 additions, they were spread out over four dates in the past four years. Wang (2007) shows that emerging equity markets suffer the most from the effect of foreign investment. This is in part due to foreign investors withdrawing their investments from foreign markets with the intention of reinvesting their money somewhere “safer”. It is likely that

foreign investors who are not familiar with JSE companies will invest in companies that are deemed as safe investments, and thus the constituents of the J203 and the J260 are likely targets. This would have to be confirmed with further research.

Secondly, the measurement of the CAAR at the announcement date may be incorrect. Thus the entire graph seen in Figure 20 should be shifted up by 2%. This means that these figures would show a temporary short term increase followed by a permanent long term increase.

The share prices of companies deleted from the J260 index displayed the only clear decrease in CAAR after the effective date. The CAAR settled at -4% on the effective day and by inspecting Figure 23 this change seems permanent.

Thus additions and deletions display a symmetrical behaviour, with the change in CAAR not reversing in the next 200 days. This behaviour supports the imperfect substitute or downward sloping demand curve hypothesis. The imperfect demand hypothesis is based on assumptions that substitutes do not exist for shares of companies that belong to specific indices (Shleifer, 1986). When companies are added to the index the share price experiences a permanent increase, and when companies are deleted from the index their share price experiences a permanent decrease. The most obvious reason why share prices of companies entering into and exiting from the J260 index do not have perfect substitutes is that membership to the J260 is not based on market capitalisation. The J260 is based on other fundamental measures, and although these measures are publicly available, the inclusion or exclusion of a company

in the J260 is likely to convey information to the market. It has been shown previously that the share price of companies belonging to a particular index will experience a permanent increase if there is a perception that inclusion of a company into that index indicates the market's approval of that company as a good investment decision (Cai, 2007). This effect is due to the information hypothesis (Jain, 1987). Thus, it is more likely that this behaviour is driven by the information hypothesis rather than the imperfect substitute hypothesis.

## 6.6 Pre-event abnormal returns

The results presented above showed cumulative returns of between 2.5% to 6% across all the indices in the 24 trading days leading up to the announcement day for index additions. Additionally, the results showed cumulative returns between 0.5% to -8.6% during the same time period for all index deletions. Similar trends have been noticed in other studies and this behaviour is often attributed to anticipatory trading by arbitrageurs (H. Chen et al., 2006; Yun & Kim, 2010). Madhavan (2003) found that additions to the Russell 2000 experience cumulative returns of more than 20% in the three months leading up to the index changes, while deletions experience cumulative returns of approximately -9%. He attributes this to arbitrage behaviour.

A criticism of this finding is that most companies that are added to market cap weighted indices are companies that are performing well (Becker-Blease & Paul, 2010; Kappou et al., 2008). Similarly, companies will only be excluded from a market capitalisation weighted index due to poor historic growth. This criticism would be supported by examining the pre-announcement cumulative

returns on the J260. While there is some evidence of an increase in the cumulative returns for additions to the index during this time, volatility around this date makes it difficult to measure this accurately. The same is true for deletions to this index. Membership in the J260 is dependent on fundamental measurements such as dividends, cash flow and sales, as well as book value (FTSE, 2008). The fact that this index does not show the same cumulative returns for additions and deletions as a market weighted index, implies that these cumulative returns are driven in part by the performance of the companies and not solely by arbitrage.

Further research is required in order to separate these two influences from the cumulative returns prior to the index announcements.

## 6.7 Review of Hypotheses and Research Questions

### 6.7.1 Hypothesis 1: Is there a price change between the announcement day and the effective day?

In order to warn the market of upcoming index changes, the JSE publishes a list of all index additions, deletions and re-weightings on the JSE website (JSE Limited, 2011c) and on the FTSE website (FTSE, 2011b). This practice is common for most markets. Since passive index tracking funds have a mandate to reduce their tracking error, and thus purchase shares in companies added to the index and sell shares in companies deleted from indices on the effective day of the change, opportunities for arbitrage exist (Green & Jame, 2011). Opportunistic traders will purchase shares in companies that will be added to

the index in the period between the announcement day and the effective day, with the intention of selling them back onto the market on the effective day when they can sell them at a higher price to the index funds (Okada et al., 2006). Thus the presence of arbitrage activity should cause a visible movement in the share prices of companies that have been added to and deleted from the index (H. Chen et al., 2006).

In order to measure this effect, the daily closing share prices were collected for all companies that were added to and deleted from the J200, J210, J213 and J260. The daily returns were calculated and then these returns were compared to a benchmark to find the abnormal return. In general, the JSE announces index changes seven days before the index change. Thus, the abnormal returns were investigated from seven trading days before the effective date until the effective date. In order to measure the true effect on the announcement day, data had to be removed for announcements that occurred more than seven trading days before the change and data had to be included for announcements that occurred less than seven trading days before the change.

Apart from deletions to the J210 and the J260, no statistically significant CAARs were observed during this seven day period for additions to or deletions from any of the indices. The results of the hypothesis testing of the price effect between the announcement day and the effective day for each index are shown Table 11.

**Table 11: Results of Hypothesis 1 for Each Index**

| Index | Event | p (market model) | p (CAPM model) | Result |
|---|---|---|---|---|
| J200 | Additions | 0.738 | 0.853 | Cannot reject $H_0$ |
| J200 | Deletions | 0.470 | 0.660 | Cannot reject $H_0$ |
| J210 | Additions | 0.780 | 0.868 | Cannot reject $H_0$ |
| J210 | Deletions | 0.058* | 0.015** | $H_0$ rejected at 10% level (market model) |
| J213 | Additions | 0.120 | 0.123 | Cannot reject $H_0$ |
| J213 | Deletions | 0.120 | 0.133 | Cannot reject $H_0$ |
| J260 | Additions | 0.430 | 0.543 | Cannot reject $H_0$ |
| J260 | Deletions | 0.000*** | 0.008*** | $H_0$ rejected at 1% level (market model) |

*statistically significant at 10% level
** statistically significant at 5% level
*** statistically significant at 1% level

However, although there is only weak statistical evidence in support of hypothesis 1, all deletions did show a negative trend based on the market model, so there is anecdotal evidence to support some weak arbitrage trading during this time. Additions to the J200 and J210 showed a positive trend while additions to the J213 and J260 did not. A large amount of volatility was observed for additions and deletions to most indices during this period. This made a thorough analysis difficult.

The volatility can be attributed to a number of factors:

**Small sample size**

Most previous studies have been conducted on indices such as the S&P 500 (comprising 500 shares) and the Russel 2000 (comprising 2000 shares). Thus a study looking at indices that are made up of no more than 40 to 50 shares will

not have the same number of additions and deletions. The reduced number of samples means that the average returns will be more heavily influenced by outliers in the data.

**Market inefficiency**

The effects of index changes on the share prices of the added and deleted companies have been documented on the S&P 500 for more than 25 years (Amihud & Mendelson, 1986; Harris & Gurel, 1986; Shleifer, 1986). Other indices such as the Russel 2000 and the Nikkei 500 have also been examined for many years (Liu, 2000; Madhavan, 2003). However, this is the first study of its kind on the FTSE/JSE indices. Petajisto (2011) notes that the public's awareness of the index phenomenon is likely to impact on the magnitude of the price change between the announcement and effective day. He describes how the effect has reduced on the S&P 500 due to increased arbitrage activity and the possibility that index funds may be trading more strategically based on knowledge of this phenomenon. A lack of knowledge about the index effect on the FTSE/JSE may mean that arbitrage activity and strategic trading is not significant and therefore there is no additional demand during the period between the announcement and the effective day. Investors are happy to trade in the days following the change, which may explain why the CAARs of the indices in the study all settle a number of days after the effective date.

**Passive linked fund market**

Wurgler (2010) showed that the rapid growth in index-linked funds leads to an increase in the price effects of index reconstitution. Petajisto (2009) stated that in 2005, index funds linked to the S&P 500 accounted for over 10% of the market and this growth is expected to continue. In South Africa, the percentage of the market that is owned by index linked funds has not been quantified. If this figure is not significant, then a smaller effect will be expected when the FTSE/JSE indices are reconstituted. Yun and Kim (2010) showed that the index effects increase as index funds in the Korean market became more popular.

**Strategic trading**

Note that although there is not a significant change in the CAAR between the announcement day and the effective day, there is a definite trend during the long term window. This would imply that investors do react to the index changes, but later than anticipated. This may be due to the fact that the market is dominated by individual investors or actively managed funds, or that the index linked funds have enough leeway in their mandate to be able to trade strategically around the effective date. This would be in line with the suggestions made by Green and Jame (2011).

### 6.7.2 Hypothesis 2: Is the price change permanent?

Since the reconstitution of a value weighted index should not convey any new information to the market, the fact that a price change is observed around the event calls the efficient market hypothesis into doubt (Petajisto, 2009). This is

because the efficient market hypothesis states that the share price of a company should reflect all publicly available information (Harris & Gurel, 1986). The efficient market hypothesis is a key assumption of the Capital Asset Pricing Model, Arbitrage Pricing Theory, the Modigliani Miller theorem and modern finance in general (Cha & Lee, 2001). While the presence of a short term price change is undisputable, prior research focuses on whether the price change is permanent or temporary. Shleifer (1986) showed that the price change is permanent, which he believed was due to the lack of perfect substitutes for the index members. Harris and Gurel (1986) showed that the price change is temporary. They stated that although the short term demand curve may not be perfectly elastic, the long term demand curve remains elastic and therefore the efficient market hypothesis remains valid.

In order to measure the long term in the share price of a company that has been added to or deleted from an index, the daily closing share prices were not only collected for the seven days between the announcement date and the effective date. Rather, closing share prices were collected from 30 days before the effective date to 200 trading days after the effective date. The abnormal daily returns were calculated by comparing the daily share returns to the daily returns of the appropriate benchmark.

The value weighted indices all displayed the same long term behaviour. Additions continued to increase after the effective day until settling at a positive CAAR. This CAAR was still present even 200 days after the effective day.

Deletions experienced some volatility, but oscillated at or near 0% from the effective day until 200 days later.

This behaviour is consistent with the proposal regarding index-linked funds mentioned previously. The index-linked funds tracking the FTSE/JSE indices may have flexibility in terms of their tracking error that allows them to buy new companies in the index at more favourable prices. Alternately, passive index-linked funds are not that dominant in the JSE/FTSE yet, and the gradual rise in the share price is due to closet indexers buying positions after the effective date as suggested by Cremers and Petajisto (2009).

Ward and Muller (2010) stated that the analysis of long term abnormal returns is difficult. Petajisto (2011) agreed with this sentiment and showed that as the horizon increases, so the range of expected returns broadens until it is not possible to say with confidence whether abnormal returns are statistically significant or not. This was seen in this study, where all 200 day CAARs were not statistically significant except for additions to the J213 and the J260 indices which had weak statistical significance. The results of the hypothesis testing of whether the price effect observed after the effective day is permanent for each index are shown in Table 12.

**Table 12: Results of Hypothesis 2 for Each Index**

| Index | Event | p (market model) | p (CAPM model) | Result |
|---|---|---|---|---|
| J200 | Additions | 0.880 | 0.813 | Cannot reject $H_0$ |
| J200 | Deletions | 0.403 | 0.905* | Cannot reject $H_0$ |
| J210 | Additions | 0.775 | 0.818 | Cannot reject $H_0$ |
| J210 | Deletions | 0.610 | 0.768 | Cannot reject $H_0$ |
| J213 | Additions | 0.903* | 0.800 | $H_0$ rejected at 10% level (market model) |
| J213 | Deletions | 0.515 | 0.190 | Cannot reject $H_0$ |
| J260 | Additions | 0.938* | 0.818 | $H_0$ rejected at 10% level (market model) |
| J260 | Deletions | 0.143 | 0.155 | Cannot reject $H_0$ |

*statistically significant at 10% level
** statistically significant at 5% level
*** statistically significant at 1% level

An additional difficulty in making conclusions over the long term CAARs is introduced by the possibility of confounding events. In the JSE/FSTE indices, many of the same companies enter and exit the same or different indices within a short time frame. An example of this is Woolworths Holdings (WHL) which was deleted from the J200 index in September 2006 and added again in March 2007. Another example is Mondi Limited (MND), which was added to the J213 in September 2009 and added to the J200 in March 2010.

The J210 demonstrates a difference between its short term behaviour and its long term behaviour. Short term, additions and deletions show symmetrical behaviour that is consistent with the price pressure hypothesis. However, over a longer horizon, the additions and deletions show behaviour that is consistent with the investor awareness hypothesis. This introduces a new aspect to the index reconstitution debate and may be a subject for future research.

### 6.7.3 Research Question 3: What are the attributes for the share price premium for different indices?

Prior studies on the index reconstitution effect have identified five main hypotheses that are able to explain the observed price changes during index reconstitution. These hypotheses are the price pressure hypothesis as first suggested by Harris and Gurel (1986), the imperfect substitute hypothesis as first suggested by Shleifer (1986), the liquidity hypothesis as first suggested by Amihud and Mendelson (1986), the information hypothesis as first suggested by Jain (1987) and the investor awareness hypothesis as first suggested by Merton (1987). The characteristics of these hypotheses are mentioned in Table 1.

Once the CAARs for additions and deletions of the four indices were calculated, they were studied visually in order to determine which hypotheses they were consistent with. Hypotheses governing the short term behaviour of the additions and deletions could not always be determined owing to disturbances in the data that have been described in the previous sections.

All value weighted indices displayed long term behaviour that was consistent with the investor awareness hypothesis. This was demonstrated by a long term increase in the share price of additions to the indices without a corresponding decrease in the share price of deletions from the indices. Elliot et al. (2006) explained that this behaviour is a result of investors becoming aware of new companies when they are added to the index, but not being able to become “unaware” of the companies that are removed from the index. Note that this hypothesis is different to the information hypothesis as it does not assume that

inclusion or exclusion from the index conveys information about the fundamental value of the company.

In contrast, companies that are included in and excluded from the J260, an index weighted by fundamental factors, display symmetric and long term increases and decreases respectively. This is consistent with the information hypothesis. Membership to the J260 can be seen as the stock market's acknowledgement that the company is a good investment. Exclusion from the index can be seen as the stock market raising doubts about whether this company is a good investment. Thus it is sensible that the investor awareness hypothesis dominates the share price behaviour of these companies.

The long term effects on the share returns after index changes for the FTSE/JSE indices can therefore be explained through two dominating hypotheses. Value weighted indices are dominated by the investor awareness hypothesis. Indices weighted based on fundamental factors are dominated by the information hypothesis. The investor awareness hypothesis brings the new companies to the attention of potential investors. The information hypothesis conveys the stock exchange's perception of the quality of the investment to the market. Therefore both these hypotheses do, in fact, bring new information to the market, so it is reasonable to observe a long term change in the share price of the affected companies. Thus the market efficiency hypothesis is not violated because of changes in the share prices of companies affected by FTSE/JSE index changes.

### 6.7.4 Research Question 4: Which indices have the largest index premium attached to them?

South Africa is traditionally a resource driven economy, however it is becoming more financial and industrial driven. In 2002 the J210 made up 45% of the market, while the J213 made up 43%. In 2010 the J210 made up 38% of the market and the J213 made up 47%. Thus it may be expected that the market attaches a higher importance to financial and industrial shares than to resources shares, which means that inclusion to (or exclusion from) the J213 should have a greater effect than inclusion to (or exclusion from) the J210 on the share price of the company concerned. However, the South African economy was created on resources. If investment decisions are influenced by sentimentality, inclusions to (or exclusions from) the J210 index may have a larger effect than inclusions to (or exclusions from) the J213 index on the share price of the company concerned.

The J200 makes up 83% of the ALSI index (J203). Additions to this index may be seen as positive since this index is tracked by ETFs such as SATRIX 40 and other passive index funds. However, additions may also have a more neutral effect since the share price returns of these companies may have a significant influence on the movement of the overall market which may reduce their abnormal returns, depending on which benchmarking model is used.

Finally, the J260 is a fundamentally weighted index. Since membership in this index may convey information to the market, it is expected that the share price

effects for inclusions to and exclusions from this index will be higher than the share price effects for any other index.

In order to see which indices have the greatest effect on the share price of included and excluded companies, the CAARs were compared visually and by using Table 4 and Table 5. Only the CAARs from the market model were used since, as discussed above, they produced more realistic abnormal returns.

Additions and deletions to the J260 displayed the highest abnormal CAARs out of the four indices under investigation. This makes sense since the market may consider the index changes to convey information about the long term investment prospects of these companies. The market cap weighted indices are driven by the investor awareness hypothesis. While this may produce an awareness of the newly included shares, there is no urgency to purchase these shares since inclusion in the index does not imply that these companies are good investments.

Out of the market cap weighted indices, deletions produced CAARs that were close to zero, which is consistent with the investor awareness hypothesis. Additions to the J210 produced the highest CAAR while additions to the J200 and J213 produced similar CAARs. The CAAR for the J210 is almost double the CAAR for the J200 or the J213.

This is surprising since the J210 is the smallest index in terms of total market capitalisation. This may indicate that investors in the FTSE/JSE are prone to

overvalue resource stocks, possibly because of South Africa's history in the resource sector.

Alternatively, this may indicate that smaller indices produce larger share price effects for added companies. This is an area that has not been investigated before and may be a topic for future research.

### 6.7.5 Research Question 5: Has the index premium changed over time?

Yun and Kim (2010) showed that in the case of the Korean market, the index premium increased significantly as index tracking funds and ETFs were introduced into the market. Wurgler (2010) showed how the index premium attached to the S&P 500 has grown over time as the popularity of index-linked investing has grown.

Data was collected in this study from the beginning of the FTSE/JSE indices in 2002. At this time, ETFs were in their infancy in South Africa. The end date of the study is 10 years later, where index-linked investing is becoming more common and ETFs are no longer regarded as exotic investment vehicles. It is therefore likely that the index premium for index changes taking place in the second half of the study (2007 to 2011) is larger than the premium for index changes in the first half of the study (2002 to 2006).

In order to determine the index premium for each interval, CAARs were calculated for additions to and deletions from each index according to the methodology described in Section 4. These CAARs were first calculated using only events that fell in the first period (2002 to 2006). Then the CAARs were

calculated using only events that fell in the second period (2007 to 2011). The results were then examined visually.

The results show very little difference in the share price effects between the two periods. This was a surprising result which may be due to two reasons. Firstly, it is possible that the sample was not large enough to give an accurate result. The CAARs were extremely volatile, especially in the long term window. Sample size has been mentioned earlier as a possible cause for volatility. Secondly, this result may support the suggestion that ETFs and other passive index-linked funds do not dominate the JSE stock market.

# 7. Conclusions

## 7.1 Summary and Conclusions

This study attempts to measure the effects on the share price of companies entering and exiting four FTSE/JSE indices. These indices were the J200 (FTSE/JSE Top 40 Index), the J210 (FTSE/JSE Resource 20 Index), the J213 (FTSE/JSE Financial and Industrial 20 Index) and the J260 (FTSE/JSE RAFI Index). This is the first study of these price effects on the FTSE/JSE.

Long horizon CAARs had only weak statistical significance. Thus strong conclusions cannot be made about the behaviour of the share prices, however, systematic patterns were observed during the event window so some conclusions can be drawn.

The study found that the behaviour of the share prices of companies entering and exiting market cap weighted indices is consistent with the investor awareness hypothesis. The shares of companies entering the index experience positive CAARs, while the shares of companies exiting the index do not experience significant negative CAARs. The CAARs are permanent and do not reverse within the first 200 days after the index change.

The behaviour of the share prices of companies entering and exiting indices weighted by fundamentals is consistent with the information hypothesis. The shares of companies entering the index experience positive CAARs and the shares of companies exiting the index experience symmetrical negative CAARs.

The CAARs are permanent and do not reverse within the first 200 days after the index change.

Abnormal returns were calculated by using two methods. Firstly, the market model was used where the daily returns of the affected companies were compared to the returns of the index that they were entering or exiting. Secondly, the CAPM model was used where daily returns were compared to the returns of the All Share Index (J203) multiplied by the company's beta. The market model was a superior benchmark in this study. This may be due to the use of a specialised index for the market model and a general index for the CAPM model.

Unlike most prior studies, the CAARs for additions to the index only became positive after the change date. This would indicate that passive investment funds are given some leeway in terms of what kind of tracking error they can incur. Therefore they are able to trade strategically around the change date. Alternatively, the activities of passive investment funds in the JSE are not as influential as the activities of these funds in other markets. This conclusion is supported by the fact that there was no observable change in the index premium over time.

In conclusion, this study found that there is a long term price effect for index changes for value weighted and fundamental weighted indices of the JSE. The fact that most of the positive abnormal returns occur after the index change may indicate market inefficiency and this means that arbitrage opportunities may exist around index changes.

## 7.2 Research Limitations

- Sample sizes were a large limitation of the research. Previous studies have been conducted on the S&P 500 (500 companies), Russel 1000 (1000 companies), Russel 2000 (2000 companies) and the Nikkei 500 (500 companies). Initially most studies were focused on the S&P 500, but the focus shifted to the Russel indices since the S&P 500 sample size was criticised as being too small. Small sample sizes mean that the erratic behaviour of one company may affect the CAAR significantly. Thus volatility increases and it becomes more difficult to draw firm conclusions from the study.
- The J260 was instituted in 2007 and the first review meeting took place in March 2008. This timing coincided with the sub-prime financial crisis. Additionally, the J260 is only reviewed once a year. Thus there were only four review meetings that determined the sample for the J260 index changes. It is possible that the J260 CAARs were affected by the market volatility in the last four years.
- The JSE is not made up of as many companies as some of the larger stock exchanges. This means that some companies may move in and out of the same index within the event window. This would create a confounding event which may skew the data. Additionally, some companies would be included in more than one index on the same day, or they would be included in one index and excluded from another in a similar time frame. These confounding events add noise to the data. Visual checks were carried out to identify

outliers, but this manual process of cleaning the data has severe limitations. This creates difficulties in making firm conclusions over long event horizons.

- In addition to the presence of confounding events, conclusions from long event horizons pose difficulties due to the standard error of the CAAR. As the event horizon increases, so the standard error increases until eventually it is impossible to state with confidence whether the CAAR is statistically significant or not.
- Most of the additions to the indices studied show a positive run up before the announcement date. The opposite is true for index deletions. While this run-up has mainly been attributed to market anticipation of the impending index change, previous studies have stated that this run-up may be due to the normal growth that the company is experiencing. It is due to this growth that the company is able to join the index in the first place. This study was not able to separate the abnormal returns due to anticipation of the index change and the business related growth of the company's share price.

## 7.3 Recommendations for Further Research

- This study used the standard market model and the CAPM model to calculate abnormal returns. This was based on an opinion of Shankar and Miller (2006) who found that there is no advantage in using more complicated models for benchmarking purposes. However, as found by Ward and Muller (2010), abnormal returns calculated using a multi-factor control portfolio are much more sensitive. This study should therefore be

repeated using this approach, and the results compared to the market model which provided the best results in this case.

- As discussed above, a positive CAAR was observed on the days preceding the announcement date for additions to indices and the opposite was observed for deletions. There is some confusion about whether these abnormal returns were due to anticipation of the index change, or whether they were due to the normal business growth of the company. A study of the volume traded during this period should be done in order to identify the drivers for this behaviour.
- The J260 experienced a disturbance from day 25 to day 80. As stated previously, the J260 index revisions all occurred during the sub-prime financial crisis, when the CAAR was susceptible to significant market movements. A suggestion to explain this disturbance is that it is likely that foreign investors who are not familiar with JSE companies will invest in companies that are deemed to be safe investments, thus the constituents of the J203 and the J260 would be likely targets. This would have to be confirmed with further research.
- Additions to the J210 index showed different behaviour for the short term horizon compared to the long term horizon. In the short term, the behaviour is consistent with the price pressure hypothesis. In the long term horizon, its behaviour is consistent with the investor awareness hypothesis. Most current research on index reconstitution effects is focused on the short term effects. However, the short term horizon may be misleading. A detailed

study should be done in order to compare the short term horizon with the long term horizon of all indices, not only the FTYSE/JSE indices.

- Finally, it was found that the size of an index may influence the effect on the share prices of companies that are affected by the index changes. This would have to be investigated in more detail.

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