THE MARKET IMPACT ON SHARES ENTERING OR LEAVING JSE INDICES

Craig Miller

Mike Ward[1]

Gordon Institute of Business Science

University of Pretoria

South Africa

[1] mchlwrd@gmail.com

Abstract

A company's entry into (or exit from) a major share index provides a special opportunity to examine price discovery. In an efficient market, we expect the demand curve to remain horizontal and to be unaffected by external events that do not communicate new information to the public, even if demand is affected. However, there is evidence that changes to index composition do impact the value of affected shares. This may be due to the price pressure generated by passively managed investment funds that simultaneously reconstitute their portfolios in order to remain aligned to the index that they are tracking. This study investigates downward sloping demand curves, price pressure and other hypotheses which are related to changes in index composition on the JSE.

We calculate abnormal returns using a control portfolio model for shares entering/exiting four major FTSE/JSE indices between 2002 and 2011.

In the pre-event window, a long term increasing trend was observed in the share prices of companies that are added to market cap weighted indices, beginning 70 trading days before the effective date. The opposite behaviour was true for index deletions, with some variation in the timing.

In the post event window the results show, to some extent, an asymmetric response to share returns; shares entering the index underperform thereafter, whereas those leaving the index out-perform. Although these findings were not significant for all of the indices examined, they do support the price pressure hypothesis of Harris and Gurel (1986).

1. Introduction

In an efficient market 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. The demand curve for the share should therefore be horizontal and the share price should not be affected by external events that do not communicate new information to the public, even if the demand for the share is affected (Scholes, 1972). This means that the demand curve for a share should be perfectly elastic.

However, there is evidence of a share price change when a company is added to or deleted from an index (Liu, 2011). This may mean that index membership changes the way that investors value the share. Since index composition changes do not contain new information about the company the price response may indicate that the demand curve for shares may be downward sloping rather than perfectly elastic (Shleifer, 1986). Alternatively, this price response may be explained due to the price pressure generated by passively managed investment funds that are all forced to simultaneously reconstitute their portfolios in order to remain aligned to the index that they are tracking (Green & Jame, 2011; Petajisto, 2009; Wurgler, 2010). This price pressure may introduce short-run liquidity constraints which would lead to a temporary price movement (Harris & Gurel, 1986). The long-run demand curve would therefore remain horizontal.

This study investigates the effect on the share price of a company's entry into (or exit from) a major FTSE/JSE Africa index. Downward sloping demand curves, price pressure and other hypotheses for this price response are investigated.

2. Literature Review

Active fund managers commonly use indices as performance benchmarks (Roll, 1992) and to reduce their risk of underperformance (Cremers & Petajisto, 2009). To reduce the tracking error between their fund's performance and the benchmark, asset managers purchase shares in companies that belong to these benchmarks in similar proportion to the benchmark weights (Kappou, Brooks, & Ward, 2010; Wurgler, 2010).

Similarly, individual investors can invest in low cost and well diversified index-linked funds to achieve returns equal to the performance of a particular index (Branch & Cai, 2010). Due to 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).

2.1 The Index Reconstitution Effect

The increasing popularity of passive investing has had some surprising effects on the share prices of the constituent companies of major market indices. Petajisto (2011) shows a share price increase of 8.8% for companies added to the S&P 500 and a 15.1% decrease for companies deleted from this index over the period 1990 to 2005. Wurgler (2010) shows that this index reconstitution effect has grown with the popularity of index-linked investing, and a number of hypotheses have been proposed to explain these observed effects.

2.1.1 Price Pressure Hypothesis

The price pressure hypothesis asserts that the share prices of companies that are added (deleted) to an index temporarily increase (decrease) due a short-term increase (decrease) in demand from index-linked funds (Harris & Gurel, 1986). Price pressure is caused since shares of newly added companies are purchased and shares of the deleted companies are sold when the index changes are effective (Petajisto, 2009). This is done by all funds on the same day since index-linked funds have an objective to reduce tracking error (Cremers & Petajisto, 2009). This hypothesis assumes that the long run demand is still perfectly elastic and therefore prices will revert to their original levels (Harris & Gurel, 1986).

At the end of 2005, funds directly linked to the S&P 500 owned just over 10% of the market value of the companies comprising this index, implying that when a company was added to the S&P 500 there was a demand shock for around 10% of its shares (Petajisto, 2009). Studies have shown that this demand shock creates a temporary surge in price and volume for the share, which reverses over time (Biktimirov, Cowen & Jordan, 2004; Shankar & Miller, 2006).

2.1.2 Imperfect Substitute Hypothesis

In contrast to these findings, Shleifer (1986) found that shares that are added to the S&P 500 index experience a permanent increase in their share price. He attributed this to a downward sloping demand curve for shares.

Chen (2006) also argued 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). Since it is arbitrage that keeps the demand curve for share prices horizontal, irrespective of the demand, this hypothesis is known as the imperfect substitute hypothesis.

2.1.3 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. The addition of a company into a prominent index may lead to more institutional and private trading and lower bid-ask spreads. This increase in liquidity leads 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).

While the majority of studies have shown that inclusion into an index does increase liquidity, some authors suggest that liquidity may occasionally decrease (Chakrabarti, Huang, Jayaraman & Lee, 2005; Wurgler & Zhuravskaya, 2002). This is due to the large number of institutional investors who have a mandate to simply 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.

2.1.4 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 company such as stability, reduced risk or improved quality of management, although he notes that the Standard and Poor's Corporation repeatedly states that their index selection process takes no account of the investment appeal of the share. Denis, McConnell, Ovtchinnikov and Yun (2003) find evidence to support this hypothesis by showing that analysts revise their earnings expectations of firms that have been added to an S&P index. They also found that these firms demonstrate better earnings per share than their peers. Further, Platikanova (2008) showed that earnings quality improves on inclusion to the S&P index. This effect is also shown with the Korean index, the KOSP 200, by Yun & Kim, (2010).

2.1.5 Investor Awareness Hypothesis

The investor awareness hypothesis asserts that the inclusion of a share into an index increases awareness of the share and this leads to a permanent increase in the share price (Chen, Noronha & Singal, 2004). Barber and Odean (2008) showed that out of the thousands of shares that they could potentially buy, individual investors will consider shares that have already caught their attention. Inclusion into an index increases the size of the investor population who own these shares, which reduces the shadow cost of these shares (Merton, 1987), causing the cost of capital of the firm to fall, leading to a higher share price (Chen et al., 2004). Additionally, the increased attention of the firm by the investor community serves as an incentive for management to produce better results (Denis et al., 2003).

According to the investor awareness hypothesis, inclusion into an index should lead to a permanent share price increase but firms that are deleted from the index should not experience an immediate permanent share price reduction

(Chen et al., 2004). This is because it is not possible to make investors unaware of a company by removing it from an index (Elliott, Ness, Walker, & Wan, 2006). Therefore asymmetric abnormal returns for additions and deletions to indices would support the investor awareness hypothesis.

2.1.6 Conclusions Regarding Benefits of Index Membership

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 by small sample sizes and other issues that make it difficult to disentangle the different effects from each other (Biktimirov et al., 2004).

A summary of the hypotheses can be found in the following table.

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. 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, Mehrotra & Morck, 2000) (Chakrabarti et al., 2005)
Liquidity Hypothesis	Additional liquidity due to increased trading volumes leads to lower cost of capital and more investment	Permanent price increase for index additions. Uncertain if price decrease for deletions is temporary or permanent.	(Amihud & Mendelson, 1986) (Hegde & McDermott, 2003) (Becker-Blease &

	opportunities.		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) (Dhillon & Johnson, 1991) (Cai, 2007)
Investor Awareness Hypothesis	Investors are aware of major index members and are more likely to buy these shares. Investors do not become unaware of companies when deleted from the index.	Permanent price increase for index additions. No permanent price effect for deletions. Price increase and decrease effects are thus asymmetrical.	(Chen et al., 2004) (Elliott et al., 2006) (Mase, 2006)

2.2 Response of Index Funds

On account of the effects noted above, index tracking funds incur costs due to trading on the day that the index re-composition occurs (Blume & Edelen, 2004; Gastineau, 2002; Green & Jame, 2011). Since the major economic benefit of investing in such funds is the reduced transaction costs due to infrequent trading (Boldin & Cici, 2010), it stands to reason that fund managers would try to minimise their costs during the times that they do trade. Green and Jame (2011) recommended that in order to reduce these re-balancing costs, index funds should trade strategically around the day of the index reconstitution. The use of intraday trading as a strategy for increased returns was suggested by Kappou et al. (2010), whilst Blume and Edelen (2004) show that some large index funds use strategic trading to provide enhanced returns while maintaining low tracking error. The fact that the price effect on the S&P 500 index reconstitutions peaked in 2000 (Petajisto, 2011), despite the growing popularity of index tracking instruments (Wurgler, 2010), might be attributable to more strategic trading by index fund managers.

3. Methodology and Data

3.1 Overview

Our study aims to examine the effects that additions and deletions of companies from different indices of the JSE have on the share price of these companies. Shleifer (1986) originally recommended using an event study methodology, and this has been the standard methodology for almost all subsequent studies (Bos, 2000; Chen, 2006).

Our study examined four indices of the JSE, each with different attributes.

3.1.1 ALSI Top 40 – J200

The FTSE/JSE Top 40 consists of the 40 largest companies of the FTSE/JSE All Share Index (ALSI) measured by market capitalisation (FTSE, 2009). In order to limit changes to the index, constituents are added when they are ranked as the 35th largest company or above and deleted when they are ranked as 46th or below (JSE Limited & FTSE, 2011). The index is reviewed quarterly.

3.1.2 RAFI 40 – J260

The FTSE/JSE RAFI 40 is the first non market-cap weighted FTSE/JSE index. It reflects the performance of the top 40 companies of the ALSI measured by fundamental variables such as dividends, cash flow, sales and book value (FTSE, 2008). The index is reviewed once a year.

3.1.3 Resources 20 – J210

The FTSE/JSE Resources 20 Index consisted of the 20 largest companies of the resource sector ranked by market cap (JSE Limited, 2008). In 2011 the J210 was changed to the Resource 10 Index and 10 shares were removed from the index. Constituents are added when they are ranked as the 8th largest company or above and deleted when they are ranked as 13th or below (JSE Limited & FTSE, 2011). Prior to March 2011, constituents were added once they were ranked 17th or above and deleted when they were ranked 24th or below. The index is reviewed quarterly.

3.1.4 Financial and Industrial 30 – J213

The FTSE/JSE Financial and Industrial 30 Index is comprised of the 30 largest companies of the financial, basic industrial and general industrial economic sector ranked by market cap (JSE Limited, 2008). Constituents are added when they are ranked as the 27th largest company or above and deleted when they are ranked as 34th or below (JSE Limited & FTSE, 2011). The index is reviewed quarterly.

3.2 Population and Sample

The population for this study consisted of all companies that were added to or deleted from these 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.

This study excluded companies that were added to or deleted from an index on account of corporate actions such as listings, de-listings and liquidations. 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 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 200 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.

All index composition adjustment announcements are published on the FTSE website (FTSE, 2011) and the JSE website (JSE Limited, 2011b). These announcements contain the announcement date and the effective date, which were both required to study the price effects (Petajisto, 2011). The majority of

relevant index changes were found in the Quarterly Index Review documents, but all announcements on the FTSE website (FTSE, 2011) from 2002 onwards were reviewed to ensure that companies that were added or excluded due to another company experiencing a corporate action were identified and included.

3.3 Data Analysis

Two events must be included in the event study: the announcement date and the effective date (Petajisto, 2011). The effective date was denoted as T=0.

The daily closing share price (P_{it}) of companies that were added to or deleted from an index between the years 2002 and 2011 were measured. The daily share price return (R_{it}) was measured by:

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

The residual or abnormal return (AR_{it}) was calculated by subtracting the actual return (R_{it}) from the expected return (K_{it}) generated by a specific benchmark:

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

The average abnormal return (AAR_t) was then calculated by averaging the abnormal returns of all sample firms being studied in common event time:

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

The cumulative average abnormal return (CAAR) was then calculated by compounding the average residuals from the beginning to the end of the event window.

In order to identify outliers, the individual cumulative abnormal return (CAR) of each company was compared to all the other individual CARs of the sample. Companies with CARs that deviated materially from the rest of the sample were removed from the CAAR since their behaviour was most likely influenced by a confounding event that was not part of this study.

3.3.1 Benchmarks

Three benchmarks have been used in other studies in order to calculate the abnormal returns.

3.3.1.1 Standard Market Model

Previous studies using the standard market model used a customised portfolio of shares (Kaul et al., 2000) or a simple market index (Chen et al., 2004; Shankar & Miller, 2006).

3.3.1.2 CAPM Model

A more refined methodology is to use the CAPM model as the benchmark. This model adjusts the market return by the company's beta. This methodology has been used by Amihud and Mendelson (1986), Elliot et al. (2006) and Shankar and Miller (2006). The expected return (K_{it}) can be represented as follows:

$$K_{it} = \beta_i R_{mt} \qquad \text{(Formula 4)}$$

3.3.1.3 Control Portfolio Model

Lyon, Barber & Tsai (1999) note that the analysis of long-term abnormal returns is "treacherous" (Lyon et al., 1999:165). Therefore, an important consideration for long-term studies is the choice of benchmark against which abnormal returns are estimated. Although many event studies use a single parameter CAPM model as the benchmark, this has been shown to be inadequate. In particular, the CAPM fails to account for expected returns on the basis of company size as well as growth versus value (see Fama & French, 1992, 1993, 1995, 1996, 1998) and in the South African context, a further consideration is 'resource' versus 'non-resource' shares (see van Rensburg 2001; van Rensburg & Robertson 2003a, 2003b). Accordingly, a 12 parameter 'style' model was used to estimate benchmark returns in this study. Following Mordant & Muller (2003), Mutooni & Muller (2007) and Ward & Muller (2010) twelve 'control portfolios' of shares representing the cross-sectional factors of size, growth/value and resources/non-resources were constructed and betas for each share in the sample estimated against these. Abnormal returns (ARs) for each share could then be estimated using the multiple regression equation described in Ward & Muller (2010).

3.3.2 Bootstrapping Procedure

Event studies generally have abnormal return distributions that are right skewed with heavy tails (Serra, 2002). Additionally, small sample sizes cannot rely on the Central Limit Theorem for normality. Therefore a non-parametric bootstrapping procedure was used for statistical testing (Ward & Muller, 2010).

The bootstrapping procedure calculated separate daily abnormal returns for each of the shares in each event sample during a two year estimation period outside of and prior to the event window. A distribution of 400 samples was constructed. Bootstrap distributions were then constructed for the CAARs of each event window. The abnormal returns for each event period could then be tested against this distribution to test for significance.

3.3.3 Event Windows

The following event windows were used in this study. The entire study uses a time frame of [-20,+200] .

Table 2: Summary of Event Windows

Description	Window	Duration
Pre-announcement Period	[-20; 0]	21 trading days
Post-Announcement Period	[-7; 0]	8 trading days
Post Change Period	[0; 20]	21 trading days
Long-horizon Post Change Period	[0; 200]	201 trading days

3.3.3.1 Pre-announcement period

Index change announcements generally occur on trading day -7. The pre-announcement window ensures that movement due to information leakage, arbitrage, or other anticipation of the announcement, can be identified (Petajisto, 2011).

3.4 Research Limitations

A limitation of this research was the small number of events available for analysis. This same limitation has been stated in studies of the S&P 500 (Biktimirov et al., 2004) and others.

The long horizon event window extends to 200 trading days after the effective date, however, standard error limits conclusions about whether the price change is temporary or permanent.

4. Results

4.1 Review of the Data

The following table shows a summary of the final data set.

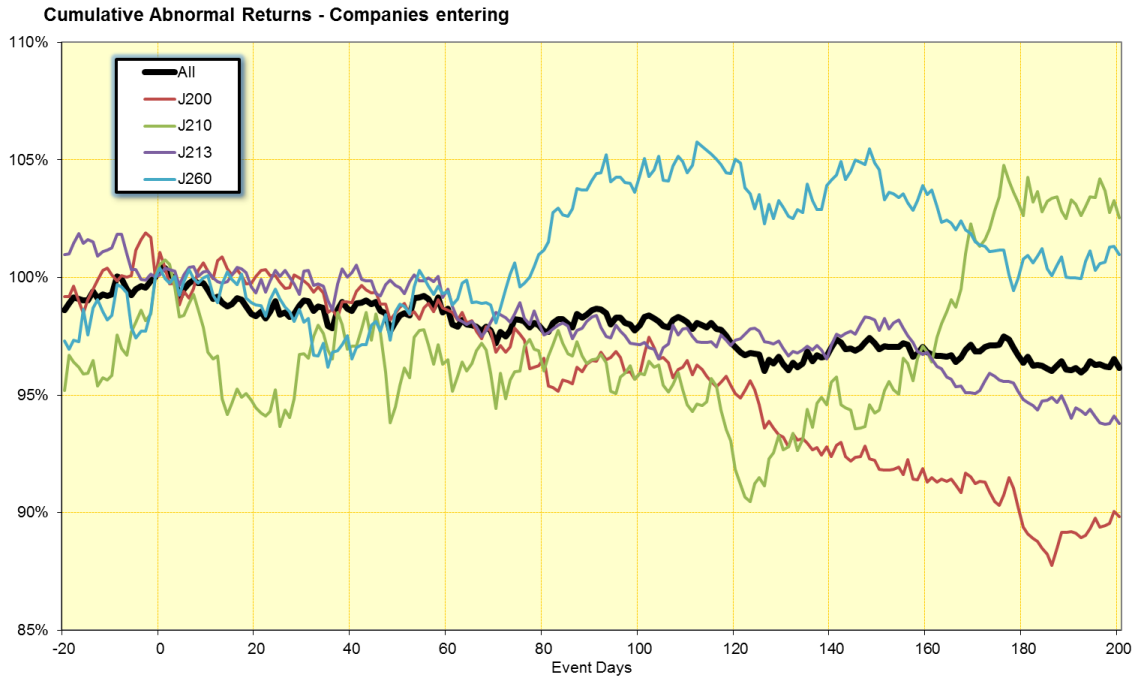
	Original Sample	Exclusions	Qualifying sample	Sample at end of window
J200 Additions	28	0	28	28
J200 Deletions	27	3	24	22
J210 Additions	30	4	26	26
J210 Deletions	35	5	30	27
J213 Additions	48	2	43	40
J213 Deletions	45	2	42	42
J260 Additions	24	2	22	19
J260 Deletions	28	3	25	25

The following figures present the cumulative average abnormal returns (CAARs) for companies that are added to or removed from the indices discussed above when measured against the Control Portfolio model. The event window [-20; 200] has been used and CAARs start at T=0 (i.e. we accumulate the CAARs from the effective day; subtracting ARs prior to T0).

4.2 Companies Entering the Index

Figure 1 presents the CAARs for companies added to the various indices.

Figure 1: CAARs for index additions for event window [-20; +200]



The black line shown in Figure 1 represents the CAARs for all companies added to all of the indices included in this study. The average share price of these companies seems to appreciate steadily from the beginning of the event window until the effective day. The share price experiences a very short increase on the effective day and for the next few days, but this increase is quickly lost as the share price decreases steadily, until stabilising after about 120 days.

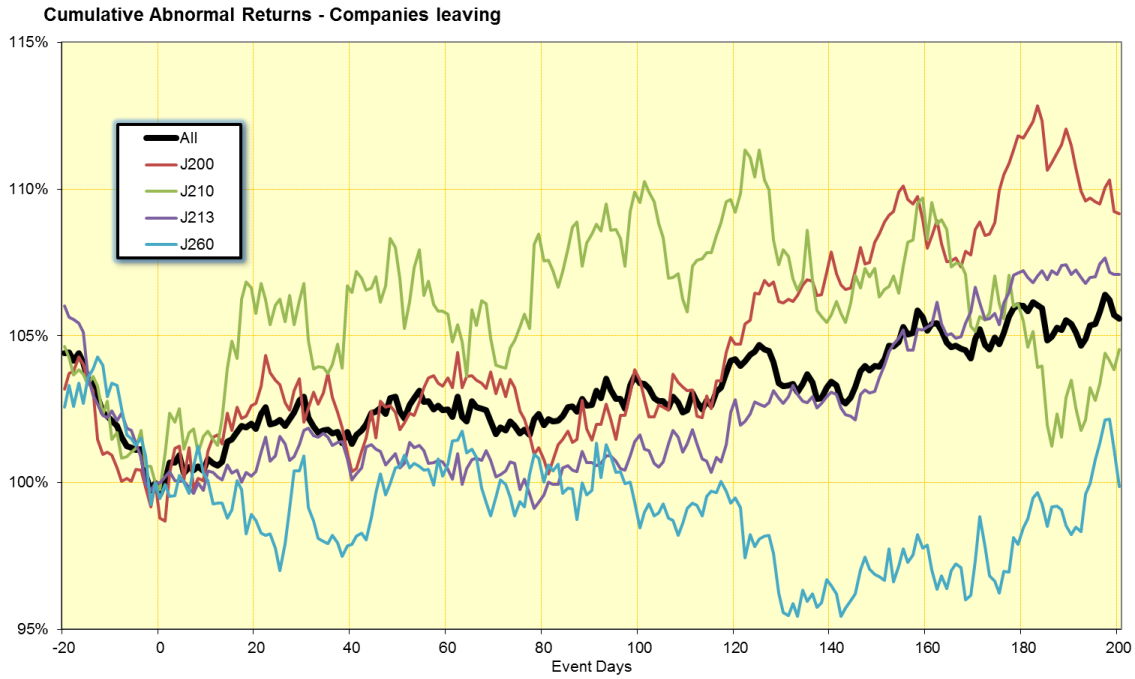
The CAARs for the J200 and the J213 follow the same general trend as described above, except that the J213 decreases slightly in the pre-event period T-20 to T=0. The CAARs for the J210 are volatile and therefore it is difficult to describe its behaviour in terms of a consistent pattern. However, the CAARs increase from T-20 to T=0 and then decrease from T=0 to T+120. From T+120 the CAARs for the J210 increase dramatically.

The CAARs for the J260 display a different behaviour entirely. The CAARs seem to increase until T=0 then decrease until T+40. After this initial decrease, the CAARs increase steadily for the next 50 days after which they stabilise.

4.3 Companies Leaving the Index

Figure 2 presents the CAARs for companies removed from the various indices.

Figure 2: CAARs for index deletions for event window [-20; +200]



The black line shown in Figure 2 represents the CAARs for the companies deleted from all of the indices included in this study. The share price behaviour, as might be anticipated, is the inverse of the behaviour of the companies that were added to the indices. The average share price of the deleted companies declines steadily from the beginning of the event window until the effective day. The share price experiences a very short decrease on the effective day and for the next few days, but this decline is reversed very quickly after T+1 as the share price increases steadily until stabilising. It is unclear whether the share price stabilises after 160 days or at a date outside of the event study since a slight upward trend remains apparent in the figure.

Once again, the CAARs of the J200 and the J213 follow the trend of the total CAARs. The J210 seems to follow this trend as well, although with much more volatility and with decreasing CAARs after T+120.

The CAARs of the J260 seem to follow a different trend. They decrease consistently until T=0, thereafter stabilising somewhere between 95% and 100%.

4.4 Statistics

The statistical significance of each index change for all the event windows is shown below. The figures in the tables are measured using a bootstrap distribution constructed from the companies making up the sample, but using random dates. Table 3 shows the statistical significance of the different event windows for index additions. Table 4 shows the statistical significance of the different event windows for index deletions.

Table 3: Statistical significance of CAARs for index additions at key points

Event	t-20	t-7	t20	t200
J200 CAAR	0.76%	-0.05%	0.04%	-10.18%
z-value	0.68	-0.04	0.26	**-2.03**
RankPct	25%	53%	37%	**101%**
J210 CAAR	4.92%	3.37%	-5.55%	2.54%
z-value	1.54	**2.04**	**-2.05**	0.05
RankPct	9%	**5%**	**99%**	45%
J213 CAAR	-1.00%	-0.99%	-0.64%	-6.20%
z-value	-0.72	**-1.45**	-0.57	**-1.57**
RankPct	72%	**95%**	72%	**97%**
J260 CAAR	2.65%	0.62%	-1.15%	0.97%
z-value	1.59	0.73	-0.56	0.41
RankPct	7%	21%	76%	27%
All CAAR	1.39%	0.48%	-1.66%	-3.86%
z-value	1.67	0.91	**-1.91**	-1.31
RankPct	7%	18%	**98%**	90%

(Figures in bold indicate significance at a 5% level)

Table 4: Statistical significance of CAARs for index deletions at key points

Event	t-20	t-7	t20	t200
J200 CAAR	3.15%	0.15%	2.72%	9.09%
z-value	**2.18**	0.25	**1.58**	**2.02**
RankPct	**3%**	39%	**4%**	**4%**
J210 CAAR	4.56%	0.90%	5.69%	5.09%
z-value	**1.50**	0.47	**2.26**	0.84
RankPct	**6%**	32%	**1%**	22%
J213 CAAR	5.87%	1.85%	0.37%	6.99%
z-value	**5.12**	**2.44**	0.57	**2.48**
RankPct	**1%**	**1%**	29%	**2%**
J260 CAAR	2.58%	1.62%	-1.26%	0.27%
z-value	1.64	1.77	-0.71	-0.11
RankPct	6%	6%	74%	49%
All CAAR	4.32%	1.23%	1.82%	5.54%
z-value	**5.29**	**2.26**	**2.04**	**2.41**
RankPct	**1%**	**1%**	**5%**	**3%**

(Figures in bold indicate significance at a 5% level)

5. Discussion of Results

5.1 General Behaviour of Indices Weighted by Market Cap

As mentioned in the review of the data, additions and deletions to all three of the indices weighted by market capitalisation display similar behaviour. Companies that are added to these indices experience an increase in their share price during the days leading up to the effective day. After the index is reconstituted, the share prices of these newly added companies experience a decrease in their share price. It is unclear whether this decrease is larger than the initial price build up, but the J210 shows statistically significant results for the T+20 event window and the J200 and J213 show statistically significant CAARs for the T+200 event window.

The opposite behaviour is true for index deletions, where the share price of deleted companies experience statistically significant decreases in the days

leading up to the effective day, and then statistically significant increases in the days following. The J200 and the J210 show significant increases for the T+20 window and the J200 and the J213 show significant CAARs for the T+200 window.

This result is unexpected and does not fit easily into any of the previously proposed hypotheses listed in Table 1.

Examining the pre-event window using a larger time frame provides insight into the nature of the JSE and offers a possible explanation for this behaviour. To test the accuracy of the control portfolio model over the large event window, we conducted a monte-carlo analysis. Using the same list of share codes (and allowing repetition to expand the sample size), but with random dates we examined the CAARs between T-100 and T+120.

Figure 3: CAARs for Companies Entering Using Random Dates

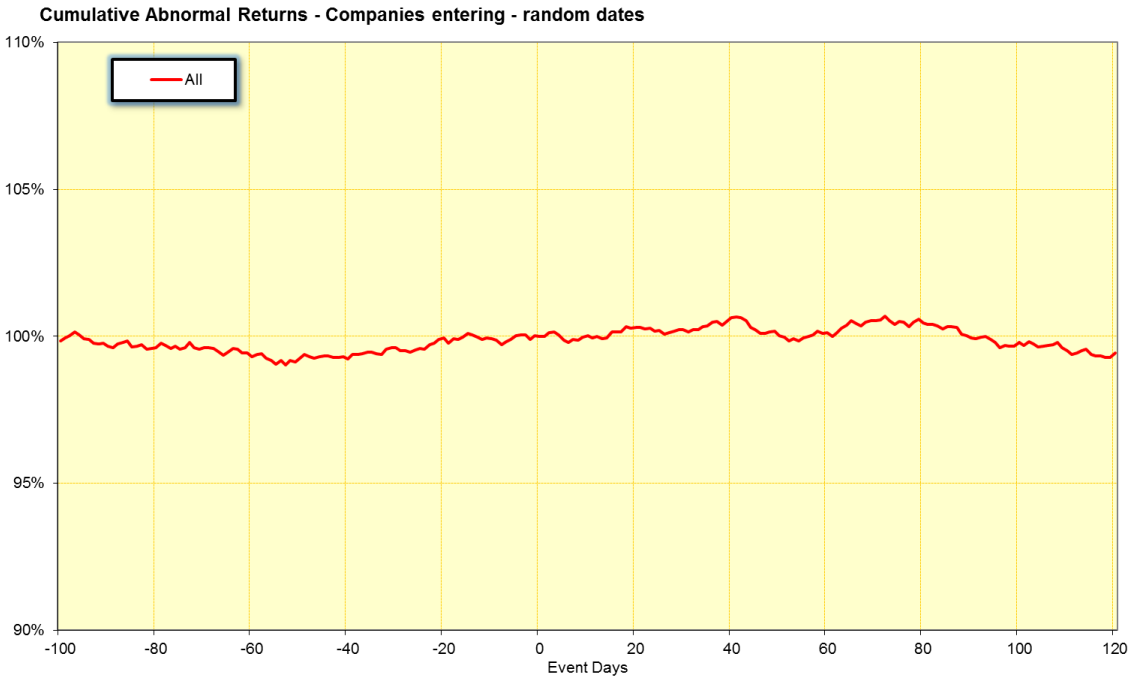


Figure 3 shows a very satisfactory plot of the CAARs for random dates across the 221 day window. Although some deviation around the base line is evident,

it is clear that the control portfolio methodology is robust enough to test long event windows – at least for shares which are well traded, as in this instance.

Figure 4: Index Additions with Extended Pre-event Window

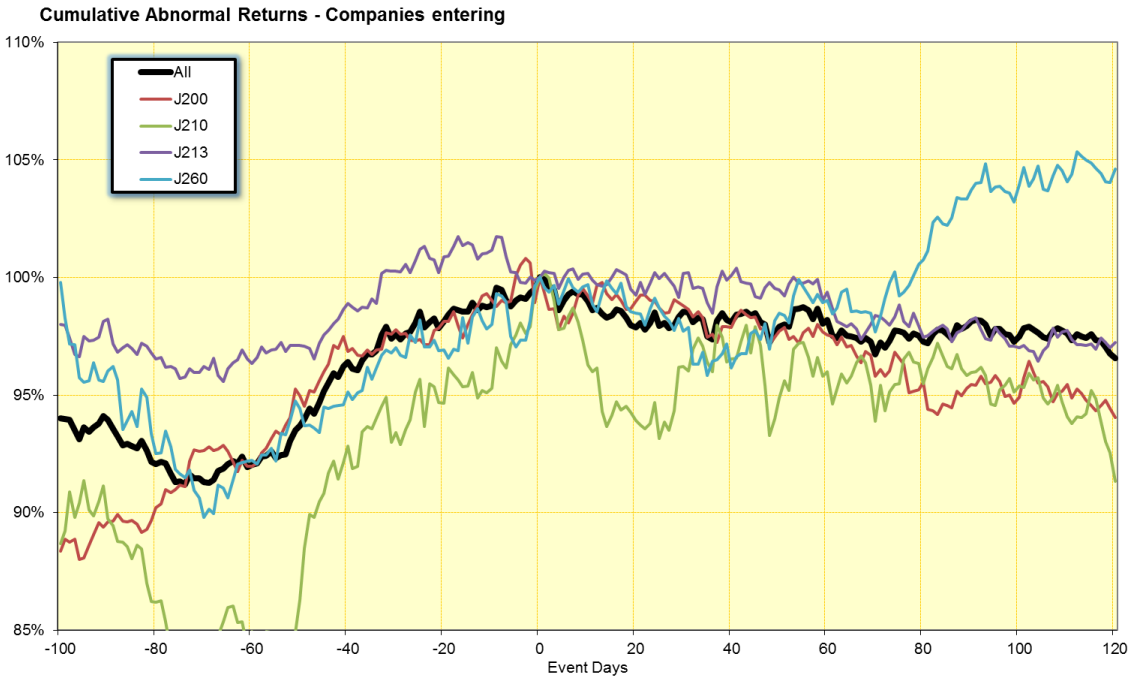


Figure 5: Index Deletions with Extended Pre-event Window

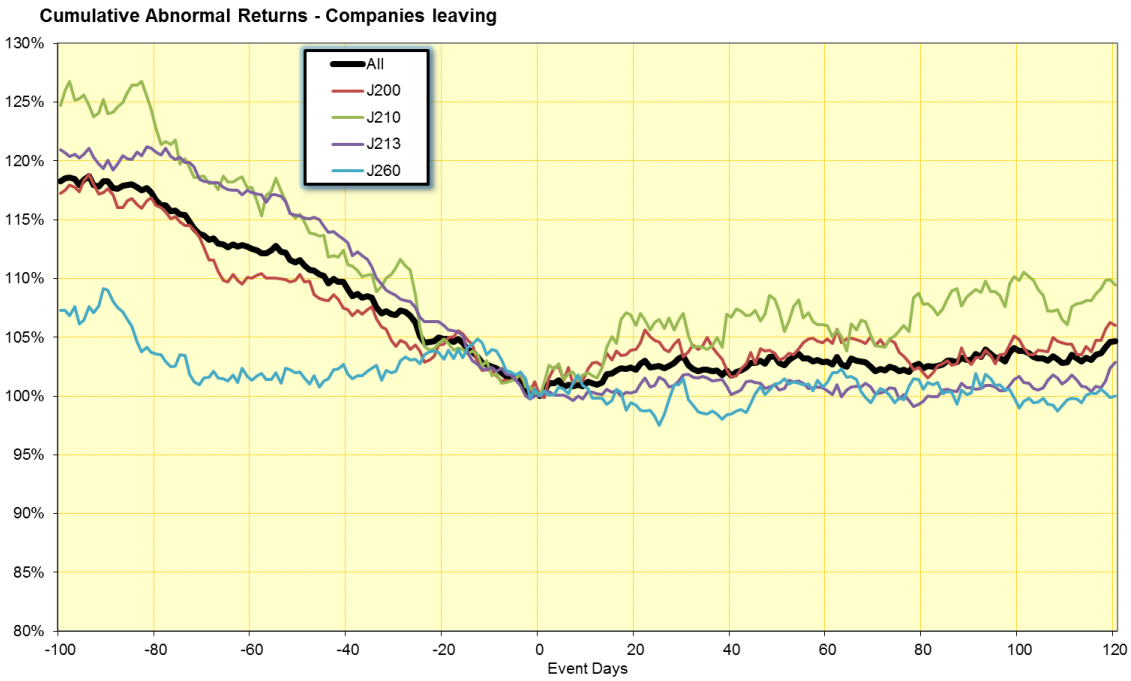


Figure 4 and Figure 5 show that a 20 day pre-event window is insufficient to capture the share price increase for index additions, or the decrease for index deletions. Rather, the share prices of companies that are to be added to the index starts increasing about 70 trading days before the index reconstitution date, and on average prices increase about 7%. Similarly, the share prices of companies that are to be deleted from the index start decreasing about 100 trading days before the index reconstitution date, and fall on average by about 17%.

The possibility exists that the pre-event share price increase for index additions (or decrease for index deletions) is an artefact of the data (i.e. we would expect share prices to decline before being deleted from the index and vice versa). This is more likely to be the case for shares deleted from the index (Figure 5) where the declining CAARS are evident for an extended period of at least 100 trading days. For shares added to the index, the CAARs only increase for about 60 days before the event, so this is less likely to be an artefact of the data, but still possible.

It is unlikely that this movement can be attributed to strategic investing by fund managers since their management ability is measured by both fund performance and tracking error against the fund's benchmark (Baker, Bradley, & Wurgler, 2011). Thus it is unlikely that fund managers would have the leeway to pre-empt the market so far in advance. A more reasonable explanation may be that the JSE is dominated by arbitrage traders who hope to maximise on the index reconstitution effect. Arbitrageurs buy shares of companies that are likely to be included into the index in advance and hold these shares until after the index is reconstituted, after which they are acquired by index trackers, but with weaker demand. The opposite would be true for index deletions.

This theory supports Chen, Noronha and Singal (2006) who report that the price increase on the effective day is primarily driven by arbitrageurs and that the price effect is only temporary. This supports the price pressure hypothesis as described by Harris and Gurel (1986).

5.2 J200 and J213 Behaviour

The behaviour of the J200 and the J213 closely follow the CAARs of all index additions and index deletions and therefore no further discussion is necessary.

5.3 J210 Behaviour

Shares entering and exiting the J210 show a similar behaviour to shares entering the J200 and J213, although the J210 contains much more volatility and therefore it is difficult to analyse the CAARs with much gravitas. Recall that the J210 was changed from a 20 member index to a 10 member index in 2011 (JSE Limited & FTSE, 2011). Thus the observed volatility is unsurprising due to the small sample size. Predictions of the behaviour of the CAARs of the J210 should therefore be based on the general behaviour of the other market cap indices, which has been discussed above.

5.4 J260 Behaviour

The J260 does not display the same behaviour as the other indices examined in this study. This is not surprising since the J260 is an index weighted by several company related fundamentals, which are more complex to anticipate than market capitalisation. The market appears to be less efficient in the estimation of these fundamentals.

The pre-event behaviour for the J260 is similar to the market cap indices for index additions and deletions and statistically significant CAARs at a 10% level are observed during this window. However, there are no statistically significant results post the effective date and therefore no inferences can be made regarding the behaviour of the share prices of companies added to or deleted from this index.

5.5 Research Limitations

Although it has been shown that the market cap indices are affected by price arbitrage and pressure effects before and during index reconstitution, this study was limited by a number of factors:

5.5.1 Small sample size

Most previous studies have been conducted on indices such as the S&P 500 (comprising 500 shares) and the Russell 2000 (comprising 2000 shares). Thus a study which examines indices comprising no more than 40 to 50 shares will evidence a reduced sample size, and the returns will be more heavily influenced by outliers in the data.

5.5.2 Market inefficiency

The effect on share prices of index reconstitutions has been documented on the S&P 500 for more than 25 years (Amihud & Mendelson, 1986; Harris & Gurel, 1986; Shleifer, 1986). However, this is the first such study 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. A lack of knowledge about the index effect on the FTSE/JSE may mean that the market is less efficient, which may explain why the CAARs of the indices in the study all settle a number of days after the effective date.

5.5.3 Passive linked fund market

This study did not quantify the percentage of the South African market that is owned by index linked funds, but we do not believe these funds dominate the market.

While there is not a significant change in the CAAR between the announcement day and the effective day, there is a definite long term trend both before and after the effective date. This would imply that investors do react to the index change. If the passive linked fund market is significant, then this would imply that funds are able to trade strategically around the effective date. This would be in line with the suggestions made by Green and Jame (2011).

5.6 Is the price change permanent?

Lyon et al. (1999) state that the analysis of long term abnormal returns is treacherous. Petajisto (2011) agrees 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. In this study however, we find significant trends in the long horizon CAARs observed both before and after the effective day.

It would appear as though the price change is not permanent for market cap weighted indices, therefore confirming that price pressure dominates these JSE indices, however, this observation makes sense only when analysed using a pre-event window that is much longer than other academic studies. This is a surprising observation and merits further investigation.

6. Conclusions

This study measures the effects on the share prices of companies entering or exiting four FTSE/JSE indices: 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.

Abnormal returns were calculated using a control portfolio model, since this provided the most sensitive and accurate measurement over a long event window. A bootstrap procedure was used for the statistical testing.

Measured at a 5% significance level, the long horizon CAARs of indices weighted by market cap were statistically significant for both index additions and index deletions. An exception to this was the J210 (Resources Index) where the CAARs exhibited high levels of volatility in the measurements. This volatility may have been caused by small sample sizes and the fact that the J210 included only 10 companies from 2011. The short horizon CAARs of the J210 were found to be statistically significant.

The CAARs for the post-event window for the J260 were not statistically significant. This index is the only index in the study that is weighted by fundamental values and not by market cap. This difference may have contributed to this result, and it is possible that the market is less efficient in assessing fundamental variables than share return data.

The pre-event window for all indices showed statistically significant increases/decreases. This was especially evident for index deletions, which on average fell about 17% in the 100 days preceding the index reconstitution.

In the pre-event window, a long term increasing trend was observed in the share prices of companies that are added to market cap weighted indices. This trend begins 70 trading days before the effective date. After the effective date, the share price decreases consistently for the next 120 days. The opposite behaviour was true for index deletions, with some variation in the timing. Thus it is shown that the share price changes are only temporary and this supports the price pressure hypothesis of Harris and Gurel (1986).

A somewhat surprising finding was how early the share prices of these companies started to respond to upcoming index changes. In most studies, share price activity is seen only a few days before the effective date. The JSE indices appear to respond to upcoming index changes much earlier. Whilst it is possibly an artefact of the data, it is also possible that the JSE is affected by arbitrage and opportunistic traders who anticipate these changes.

In the post event window the results show, to some extent, an asymmetric response to share returns; shares entering the index underperform thereafter, whereas those leaving the index out-perform. Although these findings were not significant for all of the indices examined, they do support the fact that most of the share movement precedes the event, and that this may be overstated and reversed post the event.

7. References

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics, 17*(2), 223-249.

Baker, M., Bradley, B., & Wurgler, J. (2011). Benchmarks as limits to arbitrage: Understanding the low-volatility anomaly. *Financial Analysts Journal, 67*(1), 40-54.

Barber, B. M., & Odean, T. (2008). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *The Review of Financial Studies, 21*(2), 785-818.

Becker-Blease, J. R., & Paul, D. L. (2006). Stock liquidity and investment opportunities: Evidence from index additions. *Financial Management, 35*(3), 35-51.

Biktimirov, E. N., Cowan, A. R., & Jordan, B. D. (2004). Do demand curves for small stocks slope down? *Journal of Financial Research, 27*(2), 161-178.

Blume, M. E., & Edelen, R. M. (2004). S&P 500 indexers, tracking error, and liquidity. *Journal of Portfolio Management, 30*(3), 37-46.

Boldin, M., & Cici, G. (2010). The index fund rationality paradox. *Journal of Banking & Finance, 34*(1), 33-43.

Bos, R. J. (2000). *Event study: Quantifying the effect of being added to an S&P index.* Standard and Poors.

Branch, B., & Cai, L. (2010). Fundamental weighting. *Journal of Applied Finance, 20*(1), 64-77.

Cai, J. (2007). What's in the news? Information content of S&P 500 additions. *Financial Management, 36*(3), 113-124.

Chakrabarti, R., Huang, W., Jayaraman, N., & Lee, J. (2005). Price and volume effects of changes in MSCI indices – nature and causes. *Journal of Banking & Finance, 29*(5), 1237-1264.

Chen, H., Noronha, G., & Singal, V. (2004). The price response to S&P 500 index additions and deletions: Evidence of asymmetry and a new explanation. *Journal of Finance, 59*(4), 1901-1929.

Chen, H., Noronha, G., & Singal, V. (2006). Index changes and losses to index fund investors. *Financial Analysts Journal, 62*(4), 31-47.

Chen, H. L. (2006). On Russell index reconstitution. *Review of Quantitative Finance and Accounting, 26*(4), 409-430.

Cremers, K. J. M., & Petajisto, A. (2009). How active is your fund manager? A new measure that predicts performance. *The Review of Financial Studies, 22*(9), 3329-3365.

Denis, D. K., McConnell, J. J., Ovtchinnikov, A. V., & Yun, Y. U. (2003). S&P 500 index additions and earnings expectations. *Journal of Finance, 58*(5), 1821-1840.

Dhillon, U., & Johnson, H. (1991). Changes in the Standard and Poor's 500 list. *The Journal of Business, 64*(1), 75-85.

Elliott, W. B., Ness, B. F. V., Walker, M. D., & Wan, R. S. (2006). What drives the S&P 500 inclusion effect? An analytical survey. *Financial Management, 35*(4), 31-48.

Fama, E., & French, K. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance, 47*(2), 427-465.

Fama, E., & French, K. (1993). Common Risk Factors in the Returns of Stocks and Bonds. *Journal of Financial Economics, 53*, 427-465.

Fama, E., & French, K. (1995). Size and Book to Market Factors in Earnings and Returns. *Journal of Finance, 50*, 131-155.

Fama, E., & French, K. (1996). Multifactor explanations of asset pricing anomalies. *Journal of Finance, 51*, 55-84.

Fama, E., & French, K. (1998). Value versus Growth: The International Evidence. *Journal of Finance, 53*, 1975-1999.

FTSE. (2008). *FTSE/JSE RAFI 40 index factsheet.* Retrieved August 2, 2011, from http://www.ftse.com/Indices/FTSE_JSE_Africa_Index_Series/Downloads/FTSE_JSE_RAFI_40_Index_Factsheet.pdf

FTSE. (2009). *FTSE/JSE top 40 index fact sheet.* Retrieved August 2, 2011, from http://www.ftse.com/Indices/FTSE_JSE_Africa_Index_Series/Downloads/FTSE_JSE_Top_40_Index_Factsheet.pdf

FTSE. (2011). *Index changes.* Retrieved July 30, 2011, from http://www.ftse.com/Indices/FTSE_JSE_Africa_Index_Series/Index_Changes.jsp

Gastineau, G. L. (2002). Equity index funds have lost their way. *Journal of Portfolio Management, 28*(2), 55-64.

Green, T. C., & Jame, R. (2011). Strategic trading by index funds and liquidity provision around S&P 500 index additions. *Journal of Financial Markets, 14*(4), 605-624.

Harris, L., & Gurel, E. (1986). Price and volume effects associated with changes in the S&P 500 list: New evidence for the existence of price pressures. *The Journal of Finance, 41*(4), 815-829.

Hegde, S. P., & McDermott, J. B. (2003). The liquidity effects of revisions to the S&P 500 index: An empirical analysis. *Journal of Financial Markets, 6*(3), 413-459.

Jain, P. C. (1987). The effect on stock price of inclusion in or exclusion from the S&P 500. *Financial Analysts Journal, 43*(1), 58-65.

JSE Limited. (2008). *FTSE/JSE Africa index series: A comprehensive guide.*

JSE Limited. (2011a). *FTSE/JSE.* Retrieved July 5, 2011, from http://www.jse.co.za/Products/FTSE-JSE.aspx

JSE Limited. (2011b). *ICA announcements.* Retrieved July 31, 2011, from http://www.jse.co.za/Products/FTSE-JSE/ICA-Announcements/

JSE Limited, & FTSE. (2011). *Ground rules for the management of the FTSE/JSE Africa index series version 2.2.*

Kappou, K., Brooks, C., & Ward, C. (2010). The S&P 500 index effect reconsidered: Evidence from overnight and intraday stock price performance and volume. *Journal of Banking & Finance, 34*(1), 116-126.

Kaul, A., Mehrotra, V., & Morck, R. (2000). Demand curves for stocks do slope down: New evidence from an index weights adjustment. *The Journal of Finance, 55*(2), 893-912.

Liu, S. (2011). The price effects of index additions: A new explanation. *Journal of Economics and Business, 63*(2), 152-165.

Lyon, J. D., Barber, B. M., & Tsai, C. (1999). Improved methods for tests of long-run abnormal stock returns. *The Journal of Finance, 54*(1), 165-201.

Mase, B. (2006). Investor awareness and the long-term impact of FTSE 100 index redefinitions. *Applied Financial Economics, 16*(15), 1113-1118.

Merton, R. C. (1987). A simple model of capital market equilibrium with incomplete information. *The Journal of Finance, 42*(3), Papers and Proceedings of the Forty-Fifth Annual Meeting of the American Finance Association, New Orleans, Louisiana, December 28-30, 1986), 483-510.

Mordant N., & Muller C. (2003). Profitability of director's share dealings on the JSE. *Investment Analysts Journal, 57*, 17–32.

Mutooni R., & Muller C. (2007). Equity Style Timing. *Investment Analysts Journal, 65*, 15–24.

Petajisto, A. (2009). Why do demand curves for stocks slope down? *Journal of Financial & Quantitative Analysis, 44*(5), 1013-1044.

Petajisto, A. (2011). The index premium and its hidden cost for index funds. *Journal of Empirical Finance, 18*(2), 271-288.

Platikanova, P. (2008). Long-term price effect of S&P 500 addition and earnings quality. *Financial Analysts Journal, 64*(5), 62-76.

Roll, R. (1992). A mean/variance analysis of tracking error. *Journal of Portfolio Management, 18*(4), 15-24.

Scholes, M. S. (1972). The market for securities: Substitution versus price pressure and the effects of information on share prices. *The Journal of Business, 45*(2), 179-211.

Serra, A. P. (2002). Event study tests: A brief survey. *Working Papers Da FEP no. 117,*

Shankar, S. G., & Miller, J. M. (2006). Market reaction to changes in the S&P SmallCap 600 index. *Financial Review, 41*(3), 339-360.

Shleifer, A. (1986). Do demand curves for stocks slope down? *The Journal of Finance, 41*(3), Papers and Proceedings of the Forty-Fourth Annual Meeting of the America Finance Association, New York, New York, December 28-30, 1985), 579-590.

Van Rensburg, P. (2001). A decomposition of style-based risk on the JSE. *Investment Analysts Journal, 54*, 45-60.

Van Rensburg, P., & Robertson, M. (2003a). Style Characteristics and the Cross-section of JSE Returns. *Investments Analysts Journal, 57*, 1-10.

Van Rensburg, P., & Robertson, M. (2003b). Size, Price to Earnings and Beta on the JSE. *Investments Analysts Journal, 58*, 1-11.

Ward, M., & Muller, C. (2010). The long-term share price reaction to black economic empowerment announcements on the JSE. *Investment Analysts Journal, 71*, 27-36.

Wurgler, J. (2010). On the economic consequences of index linked investing. *NBER Working Paper no. 16376.*

Wurgler, J., & Zhuravskaya, E. (2002). Does arbitrage flatten demand curves for stocks? *Journal of Business, 75*(4), 583-608.

Yun, J., & Kim, T. S. (2010). The effect of changes in index constitution: Evidence from the Korean stock market. *International Review of Financial Analysis, 19*(4), 258-269.