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THE IMPACT OF SHARES MOVING IN AND OUT OF FTSE/JSE TOP 40 INDEX

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ABSTRACT: *This study explored the price reactions of shares moving in and out of Johannesburg Stock Exchange (JSE) Top 40 Index by applying three models to calculate the abnormal returns of the stocks; namely: the market model, the Capital Asset Pricing Model (CAPM) using leveraged betas and CAPM using unlevered betas. An event study methodology was used to measure the abnormal returns around the event date windows. The average abnormal returns (AARs) and cumulative average abnormal returns (CAARs) were tested for statistical significance for various windows. The three models used show increasing (decreasing) CAARs for additions (deletions) when examined over the longer-term windows; however, CAARs showed mixed results for short-term cumulative windows. The study found price reversal for stock prices over the longer-term horizon for prior and post events. The stock price AARs for the pre-announcement date were found to be significant for the stocks to be deleted from the index, but not statistically significant for additions. There were higher asymmetric abnormal average returns for the deletions and additions when using the market model approach. The study further found that the deletion from the index and addition to the index experienced positive and negative AARs respectively on a change day of the event. This implies that it is possible to earn average abnormal returns. However, such anomalies should disappear if the market becomes more efficient.*

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1.0 INTRODUCTION

Different investors' clientele buys or sells the stocks that are moving in and out of an index. Their behaviour differs depending on whether the investor is an index tracker, speculator, individual or active managers. The prices and the volume of the stocks are affected by the actions taken by different investors. The extent of the effect differs depending on the characteristics of the stock markets – such as the breadth, volume and information flow (Chen, Hong & Stein, 2002).

This study aims to identify any possible investment opportunities that may be generated as a result of the stock moving in and out of the Financial Times Stock Exchange/Johannesburg Stock Exchange Top 40 Index (FTSE/JSE Top 40 Index). The FTSE/JSE Top 40 Index represents the 40 largest companies in the FTSE/JSE All-Share Index as ranked by full market capitalisation (FTSE/JSE Africa, 2016b:15). As some of the market participants are expected to act over a window period, the investors can position their portfolios in anticipation of the event to exploit possible arbitrage opportunities. Thus, the study was conducted to discover if there are any trading opportunities that may be exploited to take advantage of the known event impacting the market participants.

This research aimed to answer questions related to the behaviour of the stock price performance prior to index inclusion or exclusion and post the index inclusion or exclusion. A further question the study aimed to deal with was whether the abnormal price that stocks experience during the event window is temporary or permanent.

This study is structured as follows: section two focuses on the literature review. Section three is the research methodology, and the result analysis is contained in section four, while section five concludes the work.

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2.0 LITERATURE REVIEW

When a company is added to or deleted from the stock market index due to index revisions, there seem to be reactions from the market in relation to trading in that particular stock. Different literature sources present different empirical results with regard to the index revision of shares moving in and out of the index. Significant volume and price changes of that particular stock were observed (Wilkens & Wimschulte, 2005). This abnormal movement occurs even though the stock's fundamentals have not changed.

2.1 The price and trading reactions before and after the implementation (change) date

In the stock markets, there are different types of buyers and sellers of the stocks. Due to the time lag between the announcement date and effective date of the index for companies that are likely to be added and deleted to the index, different investors trade differently. The speculators and arbitrageurs buy shares that are likely to be added to the index after the announcement (-7 days before the event) date leading to the implementation (change) date and sell the stocks that are likely to be deleted from the index (Shleifer, 1986). There is a possible window of opportunity for the speculators to make a profit by positioning differently in anticipation of index activities (Beneish & Whaley, 1996). Although the speculative activities exist, in an efficient market such profitability will be inconsistent with the EMH (Fama, 1970). The index trackers are interested in reducing tracking error as much as possible and they trade on the day the changes become effective (Green & Jame, 2011).

A study on the National Association of Securities Dealers Automated Quotations (NASDAQ) and the New York Stock Exchange (NYSE) listed stocks found that the index funds rebalancing trading activities are clustered closer to and after the close of the event date, implying the funds rather try to minimise the tracking error than to maximise the profit (Kappou, Brooks & Ward, 2009). Earlier, Lynch and Mendenhal (1995) found the same trading patterns of the index funds

in Standard and Poor's top 500 companies (S&P 500). They found the trades occur the day prior to the index changes as evidenced by the largest volume and attributed that to the index funds trying to minimise tracking error relative to a benchmark (Lynch & Mendenhal, 1995:354).

Although the trading is clustered around the day before the effective date, Kappou *et al.* (2009) reported significant overnight price increases immediately after the announcement date which questions the ability of speculators to maximise profits for stocks moving in and out of the index. The existence of abnormal returns is inconsistent with a semi-strong form of the efficient market, as advocated by Fama (1965; 1998). Kappou *et al.* (2009), however, argued that the arbitrage returns exist, but diminish after the announcement date until the change date.

Amihud and Mendelson (1986) believe that the abnormal returns exist even after the effective date as speculated returns are associated with increased liquidity for stocks expected to be added to the index. However, Petajisto (2009) argued that some practitioners previously took speculative positions in anticipation of index events (such as Morgan Stanley Capital International (MSCI) rebalance) which cannot be attributed to liquidity only (Petajisto, 2009).

The competition amongst the speculators may be higher, hence reducing the speculative profit to an insignificant level (Schwert, 2002). Accordingly, Schwert (2002) agreed to the diminishing profit opportunities once the deviations from the fair value of stock prices are well discovered.

Beneish & Whaley (1996), and Blume & Edelen (2002) suggested that the index matching strategies that do not cluster trading around the effective date – but between the announcement date and the change date – reduce price pressure on change date and enhance returns for additions.

Due to minimisation of tracking error by the index funds and the predictability of announcement date for index changes, there is an opportunity for a wealth transfer from index funds to arbitrageurs that can be created in anticipation of likely index funds rebalancing to align to new index changes (Chen, Noronha & Singal, 2006:31). If the majority of FTSE/JSE Top 40 Index trackers trade in a closing auction a day (a change date) before the effective date – like major

counterparts in other indices – the question is whether there is a wealth loss suffered by the index investors. Although there is evidence of price and volume between the announcement date, the effective date, and the post-change date, there is no clear-cut literature regarding the trading strategies and trading periods in anticipation of index changes particularly by index funds (Blume & Edelen, 2002).

Frino, Gallagher, & Oetomo (2005) documented that most index funds rebalance their large portfolio holdings on the effective day of the index changes. Frino *et al.* (2005) further recommended that the index or passive fund managers should rebalance their holdings prior to the effective date of index changes. Higher returns and lower trading costs were observed when adopting this trading periods window (Frino *et al.*, 2005: 25).

3.0 RESEARCH DESIGN

For this research study, the event study methodology was suitable for examining the abnormal returns between the announcement date and effective date (Qiu & Pinfold, 2007). Most literature (Shleifer, 1986; Chen *et al.*, 2006) recommended event study methodology, which has been standard for subsequent research on index additions and deletions (Miller & Ward, 2015:88). Liu (2009) recommended the event study approach since it allows for smaller sample sizes and a shorter window period than other methodologies.

In line with the primary objective of investigating the relationship between the addition or deletion and the stock prices, the causal relationship was used to determine the direction of the market reaction (Saunders, Lewis & Thornhill, 2009).

The quantitative methodology was used for the study. The effect of the impact of the event was captured through the average abnormal returns and cumulative average abnormal/excess returns (Liu, 2011, Petajisto, 2009).

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3.1 Sampling size/data analysis

For each quarter, the population of stocks considered for sample inclusion and exclusion was all the stocks that met the FTSE/JSE criteria. The stocks that normally moved in to FTSE/JSE Top 40 Index during the study emerged from the FTSE/JSE Mid Capitalisation index (FTSE/JSE Africa, 2016b:23) – however, two stocks (British American Tobacco – BAT – and Lonmin Public Limited Company – LON) in the sample were added to the index after passing free float adjustments (FTSE/JSE Africa, 2013). Thus, the stocks (BAT and LON) were relatively higher market capitalisation stocks before they were part of the FTSE/JSE Top 40 Index but their lower free float disqualified them to be in the index. The analysis was performed on a daily basis around the event window period.

The final sample size was reduced to 56 companies after excluding some companies due to corporate actions such as mergers and acquisitions or companies that experienced a name change. Table 1 shows that over the period June 2002 to June 2016, there were 88 events of the companies included or excluded from the FTSE/JSE Top 40 Index. The maximum movement in and out of the index experienced over the period was 13 times in 2015 and the minimum was two times in both 2004 and in 2016 (as at June for 2016). The first and third quarters seem to dominate the index revisions with 23 and 28 times respectively.

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Table 1: The number of companies added and deleted from the index each year

All Year	Qtr1 Mar	Qtr2 Jun	Qtr3 Sep	Qtr4 Dec	Total
2002		4		3	7
2003	2	3			5
2004			2		2
2006	2		2	2	6
2007	4			2	6
2008	2		2	4	8
2009	4		2		6
2010	3	4			7
2011		2	2	2	6
2012		2	2	2	6
2013	2			4	6
2014	2		2	4	8
2015		6	2	5	13
2016	2				2
Total	**23**	**21**	**16**	**28**	**88**

Source: FTSE/JSE data.

Table 2 shows that there were 45 addition and 43 deletion events that occurred over the window. The mismatch of the addition and deletion events (45 and 43 respectively) was due to the dually listed equity instrument by some companies. The FTSE/JSE treated those instruments as one for index inclusions or exclusions. For example, Mondi's instruments are MNP and MND on the FTSE/JSE Top 40 Index, and Investec's equities are represented as INL and INP on the index.

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All Year	Qtr1 Mar	Qtr2 Jun	Qtr3 Sep	Qtr4 Dec	Total
Addition	12	11	8	14	**45**
Deletion	11	10	8	14	**43**
All	**23**	**21**	**16**	**28**	**88**

Table 2: The number of companies added and deleted from the index each quarter

Source: FTSE/JSE data.

Figure 1 shows that only one company (1.79% of sample of 56 companies) experienced five revisions over the study period; two companies (3.57% of sample) were revised four times; three companies (5.36% of sample) revised three times; 16 companies (28.57% of sample) two times; while 34 companies (60.71% of sample) either moved into the index and stayed, or moved out of index and never returned back over the target period.

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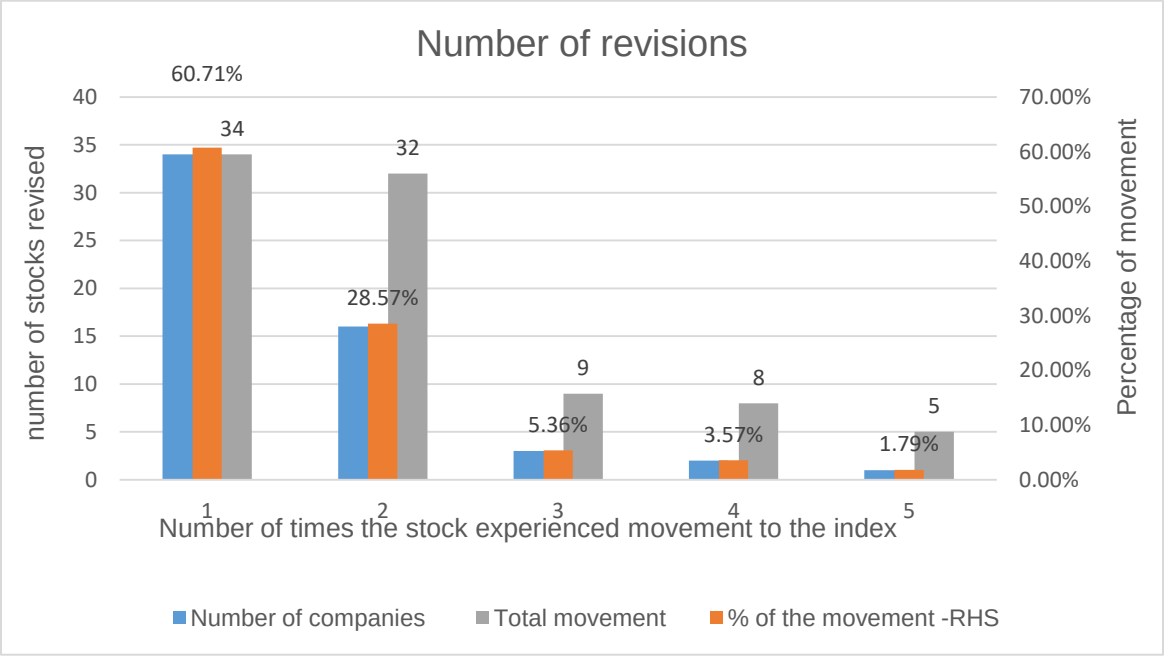

Figure 1: The number of companies that experienced revisions

3.2 Event windows

The event windows applied in previous studies varied in different markets. Figure 2 shows the entire event windows period pre-determined to be minus 20 days (-20 days) prior to the event to 200 days post the event (+200 days) in this study. This is similar to the study done in the South African market for the FTSE/JSE index (Miller & Ward, 2015). The t -20 days before the event was defined as days before the event effective date, starting from t -7 which was defined as the post announcement date, t -1 which was the change or implementation date, t = 0 which was defined as an effective date, while t +10 to less than t +20 and t +200 which were defined as the post event date. The minus seven days' post-announcement was in line with the FTSE/JSE guidelines and Miller and Ward (2015). The longer-term prior event days' (below -20 days) movement may capture most of the company specific events outside the index changes either due to the good news that the company is experiencing, causing its market value to increase and

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move into the FTSE/JSE Top 40 Index. Inversely, the decline of stock, forcing it to move out of the Top 40 maybe be due to temporary or short-term negative sentiment about the firm.

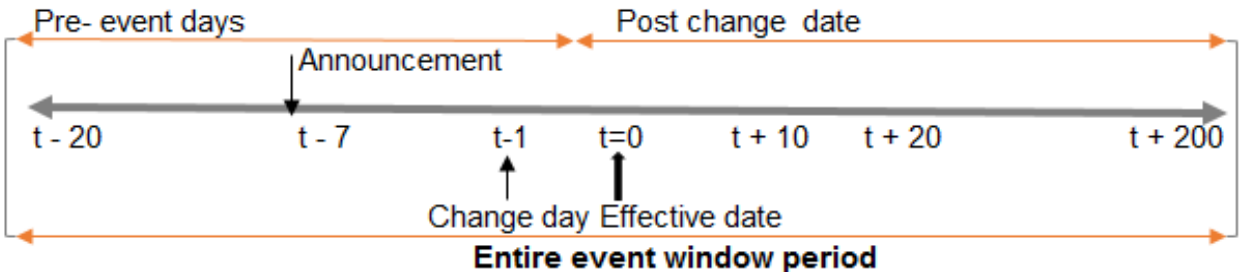

Figure 2: The event windows covered in the study

3.3 The return calculations

Literature point to the market model for the calculation of abnormal returns – either a customised (Kaul *et al.*, 2000) or a simple market model index (Chen, Noronha & Singal, 2004). The three benchmarks that were used in most markets in previous studies were the standard market model index, CAPM, and the control portfolio model. In the Miller and Ward (2015) study, the control portfolio model was used as the benchmark.

The parameters used for calculation also varied: in some markets, there was a usage of 150 days before announcement date to eliminate the noise post announcement date (Biktimirov, 2004). In previous research related to FTSE/JSE indices abnormal returns, the window period of between 20 days and 200 days was used as a measurement for pre-effective and post-effective trading days respectively (Miller & Ward, 2015). The Miller and Ward (2015) study focused on 20 days before the event, with more emphasis on between the announcement date (-7 days) and post change window. This emphasis is due to the inherent outperformance to be experienced by the companies to be included in the index: those companies which experience the increased market value that results in their inclusion in the index.

The market model and the CAPM (utilising both the leveraged and unleveraged betas), were used in this study. The CAPM is the one factor model that uses the stock beta and market returns

to arrive at risk adjusted returns of the stock relative to the market. The leveraged betas take into consideration the capital structure of the firm, while excess returns account for incremental benefits or risk associated with the geared company. The unleveraged betas take out the effect of gearing in returns. The unleveraged betas were mostly reported in the later years of this study, making it difficult for comparison of the statistical significance of returns, whether using the leveraged betas or unleveraged betas.

3.4 Calculation of abnormal returns

Due to the stock returns' distributional characteristics, the continuously compounded returns were utilised, similar to most event studies for the stock returns. Miller and Ward (2015) used this approach in their study, so also are other studies such as Wilkens & Wimschulte, 2005 and Qiu & Pinfold, 2007. The logarithm daily returns are defined as:

$$Ri,t = In\left(\frac{Si,t}{Si,t-1}\right) \quad (1)$$

The daily excess returns for the stock were calculated using the FTSE/JSE All Share Index as a benchmark as covered in the literature. The previous study by Miller and Ward (2015) utilised the same benchmark for the market model. The stock excess return over the period is denoted by:

$$ARi,t = Ri,t - Rm,t \quad (2)$$

Where Ri,t is the stock return (i) at time t and Rm,t is the FTSE/JSE All Share Index returns at time t during the event window period [-20, 200].

The average excess returns corresponding to time t are calculated across all the stocks that were impacted by the index changes (Campbell, Lo & MacKinlay, 1997). The average excess returns are calculated as:

$$AARt = \frac{1}{N}\sum_{i=1}^{N} ARi,t \quad (3)$$

This is in line with Miller and Ward (2015) event study of FTSE/JSE indices and it is recommended for event studies (Campbell *et al.*, 1997). Further, the CAARs for period t_1 and t_2 $[t_1,t_2]$ serve as the indicator for information flow processing (Wilkens & Wimschulte, 2005) . The speed of the market process information can be defined as:

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$$CAARt1,t2 = \sum_{t=t1}^{t2} 1/N \sum_{i=1}^{N} ARi,t \quad (4)$$

In addition to the simple market model, the CAPM using both the leveraged and unleveraged returns was examined. For the CAPM, the risk adjusted expected returns were calculated as:

$$Er\ (i,t) = \beta\mathbb{L},i * Rm,t \quad (5)$$

$$Er\ (i,t) = \beta\mathcal{U},i * Rm,t \quad (6)$$

Where $\beta\mathbb{L},i$ is the stock (i) at time t leveraged beta and $\beta\mathcal{U},i$ is the stock (i) at time t unleveraged betas. The betas were calculated using FTSE/JSE All Share Index returns at time t as the benchmark.

The abnormal returns for the CAPM-based returns are expressed as:

$$ARi, = Ri,t - Er\ (i,t) \quad (7)$$

Where Ri,t is the stock return (i) at time t and $Er\ (i,t)$ is the stock's CAPM (i) at time t.

3.1.5 Other hypothesis measures

The information hypothesis is tested using the change in the market value of the stocks, which is the product of the number of common stocks outstanding and stock price. The literature supported value enhancement of the firm but argued about whether it was permanent or temporary. Amongst the prior studies that followed the market capitalisation approach were Beneish and Gardner (1995). This hypothesis is an extension of price pressure hypothesis (PPH).

$$Information\ i = \frac{MCAPi}{MCAPi-1} \quad (8)$$

As supported in the literature, the imperfect substitute hypothesis uses the abnormal returns as the proxy for the downward sloping demand curve (Shleifer, 1986).

$$AARt = \frac{1}{N} \sum_{i=1}^{N} ARi,t \quad (9)$$

The investor awareness hypothesis is measured using the changes in shadow prices (Merton, 1987) evidenced in the following equation:

$$SCi = \left(\frac{residual\ \delta i}{MV\mathcal{M}}\right) * \left(\frac{Mcapi}{\text{number of shareholders}}\right) \quad (10)$$

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Where $residual\ \delta i$ is the standard deviation of the stock, $MV\mathcal{M}$ is the market capitalisation size of the benchmark index (J203) and $Mcapi$ is the market capitalisation of the individual stock. In this study, the investor hypothesis awareness, was captured through the asymmetric price response.

4.0 THE RESULTS

In this study, the descriptive statistics provided statistical characteristics of 221 data points of the entire window, while the inferential statistics arrived at a conclusion based on the sub-samples drawn from the data points. The descriptive statistics focused more on the characteristics of AARs and CAARs for the -20 days to 200 days' window. The inferential statistics focused more on the time frame range of CAARs as covered in drawing events window.

Table 3: The summary statistics daily logarithm returns of FTSE/JSE indices

	J203 (FTSE/JSE All Share index)	J200 (FTSE/JSE Top40)	J201 (FTSE/JSE Mid cap)	J202 (FTSE/JSE Small cap)
Mean	0,04%	0,04%	0,06%	0,06%
Standard error	0,02%	0,02%	0,01%	0,01%
Median	0,08%	0,09%	0,09%	0,09%
Mode	N/A	N/A	N/A	N/A
Standard deviation	1,21%	1,33%	0,80%	0,59%
Sample variance	0,01%	0,02%	0,01%	0,00%
Kurtosis	3,31	3,22	3,80	8,94
Skewness	-15,52%	-9,70%	-51,69%	-75,59%
Range	14,41%	15,67%	10,34%	10,83%
Minimum	-7,58%	-7,96%	-5,63%	-4,59%
Maximum	6,83%	7,71%	4,71%	6,25%

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Sum	161,14%	151,07%	226,05%	232,75%
Count	3 689,00	3 689,00	3 689,00	3 689,00
Confidence level (95,0%)	0,04%	0,04%	0,03%	0,02%

Source: Computed by the Authors

4.1 Inferential statistics

The research hypotheses were defined in terms of a long-term prior event window, announcement prior event window, and change day; and were used to address the main research question of finding investment opportunities given the addition and deletion events around index changes event windows. Further, the temporary or permanent opportunities were explored to ascertain their sustainability or expected duration.

The statistical significance of the event is either accepted or rejected, depending on the price reactions before and after the event. The results compare the abnormal returns of stocks before inclusion or exclusion in the FTSE/JSE Top 40 Index and after inclusion or exclusion in the FTSE/JSE Top 40 Index. The results are presented for more stocks affected at a similar event time so the (AARs) is used. The results are further presented for time interval periods of abnormal returns of stocks resulting in (CAARs) being used.

4.1.1 The price reaction hypothesis

The stock price reaction was addressed in separate windows to establish the period during the event when investors do react to information. Investors are constantly searching for information related to investments and once discovered, the stock prices are expected to adjust to new information (Fama, 1970, 1998).

The pre-event days relevant for this study were [-20, -1], [-7, -1] and [-1] and the post event days were [0, 10], [0,20] and [0,200]. The prior events are longer-term prior event [-20, -1],

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announcement prior event [-7, -1] and change date [-1]. The post event windows are long-term post event [0,200], medium-term post event [0,20], and short-term post event [0,10].

4.1.2 The long-term prior event window

The null hypothesis was performed to test whether the CAARs before the index addition and deletion are the same as after the index addition and deletion respectively. The alternative hypothesis states that the stock performance will be different. The CAARs could be temporary or permanent.

Hypothesis 1a (null hypothesis): No market reaction occurs in the window period, which includes the prior effective date window and posts event effective windows.

Hypothesis 1b (alternative hypothesis): The market reaction occurs in the window period, which includes the pre-announcement date and post event effective windows (and will be of a temporary or permanent nature).

The market model, CAPM leveraged, and CAPM unleveraged show no statistical significance at the alpha level of 1%, 5%, and 10% for both the deletions and additions and across all event windows periods. There were no price changes before and after the events for stocks moving in and out of the index when evaluated over the longer-term prior event and post event windows.

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Table 5: The statistical results for the pre-event window [-20, -1] vs. post-event windows ([0,200] vs. [0,10] vs. [0,20])

Windows [-20, -1] vs. [0,200]	Before event	After event	Market model p	CAPM leveraged p	CAPM unleveraged p
Addition event	before*Addition	after*Addition	0.422443	0.358277	0.273475
Deletion event	before*Deletion	after*Deletion	0.233117	0.500570	0.230531

Windows [-20, -1] vs. [0,10]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	before*Addition	after*Addition	0.541650	0.688077	0.778039
Deletion event	before*Deletion	after*Deletion	0.269517	0.426620	0.404594

Windows [-20, -1] vs. [0,20]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	0.682234	0.939481	0.931196

Deletion event	Deletion*before	Deletion*after	0.174896	0.323140	0.224016

*Significant at 10%, **Significant at 5%, ***Significant at 1%

Source: Computed by the Authors

The price changes for the prior event and post event windows for the additions and deletions were mixed. As reported, there was no statistical significance for this event window. Also, the AARs were contradictory where both additions and deleted events were lower before the events and higher after the events at the same time; or the AARs were higher for additions before the event and lower post the event and opposite for deletions.

The no statistical evidence and the mixed magnitude of the price movement for additions and deletions events led to the conclusion that the stock prices are random for the longer-term prior event window CAARs (-20,1) and post event CAARs (0 to 200 day, 0 to 10 days, and 0 to 20 day). The stock prices may be a random walk, where the knowledge of the past behaviour of stock prices is not beneficial as it does not lead to expected gains (Fama, 1965:56).

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Table 6: The AARs pre-event window ([-20, -1])
vs. post-event windows ([0,200] vs. [0,10] vs. [0,20])

	Market model		CAPM leveraged		CAPM unleveraged betas	
Windows [-20, -1] vs. [0,200]	Before event	After event	Before event	After event	Before event	After event
Addition event	Higher	Lower (decreased)	Higher	Lower (decreased)	Higher	Lower (decreased)
Deletion event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)
Windows [-20, -1] vs. [0,10]	Before event	After event	Before event	After event	Before event	After event
Addition event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)
Deletion event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)
Windows [-20, -1]	Before event	After event	Before event	After event	Before event	After event

vs. [0,20]						
Addition event	Lower	Higher (increased)	Lower	Higher (slightly)	Higher	Lower (slightly)
Deletion event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)

Source: Computed by the Authors

4.1.3 Announcement prior event window hypothesis

The price experiences more significant adjustments than normal on the announcement date. The FTSE/JSE Index advisory committee on average takes place seven trading days before the effective date to announce the stocks impacted by the index changes. The information gained and provided after/from the meeting should cause the market participant to act. The null hypothesis (hypothesis 2a) and alternative (hypothesis 2b) are given as:

Hypothesis 2a: No price changes (market reaction) occur between the announcement date and effective date, and post event effective windows

Hypothesis 2b: Price changes (market reaction) occur between the announcement date and effective date, and post event effective windows (and will be of a temporary or permanent nature).

Table 7 shows no statistical significance at 10% for the market model, CAPM leveraged, and CAPM unleveraged for additions events across all event windows periods.

The deletion shows statistical significance at 1%, 5% and 10% for the market model, CAPM leveraged, and CAPM unleveraged respectively for long-term stock prices changes (-20 days to 200 days). The deletions for CAPM unleveraged show the statistical significance at 1% for the shorter-term post event (0 to 10 days). Both CAPMs are statistically significant for medium-term post event windows.

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The stocks that were deleted from the FTSE/JSE Top 40 Index experienced the different stock price performance post the index deletions. The CAARs, were negative for shares deleted.

Table 7: The statistical results for the pre-event [-7-1] vs. post-event windows ([0,200] vs. [0,10] vs. [0,20])

Windows [-7, -1] vs. [0,200]	Before event	After vent	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	0.496998	0.804610	0.945501
Deletion event	Deletion*before	Deletion*after	**0.059690	*0.015444	*0.004237
Windows [-7, -1] vs. [0,10]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	0.203253	0.386498	0.524652
Deletion event	Deletion*before	Deletion*after	0.328258	0.169605	***0.060302
Windows [-7, -1] vs. [0,20]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	0.204850	0.465191	0.663407
Deletion event	Deletion*before	Deletion*after	0.230497	***0.097470	**0.036638

*Significant at 10%, **Significant at 5%, ***Significant at 1%

Source: Computed by the Authors

Table 8 shows that the stock prices were lower before the event and higher post the event consistently for additions but not significant as reported in Table 7. For the deletion event, the stocks prices were higher before but lower post the deletion event (Table 8). The statistical significance was reported for CAPMs in the case of deleted stocks for the medium-term post

event. The CAPM unleveraged further reported the significance with lower prices before deletion and lower prices post the deletion.

The statistical significance when using the CAPMs for the deletions event might imply the market's valuation of the stock changes posts the deletions from the FTSE/JSE Top 40 Index. The betas of deleted stocks are relative to the market changes. The deleted stocks move to FTSE/JSE Mid Cap index, which reduces their liquidity (increases liquidity premium), and attracts less investor attention compared to when the stock is a constituent of the FTSE/JSE Top 40 Index. The investors may be unconsciously pricing in the higher market risk (beta adjustments) for deleted stocks. For the addition to the FTSE/JSE Top 40 Index, it could be that the market risk is overstated for CAPMs as the stocks are statistically insignificant, while for CAPMs deletions they are significant. The addition event my concur with pervious findings of overstated required return for the large capitalisation firm and understated small firms (Kappou *et al.*, 2009). It appears as if for the FTSE/JSE Mid Cap, for stocks being deleted from the FTSE/JSE Top 40 Index, the investors may be adjusting for the betas consciously or unconsciously to compensate for other risks such as lower liquidity, lower size (Mid Cap), and higher cost of capital (higher betas).

The statistically significant (Table 7) coupled with higher prices before the inclusion to the index and lower post exclusions from (Table 8) for deletion from the medium-term post event [0,20] and post long-term post event [0,200] justifies a permanent price fall. The deleted companies all experienced permanent price falls from 20 days to 200 days post the deletion event, which is inconsistent with the information hypothesis. Thus, the permanent price increase for addition but not for deletion of information hypothesis did not apply. The volatility direction (increase or decrease) is uncertain, although the deleted companies experienced a significant beta adjustment and permanent stock fall.

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Table 8: The AARs of announcement prior event window ([-7, -1]) vs. post-event windows ([0,200] vs. [0,10] vs. [0,20])

	Market model		CAPM leveraged		CAPM unleveraged betas	
Windows [-7, -1] vs. [0,200]	Before event	After event	Before event	After event	Before event	After event
Addition event	Lower	Higher (increased)	Lower	Higher (slightly)	Lower	Higher (slightly)
Deletion event	*Higher	*Lower	*Higher	*Lower	*Higher	*Lower
Windows [-7, -1] vs. [0,10]	Before event	After event	Before event	After event	Before event	After event
Addition event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)
Deletion event	Higher	Lower	Higher	Lower	*Higher	*Lower
Windows [-7, -1] vs. [0,20]	Before event	After event	Before event	After event	Before event	After event
Addition event	Lower	Higher (increased)	Lower	Higher (increased)	Lower	Higher (increased)
Deletion event	Higher	Lower	*Higher	*Lower	*Higher	*Lower

*Statistical significance when the test was conducted.

Source: Computed by the Authors

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4.1.4 Change day – index rebalancing hypothesis

The change day is when the funds that track the index normally align their funds at the auction that takes place between 16:50 and 17:00. Trading volume should be above daily average, and stock prices movement could experience abnormality due to index activities. The null and alternative hypotheses for the excessive trading hypothesis are as follows:

Hypothesis 3a: No abnormal price reaction due to excessive trading occurs during the change date and post event effective windows.

Hypothesis 3b: The abnormal price reaction due to excessive trading occurs during the change date and post event effective windows (and will be of a temporary or permanent nature).

The p-value was statistically significant when the test was conducted at the minimum of 1% alpha for before and after the event, regardless of the model used (Table 9). The results show the statistical significance at p-values of less than 1% across all windows. Thus, there is a price difference experienced for stocks being added to the index, prior to the event and after the event.

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Table 9: The statistical results for the pre-event [-1] vs. post-event windows ([0,200] vs. [0,10] vs. [0,20])

Windows [-1] vs. [0,200]	Before Event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	*0.002612	*0.001181	*0.001196
Deletion event	Deletion*before	Deletion*after	*0.002970	*0.001097	*0.002605

Windows [-1] vs. [0,10]	Before Event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	*0.001639	*0.000961	*0.000995
Deletion event	Deletion*before	Deletion*after	*0.011098	*0.004907	*0.007349

Windows [-1] vs. [0,20]	Before Event	After event	Market model P	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	*0.000878	*0.000508	*0.000718
Deletion event	Deletion*before	Deletion*after	*0.005250	*0.002021	*0.004911

*Significant at 10%, **Significant at 5%, ***Significant at 1%

Source: Computed by the Authors

The change date reported the lower AARs before the event and increased AARs post the event. This was in line with the negative AARs for additions reported in this study on the change day (Figure 3 – price hypothesis for change day). The results are surprising as the expectations are higher stock prices for stocks being added to the index as the demand increases and lower stock prices for the stocks to be deleted as the stocks are being sold aggressively.

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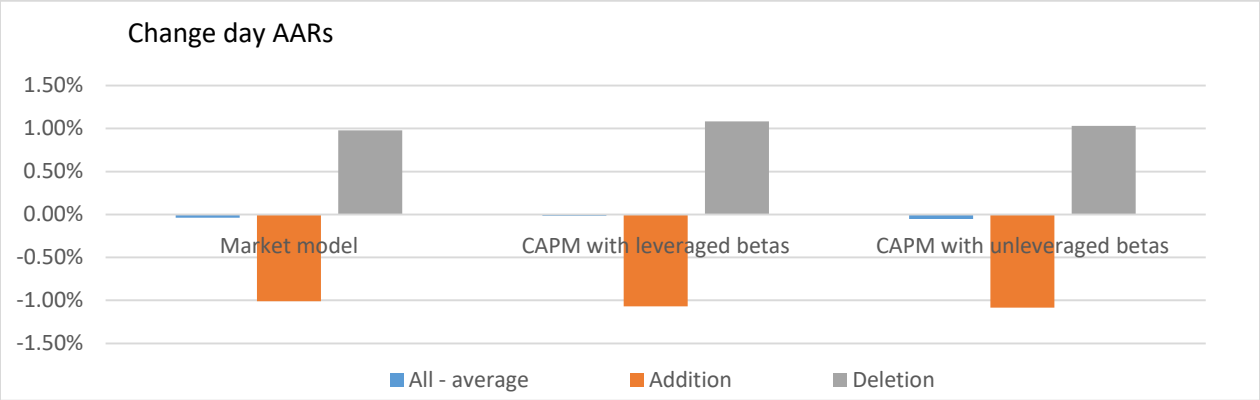

Figure 3: The change day (t-1) AARs

Source: Computed by the Authors

Table 10 shows that the stocks that are deleted from the index tend to decline in value post being deleted from the index, while the stocks being added to the index increase in value relative to the FTSE/JSE All Share Index. Thus, the imperfect substitute hypothesis did hold for the change day only for CAPMs. The AARs for change day, however, could not justify the conclusion of demand and supply forces in the FTSE/JSE index rebalancing (Figure 3). It can either be that the index trackers demand stocks are sufficiently covered by the daily liquidity of the FTSE/JSE index. Both addition and deletion events increased permanent price increases and decrease respectively. The liquidity theory did hold for addition events while being inconclusive for deletion, although the price decrease was certain.

The previous studies have suggested the limit to the length of announcement date and effective date reduce the arbitrageurs front running index activities (Chen *et al.*, 2006). The overall results support the excessive trading of stocks but not directional trading as could be expected. It is, therefore, possible that the index funds are not as big as perceived in the FTSE/JSE Top 40 Index. The results support the previous findings regarding arbitrageurs' activities leading to change day. The arbitrageurs are assumed to be buying the stock prior to the change date but

after the post-announcement date in anticipation of the selling or buying on the effective date (Chen *et al.*, 2006).

The arbitrageurs believe that the index funds rebalance on the change day to minimise the tracking errors. Chen *et al.* (2004) reported that the index fund managers may be aware of unattractive share prices on the change date; however, they continue to trade as witnessed by abnormal returns instead of average daily returns.

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Table 10: The AARs pre-event (announcement) window ([-1]) vs. post-event window ([0,200] vs. [0,10] vs. [0,20])

	Market model		CAPM leveraged		CAPM unleveraged betas	
Windows [-1] vs. [0,200]	Before event	After event	Before event	After event	Before event	After event
Addition event	*Lower	*Higher (increased)	*Lower	*Higher (increased)	*Lower	*Higher (increased)
Deletion event	*Higher	*Lower	*Higher	*Lower	*Higher	*Lower
Windows [-1] vs. [0,10]	Before event	After event	Before event	After event	Before event	After event
Addition event	*Lower	*Higher (increased)	*Lower	*Higher (increased)	*Lower	*Higher (increased)
Deletion event	*Higher	Lower	*Higher	*Lower	*Higher	*Lower
Windows [-1] vs. [0,20]	Before event	After event	Before event	After event	Before event	After event
Addition event	*Lower	*Higher (increased)	*Lower	*Higher (increased)	*Lower	*Higher (increased)
Deletion event	*Higher	*Lower	*Higher	*Lower	*Higher	*Lower

*Statistical significance when the test was conducted.

Source: Computed by the Authors

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4.1.5 The stock price changes are temporary or permanent in the longer term.

The temporary or permanent price hypothesis was tested on the longer-term prior event, announcement prior event, and change day against long-term post event window. The temporary or permanent comprises sub-constructs from the hypotheses discussed above. The null and alternative hypothesis are as follows:

Hypothesis 4a: The price changes are temporary and occur between pre-event days*, and the long-term post event window (the price reversal).*

Hypothesis 4b: Price changes (market reaction) are permanent and occur between pre-event days*, and the long-term post event window (and will be of a permanent nature).*

Table 11 shows that the longer time horizon is statistically insignificant. The study cannot completely reject the null hypothesis as they might be the price reversal experienced by the stock in the long run. However, this does not equate to negative CAARs but might mean that the stock experiences gradual wave patterns of abnormal returns. When evaluated post announcement date, however, the deletions are statistically significant. The change date is significant for both additions and deletions at 1% level of significance.

The statistical significance around the change date and post event dates (shorter term and longer term) questions the market efficiencies, as advocated by Fama (1965). The downward sloping demand did not seem to be evident in the FTSE/JSE Top 40 Index, which stipulates that the price was momentarily affected by the demand or supply shock due to indexing. The permanent price increases (decreases) prior to the event and post event was supported by the information hypothesis (symmetrical returns), and imperfect substitute hypothesis (with symmetrical abnormal returns) and was evident when using CAPMs. The CAARs for deletions and additions were fairly normally distributed for the longer term. The market model reported asymmetric CAARs, larger for deletions and lower for additions, which supports PPH (price changes temporarily for the deletion event and subsequent reverses).

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Miller and Ward (2015) reported that the price changes were significant for 200 days for the FTSE/JSE Top 40 Index, for both additions and deletions events. However, their study used a multi factor control model to measure abnormal returns. Although statistically significant, they argued that stock price changes may not appear permanent for the market capitalisation weighted indices in the event window studied, as the event results make more sense when analysed on the pre-event window that is much longer than academic studies (Miller & Ward, 2015:98). The FTSE/JSE Top 40 Index is a market capitalisation index. Petajisto (2011) argued the reliability of CAARs in the long run as the expected returns spectrum become widely dispersed (Miller & Ward, 2015:98). This is not surprising as the uncertainty is higher the longer the horizon.

Table 11: The statistical results for the pre-event windows ([-20, -1], [-7, -1], [-1]) vs. [0,200]

Windows [-20, -1] vs. [0,200]	Before event	After event	Market model p	CAPM leveraged p	CAPM Unleveraged p
Addition event	before*Addition	after*Addition	0.422443	0.358277	0.273475
Deletion event	before*Deletion	after*Deletion	0.233117	0.500570	0.230531

Windows [-7, -1] vs. [0,200]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	0.496998	0.804610	0.945501
Deletion event	Deletion*before	Deletion*after	**0.059690	*0.015444	*0.004237

Windows [-1] vs. [0,200]	Before event	After event	Market model p	CAPM leveraged betas p	CAPM unleveraged betas p
Addition event	Addition*before	Addition*after	*0.002612	*0.001181	*0.001196
Deletion event	Deletion*before	Deletion*after	*0.002970	*0.001097	*0.002605

*Significant at 10%, **Significant at 5%, ***Significant at 1%

Source: Computed by the Authors.

5.0 SUMMARY OF RESULTS AND CONCLUSION

The CAPM with unleveraged betas' AARs and CAARs has a higher statistical significance rate than the CAPM with leveraged betas and the market model. The market model was inferior compared to other CAPMs. The addition events' statistical significance for the market model was weaker for the period under the study, particularly prior to event days (-20 days) and pre-announcement day (-7 days). The deletion events reported more statistical significance than the addition events. Thus, for the deletion events, the (AARs) and (CAARs) for the stocks differed prior to the event and after the event. The results point to the possibility of implementing the trading strategy in anticipation of the deletion events and being rewarded for the stocks being deleted from the index, while for addition events the performance of added stocks seems to be random.

The results of significance on the change day have a huge implication for the index tracking, arbitrage opportunities, and the market efficiencies. The results showed the addition events experiencing the negative AARs when the demand for the stocks was higher from the index trackers and the deletion events experienced positive AARs for the stocks that were sold heavily by the index trackers. This may imply that the arbitrageurs' activities may exist in FTSE/JSE Index. It may mean that arbitrageurs take an opposite directional bet or position in anticipating the stocks to be added to or deleted from the index. It can also imply that the supply of the stocks in the FTSE/JSE Index surpass the index trackers' demand for the stocks affected by index event activities.

The above results support the existence of investment opportunities due to index activities; however, it may be prudent overlaying the price information with some understanding of stock fundamentals as 39.29% stocks experienced more than one movement between the indices. It implies those stocks move-into the FTSE/JSE Top 40 Index and experience relatively lower

market capitalisation post additions. For investors benchmarked against the FTSE/JSE All Share Index, this may lead to relative underperformance.

The study found that it is possible to earn AARs between the announcement date and change date, and between the change date and post change date. The significant AARs for the change date and post event date were in violation with the EMH that advocates that stock prices fully reflect all publicly available information.

The non-statistical significance reported for both addition and deletion, for the extended longer-term event (-20 days to 200 days) suggests the existence of stock prices reversal. This is however not surprising as the stocks that moved to the index were as a result of relatively higher stock price appreciation because the inclusion in the FTSE/JSE Top 40 Index was based on the market capitalisation weighted. Perhaps the extended longer-term event window is sufficient enough to capture for the momentum cycles (up and down price movement). The stock price change was not permanent, which conquers the price pressure hypothesis. The temporary price increases (decrease) for additions (deletions) are in line with the results reported in a study by Harris and Gurel (1986).

The leveraged companies were perceived as high risk due to higher financial obligations and had lower AARs compared to unleveraged companies for both deletion and addition, while unleveraged companies produced the best risk-adjusted performance for addition and deletion events. The higher returns, higher risk, did not hold in this study: AARs for CAPM unleveraged events were higher than CAPM leveraged. AARs were observed which investors could exploit by buying the stocks moving into the index and selling the stocks leaving the index. The CAPM produced higher returns than the market model.

In conclusion, if the anomalies that occur on the change date of stocks moving in and out of the FTSE/JSE Top 40 Index continue, it might be possible to earn AARs. However, such anomalies should disappear if the market becomes more efficient. In the efficient market, as argued by Fama (1970), the AARs can only be temporary as they are immediately arbitraged once

discovered. The competition by the arbitrageurs may be sufficient to reduce the abnormal profit opportunities to an insignificant level as argued by Schwert (2002).

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