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PRICE PRESSURE HYPOTHESIS: EVIDENCE FROM S & P CNX NIFTY INDEX CHANGES

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ABSTRACT

paper considers the effects of changes in the composition of the Nifty and Jr. Nifty index for the period 1996-2003. The study finds no significant price effects on the announcement day. However price effects were observed only for the Nifty index on the effective day, which were subsequently reversed by the ninth day. Similar results were found for the Nifty icictions too. For the Jr. Nifty, no price effects were observed either on announcement day or on the effective day-for both inclusions as well as exclusions. There were no abnormal volumes associated with price effects for the Nifty index. Since the s-ice effects are confined only to Nifty and were absent for the Jr. Nifty, certification effect may he ruled out. There is *pm/,;n* support for the price pressures hypothesis.

Keywords: Excess returns, changes in indices, event study, price and volume effects

INTRODUCTION

A stock index reflects the mood and direction of the overall market. Apart from being an indicator of the market movements, stock indices also serve as a benchmark for measuring the performance of fund managers. Innovations in the financial markets and the modern portfolio theory have redefined the uses of stock indices. Stock indices are rarely static; *heir composition changes so that objectives behind the construction of indices are served.)f course, the changes might also be driven by other reasons like mergers and corporate restructuring that make some of the stocks cease to exist in the market. Although the changes in n index like Nifty are a regular phenomenon, these actions will have implications for markets in general and index funds in particular. When a stock is included (excluded) to the Niftv, index funds will try to include it in their portfolio and these actions may induce buying (selling) pressure and correspondingly the price level is ocreased (decreased). This work attempts to mpirically investigate the implications of Nifty revisions over the period 1996-2003.

2. Theoretical backdrop

Theoretical research in this area came up with four important hypotheses to explain the reasons for the uncharacteristic changes in stock prices and trading volumes of the included (excluded) stocks around the revision dates. According to modern portfolio theory, investors hold a diversified portfolio and the markets can absorb any uninformed demand shock for a stock. Thus, the demand curves for a stock will be perfectly horizontal and any demand shocks likely to be associated with an index change should not have any statistically significant price effects. But if stocks are not close substitutes for each other, the demand curves will slope downwards and the curve will shift to the right (left), due to demand increases (decreases), permanently effecting stock prices, until another event capable of shifting can happen. This hypothesis, termed as *clown: card sloping* demand curn'es *(DSDC)* was proposed as an explanation for the index effect by Shliefer (1986). The second hypothesis called as *price pressure* /rr~potlre°sis *(PPI--I)* posits that the demand curve is only temporarily inelastic.

When a stock is included in an index, there is a significant rise (fall) in demand for stocks included (excluded) over a short period due to the rebalancing activities of the index funds. Once the demand from the index funds retreats, stock prices will revert and will reflect the long-term equilibrium prices. It may be noted that the difference between PPH and DSDC is in whether or not the stock prices exhibit reversal in the short run and both presume that the index revisions are information free events. The third explanation is termed as *Liquidity Hypothesis (LI-1),* and it states that any event leading to the improvement in the liquidity of a stock makes the investors pay a premium for those stocks. Index inclusion way lead to an increase in liquidity, as the stocks will attract more attention, thus reducing the information availability between informed and uninformed traders and this may translate into lower costs of trading (Kim and Verrecchia, 1994). The last of the explanations is termed as *Ju orivatiot content hypothesis (ICH),* and it says that new beneficial information is revealed by index inclusion (exclusion), thus permanently affecting the stock prices. This found support in some studies despite most index management committees (including S & P index committee) affirming that the inclusion (exclusion) is in no way any verdict on the investment attractiveness or the future prospects of the stock. The above hypotheses are debatable and are not mutually exclusive. Each one of them may be present in differing levels. For instance, Lynch and Mendenhall (1997)'s work is consistent with both PPH and DSDC while Dhillon and Johnson (1991) found support for ICH and DSDC.

3. Literature Review

A large body of literature examining the effect of stock inclusions (exclusions) has the S & P 500 index as the focal point. Shliefer (1986) was among the first to investigate the index effect and his study examined price impacts related to changes in S & P 500 between 1966 and 1983. I1is study found an abnormal price increase of 2.79`,', and the cumulative returns persisted. The returns are positively related to measures of buying by index funds and the results were attributed to the downward sloping demand curves for stocks. Harris and Gurel (1986) used almost a similar sample and showed a 3.13% abnormal return resulting from additions to the S & P 500. This increase is almost reversed after two weeks and thus they attributed the abnormal returns to the increased demand from index funds. Their evidence is consistent with the price pressure hypothesis. Another contemporaneous study by Woolridge and Ghosh (1986) found permanent price increases that are consistent with downward sloping long-run demand curve. They also document that trading volumes also increased during the event month, while relative volumes actually declined in the months following the event and thereby the volume results are consistent with the price pressure hypothesis. Jain (1987) also found that stocks added to S & P 500 experienced excess returns of 3% on the announcement day and these excess returns are observed for stocks added to S & P supplementary indices too, even though index funds do not try to match these indices. His study contested the PPH and DSDC hypothesis and ascribed the excess returns to the information content hypothesis. Another study that supports the ICH was that of Dhillon and Johnson (1991). This study examined only the additions to the S & P 500 index during 1978-SS and found that price levels persisted for around sixty days after the announcement, which is inconsistent with PPH. Also, they observed significant increases in returns for options and bonds of firms being included in the index, thus lending support to the ICH.

1 lowever, they argued that their results are also consistent with DSDC hypothesis and in this connection; they made a simplifying assumption that stocks, bonds and options are all close substitutes for one another. Edmister, Graham and Pirie (1994) after adjusting for the biases that creep into parameter estimation, have reported significant excess returns following a change in the index and the price effects seem to persist.

All the studies considered so far examined the index effect when the announcement and change are almost simultaneous. However in October 1989, S & P altered this policy and the changes to the index are announced after the close of trading, which become effective after a week. Following this change in the regulatory environment, Lynch and Mendenhall (1997) published their results of a detailed study of the index effect. Their study indicated a significant positive announcement of day returns; and the post announcement abnormal returns are only partially reversed, following the changes. Their study corroborated the PPH and the DSDC hypotheses. In a series of articles, Beneish and Whaley (1996, 1997, 2002) documented that excess returns associated with index revisions had increased from around 2.79% (during 1976-83) to 5.94% (during 1989-95) to 8% (during 1996-2001) and they attribute this to the growing index fund industry in the U.S. Hegde and McDermott (2003) tested for liquidity changes and found a permanent increase in liquidity measured by decreased effective spreads, increased quote depth, as well as increase in traded volumes.

As can be noted, all the studies (till 2000) have examined the index effects for S & P 500 in the U.S. This may be due to the larger size of the index funds tracking S & P 500. However, of late, there have been some studies that have examined the index effects in other countries as well. We provide a snapshot of these studies, along with few more recent studies on S & P 500 in Table 1.

TABLE 1
Summary of recent works on the index effects

Slam.	Study by	Index	Hypothesis supported	Remarks
	Chung and Krvzanowski (1998)	TSE 300 (Canada)	PPH, LH	
2	Kau], y ieluotra and Morel: (2000)	TSE 300 (Canada)	DSDC	Considered index weight adjustments, not the index changes
	Liu (2000)	Nikkei 500 (Japan)	DSDC	
1	Brealev (2000)	FTSE (U.K.)	Price pressures for deletions	
	Elavan, Li and Pinfold (^{2} 000)	NZSE 40	PPH	
<<	Chen, Noronha and Singal (200 3)	S & P 500	DSDC	For stock inclusions
	\V urgler and Zhurayskava (2002)	S & P 500	DSDC	
	Chan and Howard (2002)	AC)l (Australia)	PPH	
~	Elliott and Warr (2003)	S & P 500	PPH	On effective date

As far as Indian market is concerned, Vijaya (2002) has investigated the price effects for the Sensex. Though the study reports a weak permanent price effect for deletions, researchers caution that the study suffers from the problem of assumed announcement dates, as BSE did not maintain a record of the exact announcement dates. So, the study has rather limited research focus and findings are to be interpreted in the light of uncertainty regarding the announcement dates.

In conclusion, we can note that the existing literature is more or less unanimous on the premise that index revisions are associated with price effects; but the debate is whether the price effects are temporary or permanent, although there is disagreement on the explanations for these findings. Secondly, we note that there are few studies on emerging markets like hldia (on this particular topic). Since the index fund industry is making its presence felt in Indian markets, it will be interesting to see what kind of impact the changes to indices have on stock returns in India.

4. Objective of the study

This study aims to analyze the effects of the periodic revisions (both inclusions and exclusions) to the Nifty and Jr. Nifty indices. We also examine which of the competing hypothesis is supported by empirical evidence from Indian markets.

5. The **indices,** selection **criteria and the announcement policy of the** index maintenance committee

S **&** P CNX Nifty (Nifty hereafter) and CNX Nifty Junior (Jr. Nifty hereafter) are products of India Index Services & Products Ltd (IISL hereafter), which computes and maintains the indices, along with its other indices. Both indices are portfolios of 50 stocks each, while Nifty represents the large and liquid blue-chip stocks; Jr. Nifty represents almost the next fifty large and liquid stocks on Indian capital markets. IISL takes care in the maintenance of these indices such that these two indices arrays represent mutually exclusive sets of stocks. IISL supervises the indices such that Nifty not only reflects the larger market mood, but also is a well-diversified portfolio yielding better return-risk ratio relative to its peers and it preserves its superiority as an effective hedge. Nifty is calculated using the market capitalized weighted method and the indices are maintained by Index Maintenance Sub-Committee. The latter follows clear and w ell laid-down criteria like liquidity, market capitalization, and floating stock in selecting the stocks to be included/excluded in the indices. The index maintenance committee meets at least four times a year and decides whether any change in the composition of the index is warranted. If it is felt that way, NSE announces the change by issuing a circular after the close of trading hours. Each revision in the normal course takes around six weeks (currently') before it becomes effective unless the change is warranted by an immediate suspension of the scrip by exchange, or the scrip ceases to exist due to a corporate action like merger.

6. **Data and** Methodology

6.1 The sample

We consider all the additions and deletions to the Nifty index and Jr. Nifty index over the period 18 Sep 1996 till 4 August 2003. NSE web site provides the details of the names of all the stocks that were included and excluded to the Nifty and Junior Nifty indices during the years 1996-2003, along with the date when the change becomes effective. These two 'events'

At the time this work was being done i.e., in March 2004

are of interest to us and we call them as the `announcement dav' - defined as the trading day immediately following the circular date intimating the change (since the information is disseminated after the close of trading hours) and 'effective day' - defined as the date from which the change comes into effect and this is clearly spelt out in the circular. Though initial sample size is 36 for Nifty and 62 for the Junior Nifty, the final sample sizes are somewhat smaller due to following reasons:

i. Announcement date is not available for *ten* changes in Nifty and *three* changes in Jr. Nifty because these indices were earlier maintained by CRISIL and not the current organization IISL.

ii. On some occasions, index deletions may be triggered by corporate actions like mergers & amalgamations, voluntary delisting of the companies. Consequently, these stocks will not have any subsequent price data. Owing to these reasons, we lost *seven* changes for Nifty deletions.

iii. To overcome the problem of *clustering effect,* individual stocks were formed into portfolios and this leads to a loss of *three* changes for the Nifty additions and *one* change for Nifty deletions.

iv. Deletions from Jr. Nifty may be either due to a stock becoming member of the Nifty index or due to a stock not meeting the membership criteria laid out by the Index maintenance committee. The later deletions are termed as pure deletions and in this study, we are concerned only about pure deletions, since the former type deletions may have a positive price effect. As a result, *twenty* changes were lost.

The total sample size and how many of them were lost out due to the reasons mentioned above are clearly depicted in Tables 2A and 2B.

TABLE 2(A)
Sample size for **Nifty** Index

	Additions		Deletions	
	AD	ED	AD	ED
Total available	36	36	36	36
Availability of announcement and ! effective dates	26 '	36	26 `	36
Corporate actions	Nil	Nil	7	7
Loss due to Clustering effect	6	6	2	2
. 1:11 portfolios formed to take care cat clustering	3	3	1	1
Net sample size	26-6+3 = 23	36-6+3 = 33	26-7-2+1 = 18	36-7-2+1 = 28

r the remaining stocks Announcement date is not available

TABLE 2(B)
Sample size for Jr. Nifty Index

	Additions		Deletions	
	AD	ED	AD	ED
Total available	62	62	62	62
Availability of announcement and effective dates	59	62	39* a	42
Corporate actions	1	1	12	12
Loss due to Clustering effect	12	12	0	0
Add portfolios formed to take care of clustering	5	5	0	0
Net sample size	59-1-12+5 = 51	62-1-12+5 = 54	39-12 = 27	42-12 = 30

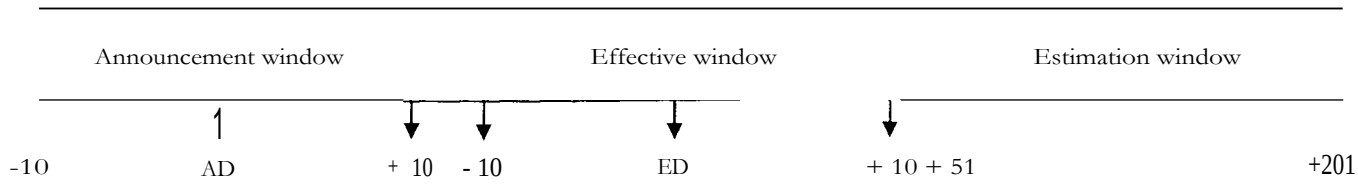
*For three stocks Announcement date is not available
Only pure deletions considered and deletions due to upgrades (20 nos) to Nifty index were not considered

6.2 The methodology

In this work, the analysis is carried out in the event study framework, which is a standard way of testing the impact of a particular event on the stock prices. An event study measures the impact of an economic event on security prices over a relatively short period of time. Empirical finance literature used event studies from quite a while to examine market efficiency, price effects of stock splits, dividend announcements etc., Briefly,' in an event study, the first step is to identify the event of interest and the impact of the event is studied by examining the abnormal returns of the security over the event windows. Here, the event is defined as the inclusion/exclusion of the stock from the index and the windows employed in the study were depicted in Figure 1.

FIGURE 1

AD stands for *Announcement day* and ED stands for *Effective day*



For a detailed account of event study methodology, refer to Elton and Gruber (19%), Mackinlay (1997)

We call the first window as the announcement window, comprising a total of 21 days starting from ten days prior to the announcement and ending on tenth day after the announcement. The next window is termed as the effective window, comprising 21 days commencing ten days prior to effective date and ending on the tenth day after :he change becomes effective. Earlier studies that investigated index effects used windows as short as 3 days to as long as 120 days around the event day-. Brown and Warner (1985) showed that test statistics are well specified when the event period is longer than one day more precisely "when abnormal performance is introduced for one day in the (-5, 5) interval the goodness of fit statistics failed to find marked evidence of test statistic misspe-cification". We premise that a 21-day window will be apt for this study. The excess/abnormal returns are the ex-post returns of security over the event window less the normal returns. The normal return is defined as the stock's return if the event had not occurred. There are several models that can be used to estimate the normal returns. We use the market model approach, which was found to be well specified under a variety of conditions when daily returns are used (see Brown and Warner, 1985). For every security, the excess return for each day in the event period is estimated as

$$R_{j,t} = \alpha_j + \beta_j R_{m,t} + \xi_{j,t}$$

uu here R and R denote the returns to stock j and the market portfolio on day t respectively. Initially we estimated the market model for each sample firm using S & P C\X 500 index as the proxy for market portfolio. In order to avoid a possible bias caused by a pre-event estimation period followin g Edmister, Graham and Pine (1994) and Chung and Krvzanowski ı l`1`)S1 , we used a post-event estimation period (ED+51 to ED+201) to estimate the market model parameters. The excess returns AR are computed as

$$AR_{j,t} \quad R_{i,t} - a1 - I3_j R_{,,,t}$$

In order to draw inferences, the excess returns were aggregated along two dimensions - along time and across securities. We define Mean Abnormal return (MAR) as the average of the excess returns across the N firms on a day't'.

$$MAR = \quad AR)_{\cdot}$$

ıı addition, cumulative excess returns were calculated as CAR (T1, T2) and is defined as the sum of all the excess returns over the window of interest.

$$MAR, = \frac{1}{N}\sum_{j=1}^{N} CAR_{j}$$

$$CAR._{(n,T2)} = \sum_{Ti}^{T2} AR_{;.,}$$

We also calculated Mean Average Abnormal Returns (MAAR) defined as the sample average of firm level average abnormal returns i.e.,

$$\text{MAAR}_{t1,t2)} \quad \frac{1}{} \sum^{y} \frac{CAR;nl,t2i}{\text{nitL}t2)}$$ where n (Ti, T2) represents the number of days in the window (T1, T2). The above excess return measures were computed in the following three investigation windows:

i. Pre-announcement window starting from AD-51 to AD-1

ii. Build-up window starting from AD+l to ED-1

iii. Post-effective window, starting from ED+1 to ED+26

where AD stands for announcement day and ED stands for effective day. It may be noted that the number of trading days between AD+1 to ED-1 may be different for each change because each announcement was not followed by the same number of trading days before implementation.

6.3 Test statistics

The test statistics are calculated using the time series standard deviation, as well as using the cross-sectional standard deviation. The test statistic using time series data has the advantage of using a sample size that is determined by the time series length and is not constrained by the number of stocks in the sample. The estimator also adjusts for possible auto-correlation between abnormal returns. The advantage of using the cross-sectional estimator is its robustness to an increase in the variance of stock abnormal returns around the event day, i.e. the cross-sectional test is well-specified for event date variance increases. The time series test statistic is computed following Linn and McConnell (1983).

$$\frac{AR_t}{S(AR)} \quad \frac{1}{N}$$

$$S(AR) = \sqrt{\frac{T-2}{N(T-4)}} \quad \text{and} \quad 1R;., = \frac{AR_{i,t}}{S_t(=1R_i)}$$

where

S:(AR)={Var(AR$_J$) +2cov(An.i,AR$_{J.t}$ +

The standard deviation includes the covariance term to adjust for first order autocorrelation and the test-statistic is approximately unit normal.

For the MCAR, the test statistic is

$$\frac{MCAR_i}{S(AR)} \quad \text{where} \quad MCAR_I = \frac{1}{N}\sum_{i=1}^{h} CAR_{i,t} \quad \text{and}$$

C:AR, : where T1 and T2 denote the starting and the end of the respective windows and Q is the number of trading days between T1 and T2 i.e., Q = T2-T1 +1.

The cross-sectional t -test (T) is computed as $\frac{MAR_t}{S_7}$ where $S^2 = \frac{1}{N}\sum_i \frac{(AR!,\sim—\backslash1..\backslash \quad C}{N-1}$

6.4 Methodology for the volume effects

To explore the trading activity changes when a stock is included (excluded) to (from) Nifty, trading volumes adjusted for market volume are examined around the event days. Past studies used different measures to examine abnormal trading volumes around the event dates. Lynch and Mendenhall (1987) used the market model approach, wherein turnover of trading values were used. Beneish and Whaley (2002) applied ratio of dollar trading volume to the average dollar volume across sixty days preceding the announcement day. While Elliott and Warr (2003) employed Harris and Gurel's (1986) metric that takes account of market volume and the individual security's volume. This study adopts a mean and market adjusted volume measure similar to those of Harris and Gurel (1986), Liu (2000) and Elliott and Warr (2003) to examine abnormal volumes around the event days.

$$V_{1t} \quad VI$$

where V and $V_{ri,a}$ are daily share volumes of the stock i and the market respectively and V, and V are the mean trading volumes of stock i and the NSE trading volumes in the estimation period [AD-201, AD-51]. This volume ratio that takes into account firm capitalization changes and market volume is expected to have a value of 1 under the null hypothesis. We used a t-statistic based on cross-sectional standard

deviation since the cross-sectional test is well-specified for event date variance increases 1;oehmer, Musumeci and Poulsen, 1991).

Statistical **Issues**

In this section, we briefly discuss four important statistical issues that crop up in event studies and in this context, we draw up on the results of Brown and Warner (1985), Strong 1992) and Corrado and Zivney (1992).

:x on-synchronous trading; The daily returns that go into the market model employed in this study necessitate that they be measured over the same fixed time interval for all securities. If the last trades for different securities occur at different times, estimates of market model parameters may be biased and inconsistent due to the first order serial correlation. Brown and Warner (1985) found that though methodologies other than OLS reduced biases in the estimates of beta, but it resulted in no improvement in either the specification, or the power of event studies. Therefore, using OLS estimates in this study may not necessarily imply misspecification.

Non-stationarity of variances: If the daily variances are non-stationary, test statistics based on variance estimates outside this period are mis-specified. Brown and Warner (1985) provide evidence of improvement in the specification of test statistics when auto-correlation adjustments are made to the time-series of mean daily excess returns. Consequently, the time series variance estimator used in the study included first-order auto correlation adjustments.

M i-nornialite of returns: The daily stock returns of individual securities are fat-tailed, relative to normal distribution (Fama, 1976; Pan and Duffie, 1997). But studies by Brown and Warner (1985) document that mean excess returns in a cross-section of securities converge to normality, as the sample size increases. The test statistics are well-specified even when sample size is only *five,* despite the *clustering* phenomenon.

d. Clustering: Cross-sectional dependence in stock returns data is likely to exist when some of the stock returns have event dates that are identical. This necessitates the calculation of variances by taking into account, the covariance across securities. The problem is exacerbated when the event securities are clustered along other added dimensions like industry. Most revisions to Nifty and Jr. Nifty have a set of stocks being included/excluded rather than one security on a particular date; but only on very few occasions the bunched securities belonging to the same industry were included/excluded. For instance, on the particular day of October 07, 1998, NIIT and Infosys belonging to the same industry were included to Nifty. To take care of the few instances of clustering, the abnormal returns are aggregated into a portfolio dated using event time and the standard portfolio concepts were applied. The procedure we have adopted was originally given by Jaffe (1974) and Mandelkar (1974). Because of this adjustment, our sample sizes further shrank, as we have to create portfolios of stocks to account for possible industry correlations.

8. Hypothesized effects of index changes

Nifty is one of those indices that are scientifically managed and the criteria used to include/exclude a stock into the index are well-defined. Given the clear selection criteria, it may appear that one can possibly predict the changes. But with hundreds of stocks to choose from, it will be difficult for the traders to speculate the inclusions consistently. The reason

is that the traders are to meet the liquidity and market-cap criteria along with keeping their portfolio well-diversified, so that it remains effective for hedging. So, to anticipate the changes over and over again is rather difficult. Earlier studies (Jain, 1987; Liu, 2000) have found no significant excess returns in the pre-announcement window. Therefore, the study sets off with the hypothesis that there is no anticipation prior to the announcement.

HI: There are no excess returns in the pre announcement window

When a stock is selected for inclusion/ exclusion in the Nifty index, assuming absence of ideal liquidity conditions, excess returns may occur on the effective day due to the activity of the index funds and self-indexing investors. From the DSDC perspective also, this holds when stock prices move along the less than perfectly elastic demand curve. Given the small size of organized index funds in India, we conjecture no excess returns on the effective date.

H2: There are no excess returns on the effective day

The decision to include a particular stock into the index may stimulate the buying interests of the indexers. This demand from them may bring about increased volumes on the implementation day or perhaps few days around the event day, depending on the response of the index funds and self-indexers. In line with our earlier hypothesis, we presume no excess volumes.

H3: There is no excess trading volume on the ettectiz'e day

Past studies by Harris and Gurel (1986) have observed that the excess returns observed on the event day are subsequently reversed, once the demand from the index funds recedes, while others like Jain (1987), Dhillon and Johnson (1991) have found that there are no reversals after the event date. Consistent with our second hypothesis, we premise no excess returns in the post-event window.

H4: There are no excess returns in the post event zoindow(ED+1 to ED+25)

Lynch and Mendenhall (1997), Elavan, Li and Pinfold (2000) have observed excess returns after the announcement of a change and its effective implementation. This is inconsistent with market efficiency. Subsequent work by Cusick (2001) on the same sample (with the inclusion of succeeding data) as used by Lynch and Mendenhall found evidence of decreasing returns and increasing efficiency.

H5: There are no excess returns in the build up window

9. Results

Price effects for Nifty Index additions

TABLE 3

Panel A **Price effects (Announcement** day) for stocks added to the NIFTY index

The sample size is 23 and AD stands for Announcement Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. $_{TMAR}$ and $_{TmcAR}$ use the cross sectional variance estimator and Z $_{m \cdot i}$, and Z use the time series variance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2

	MAR	Tm_{AR}	ZNIAR	MCAR	TmcAR	ZN1cAR
-10	-0.05%	-0.10	0.17	-0.05%	-0.10	0.17
-9	-0.24%	-0.49	-0.65	-0.30%	-0.42	-0.40
-8	0.45%	0.63	0.16	0.15%	0.19	-0.44
-7	0.21%	0.32	1.25	0.36%	0.38	0.14
-6	0.26%	0.67	0.23	0.62%	0.56	0.58
-5	0.24%	0.54	0.80	0.86%	0.83	0.59
-4	-0.60%	-0.64	-0.49	0.26%	0.18	0.45
-3	-0.08%	-0.13	-0.37	0.19%	0.11	0.14
-2	0.73%	1.21	1.15	0.91 %	0.66	0.29
-1	0.90%	1.58	1.78	1.82%	1.14	0.97
AD	0.45%	1.18	0.86	2.27%	1.47	1.16
1	0.05%	0.07	0.58	0.05%	0.07	0.16
2	-1.16%	-1.95	-1.69	-1.11%	-1.87	-0.32
3	0.21%	0.45	0.27	-0.91%	-1.40	-0.25
4	-0.40%	-1.05	-0.41	-1.30%	-1.86	-0.38
	0.25%	0.80	0.30	-1.05%	-1.40	-0.25
6	0.20%	0.32	0.81	-0.85%	-1.01	-0.07
7	-0.49%	-0.86	-0.57	-1.34%	-1.16	-0.35
8	0.57%	1.58	0.89	-0.78%	-0.73	-0.14
9	0.09%	0.17	0.84	-0.69%	-0.55	0.08
10	0.45%	0.49	1.41	-0.24%	-0.25	0.40

Pa^{g}el B Price effects (Effective **day)** for stocks **added** to the **NIFTY** index

The sample size is 33 and ED stands for Effective Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. and $T_{\sim tcn:}$ use the cross sectional variance estimator and $Z_{\sim t:\sim iz}$ and Z_{mcna} use the time series ariance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2

	MAR	Tyr.Art	Z\,Ar:	MCAR	ena	7_'.ıc 'a:
-10	0.18%	0.07	0.31	0.18%	0.38	0.31
-9	-0.52%	-1.02	-1.26	-0.34%	-0.47	-0.67
-8	0.34%	0.85	0.82	0.00%	0.00	-0.08
-7	0.33%	0.65	0.08	0.33%	0.33	-0.03
-6	0.32%	0.75	0.42	0.65%	0.52	0.16
-5	0.56%	0.69	1.03	1.21	0.79	0.57
-4	-0.31 %	-0.55	-0.70	0.86°	0.57	0.41
-3	-0.75%	-1.31	-1.49	0.10%	0.07	-029
-2	-0.66%	-1.85	-0.40	-0.56%	-0.36	-0.55
-1	-0.33%	-0.39	-1.18	1.13%	0.74	-0.94
ED	1.47%	2.60 (0.01399)	2.23 (0.0257)	2.35%	1.87	1.53
1	-0.7S%	-1.67	1.02	-0.78%	-1.67	-1.02
2	0.33%	0.68	0.41	-0.45%	-0.54	0.31
3	0.69%	1.17	0.38	0.24%	0.20	0.52
4	-0.73%	-1.33	-0.72	-1.01%	-0.83	-0.15
5	0.21%	0.41	-0.07	-0.S0%	-0.55	-0.08
6	-0.58%	-1.13	-0.50	-1.29%	-0.74	-0.44
7	0.05%	0.07	1.06	-1.25%	-0.64	-0.65
8	0.61%	1.10	1.01	-0.64%	-0.30	-0.37
9	-1.53%	-2.10 (0.043701)	-2.29 (0.022)	-2.17%	-1.99 (0.055192)	-1.86
10	-0.25%	-0.54	-0.44	-2.42%	-1.15	-0.27

The figures in the parenthesis under the T/Z statistic give the p-values

Table 3 reports the results for the Nifty index revisions, with Panel A depicting the results for the announcement window and Panel B for Effective day window. We can observe the following:

i. The excess returns are not significant around the announcement day, although a statistically significant number of firms ended on positive note around the announcement day.

ii. The excess returns on the effective day at 1.47% are statistically significant and around 60% of the sample firms experienced a non-negative price effect on the day.

iii. This price effect is almost similar to that reported for Nikkei 500 (Liu, 2000) while it is around half the average price effect reported for S & P 500 additions (Lynch and Mendenhall, 1997).

iv. More importantly, it can be seen that the MAR is significant on ninth day after the implementation, with an opposite sign indicative of a reversal.

Price effects for Nifty Index deletions

TABLE 4

Panel ***A*** **Price effects** (Announcement **day)** for stocks deleted **from the NIFTY index**

The sample size is 18 and AD stands for Announcement Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative

abnormal returns across observations and measures the abnormal performance over the event period. T and $_{Tvrcvrz}$ use the cross sectional variance estimator and Z and Z $_{MC.v}$ use the time series variance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2.

	MAR	TNIAR	Zv.AR	MCAR		Z^{y} uCAR
-10	-1.05%	-1.36	-1.92	-1.05 %,	-1.36	-1.92
-9	-0.16%	-0.27	0.97	-1.21%	-1.26	-0.77
-8	0.57%	0.81	0.50	-0.63%	-0.63	-0.75
-7	-0.90%	-1.93	-1.23	-1.53%	-1.36	-1.38
-6	-0.44%	-0.65	-1.07	-1.97%	-1.66	-1.80
-5	-0.32%	-0.69	-0.14	-2.30%	-1.60	-1.41
-4	-0.16%	-0.33	0.15	-2.46%	-1.84	-1.84
-3	0.42%	0.81	0.26	-2.03%	-1.36	-1.09
-2	-0.44%	-0.75	-0.50	-2.47%	-1.44	-0.96
-1	-0.39%	-0.76	-0.64	-2.86%	-1.66	-1.08
AD	-0.46%	-0.74	0.58	-3.32%	-1.68	-0.62
1	0.31%	0.46	0.03	0.31%	0.46	-0.74
2	-0.58%	-0.85	-1.09	-0.27%	0.35	7.33
3	0.33%	079	0.84	0.06%	0.06	-1.06
4	0.05%	0.07	0.40	0.11%	0.11	-0.95
5	0.74%	1.44	0.87	0.85%	0.76	-0.74
6	-0.16%	-0.31	0.24	0.69%	0.51	-0.48
7	0.57%	1.12	0.48	1.26%	0.74	-055
8	0.03%	0.04	-1.33	1.28%	0.65	-0.80
9	0.29%	0.50	0.26	1.58%	0.94	0.36
10	-0.50%	-0.84	-0.82	1.08%	0.73	-0.99

Panel B **Price effects** (Effective **day) for stocks** deleted from the NIFTY index

The sample size is 28 and ED stands for Effective Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. and $_{T„c.vr,}$ use the cross sectional variance estimator and Z and Z ,,, use the time series ariance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6 2.

	MAR	T\	ZyLV:	A1CAR_	Ty,-,,	Z icr,
-10	-0.30`4,	-0_67	-0.37	-0.30%	-0.67	-0
-9	-0.05%	-0.11	-0.67	-0.34' 4	-0.72	-0.37
-8	-0.10 %	-0.21	-0.46	**-0.44** 0,	-0.68	-1.07
-7	-0.32%	-0.54	-0.59	-0.76',	-0.94	-1.07
-6	-0 33%	-0.61	-0.33	-1.10%	-1.19	-1.04
-5	0.23 %	0.44	1.04	-0.86%	-0.7 6	-0.55
4	-0.47%	-0.81	0.32	-1.33%	-1.11	-0.49
-3	-0.94%	-2.15 (0.040671)	-1.46	-2.27%	-1.81	-0.85
-2	0.57"	1.14	0.74	-1.70%	-1.35	-0.70
-1	-1.12%	-2.20 (0.036546)	-1.61	-2.83"	-1.77	-1.27
EI)	-1.60%	-3.14 (0.004065)	-4.37 (0.0001)	-4.42	-2.71 (0.011546)	**-2.24** (0.0251)
1	0.21%	0.48	0.48	0.21%	0.48	0.48
2	-0.32'0	-0.59	-0.20	-0.11 0	-0.18	-1.85
3	0.58%	0.92	2.39 (0.0168)	0.47%	0.50	-1.40
4	-0284	M.77	-0.51	0.19%	0.19	-1.46
5	0.53%	1.36	1.36	0.71%	0.70	-1.18
6	0.74%	1.09	1.82	1.45%	1.24	-1.11
7	0.03%	0.06	-0.48	1.48%	1.16	-1.19
8	1.44%	2.02 (0.053407)	2.15 (0.0316)	2.93%	**2.09** (0.046168)	-1.97 (0.0488)
9	0.74%	**2.14** (0.041545)	1.96 (0.005)	3.67%	2.57 (0.016006)	-0.28
10	0.57%	0.90	1.68	**4.24%**	**2.70** (0.011821)	-0.06

The figures in the parenthesis under the T/Z statistic give the p-values

i. The announcement day price effects associated with deletions are almost similar to those of additions and can be seen in Table 4 Panel A. The excess returns are not at all significant.

ii. The excess returns on effective day at -1.60%, is statistically significant. Moreover, the excess return on effective day is also preceded by a significant price reaction on ED-3 and ED-1.

iii. The abnormal returns on eighth and ninth days are significant but in the opposite direction i.e. the prices are reverting almost after seven days.

Price *effects for Jr. Nifty Index additions* and *deletions*

TABLE 5

Panel A **Price effects** (Announcement Day) for stocks added to the **Jr. NIFTY** index

The sample size is 51 and AD stands for Announcement Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. T,,,,, and use the cross sectional variance estimator and Z and Z $_{y,cna}$ use the time series ,.ariance estimator as explained in methodology section. The cross sectional test statistics (T) are ,iistributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2

	MAR	TNIvs		MCAR	TmcAs	Z^{y}ic.-,s
-10	0.28%	0.51	-0.31	0.28%	0.51	-0.31
-9	-0.57%	-1.12	-0.70	-0.29%	-0.37	-0.71
-8	-0.08%	-0.18	-0.51	-0.37%	-0.38	-0.88
-7	-0.08%	-0.22	0.03	-0.45%	-0.48	-0.75
-6	-0.38 %	-0.92	-0.87	-0.83 %	-0.74	-1.06
-5	-0.66 %	-1.36	-1.09	-1.50 %	-1.19	-1.41
-4	-0.05	-0.13	0.03	-1.55 %	-1.20	-1.29
-3	-0.41 %	-1.14	-0.81	-1.96%	-1.56	-1.50
-2	0.06 %	0.12	0.03	-1.90 %	-1.50	-1.40
-1	-0.39%	-0.83	-1.18	-2.29%	-1.55	-1.7 O
A D	0.03 %	0.08	-0.34	-2.25 %	-1.27	-1.~ 3
1	-0.79 %	-1.82	-1.28	-0.79 %	-1.82	-128
2	0.59 %	1.64	0.90	-020 %	-0.51	-0.36
3	-0.59%	-1.70	-1.31	-0.79%	-1.13	-0.70
4	-0.06%	-0.18	-0.27	-0.85°0	-1.02	-0.71
5	0.13%	0.28	0.17	-0.72%	-0.98	-0.67
6	-0.29 %	-0.89	-0.62	-1.01 %	-1.34	-0.83
7	-0.64 %	-1.34	-0.98	-1.65 %	-1.89	-0.99
8	-0.54%	-1.32	-0.86	-2.18%	-2.41*	-1.15
9	0.13%	0.34	-0."11	-2.05°0	-1.95	-1.15
10		1.76	0.70	-1.21Y, ,	-1.74	-1.18

Panel B Price effects (Effective day) for stocks added to the Jr. NIFTY index

The sample size is 54 and ED stands for Effective Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. N1CAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. and T use the cross sectional variance estimator and Z , and Z use the time series 'variance estimator as explained in methodology section. The cross sectional test statistics (1) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2.

	MAR		Zy,:a.	MCAR	Tv:	Z.1(\1
-10	-0.25%	-0.65	-0.56	-0.25°	-0.64	-0.56
-9	0.13 %%	0.25	0.06	-0.12 0	-0.18	-0.44
-8	-0.50%	-1.17	-0.92	-0.63%	-0.65	-0.84
-7	-0.80%	-1.62	-1.09	-1.43%	-1.29	-1.35
-6	-0.86%	-1.82	-0.95	-2.29°	-1.81	-1.61
-5	0.85%	1.76	1.69	-1.44%	-0.90	-0 86
-4	0.35%	0.72	0.91	-1.09%	-0.55	-0.42
-3	-0.33%	-0.65	-1.14	-1.42%	-0.97	-0.86
-2	-0.58" ,	-1.52	-0.99	-2.00°0	-L31	-1.19
-1	0.28%	0.71	0.55	-1.72%	-0.02	-0.84
ED	0.23 /~	0.48	0.76	-1.49%	-0.76	-0.46
1	0.07%	0.16	-0.10	0.07%	0.13	0.07
2	0.03%	0.07	0.05	0.09%	0.19	0.15
3	0.77%	1.64	1.15	0.86%	-1.36	-0.32
4	-0.38%	-0.75	-0.26	0.49%	-1.49	-0.30
5	0.88%	1.43	1.27	1.37%	-0.60	-0.03
6	0.01%	0.02	-0.13	1.38%	-0.53	-0.15
7	0.38%	0.79	0.03	1.75%	-0.17	-0.22
8	0.34%	0.89	1.17	2.09%	1.02	-0 .83
9	-0.06%	-0.15	-0.15	2.04%	1.10	-0.91
10	0.47%	1.03	0.87	2.51%	1.42	1.10

TABLE 6

Panel A Price effects (Announcement **day)** for stocks deleted from the **Jr. NIFTY index (only pure** deletions)

The sample size is 27 and AD stands for Announcement Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. $T_{M\ R}$ and $_{TNfc.\r}$ use the cross sectional variance estimator and Z_{NtAR} and $Z_{N1CA\ R}$ use the time series variance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2.

	MAR	T~i.~tz	ZMAR	MCAR	TMC	ZNICAR
-10	-0.13%	-0.28	-0.68	-0.13%	-0.28	-0.68
-9	-1.06%	-1.12	-1.38	-1.19%	-1.06	-1.16
-8	1.16%	1.68	1.20	-0.03%	-1.94	-1.07
-7	0.70%	1.71	1.32	0.67%	-0.04	-0.27
-6	0.18%	0.20	0.02	0.84%	0.11	-0.23
-5	0.10%	0.21	0.08	0.94%	0.17	-0.18
-4	0.47%	0.71	0.66	1.41%	0.41	0.08
-3	0.07%	0.12	-0.23	1.48%	0.41	0.00
-2	0.67%	1.69	1.47	2.15%	1.01	0.48
-1	-1.09%	-1.65	-1.26	1.06%	0.48	0.06
AD	-0.71%	-1.26	-0.81	0.35%	0.15	-0.19
1	-0.52%	-0.88	-0.38	-0.52%	-0.88	0.16
2	0.23%	0.42	0.53	-0.29%	-0.46	0.29
3	0.27%	0.51	0.37	-0.02%	-0.03	0.38
4	-0.68%	-1.03	-0.93	-0.70%	-0.67	0.13
5	0.44%	0.68	0.36	-0.26%	-0.18	0.22
6	0.83%	1.11	1.14	0.56%	0.31	0.49
7	0.48%	0.99	0.59	1.04%	0.52	0.61
8	-0.31%	-0.89	-0.50	0.73%	0.38	0.48
9	0.33%	0.68	0.14	1.06%	0.57	0.50
10	-1.04%	-1.83	-1.55	0.02%	0.01	0.15

Panel B Price effects (Effective **day)** for stocks deleted from the Jr. NIFTY index (only pure deletions)

The sample size is 30 and ED stands for Effective Day. MAR - mean abnormal return for the day and is the average of the sample firms' abnormal returns on day t. MCAR is the mean cumulative abnormal returns across observations and measures the abnormal performance over the event period. ..... and ,i cni: use the cross sectional variance estimator and Z $_{st:\sim a}$ and Z $_{\sim,c:,ause}$ the time series ariance estimator as explained in methodology section. The cross sectional test statistics (T) are distributed Student's t with (N-1) degrees of freedom and the time series statistics Z are approximately normally distributed and the test statistic computations are explained in methodology section 6.2

	MAR	Tu.v	Zu,u A;	MCAR		Z.-MC AI:
-10	0.42%	0.60	0.37	0.42%	0.60	0.37
-9	-0.42%	-1.05	-0.36	0.00%	0.00	0.00
-8	-0.52%	-1.16	-0.79	-0.52%	-0.65	-0.45
-7	0.33%	0.64	0.51	-0.19%	-0.17	-0.14
-6	0.45%	0.88	0.73	0.26%	0.21	0.20
-5	0.34%	0.45	0.88	0.60%	0.35	0.54
-4	0.75%	1.01	1.07	1.35%	0.64	0.91
-3	-0.15%	-0.18	-0.62	1.20%	0.55	0.63
-2	-0.38%	-0.41	-0.41	0.82%	0.49	0.46
1	0.61%	0.97	0.73	1.43%	0.76	*0.6o*
ED	-0.79%	-0.71	0.68	0.64%	0.38	0.43
1	0.19%	0.35	-0.19	0.19%	0.35	-0.19
2	-0.92%	-1.48	-0.84	-0.73%	-1.07	-0.21
3	-0.42%	-0.75	-0.64	-1.15%	-1.50	-0.37
4		-1.25	-0.54	-1.62%	-1.76	-0.50
5	-0.72%	-0.83	-0.53	-2.34%	-2.57*	-0.62
6	0.80%	0.66	0.35	-1.53%	-1.05	-0.51
7	-0.63%	-1.23	-1.26	-2.17%	-1.78	-0.80
8	-0.24%	-0.34	-0.29	-2.41%	-1.18	-0.84
9	2.21%	1.68	2.07	-0.19%	-0.73	-0.36
10	-0.49%	-0.65	-0.79	-0.68%	-1.12	_0.52

Tables 5 and 6 presents the results for the case of Jr. Nifty and the MARs are not significant on any day, either in the announcement window or in the effective day window. In the case of Jr. Nifty, no such significant abnormal price effects were observed in either of the windows.

Price effects in the long windows

TABLE 7
Long window statistics

The sample sizes are described in Table 2 (A) and (B). Build up window is from AD+1 to ED-1 and PAN stands for pre announcement window starting from AD-51 to AD-1 while Post effective window is from ED+1 to ED+26. MAAR is defined as sample average of firm level average abnormal returns and the test statistic uses time series variance estimator and the statistics are distributed Student's *t* with (N-1) degrees of freedom.

Window	NIFTY				Jr. Nifty			
	Additions		Deletions		Additions		Deletions	
	MAAR *Co)*	Tye v vr	MAAR (96)		MAAR (°o)	T Y .vA ;	J1.-\AR *C°)*	T■;a_ ;;
u:1J up	0.IS	1.00	-0.10	-1.03	-0.08	-0.82	0.13	1.39
I':A N	-0.04	-0.49	-0.11	-1.38	0.04	0.67	-0.19	-1.59
st effective	-0.22	-2.06 (0.047 608)	0.38	3.36 (0.001551)	0.04	0.27	0.S9	1.34

:1w figures in the parenthesis under the T/Z statistic give the p-values

The results for the long windows are depicted in Table 7. We found no significant oycess returns in the *pre-aruiouiicenieiit window* l'.1N window from AD-51 to AD-I), either for deletions or additions- for both the indices. This may be because of the large number of stocks that may be eligible for selection and traders may find it difficult to speculate the stocks that will be entering the index. But in the case of deletions also, the test statistic is not significant which is rather surprising, since the stocks that may be possible candidates for deletions will be few in number and anticipating them is relatively easier than the possible inclusions.

The MAAR in the *build up* window (AD+1 to ED-1) is not significantly different from zero for both Nifty and Jr. Nifty in the case of additions as well as in deletions. This is in contrast to the findings of Lynch and Mendenhall (1997) where they found significant returns in this window, which is inconsistent with the market efficiency. The MAAR in the *post effective window* is significant for both additions and deletions for Nifty, while it is not significant for the Jr. Nifty.

In terms of our hypotheses, the statistics fail to reject H1, and H5, while we can reject H2 and H4. To wrap up, there is no clear stock price reaction for changes in the Nifty around the announcement day, but there are indications of temporary price pressures around the effective day and for Jr. Nifty, the event days are just like any other day.

Yoliinie effects for iNiftt1 and Jr. Nifty

TABLE 8

Trading volume effects for stocks added/deleted to Nifty index

\IVR stands for Mean volume ratio on each day and was calculated as the cross sectional average of volume ratios on the same day. The expected MVR is 1 under the null hypothesis of no volume effects. The test statistic T is calculated using the cross sectional variance estimator and the test statistics are distributed Student's *t* with (N-1) degrees of freedom.

	Additions				*Deletions*			
	Announcement dal		*Effctio'c'* Dal/		*Announcement* dale		*Effectil'e Day*	
	MVR	*T*	*MVR*	*T*	*MVR*	*T*	*M~'IZ*	*T*
-10	0.93	1.14	0.82	0.95	1.09	1.03	0.83	0.80
-9	0.79	1.15	1.12	0.95	1.72	0.53	0.85	0.51
-8	1.29	1.19	1.49	0.72	1.81	0.48	1.38	0.72
-7	1.10	1.21	1.67	0.66	1.53	0.62	0.91	0.79
-6	1.05	1.07	1.41	0.77	1.28	0.50	0.74	0.99
-5	1.45	0.48	1.10	1.00	1.63	0.58	0.89	0.91
-4	1.02	0.66	1.78	0.68	1.29	0.69	1.48	0.64
-3	0.94	0.91	1.36	0.78	0.99	0.96	1.04	0.56
-2	0.88	1.10	1.41	0.83	1.37	0.41	1.03	0.80
-1	1.00	0.81	1.57	1.08	1.13	0.49	1.66	0.72
0	1.04	0.95	1.33	1.18	0.96	0.67	1.23	0.88
1	1.06	0.75	1.33	0.95	1.10	0.55	1.42	0.70
2	1.05	1.20	1.18	0.94	1.06	0.75	1.08	0.95
3	1.11	0.84	1.18	1.02	0.79	0.62	1.36	0.63
4	1.48	0.51	1.22	0.91	1.21	0.51	1.69	0.51
5	1.38	0.68	1.11	0.82	0.92	0.60	1.31	0.60
6	0.84	0.97	1.18	0.81	0.59	0.77	2.22	0.60
7	0.89	1.01	0.96	0.94	0.66	1.12	1.60	0.95
8	1.20	0.87	0.88	0.85	0.59	0.83	1.33	0.90
9	1.11	0.68	1.16	0.72	0.53	1.00	1.23	0.91
10	1.16	0.76	0.94	0.76	0.67	0.68	1.05	0.65

TABLE **9**

Trading volume effects for stocks added/deleted **to Jr. Nifty index**

MVR stands for Mean volume ratio on each day and was calculated as the cross sectional average of volume ratios on the same day. The expected MVR is 1 under the null hypothesis of no volume effects. The test statistic T is calculated using the cross sectional variance estimator and the test statistics are distributed Student's t with (N-1) degrees of freedom.

	Addition				*Deletions*			
	Announcement day		*Effective Day*		*Alniouucenreiif* dale		*Eftectiz'e Dray*	
	MVR	*T*	*MVR*	*T*	*lviVR*	*T*	*MVR*	*T*
-10	1.08	*0.93*	1.06	1.04	1.04	*0.80*	*0.82*	*0.37*
-9	*1.20*	1.01	1.12	*0.79*	*0.58*	*0.53*	*0.96*	0.37
-8	1.16	1.14	*1.22*	0.61	1.17	*0.57*	*1.12*	*0.35*
-7	*0.96*	*1.02*	1.21	*0.65*	*0.93*	1.05	*1.23*	*0.48*
6	1.01	*1.06*	*1.03*	*0.63*	*0.74*	0.48	*1.04*	0.42
-5	*1.09*	*0.84*	1.15	*0.83*	1.43	0.44	1.79	*0.48*
-4	*1.18*	1.00	*1.08*	0.78	1.27	*0.35*	*0.94*	*0.43*
-3	1.19	0.91	1.17	*0.73*	*0.97*	*0.33*	*0.78*	0.45
-2	1.30	1.02	1.07	*0.81*	1.31	*0.42*	*0.88*	*0.53*
-1	1.34	1.04	1.28	0.71	1.10	*0.41*	0.90	*0.39*
0	1.07	1.12	1.33	0.78	*0.90*	*0.36*	*0.64*	*0.41*
1	*1.07*	*1.31*	1.35	*0.62*	1.48	*0.47*	*0.58*	0.43
2	*0.95*	*1.02*	1.36	0.84	*0.69*	*0.44*	1.09	0.40
3	*0.93*	*0.95*	*1.08*	*0.79*	*0.76*	*0.49*	*0.57*	*0.47*
4	1.12	0.87	1.12	*0.80*	*1.07*	*0.49*	*0.58*	0.43
5	1.11	*0.62*	*1.31*	0.84	*0.94*	0.42	*0.93*	*0.39*
6	*1.06*	*0.97*	1.15	*0.79*	*1.30*	*0.52*	*0.98*	0.41
7	*1.05*	*0.97*	1.21	*0.83*	*1.04*	*0.68*	*0.38*	*0.47*
8	*1.19*	*0.83*	1.18	1.07	*1.06*	*0.63*	*0.57*	*0.52*
9	*1.44*	0.70	*1.13*	1.02	*0.92*	*0.57*	*0.63*	*0.46*
10	1.17	*0.84*	1.19	*0.93*	*0.58*	0.40	1.51	*0.52*

No abnormal volumes were observed in anv windows for either indices and for both inclusions and exclusions. This is in sharp ” ntrast to the earlier studies, wherein volume -Lilts are more or less consistent with the price alts.

10. Discussion of Results

Juxtaposing the results for volume effects th the price effects, we can infer that the price .ctions around the effective day may be ',ibly driven by indexers whizzing to buy -ell) up the added (deleted) stock in order to reduce the tracking error, but their purchases were spread out, since no abnormal volumes were detected around the effective day and in terms of our hypothesis, the statistics are not large enough to reject *H3.*

Given the stock price effects, we could possibly rule out the information content hypothesis or the certification effect, since the index revisions are routinely carried out at periodic intervals and these are based on well-defined criteria. If the stock price reactions are due to the certification effect, then they should be observed on the announcement day and not on effective day, since no new information is

disclosed on the effective day. Also the certification should be applicable symmetrically to both Nifty and Jr. Nifty, since the same committee maintains both the indices and no price effects were observed for Jr. Nifty. Therefore we can infer that price effects around the Nifty revisions were not due to release of new information.

The liquidity hypothesis implies that addition (deletion) to an index results in increased (decreased) liquidity. To investigate this, we compared the trading volumes before and after the index change to test whether the sample stocks experience any change in the liquidity. We carried out a paired t-test on the pre revision and post revision mean market adjusted trading volume ratio during the 150 trading days before announcement and after the change becomes effective i.e., mean market adjusted trading volumes (as defined in the volume analysis section) are calculated for the periods AD- 201 to AD - 51 and ED+ 51 to ED + 201. The t- value is 0.093 (p- value 0.926028) and is not significant at the conventional levels, while for deletions, the t- value is 0.077 (p-value 0.938726) which is also not significant. The test statistics fail to reject the hypothesis of no changes in the liquidity for sample firms. Therefore, the observed price effects for Nifty are not due to changes in liquidity.

Given the small sample size, the results have to be interpreted with caution. According to PPH, any price effects end when all the index funds have completed their trades. Lynch and Mendenhall (1997) following Keim and Madhavan (1996) use a sophisticated methodology and criteria based on trading volume patterns to determine the release-ending day. But employing such criteria is rather unworkable here, since no abnormal volumes were detected around the event dates. However, the presence of statistically significant negative (positive) MARs after the effective date for inclusions (exclusions) implies that the price reversals may be due to easing of the indexers' demand. We further probed this using the long window MAAR i.e. the post effective \LA.AR is found to be statistically significant and opposite in direction for both additions and deletions and as the same were absent for the Jr. Nifty, which is not tracked by the indexers we infer that the price pressures are present and are due to the activities of the indexers. To conclude, we can infer that there are some price pressures, but the study is not emphatic about the existence of price pressures in the same form as observed in the developed markets and documented in the works of Harris and Gurel (1986) or Lynch and Mendenhall (1997) since no abnormal volumes were detected around the change day.

CONCLUSIONS

This study is an effort to understand whether the 'index effects' documented for the indices abroad happen for the Nifty and Jr. Nifty indices. We find that the stock prices, on average, increase (decrease) significantly on the effective day for the Nifty index and no such effects were observed for Jr. Nifty index. The prices revert after around a week's time- both for additions as well as for deletions. But no abnormal volumes were detected around the effective day. Since no such reactions were observed for Jr. Nifty revisions, we can possibly discredit the certification effect and no significant changes in the liquidity were observed. So we cannot attribute the price reactions to the expected increase in liquidity. Prima facie, there are pointers to support for the price pressure hypothesis that the impact of inclusion/exclusion is simply a transitory event with no permanent valuation effect. However, the conclusions are not emphatic because of the lack of abnormal volumes in the effective day window.

REFERENCES

Beneish, NI. and RWhaley, "An Anatomy of the'S & P la mes': The Effects of changing the Rules", *The Journal .Finance* Vol. 51, *No. 5* (1996): 1909-30.

Beneish, M. and R.Whaley, "A Scorecard from the S & P Games", *The Journal of Portfolio Management* Vol. *23,* No. *2 (1997): 16-23.*

Beneish, M. and R.AWhaley, "S & P *500* Index Replacements", *7 he Journal of Portfolio ;AIarragenrent* Fall 2002): *51-60.*

Boehmer, E., J. Musumeci and A.B. Poulsen, "Event Study Methodology under Conditions of Event Induced Variance", *Journal of Financial Economics* Vol. 30 (1991): *355-85.*

Brealey, R.A., " Stock Prices, Stock Indexes and Index Funds", *Bank of England Quarterly Bulletin* (February 2000): 61-8.

Brown S.J. and J. B.Warner,, "Using Daily Stock Returns", *Journal of Financial Economics Vol. 14* (1985): 3-31.

Chan, H.W.H. and P.F. 1 Ioward, "Additions to and Deletions from an Open-ended Market Index: Evidence from the Australian All *Ordinaries". Australian journal of.Alanag>enrent,* Vol. 27 *(2002):* 45-74.

Chen, 1I., G. Noronha, and V. Singal, "The Price Response to the S & P *500* Additions and Deletions: Evidence of Asymmetry and a New Explanation". *Journal of Finance. (2003).*

Chung, R and L. Kr-vzanowski, "Are the Market Effects associated with revisions to the TSE 300 index Robust?" *Multinational Finance Journal, Vol. 2, No.* 1 11998): 1-36.

Corrado, C.J. and T.I. Zivney, "The Specification and Power of the Sign 'Lest in Event Study hypothesis tests using daily Stock returns". *Journal of Financial and c' uantitati:'c^Analusis,* Vol. *27, No. 3* (1992):465-78.

Cusick, P. "Price effects of Addition or Deletion from the Standard and Poor's *500* Index: Evidence of Increasing Market Efficiency". lVorkirtg *Piper,* The Leonard N. Stern School of Business, 2001.

Dhillon, U. and H. Johnson, "Changes in the S & I' SC) List". *Journal of Business* Vol. *64, No. 1* (1991) :

l dmister, R., S. Graham, and \V. Pixie, "Excess Returns of Index Replacement Stocks: Evidence of Liquidity and Substitutability ". *Journal of Financial Rosearclr* Vol. 17, No 3 (1994): *333-346.*

Edmister, R., S. Graham, and \V. Pixie, "Trading Cost Expectations: Evidence from S & P 500 Index Replacement Stock Announcements". *Journal of Economics and Finance,* Vol. 20, *No. 2 (1996):* 75-85.

Elayan, F., AV. Li, and J. Pinfold "Price Effects of Changes to the Composition of New Zealand Share Indices." *Working paper series,* no. 24 (2000), Massey University, Auckland.

Elliott, W. and R. Warr, "Price Pressure on the NYSE and the Nasdaq: Evidence from S & P 500 Index changes". *Financial Management* (Autumn) (2003) ' 85-*99.*

Elton, Eduriw and Martin Gruber, *Aloder: Portfolio Theory.* Singapore : John Wiley & Sons, 1996.

harm E., " *Foundations of Financ,"". New* York Basic Books, 1976.

Harris, L. and E. Gurel, "Price and Volume Effects Associated with Changes in the S & P 500 List: New Evidence for the Existence of Price Pressure." *Journal ofFinance, Vol.* 41, *No. 4* (1986): 815-829.

Hegde, S.P. and J.B. McDermott, "The Liquidity Effects of Revisions to the S & P 500 Index: An Empirical Analysis". *Journal of Financial Markets,* Vol. *6, No. 3* (2003): 413-459.

Jaffe, J.F., "Special Information and Insider Trading". *journal of Business,* Vol. 47 *(1974):* 410-28.

Jain, P.C., "The Effects on Stock price of Inclusion or Exclusion from the S & P *500"". Financial Journal* Vol. 43 (1987): 5S- *65.*

Kau], A., V. Nlehrotra, and R. Mtorck, "Demand Curves for Stocks do Slope Down: New Evidence From An Index Weights Adjustment". *Journal of Finance,* Vol. *55, No. 2* (2000): *893-* 912.

Kelm, D. and A. Madhavan, "The Upstairs Market for large block t'ansactions: Analysis and Nleasurenu'nt of Price effects". *Re^P ictd' of Financial studies, Vol. 9* (19%): 1-36.

Kim, O. and R.E. Verrecchia, "Liquidity and Volume around Earnings Announcements". *Journal of Accountin g and Economics,* Vol. *17* (1994): *41-67.*

Linn, S.C. and J.J. McConnell, "An empirical Investigation of the Impact of 'Antitakeover' Amendments on common Stock Prices". *Journal of Financial Ecouornics,* Vol. *11 (1953):* 361-99.

Liu, S., "Changes in the Nikkei 500: New Evidence for Downward sloping Demand Curves for Stocks". *International Rez,ieoo of Finance,* Vol. 1 *No. 4* (2000) : 245-267.

Lunch, A. and R. Mendenhall, "New Evidence on Stock Price Effects Associated with Changes in the S & P 500 Index". *Journal of Business, Vol.* 70 No. 3 (1997): 351-383.

MacKinlav, A.C., "Event studies in Economics and Finance". *Journal of Economic Literature,* Vol. *XXXV* (1997): 13-39.

Malkeil, B. and A. Radisich, "The Growth of Index Funds and the Pricing of Equity Securities". *Journal of Portfolio Management, Vol.* 27 No. 2 (2001): 9-21.

Mandelkar, G., "Risk and Return: The Case of Merging Firms". *Journal of Financial Economics,* Vol. 1 (1974): *303-35.*

NSE website.www.nseindia.com.

Pan, J. and D. Duffie, "An Over View of Value at Risk". *Journal ofDeru'atiu'es,* Spring (1997): 7- 49.

Shleifer, A., ""Do Demand Curves for Stock Slope Down?", *Journal of Finance,* Vol. 41 *No.* 3 (1986): 579-590.

Standard and Poor (2000) http://www.ifa.com/Media/Images/PDF' 20files/SP500_Rules_General Criteria.pdf

Strong, N., "Modelling Abnormal Returns: a review article". *Journal of Business Finance arm Accounting,* Vol. 9 No. 4 (1992) : 533-53.

Vijaya, B.M., "The Dynamics around Sensex Reconstitutions". *UTI Institute of Capital markets Conference Proceedings* (2002.)

Woolridge, R. and C. Ghosh, "Institutional Trading and Security Prices: The Case of Changes In The Composition of the S & P 500 Index". *Journal ofFinancial Research,* Vol. 9 No. 1, 1986 : 13-24.

Wurgler, J. and E. Zhurayskaya, "Does Arbitrage Flatten Demand Curves for Stocks?" *Journal ofBusiness,* Vol. 75 No. 4, 2002: 583-608.

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