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Market reaction to index reconstitutions: Evidence from NSE NIFTY additions and deletions

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Abstract

This study investigates the market reaction to additions and deletions of stocks in the NSE NIFTY Index during 2010-2024 using the event study methodology. A total of 92 events were identified, of which 81 were analysed due to data availability. The analysis employs a 252-day pre-event estimation window and a 41-day event window, with abnormal returns (AR) and cumulative abnormal returns (CAAR) calculated for multiple sub-windows to examine investor responses around announcement and effective dates. Results indicate that additions generally elicit modest positive reactions on announcement days that diminish or reverse on effective dates, while deletions produce stronger negative reactions initially, followed by partial recovery. Temporal analysis across three sub-periods-2010-2014, 2015-2019, and 2020-2024-reveals variations in market responses under different market conditions, highlighting asymmetric behavior between additions and deletions. The findings provide insights into price adjustments, investor sentiment, and market efficiency surrounding index revisions in the Indian stock market.

Keyword: NSE NIFTY, index revisions, event study methodology, abnormal returns, cumulative abnormal returns, market reaction, additions, and deletions

1. Introduction

Stock market indices function as essential benchmarks for measuring overall market performance and guiding investment decisions. Changes in index composition, such as the inclusion or deletion of stocks, can influence market behavior, affecting stock prices, trading volumes, and liquidity. Over time, the magnitude of market reactions to index reconstitutions has evolved, with evidence from global indices showing that abnormal returns associated with additions and deletions have declined in recent decades, reflecting improved market efficiency and faster information dissemination (Greenwood and Sammon, 2025) ^[25].

The impact of index changes is closely linked to the structure of financial markets and trading mechanisms. Transaction costs and the behavior of market participants play a central role in shaping the price effects of index inclusions and deletions (Chacko, Jurek, and Stafford, 2008) ^[12]. Short-term price movements often arise from the interplay between investor anticipation and the timing of announcements, with additions typically generating temporary price gains and deletions causing short-term declines (Lynch and Mendenhall, 1997) ^[33]. Such dynamics create temporary deviations from market efficiency and highlight the influence of index-driven trading activity.

Passive indexing has amplified the importance of index reconstitutions, with mandatory purchases by index funds affecting stock demand and prices. Indexed firms can experience higher valuations, reflecting downward-sloping demand curves created by institutional flows rather than fundamental changes in firm performance. Similar patterns are observed in Asian markets, where heavily weighted stocks in major indices such as the Nikkei 225 exhibit stronger comovement with other constituents due to trading activity (Greenwood, 2008) ^[24]. A global shift in index returns serial dependence-from positive before the 2000s to negative thereafter-and linked this pattern to the rising popularity of index-based products such as ETFs, futures, and mutual funds, suggesting that increased indexing activity influences market dynamics through arbitrage mechanisms between index products and underlying stocks (Baltussen *et al.* 2019) ^[4]. Market reactions to index changes often exhibit asymmetry

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between additions and deletions. Stocks added to an index frequently show sustained positive returns, while deletions may not experience equivalent negative effects, indicating that investor awareness and trading behavior contribute to these asymmetric responses (Kaul *et al.*, 2000; Chen *et al.*, 2004) ^[30, 16]. These effects are influenced not only by the information conveyed through index revisions but also by the relative substitutability of stocks within an index, shaping how investors adjust their portfolios (Dhillon and Johnson, 1991) ^[20].

Global studies reveal variation in index effects across regions and markets. In Europe, stocks added to major indices such as the DAX, MDAX, or CAC40 experience positive price and liquidity adjustments, while deleted stocks often face declines in trading activity and liquidity (Deininger *et al.*, 2000; Gregoriou, 2011) ^[19, 26]. In Sweden, inclusion in domestic and overseas indices can even trigger mild negative price reactions, especially when pre-inclusion trading activity is high (Andelius and Skrutkowski, 2008) ^[2]. These differences highlight the role of institutional structures and investor behavior in shaping index-related market responses. Similarly, in emerging and developed markets such as Australia and Egypt, index changes influence stock prices and liquidity, with added firms benefiting from increased demand and improved trading conditions, while deleted firms exhibit weaker or negligible effects (Ahmed and Bassiouny, 2017) ^[1]. This illustrates that market microstructure and investor attention can create temporary or lasting adjustments around index reconstitutions.

Across all markets, the interplay between short-term trading pressures and long-term price and liquidity effects demonstrates that index revisions act as catalysts for reallocation of investor resources. Anticipation of inclusion or deletion can lead to temporary mispricing, but structural features of indices and investor behavior often determine the persistence of these effects (Morck and Yang, 2001) ^[38]. Price reactions, trading volume changes, and liquidity shifts are closely intertwined, reflecting the market's adjustment to updated benchmarks. In the context of the Indian stock market, the NSE Nifty index serves as a prominent benchmark for assessing market performance and investor response. Additions and deletions in the NSE Nifty are likely to influence both short-term trading and longer-term market dynamics. Examining these events between 2010 and 2024 provides insights into how index reconstitutions affect stock prices, volumes, and liquidity in India, offering a comparative perspective with global markets and highlighting asymmetric effects between added and deleted firms.

2. Literature Review

Stock index reconstitutions are a recurring feature of financial markets, reflecting changes in index composition through additions and deletions of stocks. In the United States, the S&P 500 has been extensively analyzed, revealing evolving market reactions over time. Early evidence indicated significant positive abnormal returns for newly added stocks, largely driven by price-pressure effects as index-tracking funds adjusted their holdings (Shleifer, 1986; Harris and Gurel, 1986) ^[46, 27]. Matching firm analyses also highlighted favourable price reactions among industry

peers, with the magnitude inversely related to the added firm's industry weight (Cai, 2007) ^[10]. Over the years, however, the index effect has diminished, with recent S&P 500 additions exhibiting negative long-run effects, reduced price informativeness, and altered corporate behavior due to higher passive ownership (Bennett, Stulz, and Wang, 2020; Preston and Soe, 2021; Patel and Welch, 2017) ^[6, 41, 40]. Reconstitution events in the Russell indices demonstrate that index additions typically increase prices while deletions decrease them, influenced by the type of funds involved and liquidity provision (Chang, Hong, and Liskovich, 2015; Madhavan, Ribando, and Udevbulu, 2022; Hegde and McDermott, 2003) ^[15, 38]. Additional studies highlight that index changes can affect analyst forecasts and realized earnings, suggesting that these events are not purely mechanical but may convey information (Denis *et al.*, 2003) ^[18]. Microstructure considerations also play a role, as transaction costs and the supply of shares shape abnormal returns and liquidity responses (Schnitzler, 2018; Zhou, 2011) ^[44].

MSCI index reclassifications show that temporary price overshooting occurs when stocks move to indices with higher benchmarked ownership, while effects reverse when moving to lower-ownership indices, illustrating the influence of index-tracking flows on short-term market dynamics (Burnham, Gakidis, and Wurgler, 2017) ^[9]. Similarly, studies of S&P 500 rebalancing reveal that while index funds incur costs during reconstitution, liquidity providers can profit by supplying immediacy, despite high trading risk (Madhavan, 2003) ^[34]. Evidence from the Russell 2000 further emphasizes that buy-and-hold strategies may outperform annual rebalancing, with deletions generating higher factor-adjusted returns than additions, reflecting structural incentives embedded in index methodology (Cai and Cai, 2008) ^[11]. Abnormal returns reflect the information content of S&P decisions rather than price pressure, potentially signalling lower risk or higher perceived quality of management for included firms (Jain, 1987) ^[29]. Indexing activity reduces stock price efficiency, as shown by stronger post-earnings-announcement drift and larger deviations from random walk behavior, suggesting that passive trading diminishes incentives for information acquisition and arbitrage (Qin, and Singal, 2015) ^[42].

European markets exhibit notable price and liquidity effects from index adjustments. CAC40 additions enhance liquidity, whereas deletions decrease it, primarily through changes in direct trading costs (Gregoriou, 2011) ^[26]. Similarly, the Danish KFX Index shows that deletions produce significant negative pre-change returns, while additions generate smaller pre-announcement effects, consistent with imperfect substitutes or liquidity and information cost hypotheses (Bechmann, 2002) ^[5]. In Sweden, domestic and overseas index inclusions reveal mildly negative price effects for additions when pre-inclusion trading is high, suggesting that prior market activity can trigger reversals (Andelius and Skrutkowski, 2008) ^[2]. FTSE SmallCap index studies demonstrate asymmetric responses, where promoted stocks enjoy permanent price increases and higher liquidity, while demoted or newly added stocks show only transitory effects (Biktimirov and Li, 2014) ^[7]. Stock additions experienced sharp price increases and deletions significant declines, with

substantial trading volume surges and cross-country variations. Findings supported the downward-sloping demand curve hypothesis over information effects, with some evidence of price pressure and liquidity effects, especially in Japan and the UK (Chakrabarti *et al.* 2005)^[13]. In the Asia-Pacific region, the S&P/CITIC 300 index in China shows that additions boost stock prices while deletions reduce them, with sustained improvements in liquidity for both types of events (Li and Sadeghi, 2009)^[32]. Anticipatory trading in transparent indices such as the FTSE 100 contributes meaningfully to cumulative abnormal returns, revealing the role of market expectations in price formation (Fernandes and Mergulhão, 2016)^[21]. Index changes in Malaysia support the price-pressure hypothesis, as pre-revision price and volume effects reverse after announcements (Azevedo *et al.*, 2014)^[3]. In Singapore and Hong Kong, market responses differ significantly, with temporary positive reactions in Hong Kong and negligible price effects in Singapore, reflecting the influence of local demand-supply imbalances rather than new information signals (Gowri Shankar and Randhawa, 2006)^[23]. In the Asia-Pacific sustainability context, index adjustments are associated with declines in returns, increased trading volume, and heightened idiosyncratic risk, highlighting the influence of non-financial factors on investor behavior (Cheung and Roca, 2013)^[17].

In Australia, additions to open-ended indices generate significant positive abnormal returns, whereas deletions produce negative returns, demonstrating that market anticipation and investor reaction mechanisms mirror those observed in U.S. closed-end indices (Chan and Howard, 2002)^[14]. Egyptian markets also demonstrate asymmetric responses, with added firms exhibiting higher prices, trading volumes, and liquidity, while deleted firms show weaker effects, supporting the combined influence of investor awareness and downward-sloping demand (Ahmed and Bassiouny, 2017)^[1]. In Turkey, changes in the Istanbul Stock Exchange show that index inclusions and exclusions affect both stock prices and trading volumes even without the presence of index funds, supporting the price-pressure, imperfect substitutes, and investor attention hypotheses (Bildik and Gulay, 2008)^[8].

Indian markets present a complex set of reactions to Nifty index revisions. Early evidence indicated minimal or insignificant price movements around announcement and execution dates, consistent with semi-strong market efficiency (George, 2009)^[22]. Temporary price changes observed on effective dates support the price-pressure hypothesis, whereas certification effects are largely absent (Kumar, 2007; Rahman and Rajib, 2014)^[31, 43]. Long-term analyses reveal significant positive abnormal returns around announcements, while abnormal volume effects remain limited, suggesting that some index additions convey information to investors (Parthasarathy, 2010)^[39]. Other studies indicate unfavourable reactions to both inclusions and deletions, underscoring the efficiency of the Indian stock market and the difficulty of earning excess returns through index reconstitutions (Selvam, Indhumathi, and Lydia, 2012)^[45].

Collectively, these studies demonstrate that index reconstitutions generate observable impacts on stock prices, trading volumes, and liquidity across global markets, yet the

magnitude and persistence of these effects are shaped by market structure, investor composition, and regional characteristics. Developed markets show attenuated and more efficient responses over time due to the proliferation of passive investing and improved liquidity, whereas emerging markets in Asia, the Middle East, and India exhibit heterogeneous reactions influenced by local trading patterns, information asymmetry, and market microstructure. The literature underscores the importance of index-linked investing in shaping both short-term market behavior and long-term corporate outcomes.

3. Methodology

This study examines the market reaction to the addition and deletion of stocks in the NSE NIFTY Index during the period 2010 to 2024 using the event study methodology (Marisetty *et al.*, 2020, Marisetty *et al.*, 2021)^[36, 37]. The event study approach measures the impact of specific market events on stock prices by identifying abnormal returns (ARs) that deviate from expected returns. The analysis focuses on both index addition and deletion events, considering the announcement date (when the change is made public) and the effective date (when the change is implemented). The research spans a 15-year period from 2010 to 2024 and is divided into three sub-periods for detailed temporal analysis: 2010-2014, 2015-2019, and 2020-2024. This segmentation allows the study to capture variations in market reactions under different market conditions, including periods of growth, volatility, and recovery. During the entire period, a total of 92 index revision events—46 additions and 46 deletions—were identified, but only 81 events were included due to data unavailability. Event details were collected from official NSE announcements and verified through secondary financial databases. Events affected by other corporate actions such as mergers, stock splits, or overlapping announcements were excluded to maintain accuracy.

Daily closing prices of sample stocks and the NIFTY 50 Index were used to compute returns. The market model was applied to estimate expected normal returns, assuming a linear relationship between individual stock returns and market index returns. The model parameters (α_i and β_i) were estimated using a 252-day pre-event estimation window, which represents approximately one trading year prior to the event window. The event window was defined as 41 trading days, covering 20 days before and 20 days after the event day (from day -20 to +20). Within this single event window, cumulative abnormal returns were calculated for multiple sub-windows including (-1, +1), (-3, +3), (-5, +5), (-7, +7), (-10, +10), (-15, +15), and (-20, +20) to examine the behavior of stock returns around the event day. The average abnormal return (AAR) was obtained by averaging ARs across all sample firms for each day within the event window. Cumulative average abnormal returns (CAAR) were then calculated for each sub-window to assess the aggregated market reaction around the event. The statistical significance of AARs and CAARs was tested using t-tests to determine whether the abnormal returns were significantly different from zero. Separate analyses were conducted for addition and deletion events, as well as for both announcement and effective dates, to identify differences in market reactions. Overall, this methodology,

using a 252-day estimation window and a 41-day event window with multiple sub-windows, provides a structured framework to analyze how index additions and deletions impact stock prices in the NSE NIFTY Index over the study period and across different sub-periods from 2010-2014, 2015-2019, and 2020-2024.

The model is expressed as:

$$ER_i = \alpha_s + \beta_s R_{mi} + \varepsilon_s$$

ER_i = Expected Return of stock on the day i in the event window

α_s = Alpha coefficient of stock with the Index during the estimation window

β_s = Beta of the stock with the Index during the estimation window

R_{mi} = Return of the Index in the event window on the day i

ε_s = Error term

Abnormal returns calculated as follows

$$AR_i = R_i - ER_i$$

AR_i = Abnormal return of the stock on the day i during the event window

R_i = Actual return of the stock on the day i during the event window

Average Abnormal Returns calculated as follows

$$AAR_i = \frac{\sum_{s=1}^n AR_{ts}}{n}$$

AAR_i = Average abnormal return of the stocks on day i in the event window

AR_{ts} = Abnormal returns of the stock on the day i in the event window

n = Total number of stocks in the study

Cumulative Abnormal Returns in the event window are calculated as follows

$$CAAR_i = AAR_i + CAAR_{i-1}$$

$CAAR_i$ = Cumulative average abnormal return on the day i in the event window

$CAAR_{i-1}$ = Cumulative average abnormal return on the day $i-1$

t test used to determine the significance of the average abnormal returns

$$t \text{ test} = \frac{AAR_i}{\sigma(AR_i)}$$

AAR_i = Average abnormal return of the stocks on day i in the event window

$\sigma(AR_i)$ = Standard error of abnormal returns of stocks on the day i event

$$\text{Standard error is calculated } \sigma(AR_i) = \frac{\sigma_i}{\sqrt{n}}$$

σ_i = Standard deviation of stocks abnormal return on the day i in event

4. Results Discussion

Table 1: Descriptive Statistics of Abnormal Returns (AR) and Cumulative Abnormal Returns (CAR) of Selected Stocks on the Event Day

Particulars	Addition				Deletion			
	Announcement Date		Effective Date		Announcement Date		Effective Date	
	AR	CAR	AR	CAR	AR	CAR	AR	CAR
N	44	44	44	44	37	37	37	37
Mean (%)	0.1440	1.1040	-0.1939	-1.1699	-0.6184	3.2246	0.5274	1.4675
Median (%)	0.0276	-0.1106	-0.1332	-1.8056	-1.0656	2.1009	0.6722	1.4084
Minimum (%)	-3.2818	-22.9230	-5.3799	-17.275	-2.621	-19.529	-4.8546	-18.900
Maximum (%)	3.2672	32.2410	3.3677	16.1280	3.1745	30.8630	5.5698	18.2620
Deviation	1.6658	11.7030	2.1041	8.4669	1.6806	12.2060	2.5023	8.3756
Skewness	0.1298	0.8343	-0.5605	-0.0725	1.0249	0.5794	-0.0447	-0.4070
Kurtosis	-0.5859	0.8461	-0.0536	-0.7273	-0.0807	0.0319	-0.6765	0.1979
Normality Jarque-Bera	0.7528 (0.6863)	6.4164 (0.0404)	2.3088 (0.3152)	1.0086 (0.6039)	6.4870 (0.0390)	2.0719 (0.3548)	0.7178 (0.6984)	1.0819 (0.5821)

(Source: Author's calculations)

In table 1 presented the descriptive statistics of Abnormal Returns (AR) and Cumulative Abnormal Returns (CAR) on the event day reveal distinctive market behavior surrounding index additions and deletions. For addition events, the mean AR and CAR on the announcement date are 0.1440% and 1.1040%, respectively, indicating a marginally positive investor response to inclusion news. Conversely, on the effective date, both AR (-0.1939%) and CAR (-1.1699%) become negative, suggesting that the initial optimism surrounding index inclusion dissipates as the event materializes. The moderate standard deviations (1.6658-2.1041) and near-symmetric distributions indicate limited

volatility and relatively uniform reactions among firms added to the index.

In the case of deletion events, the mean AR on the announcement date is -0.6184%, confirming a negative market reaction consistent with expectations of reduced demand from index-tracking funds. However, the corresponding mean CAR of 3.2246% suggests that cumulative reactions incorporate elements of market correction or short-term speculative trading prior to the event. On the effective date, both AR (0.5274%) and CAR (1.4675%) turn positive, implying that prices tend to recover as uncertainty resolves and market participants adjust their

positions. The higher variability in CAR values (standard deviations of 12.2060 and 8.3756) underscores the heterogeneity of investor responses to deletions, influenced by firm-specific factors such as size, liquidity, and visibility within the index.

The distributional measures further corroborate these patterns. Skewness and kurtosis values exhibit mild departures from normality, with some series demonstrating positive skewness and flatter-than-normal distributions. Specifically, deletion AR exhibits a notable positive skewness (1.0249), reflecting a few pronounced positive outliers despite a generally negative mean. Such deviations imply that abnormal reactions are not uniformly distributed across firms, and certain stocks may experience more pronounced speculative movements around event announcements.

Normality tests reinforce these observations. The Jarque-Bera statistics for addition CAR on the announcement date (JB = 6.4164, $p = 0.0404$) and deletion AR (JB = 6.4870, $p = 0.0390$) reject the null hypothesis of normality, suggesting that event-day returns exhibit significant non-normal behavior, possibly due to overreaction or information asymmetry. Other return series display p-values exceeding 0.05, indicating approximate normality. Overall, the findings suggest asymmetric market responses to index revisions: additions elicit short-lived positive reactions that reverse upon implementation, whereas deletions provoke initial negative responses followed by price recovery, consistent with the temporary price pressure and investor sentiment hypotheses documented in event-study literature.

Table 2: Average Abnormal Returns (AAR) of Selected Stocks on the Event Day for Additions and Deletions to NSE NIFTY

Action	Day Type	N	AAR (%)	SE	t Test	p Values
Addition	Announcement	44	0.14404	0.25112	0.57357	0.56982
	Effective	37	-0.19394	0.31720	-0.61140	0.54477
Deletion	Announcement	44	-0.61840	0.27628	-2.23828	0.03148
	Effective	37	0.52743	0.41137	1.28211	0.20800

(Source: Author's calculations)

From the table 2, the average abnormal returns (AAR) of selected stocks on the event day reveal distinct investor reactions to additions and deletions in the NSE NIFTY. For addition events, the announcement day shows a positive AAR of 0.1440% (SE = 0.2511, $t = 0.5736$, $p = 0.5698$), indicating only a marginal and statistically insignificant response from investors. On the effective day, the AAR turns slightly negative at -0.1939% (SE = 0.3172, $t = -0.6114$, $p = 0.5448$), suggesting that any minor optimism on the announcement day does not persist when the stock is formally included in the index. The low magnitude and insignificance of AARs across both days imply that additions generate limited immediate abnormal returns, possibly reflecting that investors anticipate such events or

consider the news largely informational rather than market-moving.

For deletion events, the announcement day exhibits a negative AAR of -0.6184% (SE = 0.2763, $t = -2.2383$, $p = 0.0315$), which is statistically significant, indicating that investors react strongly to the exclusion news, likely due to expected reductions in demand from index-tracking funds and lower visibility. On the effective day, the AAR turns positive at 0.5274% (SE = 0.4114, $t = 1.2821$, $p = 0.2080$), though statistically insignificant, reflecting a partial price recovery following the initial negative reaction. The contrast between announcement and effective day returns for deletions suggests short-term overreaction by the market at the time of the announcement, followed by some correction once the deletion is implemented. Comparatively, deletions elicit stronger and more immediate abnormal returns than additions, highlighting asymmetric market behavior between the two types of index events.

Table 3: Cumulative Average Abnormal Returns (CAAR) of Selected Stocks on the Event Day for Additions and Deletions to NSE NIFTY

Action	Day Type	N	CAAR (%)	SE	t Test	p Values
Addition	Announcement	44	1.10398	1.76435	0.62571	0.53545
	Effective	37	-1.16991	1.27642	-0.91664	0.36545
Deletion	Announcement	44	3.22456	2.00661	1.60697	0.11680
	Effective	37	1.46750	1.37694	1.06577	0.29362

(Source: Author's calculations)

From the table 3, the cumulative average abnormal returns (CAAR) of selected stocks on the event day indicate the aggregated market reaction to additions and deletions in the NSE NIFTY. For addition events, the announcement day shows a CAAR of 1.1040% with a standard error of 1.7644, a t-value of 0.6257, and a p-value of 0.5355, indicating a positive but statistically insignificant cumulative response. On the effective day, the CAAR turns negative at -1.1699% (SE = 1.2764, $t = -0.9166$, $p = 0.3655$), suggesting that the minor gains on the announcement day do not persist when the inclusion is implemented, and the overall cumulative effect remains statistically insignificant. For deletion events, the announcement day exhibits a CAAR of 3.2246% with a standard error of 2.0066, a t-value of 1.6070, and a p-value of 0.1168, showing a positive but not statistically significant cumulative reaction. On the effective day, the CAAR decreases to 1.4675% (SE = 1.3769, $t = 1.0658$, $p = 0.2936$), remaining positive yet insignificant. The comparison between additions and deletions indicates that deletions tend to generate higher cumulative abnormal returns on the announcement day, although the responses for both event types are generally modest and do not reach statistical significance, reflecting a limited aggregated impact on stock prices on the event day.

Table 4: Average Abnormal Returns (AAR) of selected stocks for the various time periods on the event day for Additions and Deletions to NSE NIFTY.

Action	Time Period	Day	N	AAR (%)	SE	t Test	p Values
Addition	2010-2014	Announcement	15	0.13841	0.39416	0.35115	0.72753
		Effective	15	0.63377	0.35404	1.79013	0.08185
	2015-2019	Announcement	16	-0.12409	0.43561	-0.28485	0.77739
		Effective	16	-0.08773	0.59322	-0.14789	0.88325

Deletion	2020-2024	Announcement	13	0.48053	0.49694	0.96698	0.34001
		Effective	13	-1.27970	0.58728	-2.17904	0.03595
	2010-2014	Announcement	11	-0.72046	0.51197	-1.40723	0.16793
		Effective	11	-1.25071	0.59028	-2.11883	0.04107
	2015-2019	Announcement	16	-0.67319	0.41874	-1.60768	0.11664
		Effective	16	1.17789	0.68396	1.72216	0.09362
	2020-2024	Announcement	10	-0.41847	0.57926	-0.72241	0.47471
		Effective	10	1.44263	0.52586	2.74338	0.00942

(Source: Author's calculations)

From the table 4, the average abnormal returns (AAR) of selected stocks on the event day for additions to NSE NIFTY show varying market reactions across different time periods. During 2010-2014, the announcement day AAR is 0.1384% (SE = 0.3942, $t = 0.3512$, $p = 0.7275$), while the effective day AAR rises to 0.6338% (SE = 0.3540, $t = 1.7901$, $p = 0.0819$), indicating a modest positive response that approaches statistical significance on the effective day. In 2015-2019, both announcement (-0.1241%, $p = 0.7774$) and effective (-0.0877%, $p = 0.8833$) day AARs are negative and insignificant, suggesting limited market reaction to additions during this period.

For the 2020-2024 period, the announcement day AAR for additions turns positive at 0.4805% (SE = 0.4969, $t = 0.9670$, $p = 0.3400$), while the effective day AAR becomes significantly negative at -1.2797% (SE = 0.5873, $t = -2.1790$, $p = 0.0359$), reflecting a stronger adverse adjustment when the inclusion takes effect. This indicates that while initial investor sentiment may be slightly

optimistic, the actual implementation of the addition triggers a downward adjustment in stock prices. Overall, addition events show modest and mostly insignificant abnormal returns across time periods, with the notable exception of the effective date in 2020-2024.

For deletion events, the announcement day AARs are consistently negative across all periods, with 2010-2014 showing -0.7205% (SE = 0.5120, $t = -1.4072$, $p = 0.1679$) and 2015-2019 at -0.6732% (SE = 0.4187, $t = -1.6077$, $p = 0.1166$). The effective day reactions vary, with 2010-2014 showing a significant negative AAR of -1.2507% (SE = 0.5903, $t = -2.1188$, $p = 0.0411$), 2015-2019 turning positive at 1.1779% (SE = 0.6840, $t = 1.7222$, $p = 0.0936$), and 2020-2024 displaying a significant positive AAR of 1.4426% (SE = 0.5259, $t = 2.7434$, $p = 0.0094$). These results suggest that deletion events elicit stronger and more immediate market reactions than additions, with notable rebounds on effective dates in later periods.

Table 5: Cumulative Average Abnormal Returns (CAAR) of selected stocks for the various time periods on the event day for Additions and Deletions to NSE NIFTY.

Action	Time Period	Type	N	CAAR (%)	SE	t Test	p Values
Addition	2010-2014	Announcement	15	-0.57328	2.50617	-0.22875	0.82036
		Effective	15	-0.72317	1.87620	-0.38544	0.70218
	2015-2019	Announcement	16	-0.37367	3.43843	-0.10867	0.91406
		Effective	16	1.39188	2.32243	0.59932	0.55271
	2020-2024	Announcement	13	4.85791	3.07270	1.58099	0.12263
		Effective	13	-4.83860	2.21584	-2.18365	0.03559
Deletion	2010-2014	Announcement	11	3.81379	3.46520	1.10060	0.27838
		Effective	11	-1.31801	2.55791	-0.51527	0.60952
	2015-2019	Announcement	16	1.34359	3.11274	0.43164	0.66858
		Effective	16	2.66179	2.45813	1.08285	0.28607
	2020-2024	Announcement	10	5.58595	4.21747	1.32448	0.19369
		Effective	10	2.62070	1.61265	1.62509	0.11287

(Source: Author's calculations)

From the table 5, the cumulative average abnormal returns (CAAR) of selected stocks on the event day for additions to NSE NIFTY show varying patterns across different time periods. During 2010-2014, the announcement day CAAR is -0.5733% (SE = 2.5062, $t = -0.2288$, $p = 0.8204$) and the effective day CAAR is -0.7232% (SE = 1.8762, $t = -0.3854$, $p = 0.7022$), indicating minimal and statistically insignificant cumulative market reactions. In 2015-2019, the announcement CAAR is -0.3737% (SE = 3.4384, $t = -0.1087$, $p = 0.9141$) and the effective day CAAR is 1.3919% (SE = 2.3224, $t = 0.5993$, $p = 0.5527$), showing slightly positive cumulative returns on the effective day, though still statistically insignificant.

For the 2020-2024 period, the announcement day CAAR rises to 4.8579% (SE = 3.0727, $t = 1.5810$, $p = 0.1226$), suggesting a higher cumulative response compared with

earlier periods, while the effective day CAAR turns negative at -4.8386% (SE = 2.2158, $t = -2.1837$, $p = 0.0356$), indicating a statistically significant downward adjustment when the additions are implemented. These figures suggest that cumulative market reactions to additions are generally limited but can exhibit notable shifts on the effective date in recent periods.

For deletion events, CAARs show a mixed pattern across time periods. In 2010-2014, the announcement CAAR is 3.8138% (SE = 3.4652, $t = 1.1006$, $p = 0.2784$) and the effective CAAR is -1.3180% (SE = 2.5579, $t = -0.5153$, $p = 0.6095$), indicating slight positive reactions on announcements followed by minor declines on the effective date. During 2015-2019, the announcement and effective day CAARs are 1.3436% (SE = 3.1127, $t = 0.4316$, $p = 0.6686$) and 2.6618% (SE = 2.4581, $t = 1.0829$, $p = 0.2861$),

respectively, showing moderate positive cumulative returns. In 2020-2024, the announcement CAAR rises to 5.5859% (SE = 4.2175, $t = 1.3245$, $p = 0.1937$) and the effective day CAAR is 2.6207% (SE = 1.6127, $t = 1.6251$, $p = 0.1129$), indicating stronger cumulative positive responses for deletions compared with additions across recent periods.

Table 6: CAAR of the Addition to Index Announcement Day event across various window periods

Window Period	CAAR (%)		
	Window Start Day	Event Day	Window End Day
(-1, 1)	-0.01663	0.12741	1.15325
(-3, 3)	-0.11789	0.30760	0.88073
(-5, 5)	-0.01007	0.11341	0.05695
(-7, 7)	-0.29299	-0.17022	-0.39255
(-10, 10)	0.00050	0.23206	-0.27898
(-15, 15)	0.26174	0.21386	-1.16606
(-20, 20)	0.16445	1.10398	-1.19701

(Source: Author's calculations)

The table 6 presents the CAAR values for the Addition Announcement Day event across various event windows, showing how cumulative abnormal returns behave before, during, and after the announcement period. In the short-term windows, such as (-1, +1) and (-3, +3), the CAAR on the event day is positive at 0.12741% and 0.30760%, respectively, indicating a favourable market reaction to the announcement. However, the values before and after the event day show fluctuations, with slight negative returns before and modest gains afterward. This pattern suggests that investors respond positively at the time of the

announcement, reflecting short-term optimism and speculative buying, but the overall magnitude of the reaction remains limited, indicating that the announcement effect is not very strong.

In the medium-term windows, including (-5, +5) and (-7, +7), the CAAR values show a declining trend, turning negative around the event period. For the (-7, +7) window, the event-day CAAR of -0.17022% and end-of-window value of -0.39255% suggest that the market reaction weakens over time, possibly due to profit booking after the initial excitement. This pattern indicates that the short-term price gains observed earlier may not sustain as the market reassesses the fundamental impact of the addition. The results are consistent with the price pressure hypothesis, which implies that initial price increases due to index inclusion are often followed by partial reversals once temporary trading pressures ease.

In the long-term windows of (-15, +15) and (-20, +20), the CAAR results show mixed behavior with some positive reactions on the event day (0.21386% and 1.10398%), followed by a decline to negative values at the end of the window (-1.16606% and -1.19701%). This suggests that while the announcement initially triggers a positive response, it does not lead to sustained abnormal performance over an extended period. The diminishing CAAR over longer windows reflects that the market absorbs the information quickly, and any short-term gains from speculative or index-related demand eventually normalize. Overall, the table indicates that the addition announcement leads to brief positive market reactions, but these effects fade over time, resulting in no lasting abnormal returns.

Table 7: CAAR of the Addition to Index Effective day event across various window periods

Window Period	CAAR (%)		
	Window Start Day	Event Day	Window End Day
(-1, 1)	0.32794	0.13401	0.25303
(-3, 3)	-0.50815	-0.36360	-0.51222
(-5, 5)	0.21695	-0.25262	-0.42910
(-7, 7)	-0.15345	-0.59305	-0.87556
(-10, 10)	-0.11934	-0.95748	-1.16393
(-15, 15)	-0.74046	-1.63621	-2.47875
(-20, 20)	0.36903	-1.16998	-2.45281

(Source: Author's calculations)

The table 7 presents the CAAR values for the Addition Effective day event across different window periods, providing insights into how stock prices react before, during, and after the effective date of index inclusion. In the short-term windows, such as (-1, +1), the CAAR remains positive throughout, with 0.13401% on the event day and 0.25303% at the end of the window, indicating a mildly positive market response during the immediate period surrounding the effective date. However, the magnitude of these values suggests that the reaction is relatively weak, reflecting limited short-term enthusiasm among investors once the stock officially becomes part of the index.

In the medium-term windows, such as (-3, +3), (-5, +5), and (-7, +7), the CAAR values turn negative, particularly on and after the event day. For example, in the (-3, +3) window, the CAAR declines from -0.36360% on the event day to -0.51222% by the end of the period. Similarly, the (-7, +7) window shows a drop from -0.59305% to -0.87556%. These

negative returns imply that the market may experience a correction after the inclusion takes effect, possibly due to profit booking by short-term traders or the fading of speculative demand that existed around the announcement period. Such a trend supports the idea that the effective inclusion does not lead to sustained positive abnormal performance, as the price adjustments may have already been incorporated earlier during the announcement phase.

In the long-term windows of (-10, +10), (-15, +15), and (-20, +20), the CAAR values continue to show a downward trend, with larger negative returns observed over extended periods. The event-day CAAR becomes increasingly negative, reaching -0.95748% for (-10, +10), -1.63621% for (-15, +15), and -1.16998% for (-20, +20). The cumulative effect by the end of these windows also deepens into negative territory, indicating a consistent decline after the effective date. This pattern suggests that the positive effects seen during the addition announcement phase do not persist

once the stock is officially included in the index. Instead, the market appears to undergo a gradual correction, consistent with the notion that initial gains are temporary and that prices revert toward their fundamental levels over

time. Overall, the table reflects that the Addition Effective event leads to short-term neutrality followed by long-term negative adjustments in cumulative abnormal returns.

Table 8: CAAR of the Deletion from Index Announcement Day event across various window periods

Window Period	CAAR (%)		
	Window Start Day	Event Day	Window End Day
(-1, 1)	0.86967	0.25127	-0.48792
(-3, 3)	1.06444	1.29869	1.15256
(-5, 5)	-0.17527	1.16687	1.81890
(-7, 7)	0.24730	1.93395	2.14880
(-10, 10)	0.13083	2.00284	2.91762
(-15, 15)	-0.32180	3.03962	4.82943
(-20, 20)	0.51684	3.22456	4.62390

(Source: Author's calculations)

The table 8 presents the CAAR values for the Deletion from Index Announcement Day event across various window periods, showing how stock prices behave before, during, and after the announcement. In the short-term windows such as (-1, +1) and (-3, +3), the CAAR values show a mixed response. For the (-1, +1) window, the CAAR declines from 0.86967 percent before the event to -0.48792 percent after the event day, suggesting an initial positive reaction followed by a quick correction. However, in the (-3, +3) window, the CAAR remains positive throughout, increasing from 1.06444 percent before the event to 1.15256 percent at the end of the window. This indicates that investors may have anticipated the deletion and adjusted their positions accordingly, resulting in a relatively stable short-term reaction around the announcement period.

In the medium-term windows such as (-5, +5) and (-7, +7), the CAAR values continue to rise. For example, in the (-5, +5) window, the event-day CAAR is 1.16687 percent and increases to 1.81890 percent by the end of the period. Similarly, in the (-7, +7) window, the CAAR rises from 1.93395 percent on the event day to 2.14880 percent at the end of the window. This upward trend indicates that the

market response becomes increasingly positive as time progresses after the deletion announcement. Such a pattern suggests that the initial pessimism typically associated with deletions may be short-lived and that the market gradually corrects itself, possibly due to bargain buying or the perception that deleted stocks could offer future value once removed from the index.

In the long-term windows, including (-10, +10), (-15, +15), and (-20, +20), the CAAR values display a continued increase, reinforcing the pattern of sustained positive abnormal returns over extended periods. The event-day CAAR rises from 2.00284 percent in the (-10, +10) window to 3.22456 percent in the (-20, +20) window, with end-of-window values reaching 4.82943 percent and 4.62390 percent respectively. This consistent upward trend suggests that, contrary to traditional expectations of a negative impact from index deletions, the affected stocks experience a gradual recovery and even long-term gains. The results imply that the deletion announcement may initially create volatility, but over time, investor confidence and buying interest led to a positive cumulative return, reflecting the market's tendency to correct overreactions to index changes.

Table 9: CAAR of the Deletion from Index Effective day event across various window periods

Window Period	CAAR (%)		
	Window Start Day	Event Day	Window End Day
(-1, 1)	-0.09057	0.43686	-0.22946
(-3, 3)	-0.29285	-0.12994	-0.37268
(-5, 5)	-0.05260	-0.37056	0.32675
(-7, 7)	-0.15719	-1.16503	-0.57101
(-10, 10)	-0.20439	-1.17659	-0.22844
(-15, 15)	-0.18886	-0.30639	0.33976
(-20, 20)	-0.48440	1.46750	2.80518

(Source: Author's calculations)

The table 9 presents the CAAR values for the Deletion from Index Effective Day event across various window periods, reflecting how the market reacts to the actual removal of a stock from an index. In the short-term windows such as (-1, +1) and (-3, +3), the CAAR values fluctuate mildly around the event day. For the (-1, +1) window, the CAAR is positive on the event day (0.43686 percent) but turns negative afterward (-0.22946 percent), suggesting that the market initially reacts with slight optimism or correction

before experiencing a small decline. In the (-3, +3) window, the CAAR remains negative throughout, indicating that investors may show mild caution or selling pressure around the effective date. These patterns imply that the short-term reaction is generally weak and mixed, with no strong directional movement following the deletion's implementation.

In the medium-term windows such as (-5, +5) and (-7, +7), the CAAR values continue to show alternating behavior. For

instance, in the (-5, +5) window, the event-day CAAR is -0.37056 percent but improves to 0.32675 percent by the end of the window, showing a modest recovery after the deletion becomes effective. However, in the (-7, +7) window, the CAAR drops to -1.16503 percent on the event day and slightly improves to -0.57101 percent afterward, suggesting that negative reactions may persist for a few days before stabilizing. These results imply that the market initially perceives deletions negatively but tends to adjust afterward as selling pressure from index-tracking funds subsides and other investors begin to find value opportunities.

In the long-term windows, including (-10, +10), (-15, +15), and (-20, +20), the CAAR trend becomes more positive. While the event-day CAAR remains negative in the shorter long-term windows (-1.17659 percent and -0.30639 percent), the values improve substantially by the end of these periods. Notably, the (-20, +20) window shows a significant increase, with a CAAR of 1.46750 percent on the event day and 2.80518 percent at the end of the window. This indicates a gradual recovery and positive adjustment in prices over time, suggesting that the negative effects of deletion are short-lived. The overall results demonstrate that while the immediate and medium-term responses to deletion are mildly negative, the long-term market behavior reflects resilience, with cumulative abnormal returns turning positive as investors realign their portfolios and reassess the deleted stocks' potential.

5. Conclusion

The analysis of NSE NIFTY index additions and deletions during the period 2010-2024 demonstrates that market reactions to index revisions are asymmetric and vary across announcement and effective dates. Addition events generally elicited modest positive abnormal returns on announcement days, reflecting initial optimism and anticipatory buying by investors. However, these effects tended to diminish or turn slightly negative on the effective dates, indicating that the initial enthusiasm often did not persist once the stock became part of the index. Deletion events, on the other hand, triggered stronger negative abnormal returns on announcement days, consistent with expectations of reduced demand from index-tracking funds and lower visibility. Effective dates for deletions, however, showed signs of partial price recovery, highlighting that the negative effects of deletions are initially more pronounced than the positive effects of additions, reflecting asymmetric market responses.

Temporal analysis across three sub-periods-2010-2014, 2015-2019, and 2020-2024-revealed that investor responses evolved over time, likely reflecting changing market conditions, liquidity levels, and investor behavior. In the earlier periods, market reactions were generally muted for additions, while deletions elicited moderate negative responses. In the most recent period (2020-2024), additions showed slightly stronger negative adjustments on effective dates, whereas deletions exhibited more pronounced recovery, emphasizing that the magnitude of reactions is not uniform. This asymmetry suggests that investors react more strongly to removal news than to inclusion news, and the market tends to overreact to deletions, which is later corrected over time.

Overall, the study confirms that index revisions in the NSE

NIFTY influence stock prices, with asymmetric effects between additions and deletions. Additions induce smaller and short-lived positive reactions, while deletions generate stronger immediate negative responses that are partially reversed over time. These patterns align with the temporary price pressure hypothesis and behavioural explanations of investor overreaction and correction. The findings have practical implications for portfolio managers, traders, and regulators, emphasizing the importance of monitoring both announcement and effective dates to anticipate price adjustments. They also contribute to the broader literature on event studies and market reactions in emerging markets, highlighting the asymmetric and dynamic nature of investor responses to index changes.

References

1. Ahmed N, Bassiouny A. The effects of index changes on stock trading: Evidence from the EGX. *Review of Economics and Finance*. 2017;11(1):55-66.
2. Andelius J, Skrutkowski M. Valuation effects of index inclusions - Evidence from Sweden. 2008.
3. Azevedo A, Karim M, Gregoriou A, Rhodes M. Stock price and volume effects associated with changes in the composition of the FTSE Bursa Malaysian KLCI. *Journal of International Financial Markets, Institutions and Money*. 2014;28(1):20-35.
4. Baltussen G, van Bakkum S, Da Z. Indexing and stock market serial dependence around the world. *Journal of Financial Economics*. 2019;132(1):26-48.
5. Bechmann KL. Price and volume effects associated with changes in the Danish blue-chip index: The KFX Index. *Multinational Finance Journal*. 2004;8(1-2):3-34.
6. Bennett B, Stulz R, Wang Z. Does joining the S&P 500 Index hurt firms? *SSRN Electronic Journal*. 2020.
7. Biktimirov EN, Li B. Asymmetric stock price and liquidity responses to changes in the FTSE Small Cap Index. *Review of Quantitative Finance and Accounting*. 2014;42(1):95-122.
8. Bildik R, Gulay G. The effects of changes in index composition on stock prices and volume: Evidence from the Istanbul Stock Exchange. *International Review of Financial Analysis*. 2008;17(1):178-197.
9. Burnham T, Harry G, Jeffrey W. Investing in the presence of massive flows: The case of MSCI country reclassifications. *Financial Analysts Journal*. 2018;74(1):77-87.
10. Cai J. What's in the news? Information content of S&P 500 additions. *Financial Management*. 2007;36(3):113-124.
11. Cai TI, Cai J. The long-term impact of rebalancing the Russell 2000 Index. *Financial Analysts Journal*. 2008;64(4):76-91.
12. Chacko GC, Jurek JW, Stafford E. The price of immediacy. *Journal of Finance*. 2008;63(3):1253-1290.
13. Chakrabarti R, Huang W, Jayaraman N, Lee J. Price and volume effects of changes in MSCI indices - Nature and causes. *Journal of Banking and Finance*. 2005;29(5):1237-1264.
14. Chan HWH, Howard PF. Additions to and deletions from an open-ended market index: Evidence from the Australian All Ordinaries. *Australian Journal of Management*. 2002;27(1):45-74.

15. Chang YC, Hong H, Liskovich I. Regression discontinuity and the price effects of stock market indexing. *Review of Financial Studies*. 2015;28(1):212-242.
16. Chen H, Noronha G, Singal V. The price response to S&P 500 Index additions and deletions: Evidence of asymmetry and a new explanation. *Journal of Finance*. 2004;59(4):1901-1929.
17. Cheung A, Roca E. The effect on price, liquidity, and risk when stocks are added to or deleted from a sustainability index: Evidence from the Asia-Pacific context. *Journal of Asian Economics*. 2013;24:51-65.
18. Denis DK, John JM, Alexei VO, Yun Y. S&P 500 index additions and earnings expectations. *Journal of Finance*. 2003;58(5):1821-1840.
19. Deininger C, Kaserer C, Roos S. Stock price effects associated with index replacements in Germany. EFMA 2001 Lugano Meetings. 2000.
20. Dhillon U, Johnson H. Changes in the Standard and Poor's 500 list. *Journal of Business*. 1991;64(1):75-85.
21. Fernandes M, Mergulhão J. Anticipatory effects in the FTSE 100 index revisions. *Journal of Empirical Finance*. 2016;37:79-90.
22. George R. Price reactions to index reorganization announcements: Indian evidence. *Paradigm*. 2009;13(2):88-97.
23. Gowri Shankar S, Randhawa DS. The effects of index changes in the Hong Kong and Singapore stock markets. Working Paper 06-01. 2006.
24. Greenwood R. Excess comovement of stock returns: Evidence from cross-sectional variation in Nikkei 225 weights. *Review of Financial Studies*. 2008;21(3):1153-1186.
25. Greenwood R, Sammon M. The disappearing index effect. *Journal of Finance*. 2025;80(2):657-698.
26. Gregoriou A. The liquidity effects of revisions to the CAC 40 stock index. *Applied Financial Economics*. 2011;21(5):333-341.
27. Harris L, Gurel E. Price and volume effects associated with changes in the S&P 500 list: New evidence for the existence of price pressures. *Journal of Finance*. 1986;41(4):815-829.
28. Hegde SP, McDermott JB. The liquidity effects of revisions to the S&P 500 Index: An empirical analysis. *Journal of Financial Markets*. 2003;6(4):413-459.
29. Jain PC. The effect on stock price of inclusion in or exclusion from the S&P 500. *Financial Analysts Journal*. 1987;43(1):58-65.
30. Kaul A, Mehrotra V, Morck R. Demand curves for stocks do slope down: New evidence from an index weights adjustment. *Journal of Finance*. 2000;55(2):893-912.
31. Kumar SSS. Price pressure hypothesis: Evidence from S&P CNX Nifty index changes. *Metamorphosis*. 2007;6(1):9-32.
32. Li Y, Sadeghi M. Price performance and the liquidity effects of index additions and deletions - Evidence from Chinese equity market. *Asian Journal of Finance and Accounting*. 2009;1(2):16-52.
33. Lynch AW, Mendenhall RR. New evidence on stock price effects associated with changes in the S&P 500 index. *Journal of Business*. 1997;70(3):351-383.
34. Madhavan A. The Russell reconstitution effect. *Financial Analysts Journal*. 2003;59(4):51-64.
35. Madhavan A, Jason R, Nogie U. Demystifying index rebalancing: An analysis of the costs of liquidity provision. *Journal of Portfolio Management*. 2022;48(2):171-184.
36. Marisetty N, Suresh Babu M, Rao SVR. An empirical study on expected return models with reference to bonus issues and stock splits in Indian share market. *International Journal of Management*. 2020;11(5):1612-1630.
37. Marisetty N, Madasu P. Corporate announcements and market efficiency: A case on Indian capital market. *International Journal of Business and Management*. 2021;16(8):71-83.
38. Morck R, Fan Y. The mysterious growing value of S&P index membership. Working Paper, University of Alberta, Edmonton. 2001.
39. Parthasarathy S. Price and volume effects associated with index additions: Evidence from the Indian stock market. *Asian Journal of Finance & Accounting*. 2010;2(2):55-80.
40. Patel N, Ivo W. Extended stock returns in response to S&P 500 index changes. *Review of Asset Pricing Studies*. 2017;7(2):172-208.
41. Preston H, Aye S. What happened to the index effect? A look at three decades of S&P 500 adds and drops. *Research S&P Dow Jones Indices*. 2021.
42. Qin N, Singal V. Indexing and stock price efficiency. *Financial Management*. 2015;44(4):875-904.
43. Rahman A, Rajib P. Associated effects of index composition changes: Evidence from the S&P CNX Nifty 50 index. *Managerial Finance*. 2014;40(4):376-394.
44. Schnitzler J. S&P 500 inclusions and stock supply. *Journal of Empirical Finance*. 2018;48:341-356.
45. Selvam M, Indhumathi G, Lydia J. Impact on stock price by the inclusion to and exclusion from CNX Nifty index. *Global Business Review*. 2012;13(1):39-50.
46. Shleifer A. Do demand curves for stocks slope down? *Journal of Finance*. 1986;41(3):579-590.
47. Zhou H. Asymmetric changes in stock prices and investor recognition around revisions hypotheses regarding price. *Financial Analysts Journal*. 2011;67(1):72-84.