

Impact of the Changes in the Nifty Index Constituents

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Abstract

The objective of this study is to conduct an empirical examination of the S&P CNX Nifty index reconstitutions, between 2009 and 2018, focusing on both the price and non-price effects and the explanations surrounding them. The event methodology, with multiple abnormal return computational methods, is employed to improve the robustness and reliability of the results. The results show that the Nifty index additions (deletions) are associated with significant positive (negative) permanent abnormal returns. But the evidence of permanent abnormal volume is limited, unlike the developed markets. The evidence in this study favours the downward sloping demand curve hypothesis as the dominant explanation for the permanent abnormal return. This study extends the existing literature to a hitherto unexplored new sample period.

Keywords: India, Financial markets, Index additions and deletions, Nifty index

1. Introduction

The slope of the demand curves of stocks has fascinated researchers since 1972, when Scholes (1972) contended that the market will price securities in such a way that the returns of assets with similar risk are equal. If this equilibrium is violated, investors will arbitrage them away. He further adds that this arbitrage is possible because stocks are not unique work of art, but rights to certain future stream of cash flows for which close counterparts exist either directly or through some combination of different assets. One of the most debated concepts in the area of financial economics is the 'Efficient Market Hypothesis' (EMH). The efficient market hypothesis has dominated economics and finance in the past decades and is central to both theoretical and empirical finance. It has implications not only on the market structure, cost of capital and portfolio management but also the Capital asset pricing model (CAPM) and Arbitrage pricing theory (APT). One of the important assumptions underlying

the EMH is the horizontal demand curves in which investors can buy and sell stocks without affecting the price. The home leverage assumption of the 'Modigliani and Miller' also depends on the basic premise of arbitrage and predicts horizontal demand curves for stocks.

EMH asserts that all information is reflected in the stock prices quickly and correctly and investors cannot make consistent gains by trading on past prices or information. The ascendancy of this paradigm had its impact on the portfolio management and passive investment strategies like the index funds. This could lead to buying and selling pressure during index revisions leading to significant price effects. Further, the index addition announcements, made with public available information, should not have any impact on the price as any information should be quickly reflected in the prices quickly. Therefore, this empirical examination on index inclusions has implications for the market efficiency in the Indian stock market. These studies on index inclusion have important implications for the investors, traders, and portfolio managers. This study also has implication on the choices decision-making of corporate finance managers.

The researchers have focused on various events to examine the slope of demand curves. Scholes (1972) and Mikkelson and Partch (1985) were the first studies on the slope of the demand curves using secondary equity offerings as the event. Though, both the studies evidenced weak support for the downward sloping demand curve hypothesis, they concluded that the adverse information content of the secondary equity offerings may explain the abnormal price effects rather than the slope of demand curves. The next most studied event is the periodic reconstitution of the widely followed stock indices. The index reconstitution events also provide an opportunity for examining the horizontal demand curves as it is supposedly devoid of any information content. Shliefer (1986) reported a permanent price increase following stocks addition to the S&P 500 index and found support for the downward sloping demand curve as stock addition to index increases the demand for the stock. However, other explanations like liquidity, certification, investor awareness and price pressure also provide alternate explanations for the index reconstitution effects. The different explanations may not be mutually exclusive and may be complementary.

The downward sloping demand curve (DSDC hypothesis) asserts that the stocks are not perfect substitutes; consequently the demand for stocks will be long term downward sloping or less than perfectly elastic. Consequently, the price effects following index changes should be permanent as evidenced by Shleifer (1986), and Wurgler & Zhuravskya (2002). The Price Pressure Hypothesis (PPH) also assumes downward sloping curve, but only in the short run as the investors must be compensated for transaction costs and risk for selling (buying) in order to satisfy the short term demand of the index funds tracking the index. Once the index funds rebalance their portfolio, the stock prices will revert back to its original level, Harris & Gurel (1986) and Vespro (2006).

The investor awareness hypothesis contends that the investor awareness or the greater interest by analysts in the added stocks might coerce the management in providing superior results, Denis et al. (2003). However, Chen et al. (2004) predict asymmetric response to deletions as it is difficult to become 'unaware' of the deleted stocks. Further, Abnormal trading volume

effects were evidenced by Chen et al. (2004) and Hradzil (2007). Next, index inclusion and exclusion might be a signal to the investors regarding the future prospects of the firm (certification hypothesis) Jain (1987) and Dhillon & Johnson (1991). The liquidity hypothesis contends that the increased interest in index stocks causes more efficient information production leading to reduced information asymmetry and consequently improved liquidity and vice versa. The results of Amihud & Mendelson (1986), Hegde & Mcdermott (2003) and Hradzil et al. (2007) are consistent with the liquidity hypothesis.

This study investigates the following research questions: Whether Nifty index reconstitutions are associated with positive, permanent price effects for additions and negative, permanent price effects for deletions; Whether Nifty index reconstitutions are associated with permanent increase in volume for additions and permanent decrease in volume for deletions; Whether Nifty index reconstitutions are associated with permanent increase in liquidity for additions and permanent decrease in liquidity for deletions.

The objective of this study is to conduct an empirical examination of the S&P CNX Nifty index reconstitutions, between 2009 and 2018, focusing on both the price and non-price effects and the explanations surrounding them.

The next section reviews the literature so far and develops the hypothesis. The third section details the data and methodology. The fourth section reports and discusses the results of the comprehensive empirical investigation. The fifth section concludes.

2. Review of Literature and Hypotheses

The prior research has evidenced significant price and non-price effects on the announcement day (AD) and the effective date of inclusion (ED). Shleifer (1986) examined the S&P 500 additions for the 1976-1983 period and evidenced a permanent price increase of nearly 3% on the announcement day which persisted till at least 20 days after inclusion. Lynch and Mendenhall (1987) examined the S&P 500 additions and deletions during the 1990-1995 period and found significant positive (negative) permanent abnormal returns following announcement of addition (deletion) which was only partially reversed in subsequent days. They found support for the DSDC hypothesis which was later supported by Wurgler & Zhuravskaya (2002), Cai & Houge (2008), and Fernandes & Mergulhao (2016).

Harris & Gurel (1986), examining the S&P 500 additions for the 1976-1983 period, evidenced a price increase to the tune of 3.13% post addition and documented a systematic reversal in support of price pressure hypothesis. In the later studies, Mase (2002), Elliot et al. (2006), Vespro (2006), Miller & Ward (2015) and Wang et al. (2015) also found evidence in support of price pressure hypothesis.

Chen et al. (2003) analysing S&P 500 additions and deletions, for the period 1963-2000, evidenced asymmetric price responses for additions and deletions and found support for the investor awareness hypothesis. Denis et al. (2003), examining the S & P 500 addition between 1987 and 1999, argue that the firms' inclusion in widely followed index might convey information about the prospects of the firm. In the recent studies on the index revisions, Hacibedel & Bommel (2007), Daya et al. (2012) and Kamal (2014) found support

for the information based theories. According to Chen et al.(2003), increase in analyst coverage is likely to impact favourably on the volume and quality of the information which in turn will reduce information asymmetry and thereby increase liquidity. Beneish & Whaley (1996), Hegde & Mcdermott (2003), Gregariou et al. (2006) and Hradzil (2007) found support for the liquidity hypothesis.

The other recent studies on index reconstitutions are Biktimirov and Li (2014) studied the FTSE index and found support for liquidity hypothesis. Baran and King (2014) analysed the S&P 500 index and showed that the forecast accuracy actually increases for additions. Li and Tan (2014) examined the S&P 500 index and found support for corporate governance effects. While Afego (2016) examined the Nikkie index changes, Kot et al. (2015) analysed the Hangseng index changes.

The studies focusing on Nifty index additions in the Indian market are few and out dated. Kumar (2007), examining Nifty index revisions during 1996-2003 period, evidenced temporary abnormal returns which was reversed within a week. Rahman et al. (2014) examined the price and volume effects of companies included and excluded for the Nifty index during the 2008-2010 period and evidenced temporary abnormal returns around ED. They found support for PPH. Kumar (2003) also evidenced temporary abnormal returns and found support for PPH. Joshipura & Janakiraman (2015) examined Nifty revisions between 1998 and 2009 and did not evidence any significant abnormal returns around announcement. They, however, evidenced significant abnormal returns around actual inclusion date which was reversed subsequently giving support to the price pressure hypothesis. However, Chakrabarti et al (2005) studied the additions to MSCI India Standard Index during the 1998-2000 period and evidenced permanent abnormal returns, post announcement, to the tune of 4.17 % and found support for the information based theories. Parthasarathy, S. (2010) examined the Nifty index addition between 1999 and 2010 and evidenced permanent abnormal returns to the tune of 4.90%. But the evidence for permanent abnormal volume was limited. This study found support for information related explanations.

The literature review brings out the importance and continuing interest in index revision effects across the world and the conflicting evidence with regard to the price effects in the Indian Nifty additions. Though the existing literature generally evidenced price and non price effects following index changes, the results appear to be sensitive to sample and the methodology used. The choice of the abnormal return calculations is also different for different studies. While some studies have evidenced temporary abnormal returns, others have experienced permanent abnormal returns. There is also lack of consensus about the explanation for the observed index effects. The conflicting evidence and the varying explanations might be due to the choice of the methodology, abnormal returns and the market index. This study intends to enter the debate by conducting a comprehensive examination of the price and non – price effects in the recent 2009 - 2018 period. The Securities Exchange Board of India (SEBI), since 2000, had initiated steps (Note 1) to improve investor protection, disclosure norms and corporate governance, which has also contributed to the growth of both cash and mutual fund segment, especially from 2009 to 2018. Further, both the studies evidencing temporary abnormal returns have used market model based abnormal return

calculation. This study fills the gap by examining Nifty index revisions in the recent period using multiple abnormal return calculations.

The investor awareness hypothesis predicts asymmetric price response to additions and deletions and will be automatically negated, if the results of the study were to support hypothesis 1. If the Nifty index additions price effects are due to increase in expected cash flow due to certification, this study hypothesis that percentage of retail shareholding must increase (decrease) post additions (deletions). However, according to DSDC hypothesis, due to the buying (selling) action of index funds, the percentage of retail shareholding will decrease (increase) post addition (deletion).

The price pressure hypothesis predicts temporary abnormal price and non-price effects around both AD and ED. However, the ED makes more sense as the exact weights will be known at ED rather than AD. Beneish and Whaley (1996) show that the trading volume and stock prices increase around announcement of impending inclusion and contend that this is due to investors front running the index funds. They also add that any potential effect of the downward sloping demand curve should be present around announcement date. Similarly, if investors perceive index addition as an indicator of future improved performance or becoming more efficient in incorporating information into prices, then the abnormal price effects should occur around AD.

Hypothesis 1a: The Nifty index reconstitution announcements are associated with positive permanent abnormal return for additions.

Hypothesis 1b: The Nifty index reconstitution announcements are associated with negative permanent abnormal return for deletions.

Hypothesis 2: The Effective reconstitution dates are associated with temporary abnormal returns.

According to Hegde and Mcdermott (2003), the liquidity hypothesis has the following potential implications: permanent increase (decrease) in volume and liquidity post addition (deletion).

Hypothesis 3a: Nifty index reconstitution announcements are associated with permanent positive increase in trading volume for additions.

Hypothesis 3b: Nifty index reconstitution announcements are associated with permanent negative decrease in trading volume for deletions.

Hypothesis 4a: Nifty index reconstitution announcements are associated with permanent positive increase in liquidity for additions.

Hypothesis 4b: Nifty index reconstitution announcements are associated with permanent negative decrease in liquidity for deletions.

The Indian equity market is one of the fastest growing emerging markets and the institutional setting for Nifty index reconstitutions is somewhat similar to those of S&P 500 index. However, both differ in overall regulatory environment, level of informational efficiency and

liquidity. Therefore, the framework of the Nifty index reconstitutions provides an out of sample test for the slope of demand curves for stocks in an alternative equity market. The comprehensive single country studies in the emerging markets, like Miller & Ward (2015) and Wang et al. (2015), are few and far in between. This study extends the previous empirical literature on Nifty index reconstitutions to the recent period as it reflects the current economic environment. To my best knowledge, no study has examined the Nifty index reconstitution using the recent data so far.

3. Data and Methods

3.1 Nifty Index Selection Process

The National Stock Exchange (NSE) is the largest stock exchange in India and was ranked tenth in the world in terms of domestic market capitalization in 2017. The Nifty 50 index (NIFTY) is the flagship index of the NSE tracking the portfolio of fifty large, liquid, blue chip companies and capturing approximately 63% of its equity market capitalization as on March, 2017. The Nifty is owned and managed by NSE Indices Ltd. The Nifty index constituents are selected on the basis of market capitalisation, liquidity and industry representation. The index is normally reviewed twice a year with a notice period of six weeks. The stocks are normally removed due to corporate actions like restructuring, mergers or when the free float market capitalisation of the companies eligible for inclusion is at least 1.5 times the free float market capitalisation of the smallest constituent in the index.

3.2 Sample Selection

The sample period begins on June 2009 and ends on Oct 2018 to coincide with the change of the computation methodology of S&P CNX Nifty index from full market capitalization weighted methodology to the free float market capitalization weighted methodology. The daily data from the NSE official website is used to calculate the return and volume of the added stocks and the market index. The data is adjusted for corporate actions like stock dividend and stock splits. During this sample period, 36 stocks were added (deleted) to (from) the Nifty index and from this original sample, a 'clean sample' is constructed separately for additions and deletions.

As in Chen et al (2004) and Wurgler & Zhuvarskya (2002), only clean reconstitutions that did not result from spin-off, mergers & acquisitions and name changes are considered. Also, the stocks should have at least one year trading history before announcement for both additions and deletions. The final sample (Note 2) consists of 30 additions and 28 deletions. NSE normally makes the announcement four weeks before the actual inclusion day. Table 1 reports the sample statistics. The free float market capitalization, index weights and the number of trading days between AD and ED are reported for both the addition and deletion samples. The free float market capitalization of the added stocks is, on an average, 1.75 times more than that of the deleted stocks. The number of days between announcement and inclusion varies between 18 and 29 with a mean of approx 25 days.

Table 1. Descriptive statistics for the Nifty index revisions from 2009-2018

PANEL A - Additions N=30	Mean	1st quartile	Median	3rd quartile
Free Float Market Capitalisation / Rs Millions	217621	149653	186615	280632
Index weights in percentages	0.57%	0.49%	0.56%	0.63%
Trading days between AD and ED	25.07	22.00	27.00	28.00
PANEL B - Deletions N =28	Mean	1st quartile	Median	3rd quartile
Free Float Market Capitalisation / Rs Millions	88409	46071	65341	142741
Index weights in percentages	0.33%	0.25%	0.28%	0.42%
Trading days between AD and ED	25.75	23.00	27.00	28.00

The final sample consists of 30 additions and 28 deletions. Panel A reports the details of the addition sample: free-float market capitalisation, index weights immediately after addition to the Nifty index; and number of trading days between announcement and actual inclusion. Panel B reports the details of the deletion sample: free-float market capitalisation and index weights immediately before deletion from the Nifty index; and number of trading days between announcement and actual deletion.

All the data are from the NSE official website.

3.3 Methodology

This study uses an event study methodology of ‘Brown and Warner’ with two event dates for each sample; the announcement date (AD) and effective date (ED). As NSE normally announces the Nifty index revisions after trading hours, the following day or AD+1 is the actual announcement day. The CNX 500 index (a 500 stock portfolio) is the appropriate choice for market index, as it captures approximately 90% of NSE’s equity market capitalization.

3.3.1 Cumulative Abnormal Returns

According to Kothari and Warner (2007), the difficulty of dealing with statistical and econometric inferences in event study methodology might weaken the robustness and reliability of the results. Consequently, this study uses three abnormal return computational methods in this study. In order to examine the index reconstitution effects, the abnormal

return is calculated around the two event dates namely, AD and ED.

The first method is the market adjusted abnormal return (MCAR) which is arrived at by subtracting the broad based CNX 500 index return from the stock return. The abnormal return is then aggregated over the estimation period to calculate the CAR. The CAR represents the buy and hold return which makes sense to the investors. The daily return is the log return using closing price at time t and time $t-1$.

$$\text{MCAR Abnormal Return } AR_{it} = R_{it} - R_{mt}, \quad (1)$$

Where, R_{it} is the stock return and R_{mt} is the CNX 500 index return on day 't'.

In the second method, the abnormal return is calculated using the widely used OLS market model where the expected return is calculated as

$$E[R_i] = \alpha_i + \beta_i E[R_m], \quad (2)$$

Where, α_i and β_i are the model parameters and R_m is the CNX 500 return and the estimation window starts 130 days before and ends 11 days (120 trading days) before the index addition AD. The abnormal return is,

$$\text{OCAR Abnormal Return } AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \quad (3)$$

The OLS market model abnormal return has two key methodological issues in the context of index revision studies. The abnormal return might be biased downwards (upwards) for additions (deletions), as stocks added (removed) to the index are likely to have performed well (poorly) just prior to the addition (deletion). The model parameters may produce upwardly (downwardly) biased alpha estimates especially when aggregated over time (Lynch and Mendenhall, 1987). The second methodological problem is the possible shift in beta, post addition.

The third method of calculating abnormal return is subtracting the 'control sample' return from the stock return (CCAR) as in Hradzil (2009). The candidates for the control stocks are the eligible candidates for inclusion in the Nifty index based on market capitalization, but are not added. The stocks added to 'Nifty' index generally come from the 'Nifty Next 50' (Formerly Nifty Junior Index) index and the stocks deleted from the Nifty index generally find a place in that index. The top three stocks, in the Nifty Next 50 index other than the added stocks will be the control sample. The ratio of control (eligible) stocks to added stocks is three to one.

3.3.2 Abnormal Volume

The abnormal trading volume turnover approach is used in this study, to estimate the volume effects following Nifty index reconstitutions.

$$\text{Volume Ratio (VR)} = (V_{it} / V_{mt}) \div (V_i / V_m) \quad (4)$$

Where V_{it} and V_{mt} are the trading volumes of the stock and the total NSE respectively, and V_i and V_m are the average trading volumes of the stock and total NSE for the period AD-70 through AD-11. The daily Volume ratio is averaged across the various event windows and the VR should have a value of 'one' under null hypothesis. If, in any event window, the volume ratio (VR) is significantly greater than one, then it is said to be abnormal for that event window.

3.3.3 Liquidity Ratio

Amihud (2002) 'liquidity' measure is used in this study to examine the stock liquidity around the Nifty additions and deletions. This is calculated as the ratio of daily rupee volume of the stock to the absolute stock return, which can be interpreted as the daily price response to one rupee of trading value and essentially capturing the price impact.

$$\text{Liquidity Ratio (LR)} = \text{VOL}_{it} / |R_{it}| \div \text{VOL}_i / |R_i| \quad (5)$$

Where R_{it} is the daily stock return and VOL_{it} is the daily rupee volume. ' $\text{VOL}_i / |R_i|$ ' is the average liquidity of the stock for the period AD-70 through AD-11. The liquidity ratio is averaged across the various event windows and if, in any event window, the average liquidity ratio is significantly greater than one, then it is said to be abnormal for that event window. Amihud (2002) has discussed the advantages of this measure and disadvantages of measures like rupee volume and turnover.

Further, there could be biases in standard errors associated with date clustered event studies especially for studies focusing on single event change like index addition. However, the impact of the bias will be minimal in this study as generally only around two stocks were added in the Nifty biannual revisions.

4. Results and Discussion

This section reports the long window statistics for the daily abnormal returns using multiple calculation methodology around the announcement day (AD+1) and the effective date (ED). The abnormal stock returns are investigated using the normal event study methodology. Similar to Lynch and Mendenhall (1997), this study focuses on the following event windows to examine the abnormal returns and abnormal volume and to discriminate between the various theories explaining the index inclusion (exclusion) premia. The anticipation window (AD-9: AD), The AD window is AD+1 for additions and AD+1 to AD+3 for deletions. The rationale behind the choice of AD window (AD+1 to AD+3) for the deletion sample is that the fraction of stocks with positive CAR is more than 50% for AD+1, AD+2 and AD+3. Neither AD nor AD+4 satisfy these criteria for deletion sample. The run-up Window is AD+2 to ED-3 for the addition sample and 'AD+4 to ED-3' for the deletion sample. The effective change window (ED window) is 'ED-2 to ED'. The fraction of stocks with positive CAR is more than 50%, for addition sample, only for ED-2, ED-1 and ED. Neither ED-3 nor ED+1 satisfy these criteria for deletion sample. The pressure release window is ED+1 to ED+3. The two long term windows are AD40 (AD+1 to AD40) and AD60 (AD+1 to AD60). The abnormal returns are aggregated over the event period to get the CAR. The CAR is considered permanent in this study, if it is permanent for at least 40 days from AD, in order to avoid

confounding noise added by other events and news.

4.1 Index Additions

Table 1 reports the mean and median CAR for all the event windows along with the fraction of stocks with CAR greater than zero. Similar to evidence in the US and other developed markets, this study evidences significant abnormal AD window returns to the tune of 1.73%, 1.67% and 1.72% for index additions based on MCAR, CCAR and OCAR respectively. Furthermore, the fraction of added stocks with positive CAR is around 80%. Though the announcement day abnormal returns are little less than the nearly 3% evidenced in the developed markets, the fraction of added stocks with positive CAR is similar to that of the developed markets. Further, Kamal (2012) showed that the index effects have declined in the recent period for US and other developed market indices. Though the run-up window CAR is not statistically significant, the effective inclusion window (ED) CAR is statistically significant 1.18%, 1.14% and 1.46% for index additions based on MCAR, CCAR and OCAR respectively. The significant negative price pressure window (ED+1 to ED+3) CAR suggest partial reversal around ED for index additions. The mean AD40 CAR is a positive and significant 3.01%, 2.74% and 2.96% for index additions based on MCAR, CCAR and OCAR respectively. This, along with the positive, significant mean AD60 CAR, shows that the price effects are permanent following index additions. The median and the fraction of positive abnormal return for the long term windows, AD40 and AD 60, show that the results are not due to outliers. The results support hypothesis 1a. The results are different from earlier studies on Nifty index additions evidencing temporary abnormal returns. This may be due to the choice of the abnormal return calculation and market index in those studies.

Table 2. Long window statistics for the daily abnormal returns for the stocks added to the Nifty index using multiple calculation methodology for the 2009-2018 period

Windows		Additions N = 30			Deletions N = 28			
		MCAR	CCAR	OCAR	MCAR	CCAR	OCAR	
Anticipation Window	Mean	-0.36%	-0.89%	-0.55%	-0.13%	-0.76%	1.34%	
AD-9: AD	Median	0.03%	-0.35%	-0.02%	-2.14%	-1.33%	-0.92%	
	CAR > 0	50%	40%	50%	CAR < 0	61%	61%	
AD window AD+1	Mean	1.73%**	1.67%**	1.72%**	AD+1:AD+3	-2.12%**	-2.33%**	-2.01%**
	Median	1.83%	2.11%	1.62%		-1.48%	-2.94%	-1.32%
	CAR > 0	80%	67%	83%	CAR < 0	82%	82%	78%
Run up window	Mean	0.48%	0.78%	0.58%	AD+4:ED-3	-0.61%	-0.18%	0.56%
AD+2:ED-3	Median	1.28%	1.88%	-0.52%		-1.41%	-0.75%	2.55%
	CAR > 0	57%	53%	43%	CAR < 0	50%	46%	44%
ED Window	Mean	1.18%**	1.14%*	1.46%**		-0.94	-1.86*	-1.60*
ED-2: ED	Median	1.10%	0.81%	1.24%		-2.53%	-2.32%	-1.82%
	CAR > 0	70%	63%	73%	CAR < 0	61%	74%	74%
Pressure Release	Mean	-0.82%**	-1.18%**	-0.65%*		0.84%	0.54%	1.21%*
Window ED+1:ED+3	Median	-0.84%	-1.00%	-0.81%	ED+1:ED+5	0.36%	-0.15%	0.48%
	CAR > 0	37%	30%	37%	CAR < 0	43%	54%	44%
Permanent AD 40	Mean	3.01%*	2.74%*	2.96%*		-3.33%	-3.81%	-3.62%
AD+1: AD+40	Median	3.12%	2.67%	4.72%		-0.89%	-0.49%	1.21%
	CAR > 0	60%	53%	63%	CAR < 0	56%	52%	48%
Permanent AD 60	Mean	2.96%*	2.71%	3.06%		-8.26%**	-8.52%**	-7.50%**
AD+1: AD+60	Median	4.12%	5.06%	2.23%		-9.15%	-7.28%	-4.42%
	CAR > 0	57%	60%	63%	CAR < 0	70%	74%	67%

This table reports the long window statistics for the daily abnormal return for the period of 2009-2018. The final sample consists of 30 additions and 28 deletions. Using the standard event methodology, the market adjusted (MCAR); market model adjusted (OCAR); control sample adjusted (CCAR) are calculated using daily returns from the NSE, India official website. The market return is represented by the CNX 500 index return. The control sample are the other firms which satisfy all the addition criteria, however were not added. AD-9: AD CAR represents CAR from AD-9 to AD. Permanent AD 40 indicates CAR from AD+1 to AD+40. The mean and median CAR are reported. CAR>0 represents the fraction of stocks for which the CAR is positive. CAR<0 represents the fraction of stocks for which the CAR is negative. Values are returns in percentages and **, * represent significance (t -test) at 5% level and 10% level respectively.

Table 3. Panel A: The daily abnormal volume and mean event window volume for additions and deletions for the period of 2009-2018

Day T	Mean VR on Day T / event window			Mean VR on Day T / event window		
	Median	VR > 1	Median	VR > 1	Median	VR > 1
	Additions			Deletions		
AD-2	1.07	0.88	43%	1.08	0.90	46%
AD-1	1.06	0.69	33%	1.43	0.90	43%
AD	1.13	0.99	50%	1.34	0.82	39%
AD+1	1.37**	1.14	57%	1.30**	1.14	61%
AD+2	1.36**	1.01	50%	1.03	0.93	43%
AD+3	1.11	0.96	43%	1.05	0.84	36%
AD+4	0.99	0.79	43%	1.24	0.97	50%
AD+5	0.92	0.73	30%	1.25	0.96	43%
Anticipation W	1.00	0.93	37%	1.28	1.13	54%
AD +1	1.37**	1.14	57%	1.30**	1.14	61%
Run up window	1.23	0.98	48%	1.21*	1.16	61%

ED Window	2.17**	1.99	93%	1.67**	1.23	75%
ED1:ED3	1.11*	1.03	53%	1.17	0.88	36%
ED+6 : ED+30	1.15	0.93	43%	0.94	0.79	36%

Table 3. Panel B: The steady state liquidity ratio (LR)

Period	Additions			Deletions		
	Mean	Media n	LR > 1	Mean	Media n	LR > 1
ED+6 : ED+30	1.27	0.78	30%	1.05	1.00	50%

The abnormal trading volume turnover approach is used in this study, to estimate the volume effects following Nifty index reconstitutions. Volume Ratio (VR) = $(V_{it} / V_{mt}) \div (V_i / V_m)$

Where V_{it} and V_{mt} are the trading volumes of the stock and the total NSE respectively, and V_i and V_m are the average trading volumes of the stock and total NSE for the period AD-70 through AD-11.

$$\text{Liquidity Ratio (LR)} = \text{VOL}_{it} / |R_{it}| \div \text{VOL}_i / |R_i|$$

Where R_{it} is the daily stock return and VOL_{it} is the daily rupee volume. ' $\text{VOL}_i / |R_i|$ ' is the average liquidity of the stock for the period AD-70 through AD-11.

The VR/LR is significant only if the statistical significance suggested by the parametric t-test is confirmed by the non-parametric Wilcoxon signed rank test.

**, * represent significance (t -test) at 5% level and 10% level respectively

Table 3 presents the volume results (VR) around the announcement day and the various event periods. The VR is significant only if the statistical significance suggested by the parametric t-test is confirmed by the non-parametric Wilcoxon signed rank test. The results show that only AD+1 and AD+2 VR are statistically significant for the addition sample. The ED window VR and the pressure release window VR are statistically significant. The significant AD+1 and ED window VR are consistent with previous research on index additions. However, there is no evidence of any permanent increase in volume for index additions unlike the prior evidence in the developed markets (Hegde & Mcdermott (1987) and Hradzil (2007)). Though, the ED+6 to ED+30 mean VR is 1.15, the median and the fraction of stocks with VR greater than one suggests that the high volume outliers have skewed the results. Further, the lack of statistical significance, for 'ED+6 to ED+30' mean VR, supports the earlier result suggesting lack of permanent abnormal volume following index additions. The trading volume results are not consistent with hypothesis 3a.

4.2 Index Deletions

Table 1 reports the mean and median CAR for all the event windows along with the fraction of stocks with CAR greater than zero. The prior studies on index changes in the developed markets generally evidence results for deletions which are opposite to that of additions. The results in Table 1 is similar to prior studies on index changes in the developed markets which, evidence results for deletions which are opposite to that of the additions. The AD window CAR is a statistically significant -2.12%, -2.33% and -2.01% based on MCAR, CCAR and OCAR respectively. Similarly, the ED window CAR is a statistically significant -0.96%, -1.86% and -1.60% based on MCAR, CCAR and OCAR respectively. The mean AD40 CAR is a negative -3.33%, -3.81% and -3.62% for index deletions based on MCAR, CCAR and OCAR respectively. The mean AD60 CAR is a negative, significant -8.26%, -8.52% and -7.50% for index deletions based on MCAR, CCAR and OCAR respectively. The median and the fraction of positive abnormal return for the long term windows, AD40 & AD60 MCAR and CCAR, show that the results are not due to outliers. Overall, the deletion results evidence long term, permanent, negative abnormal return following index deletion announcements. The results support hypothesis 1b.

The volume ratio (VR) results in Table 3 show that the AD window VR and ED window VR are statistically significant for the deletion sample similar to prior research on index deletions in the developed markets. Also, this study evidences permanent decrease in trading volume, post deletion similar to other studies on index deletion in the developed markets.

4.3 Nifty Index Reconstitutions in the Context of Prior Research

This study examines the prior explanations in the literature in the context of the Nifty index reconstitutions.

4.3.1 Investor Awareness and Certification Hypothesis

The stocks added to the index, attract the market attention, leading to permanent increase in prices since it draws new investors by increasing the awareness of the stock. Chen et al (2003), evidencing asymmetric price effects for S&P 500 additions and deletions, contend that investors' deletion from index does not decrease the awareness. However, the findings in this study, evidencing symmetric permanent price effects for Nifty additions and deletions, are not consistent with the investor awareness hypothesis.

Chen et al. (2004) contend that the assessment of certification hypothesis is difficult in the absence of direct measures. This study uses percentage of retail shareholding as the proxy for investor awareness and certification. The percentage of retail shareholding before announcement is compared with the percentage of retail shareholding after the effective date. The pre-announcement data is obtained from the quarter immediately preceding the AD. The post- effective date data is obtained at least three months after the effective date.

Table 4. Mean CAR from ED+1 to Day T and the Mean AR for the stocks added (deleted) to (from) Nifty index between 2009 and 2018

Day T	Addition N = 30			Deletion N = 28			Mean CAR from ED+1 to the day T	Mean CAR from ED+1 to the day T
	Mean AR on Day T	Median	AR > 0	Mean AR on Day T	Median	AR < 0		
ED-3	0.05%	-0.48%	40%	-0.90%	-0.19%	61%		
ED-2	0.14%	0.15%	50%	-0.31%	-0.41%	64%		
ED-1	0.80%	0.62%	70%	-0.68%	-1.27%	64%		
ED	0.21%	0.69%	60%	0.04%	-0.91%	54%		
ED+1	-0.10%	-0.41%	43%	-0.10%	-0.54%	-0.69%	64%	-0.54%
ED+2	-0.46%	-0.64%	37%	-0.56%	0.17%	-0.07%	50%	-0.37%
ED+3	-0.25%	-0.02%	50%	-0.82%	0.50%	-0.28%	54%	0.14%
ED+4	0.29%	0.16%	53%	-0.53%	0.49%	0.48%	36%	0.62%
ED+5	-0.08%	-0.23%	47%	-0.61%	0.21%	-0.14%	57%	0.84%
ED+6	-0.28%	-0.20%	43%	-0.89%	-0.18%	-0.20%	54%	0.65%
ED+7	0.02%	0.25%	60%	-0.87%	-0.02%	-0.15%	54%	0.63%
ED+8	0.26%	-0.29%	40%	-0.61%	-0.48%	-0.46%	75%	0.16%
ED+9	0.38%	0.35%	57%	-0.23%	0.00%	0.04%	46%	0.16%
ED+10	0.64%	0.47%	53%	0.41%	0.02%	0.15%	47%	0.18%

Table 5. Univariate and regression results for Nifty index reconstitutions between 2009 and 2018

Panel A: DSDC hypothesis				
Dependent variable - AD2 Abnormal return				
Additions N = 30				
	Reg 1	Reg2		
C	-0.007	0.016		
Prob	(0.458)	(0.291)		
AD ABVOL	0.015**	0.018**		
Prob	(0.010)	(0.002)		
USVOL		-0.028**		
Prob		(0.024)		
R sq	0.217	0.354		
Panel B: Liquidity hypothesis				
Additions N = 30				
Dependent variable	AD Abnormal Return		AD40 Abnormal Return	
C	-0.007	-0.003	-0.028	-0.018
Prob	(0.458)	(0.759)	(0.623)	0.757
AD / AD40 ABVOL	0.015**	0.015**	0.051	0.061
Prob	(0.010)	(0.011)	(0.286)	(0.210)
AD / AD40 ABLIQ		-0.003		-0.014
Prob		(0.373)		(0.262)
R sq	0.217	0.24	0.04	0.085
Panel C: Price pressure hypothesis				
Dependent variable - ED release window				

N =39	ED+1:ED+3	ED+1:ED+4	ED+1:ED+5
C	-0.005	-0.001	-0.003
Prob	(0.349)	(0.926)	(0.682)
ED WINDOW	-0.037	-0.013	-0.007
	(0.758)	(0.925)	(0.962)
R sq	0.003	0.001	0.001
Panel D: Investor awareness and certification hypothesis			
		Additions N = 28	Deletions N = 27
Mean % change in Retail Share holding	Mean	-0.25%*	0.03%
	Median	-0.10%	0.05%
	% change >0	42%	54%

The Panel A relates the abnormal returns around AD with the abnormal volume and usual volume for the 2009 -2018 period. The specified equations are:

$$\text{AD window CAR} = a_0 + a_1 * \text{AD ABVOL} + \epsilon_{it}$$

$$\text{AD window CAR} = a_0 + a_1 * \text{AD ABVOL} + a_2 * \text{USVOL} + \epsilon_{it}$$

The dependent variable is AD+1 to AD+2 CAR. Abnormal volume is the average VR for AD+1 and AD+2. The usual volume is the mean VR from AD-10 to AD-6. The statistic and associated p-values are given. **, * represent significance (t -test) at 5% level and 10% level respectively.

The Panel B relates the abnormal return with abnormal volume and abnormal liquidity for the complete period and first period and second period. The specified equation is:

$$\text{AD CAR} = a_0 + a_1 * \text{ABVOL}_i + a_2 * \text{ABLIQ}_i + \epsilon_{it}$$

First regression is conducted with CAR AD window as the dependent variable. The second regression is conducted with AD40 CAR as the dependent variable. The regressors are the corresponding ABVOL (which is the average VR from AD+1 to Day T) and ABLIQ (which is the average LR from AD+1 to Day T). The statistic and associated p-values are given. **, * represent significance (t -test) at 5% level and 10% level respectively.

The Panel C relates the ED release window CAR with the ED window car for added stocks with positive ED window CAR (N=17) and deleted stocks with negative ED window CAR (N=22). The specified equation is

$$\text{Pressure release window CAR} = \alpha_0 + \alpha_1 \text{ED window CAR} + \epsilon_{it}$$

ED release window CAR is ED+1 to ED+3 CAR, ED+1 to ED+4 CAR and ED+1 to ED+5 CAR. ED window CAR is ED-2 to ED CAR. The statistic and associated p-values are reported. **, * represent significance (t -test) at 5% level and 10% level respectively.

Panel D compares the percentage of shareholding before announcement and after inclusion for the Nifty index additions and deletions from 2009 to 2018.. The percentage of shareholding data before AD is obtained from the quarter immediately preceding the AD. The percentage of shareholding data after the effective date is obtained at least 3 months after the effective date. **, * represent significance (t -test) at 5% level and 10% level respectively.

Table 5, Panel D reports the mean % change in retail shareholding, for both addition sample and deletion sample, before the announcement date and after the effective date. Table 5, Panel D reports the paired changes, where the change for each stock is calculated before calculating the mean and median, similar to Chen et al. (2003). The mean percentage change in the retail shareholding decreases by a statistically significant -0.25% for the addition sample. The mean percentage change in the retail shareholding increases by 0.03% for the deletion sample. The median and proportion of stocks with positive (negative) changes in retail shareholding show that the evidenced results are not due to outliers.

Chen et al. (2003) are of the opinion when index funds buy (sell) large amount of stock following index addition (deletion), pressure is exerted, on the other investors in general and retail investors in particular, in the direction of reduction (increase) in shareholding, in the absence of opposing forces like certification or investor awareness. The results in this study, evidencing significant decrease in retail shareholding for additions and increase in retail shareholding for deletions, are not consistent with the certification or investor awareness hypothesis. In fact, the evidenced results support the demand based explanations, DSDC and PPH.

4.3.2 Liquidity Hypothesis

According to Hegde & Mcdermott (2003), liquidity hypothesis implies that the trading volume and liquidity increase permanently for additions and decrease permanently for deletions. The results in this study are not consistent with the liquidity hypothesis.. Table 3 Panel B reports the steady state liquidity (ED+6 to ED+30) for both additions and deletions. Though, the 'ED+6 to ED+30' window mean 'Amihud' liquidity ratio (LR) is 1.27 for the addition sample, the median of 0.78 and the fraction of stocks with LR greater than one is 30% only. This clearly suggests that the outliers have skewed the results. The 'ED+6 to ED+30' window mean 'Amihud' liquidity ratio (LR) is 1.05 for the deletion sample. The median and the fraction of stocks with LR greater than one clearly show that the result is not due to outliers. The findings do not support the hypothesis 4a or 4b.

Similar to Beneish and Gardner (1995) and Gregoriou et al. (2006), this study performs a cross sectional regression with the permanent window CAR (Note 3) as the dependent variable for the addition sample. The regressors are proxies for the volume and liquidity. A significant positive coefficient for liquidity proxy will suggest that the permanent abnormal CAR is associated with increase in liquidity.

$$AD\ CAR = \alpha_0 + \alpha_1 ABVOL_i + \alpha_2 ABLIQ_i + \varepsilon_{it} \quad (9)$$

Where, AD CAR is the MCAR from AD+1 to Day 'T', ABVOL is the mean VR and ABLIQ is the mean LR for the same period.

Table 5 panel B reports the results of the cross sectional regression. The cross sectional regression was performed with AD40 CAR and the corresponding volume and liquidity regressors. The coefficient of ABVOL is positive the coefficient of the ABLIQ is negative. Both the coefficients are not significant at any level of significance. The cross sectional regression was performed again with AD window CAR and corresponding volume and liquidity regressors. The coefficient of ABVOL is positive and significant at 5% level of significance. The coefficients of ABLIQ are negative. The results show that the liquidity hypothesis might not explain the significant permanent abnormal return around AD.

4.3.3 Price Pressure Hypothesis

The price pressure hypothesis posits downward sloping demand curve but only in the short run. There will be price reversal once the demand of the index funds is satisfied. Table 4 reports the mean AR around ED and the mean CAR from ED+1 to Day T. The ED window MCAR for addition sample is 1.15% with a maximum cumulative reversal of -0.82% at ED+3. The ED window MCAR for deletion sample is 1.03% with a maximum cumulative reversal of -0.84% at ED+5. The evidence suggests that price reversal is only partial.

Elliot et al. (2006) asserts that the ED window CAR and the subsequent price reversal is due to short term price pressures, while the magnitude of reversal should be inversely proportional to the ED window CAR. This study performs a cross sectional regression with the ED window as the regressor and pressure release window as the dependent variable, using both addition and deletion sample (Note 4).

$$\text{Pressure release window CAR} = a_0 + a_1 \text{ ED window CAR} + \varepsilon_{it} \quad (8)$$

According to Lynch and Mendenhall (1997), the effective day of addition (deletion) should be positive (negative), due to action of index funds. Therefore, this study has included only the stocks with positive (negative) ED window CAR for addition (deletion) sample. This is more appropriate as the price pressure hypothesis postulates complete reversion once the excess demand is satisfied. Table 5, Panel C reports the results of three cross sectional regression with ED+1 to ED+3, ED+1 to ED+4 and ED+1 to ED+5 as dependent variables respectively. The results show that neither the coefficients are closer to minus one nor are they are statistically significant. Therefore, it seems reasonable to conclude that the evidence in favour of price pressure hypothesis is limited.

4.3.4 Downward Sloping Demand Curve Hypothesis

DSDC hypothesis implies that due to lack of perfect substitutes for stocks, Nifty index additions should be associated with permanent positive price effects and deletions should be associated with permanent negative abnormal returns. The symmetric results for permanent abnormal return following additions and deletions support the DSDC hypothesis and supports hypothesis 1. Bheneish & Whaley (1986) contend that the stock price and trading volume

increase around AD is evidence of short term investors' front running the index funds indicating the possibility of the downward sloping curves. The evidence so far is consistent with the previous findings of the DSDC hypothesis.

Shleifer (1986), examining S&P 500 index additions, contends that a significant positive slope in the cross sectional regression between AD window abnormal return and abnormal trading volume is consistent with DSDC hypothesis. In the spirit of Shleifer (1986), this study performs cross sectional regression using addition sample.

$$\text{AD window CAR} = a_0 + a_1 * \text{AD ABVOL}_i + \varepsilon_{it} \quad (6)$$

Where, AD window CAR is the AD+1 to AD+2 CAR, AD2 ABVOL is the average of AD+1 and AD+2 VR. Table 5, Panel A reports the results of the Shleifer (1986) regressions. The results show that the slope estimate is positive at 5% level of significance. Shleifer (1986) contends that due to standard errors, the slope coefficient may be biased towards zero and recommends introducing usual volume independently in the regression. A significantly positive abnormal volume coefficient and significantly negative usual volume slope coefficient is consistent with DSDC hypothesis.

$$\text{AD2 window CAR} = a_0 + a_1 * \text{AD2 ABVOL}_i + a_2 * \text{USVOL}_i + \varepsilon_{it} \quad (7)$$

Where, USVOL (Note 5) is the average of AD-10 to AD-6 VR. Table 5, Panel A reports that not only the signs of coefficients of both the ABVOL and USVOL are of proper sign but also both the coefficients are statistically significant at 1% level of significance. Overall, the results are consistent with the DSDC hypothesis. This result is different from earlier studies on Nifty index revisions evidencing temporary returns and supporting the price pressure hypothesis. This study concludes that the price and non price effects associated with Nifty index reconstitutions imply long term downward sloping demand curves for the affected stocks.

The evidence pointing towards downward sloping demand curve is not consistent with efficient market hypothesis (EMH) as it which relies on arbitrage and smart traders in a competitive setting. Also, the finance theory contention that only the information about future cash flows and appropriate discount rate determines the stock price, is not consistent with the downward sloping curve.

5. Conclusion

This study examines the impact of the Nifty index reconstitutions from 2009 to 2018. The analysis of the price and non-price effects around the announcement date and the effective date indicate a significant, permanent increase in abnormal return for additions and significant, permanent decrease in abnormal return for deletions. The abnormal volume is evidenced only around announcement date and inclusion date for both additions and deletions. Therefore, unlike the developed markets, the evidence of permanent abnormal volume is not supported in this study. The results are also different from the previous studies on Nifty index revisions which evidenced temporary abnormal returns around the inclusion date.

The extant literature presents four explanations for the index effect namely, investor

awareness & certification, downward sloping demand curve, price pressure and liquidity. This study contributes the following findings to the literature. First, this study extends the previous empirical literature on Nifty index additions to the recent period. Second, the results, associated with volume & liquidity, are not supportive of the liquidity hypothesis. Third, the evidenced changes in the retail shareholding for additions and deletions do not support the certification or investor awareness hypothesis. Fourth, the univariate and regression results around ED are not supportive of the price pressure hypothesis. The symmetric permanent price effects for additions and deletions along with the volume and regression results support the long term downward demand curve hypothesis. Finally, the result is not consistent with the efficient market hypothesis which implies potential for profitable trading opportunities.

This study has important implications for the existing finance theories and the models based on the assumption of horizontal demand curves. It also has implications for the EMH which is the basic assumption of the Finance models; including CAPM. The findings in this study are relevant to the market regulator, investors and corporate managers due to the unique institutional setting of the Indian stock market. This study examines only the Nifty 50 index changes and generalizes the results to the entire Indian stock market, the index changes of other major indices or broad based indices can throw more light on the index reconstitution effect. The study used only the recent period data, future research can use a larger sample and extended period of data. The other limitation of this study is that it focussed only on the price and non-price effects but not on the trading behaviour of the index funds. Future studies can also focus on the relationship between index effect studies and behavioural biases.

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Notes

Note 1. https://www.sebi.gov.in/media/speeches/mar-2004/a-historical-perspective-of-the-securities-market-reforms_2882.html. https://www.nseindia.com/education/content/prs_publications.htm

The index funds including ETF were 10 in number in 2003. It increased to 32 in 2011 and 67 in 2017.

Note 2. The last announcement and actual inclusion (deletion) in 2018 happened during the study and has been included due to the small sample. Consequently, the data for that added (deleted) stock ends 15 days from ED.

Note 3. The reported regression results are based on MCAR, However, similar results were evidenced when the regression was conducted again with OCAR and CCAR.

Note 4. The regression was also conducted separately for addition and deletion samples and the study evidenced similar results.

Note 5. The regression was repeated with AD-9 to AD-5 VR and AD-8 to AD-4 VR and evidenced similar results.

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