Re-examining the Expiration Effects of Index Futures: Evidence from India

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ABSTRACT

This study investigates the expiration effects of stock index futures before and after the introduction Bank Nifty weekly options from April 2013 to June 2019. To check for the expiration effects, the volume and mean returns for expiration groups is compared with non-expiration groups or comparison groups. We had a total of 74 expiration dates; 37 expiration dates are before the introduction Bank Nifty weekly option and 37 are after the introduction Bank Nifty weekly options. The current study used t-test, pooled t-test, and Wilcoxon rank sum test to investigate if the mean return and volume for expiration were significantly different from the comparison group. We also check day of the week and if there is significant difference in nifty futures returns based on different expiration dates using Kruskal-Wallis test. The finding of the study found trading volume for the expiration groups is significantly different from the comparison. There was evidence of high return, low volatility and decrease in volume after the introduction of Bank Nifty weekly option.

Keywords: Stock Market, Expiration Month, Expiration Week, Expiration Day
JEL Classifications: G12, G 14

1. INTRODUCTION

The introduction of financial derivatives has been the most significant event in the financial world in recent times. The global market for derivatives is enormous, and it has grown exponentially in the last couple of decades in both developed and developing economies. Stock index futures contracts were introduced in the 1980s, and the first contract was traded in the U.S. in April 1982. The markets for such products after appearing in the U.S. got adopted by other major financial centers of Europe and the Pacific Rim.

The introduction of derivatives trading in the Indian secondary market was approved by SEBI in June 2000. Stock index futures in India are available with 1 month, 2 months, and 3-month expiration. Index futures contracts in India are settled in cash, and the closing index value on the date of the expiry of the contract

is considered as the settlement price for index futures. Stock index futures derive their value from the stock index, which is composed of selected securities. The reasons for popularity of stock index futures is they help in transfer of risk management through hedging and speculation, plays a crucial role in price discovery process, difficult to manipulate the stock index whereas it is easy to manipulate the individual stock price, low transaction cost because of high liquidity, etc. Volume of trading in stock index futures has increased dramatically and in some cases even exceeds the spot index market. Hence, stock index expiration is widely studied because of the high volume and significant change in volatility around expiration.

The expiration effect is the effect on stock prices and liquidity in the spot market as market participants adjust their positions around the expiration of options and futures contracts. The primary reasons for the expiration day effect on futures and spot

market is arbitrageurs liquidating their stock position, and the order imbalances that arise from unwinding cash positions when the futures contract expires (Chamberlain et al., 1989; Stoll and Whaley, 1987), settlement procedure for delivery (Physical settlement vs. Cash Settlement), attempts to manipulate stock price in a favorable direction (Bollen and Whaley, 1999; Chow et al., 2003; Stoll and Whaley, 1991; 1997). Most of the empirical work focuses on expiration day effect during the "triple witching hour" when stock index futures, stock index options, and individual stock options expire quarterly in the U.S.

However, most of the studies have focused on the developed market, such as the U.S., and very few studies check for the expiration day effect on emerging markets. Previous studies have found abnormal returns with great volatility (Arago and Fernandez, 2000), abnormal trading volume (Stoll and Whaley, 1997; Vipul, 2005), or evidence of price reversal (Stoll and Whaley, 1997) in the spot market as we move closer to the expiration day. Other studies have found no significant expiration effect on the expiration day (Corredor et al., 2001; Kan, 2001).

Looking at the previous studies, most of them focus on the month end-expiration effect in the spot market. Index and stock derivatives are traded in monthly series, and the expiration date for each series is the last trading Thursday of every month. In India, the first weekly option Bank Nifty was introduced in May 2016. However, with the introduction of weekly options, the expiration day effect goes from a once-a-month effect (expiration days of the monthly options and futures) to a once-a-week effect (expiration days of weekly options). Weekly Options expire every week, typically on Thursday at market close, excluding the Thursday of the monthly expiry week. After the launch of weekly options, market participants who historically enjoyed 12 monthly expiries on the last Thursday of each month can now enjoy 52 expiries a year. In this paper, we investigate the expiration day effect for Nifty Futures before and after the introduction of Bank Nifty weekly options.

The remainder of the paper is organized as follows. Section 2 provides a literature review; in Section 3, we describe the data and methodology used. We report the results and discuss their implication in Section 4. Section 5 concludes the paper.

2. LITERATURE REVIEW

The expiration day is the effect on stock prices and Volume as traders adjust their position in option and futures market around the expiration day. The existence of the expiration day effect and its impact on the underlying spot market is an essential feature of the modern-day stock market dynamics. Various factors which contribute to the impact are arbitrage opportunity, the settlement procedure, and market price manipulation. Stoll and Whaley (1986; 1987) examined the expiration day effect for the U.S. index derivatives. They found abnormal Volume and insignificant price movement for "triple witching hour." The quarterly expiration of three kinds of derivatives, namely, stock options, stock index futures, and stock index options contracts all occurring on the same day, is known as the "triple witching"

and the last hour of the trading session is "triple witching hour." Edwards (1988) extended the study by using daily data for "triple witching" and found high short term volatility for the spot market during expiration days of the index futures contract. There was also evidence of abnormal volatility on expiration days when the contracts were settled against the closing market index (Arago and Fernandez, 2002; Stoll and Whaley, 1997; Vipul, 2005). However, when the contracts were settled against the opening market index following the rule change in 1987, lesser abnormal Volume was observed during the "triple witching hour" (Hancock, 1993). Herbst and Maberly (1990) also checked for the effect of change in settlement procedure on expiration effect. They found that volatility on the expiration days got significantly reduced after the change in settlement mechanism for the S&P 500 in June 1987. Similar studies were carried to check for the expiration day effect on other markets.

Pope and Yadav (1992) examined the effect of the expiration of options market on the underlying stocks for the U.K. They found the negative return on expiration day and abnormal increase in Volume before the option expiration. Karolyi (1996) examined the Nikkei 225 futures expiration effect and found abnormal trading volume but insignificant price movement. Chow et al. (2003) analyzed the expiration day effect for Hang Sang Index from 1990 to 1999 and found no abnormal trading volume on the expiration day. Alkeback and Hagelin (2004) examined the expiration day effect for index futures and options for the Swedish market and confirmed an increase in trading volumes on expiration days compared to non-expiration days. Other studies also experienced abnormal stock volatility and volume on expiration day (Schlag, 1996; Stoll and Whaley, 1997). A recent study by Gurgul and Suliga (2019) based on high-frequency data examined the effect of stock futures expirations on the spot market on the Warsaw Stock Exchange observed significant abnormal trading volume and abnormal turnover of stocks that are underlying assets of futures as well as increased volatility of the stocks returns on the expiration day. Drimbetas et al. (2007) investigated the effects of the introduction of the futures and options on the volatility of the FTSE/ASE-20 index from August 1997 to April 2005. They analyzed the data with the help of EGARCH model. The results shows that conditional volatility of the FTSE/ASE-20 index is significantly reduced post the introduction and consequently increased the efficiency of the market.

For the Indian stock market, Vipul (2005) found that prices of underlying stocks give negative returns a day before expiration, but significant reversal happens on the next trading day. Thenmozhi and Thomas (2004) examined the expiration day effect on NIFTY index derivatives using the GARCH (1, 1) model. They found a significant increase in volatility on expiration days but observed less relative volatility during the expiration week compared to non-expiration weeks. Jindal and Bodla (2007) observed the existence of abnormally high trading volume on expiration days and concluded the presence of manipulating and arbitrage trading activity. Tripathy (2010) examined expiration effects for the Nifty futures by comparing the trading volume and return process for expiration group with comparison group. The effects were studied by using Kruskal-Wallis test during 2007-2009. The study also analyzed the day of the week effect for different bullish phase

and bearish phase. The study found no expiration effect on return and volatility. However, the trading volume was higher on the expiration day. The results suggested that there were no price distortions on the expiration day/week. From the existing literature, various studies have observed unusual behavior in the underlying spot and derivatives markets around the expiration of derivatives contracts. In this study, we check for the day of the week effect to check if the expiry of futures and options contracts on Thursday provides unusual returns or abnormal Volume compared to other trading days of the week. We also check for any significant difference in nifty returns based on different expiration days.

Most of the previous studies (Stein, 1987; Raju and Karande, 2003; Vipul, 2006) analyze the impact of introduction of future and options on the spot market. Some researchers have found that the introduction of futures and options trading does not have any impact on stock volatility. Most of the evidence suggests that introduction of derivatives market may have increased the volatility for cash market in Japan and the U.S., but it had no impact on other markets (Gulen and Mayhew, 2000). The study contributes to the existing literature by examining the expiration effect on Nifty Futures before and after the introduction of the BANK NIFTY weekly option in May 2016. There are very few studies that check the impact of introduction of weekly option on Futures market for an emerging economy.

Most of the previous studies checking for the expiration day effect have focussed extensively on the developed market; to address this gap in the literature, we look for the expiration day effect of NIFTY FUTURES in the Indian stock market during April 2013-June 2019.

3. DATA AND METHODOLOGY

The study examines the expiration day, week, and month effects during the period of April 2013-June 2019. The data used for analyzing the expiration effect has been taken from www.nse.com and includes daily closing prices and Volume for NIFTY FUTURES. We compare the trading volume and returns of nifty futures for expiration days, expiration weeks, and expiration months with a set of non-expiration days, weeks, and months. We test the following hypothesis for expiration effect:

H_1: The NIFTY FUTURES trading volume at expiration is not different than the Volume for comparison groups

H_2: The daily mean return for NIFTY FUTURES at expiration is not different than the return for comparison groups

H_3: The volatility for NIFTY FUTURES at expiration is not different than the volatility for comparison groups.

All the above three hypotheses are tested for expiration days, weeks, and months. To examine whether the introduction BANK NIFTY weekly option in May 2016 resulted in differences between the expiration and comparison group, we divided the entire sample period into two sub-periods. One sample consists of 37 expiration days from April 2013 to April 2016, i.e., before the introduction of Bank Nifty weekly option, and the other consist of 37 expiration days from June 2016 to June 2019, i.e., after the introduction of Bank Nifty weekly option. The data is divided into two groups:

comparison group and expiration group to check for the month, week, and day effect of NIFTY FUTURES. The composition of sample construction is given in Table 1. Stock futures and options at NSE expire on the last Thursday of every month. The continuously compounded index return is calculated using close prices:

$$R_t = ln\left(\frac{P_t}{P_{t-1}}\right) \qquad (1)$$

The standard deviation is calculated and used as a measure of volatility for NIFTY FUTURES for both expiration and comparison groups. t-test, Pooled t-test, and Wilcoxon rank-sum test are applied to find whether the mean return, trading volume, and volatility change significantly for expiration day, expiration week, and expiration month compared to the comparison groups. To capture the non-normality nature of NIFTY FUTURES, we have used the nonparametric tests: Kruskal-Wallis test and Wilcoxon rank-sum test. The Kruskal-Wallis is a one-way analysis of variance by rank captures equality of means across groups similar. We also check the day of the week effect by using the Kruskal-Wallis test. The null hypothesis is that mean returns across all the five trading days in the week do not exhibit statistically significant differences. If the Kruskal Wallis statistic is less than the critical chi-square value, in that case, we will not reject the null hypothesis, and that mean returns across week-days are not significantly different from each other. The formula for calculating the K-W test is:

$$K - W = \frac{12}{N(N+1)} \sum_{i=1}^{k} R_i^2 - 3(N+1) \qquad (2)$$

The Wilcoxon signed-rank test is a popular, nonparametric substitute for the t-test. It assumes that the data follows a symmetric distribution. The significance of the test statistic is determined by computing the P-value using the standard normal distribution. If this P-value is less than a specified level (usually 0.05), the null hypothesis is rejected in favor of the alternative hypothesis. Otherwise, no conclusion can be reached.

4. EMPIRICAL RESULTS

4.1. Month Effect of Expiration
Table 2a shows the monthly expiration effect of Nifty Futures from April 2013 to April 2016, before the introduction of Bank Nifty

Table 1: Sample composition of expiration group and comparison group

Expiration effect	Expiration group	Comparison group
Month effect	One full expiration month of a particular expiration series	Previous 2 months trading data of a particular expiration series before the actual expiration month
Week effect	Last week of expiration month (Except Friday)	First 2 weeks of each expiration month
Day effect	Last Thursday of every month	First 2 Thursdays of each expiration month

weekly options by providing statistics such as mean, standard deviation, median, t-test, pooled t-test, W-test. The average daily return for the expiration group is 477.811% higher compared to comparison groups. However, the high return for the expiration group comes with a low standard deviation, which is surprising. The results of t-test, pooled t-test, and W-test indicate a statistically insignificant relationship between the expiration group and the comparison group for mean return. The Volume is the number of Nifty Futures contracts traded on a particular trading day. Looking at the results for Volume, we find a significant increase of 1290.90% for the expiration group as against the comparison the group. The results of t-test, pooled t-test, and W-test suggest that trading volume was significantly higher for the expiration month compared to comparison month, and the difference is statistically significant.

Table 2b reports the results from June 2016 to June 2019 i.e., after the introduction of Bank Nifty weekly options. The average daily return for the expiration group is 69.51% higher compared to comparison groups. The results of t-test, pooled t-test, and W-test indicate statistically insignificant relationship between return series of comparison and expiration group for month-end effect of Nifty Futures. Looking at the results for Volume, we find a significant increase of 1118.90% for the expiration group as against the comparison group. The results of t-test, pooled t-test,

and W-test suggest that trading volume is significantly higher for the expiration month compared to non-expiration months, and the difference is statistically significant at a 5% level. We find relatively low returns and low Volume for expiration month post the introduction of the Bank Nifty weekly option. Such a high increase in volume for expiration group compared to comparison could be because of unwillingness of market participants to trade the further month expiration. Hence, the expiration month which is the delivery month is most active by volume and experiences high volume for expiration group.

4.2. Week Effect of Expiration

Table 3a show the weekly expiration effect of Nifty Futures before the introduction of Bank Nifty weekly options by providing the same statistics details as in Table 1. The period of analysis is April 2013-April 2016. The average daily return for expiration group is negative compared to positive returns for comparison groups. However, the negative return for expiration group comes with high standard deviation. The results of t test, pooled t-test and W- test statistically insignificant relationship return series and weekly effect of Nifty Futures. Looking at the results for Volume we find an increase of 29.10% for expiration group as against the comparison the group. The results of t-test, pooled and W-test suggest that trading volume were significantly higher for the expiration month compared

Table 2a: Month effect of NIFTY FUTURES (Before BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison group
No. of trading days	799	1431	799	1431
Mean	0.0002173	0.0000376	310597	22331.42
Standard deviation	0.0103961	0.0138981	166308	58152.88
Median	0.0005828	0.0001396	260227	6071
t-test (P-value)	0.3457 (0.7296)		47.404*** (0.0000)	
pooled t-test (P-value)	0.31904(0.7497)		59.396*** (0.0000)	
W test (P-value)	580468 (0.5469)		1123509*** (0.0000)	

Table 2b: Month effect of NIFTY FUTURES (After BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison group
No. of trading days	811	1457	811	1457
Mean	0.00025849	0.00015228	131275.60	10770.30
Standard deviation	0.00734221	0.01099305	48720.67	26641.18
Median	0.00045422	0.00056980	121944.00	3300.00
t-test (P-value)	0.27478 (0.7835)		65.219*** (0.0000)	
pooled t-test (P-value)	0.24626 (0.8055)		76.154*** (0.0000)	
W test (P-value)	587847 (0.8427)		1158337*** (0.0000)	

Table-3a: Week effect of NIFTY FUTURES (Before BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison group
No. of trading days	139	417	139	417
Mean	−0.001382415	0.000492951	371675.8	287933.2
Standard deviation	0.01068924	0.01027682	200647	156843.3
Median	−0.000370625	0.000311134	306170	246439
t-test (P-value)	−1.8085 (0.07184)		4.485*** (0.0000)	
pooled t-test (P-value)	−1.8445(0.06564)		5.0647*** (0.0000)	
W test (P-value)	26531(0.1353)		36979 *** (0.0000)	

to non-expiration month and the difference is statistically significant at 5% level.

Table 3b reports the results from June 2016 to June 2017 i.e., after the introduction of Bank Nifty weekly options. The average daily return for expiration group is higher by 141.74% compared to comparison groups. The return volatility shows no difference between the two samples. The results of t-test, pooled t-test and W-test statistically insignificant relationship between the return series and week effect of Nifty Futures expiration. Looking at the results for Volume we find an increase of 40.00% for expiration group as against the comparison the group. The results of t-test, pooled and W-test suggest that trading volume were significantly higher for the expiration month compared to non-expiration month and the difference is statistically significant.

4.3. Day Effect of Expiration
Table 4a summarizes the return series and Volume for the Nifty Futures from April 2013 to April 2016 i.e., before the introduction of Bank Nifty weekly options. The average daily return for expiration group is negative compared to positive return for comparison groups. However, the negative return for expiration group comes with high standard deviation. The results of t-test, pooled t-test and W-test statistically insignificant difference between the two sample return series and expiration day effect of Nifty Futures. Looking at the results for Volume we find an

increase of 33.60% for expiration group as against the comparison the group. The results of t-test, pooled and W-test suggest that trading volume were significantly higher for the expiration month compared to non-expiration month and the difference is statistically significant at 5% level.

Table 4b reports the results after the introduction of Bank Nifty weekly options from June 2016 to June 2019. The average daily mean return for expiration group is positive compared to negative mean return for comparison groups. The return volatility shows no difference between the two samples. The results of t-test, pooled t-test and W-test statistically insignificant relationship between return series and week effect of Nifty Futures expiration. Looking at the results for Volume we find an increase of 41.20% for expiration group as against the comparison the group. The results of t-test, pooled and W-test suggest that trading volume were significantly higher for the expiration month compared to non-expiration month and the difference is statistically significant.

4.4. Day of the Week and Expiration Effect
The null hypothesis states that the mean return and Volume for Nifty Futures in the given period is equal for all trading days of the week. Table 5a and b shows the days of the week effect before and after the introduction of Bank Nifty weekly option. Looking at the P-value for both the cases, we reject the null hypothesis as daily return and Volume is significantly different for all the trading

Table 3b: Week effect of NIFTY FUTURES (After BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison group
No. of trading days	143	421	143	421
Mean	0.00067598	0.00027962	169525.50	121095.10
Standard deviation	0.00722557	0.00731653	38190.27	46305.19
Median	0.00138915	0.00035914	168413.00	111446.00
t-test (P-value)	0.56493 (0.5726)		12.385*** (0.0000)	
pooled t-test (P-value)	0.56145(0.5747)		11.271*** (0.0000)	
W test (P-value)	31410(0.4372)		49881*** (0.0000)	

Table 4a: Day effect of NIFTY FUTURES (Before BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison` roup
No. of trading days	37	69	37	69
Mean	−0.000403	0.001657679	387391.4	289939.7
Standard Deviation	0.01030673	0.009397492	176952.7	137292.8
Median	0.00109025	0.000678233	326298	554431
t-test (P-value)	−1.0114 (0.3154)		2.9126*** (0.0050)	
pooled t-test (P-value)	−1.0402 (0.3006)		3.1424*** (0.0021)	
W test (P-value)	1165 (0.4619)		1733*** (0.0025)	

Table 4b: Day effect of NIFTY FUTURES (After BANK NIFTY weekly options)

Statistics	Return series		Volume	
	Expiration group	Comparison group	Expiration group	Comparison roup
No. of trading days	37	71	37	71
Mean	0.00122870	−0.00069575	191198.90	134982.30
Standard deviation	0.00816738	0.00779282	32852.50	49960.08
Median	0.00138915	−0.00046537	185747.00	135985.00
t-test (P-value)	1.1804 (0.2418)		7.0093*** (0.0000)	
pooled t-test (P-value)	1.1981 (0.2336)		6.1768*** (0.0000)	
W test (P-value)	1514 (0.1954)		2299*** (0.0000)	

Table 5a. Day of the week effect: Pre BANK NIFTY weekly options

Day of the week	Return series		Volume
	Number of trading days	Mean±Standard deviation	Mean±Standard deviation
Monday	455	0.00016410±0.01144638	111671.7±160756.6
Tuesday	456	−0.00135866±0.01081804	130546.2±185868.9
Wednesday	453	−0.00001447±0.00838476	130073.8±180542.9
Thursday	440	0.00050246±0.01104715	140993.4±183863.4
Friday	426	0.00130944±0.01956725	114607.8±169587.4
		Return series	Volume
K-W test	11.391	P-value 0.02251*	K-W test 10.121 P-value 0.03844*

Table 5b: Day of the week effect: Post BANK NIFTY weekly options

Day of the week	Return series		Volume
	Number of trading days	Mean±Standard deviation	Mean±Standard deviation
Monday	449	0.00101±0.00978	47857.4±61207.3
Tuesday	447	0.00074±0.00646	52797.5±65810.9
Wednesday	457	0.00009±0.00675	56534.3±69041.1
Thursday	454	0.00012±0.00721	62854.4±76091.2
Friday	461	−0.00100±0.01583	49015.0±66626.3
K-W test	11.695	P-value 0.01977*	K-W test 15.714 P-value 0.003427**

days. Volume is high for Thursday for both the cases of before and after the introduction of weekly option. However, we find significant decrease in volume for each day after the introduction of Bank Nifty weekly options. In Appendix 1, Table 6, we check for any differences in the Nifty Futures returns based on expiration dates. Looking at Table 6a, we do not reject the null as chi-square is 18.127; P-value is 0.994 based on K-W test which suggests that there is no significant difference in nifty returns based on expiration dates before the introduction of Bank Nifty weekly option. In Table 6b, we find that there is also no significant difference in nifty returns based on expiration dates after the introduction of Bank Nifty weekly option as chi-square is 16.651 and P = 0.9976.

5. RESULTS

Looking at the mean return, we find high returns for expiration group (Week and Day) as against the comparison group post the introduction of Bank Nifty weekly options. The negative return before the introduction of weekly options could be linked to the high volume for Nifty Futures. High volume for expiration groups and comparison group resulted in early unwinding of long positions in the cash market. The unwinding puts pressure on the Nifty Index and gives negative return. The reason for high mean return for expiration group in Table 1 is because the comparison group had further month contract which were thinly traded until they became near-month futures contracts. The median return is higher than mean return, for 5 cases out of 6. Market participants won't be attracted to the Nifty Futures for a long period of time because the mean return is below the median return.

The volatility for mean return has decreased after the introduction of Bank Nifty weekly option for both comparison and expiration groups. The decrease in volatility post the introduction of weekly option could be due to the stabilizing effect of weekly option which tends to give more information through call-put option data and Implied volatility on weekly basis also along with the monthly expiry series.

There is considerable decrease in the volume for Nifty Futures after the introduction of Bank Nifty weekly option for both expiration and comparison group. The decrease in volume could lead to price distortion post the introduction of Bank Nifty weekly option for Nifty Futures. Less volume for Nifty Futures could be due to widespread acceptance of these new weekly options and the market participants such as traders, hedgers, speculators, brokers, etc. are switching from futures to options due to increase in the flexibility of these options. Weekly options provide precise hedging opportunities and are best suited to trade short term movement in Nifty Index. These weekly option might also be priced more efficiently and lead to better price discovery because of the high volume. The premium for a weekly option is also very less compared to monthly options or a Futures contract. The decrease in volume post the introduction of bank nifty weekly option is seen for all the three samples. The mean volume for expiration group is higher than mean volume for comparison group for all the three cases suggesting evidence of arbitrage activity, position remaining unwound during for expiration groups as traders roll over their futures contract. High volume for expiration group also suggests that there are limited price distortions for the expiration groups as against the comparison groups. Hence, transaction involving huge chunks of order can't create large price movement. However, the decrease in volume after the introduction of Bank Nifty weekly will lead to price distortion in Nifty Futures.

6. CONCLUSION

The current study examined the expiration day effect before and after the introduction of Bank Nifty weekly options by comparing the mean return and volume for expiration month, expiration week and expiration day with a set of comparison groups. The study looked at both prices and volume of Nifty Futures for the Indian market from April 2013 to June 2019. The complete period was divided into two groups namely, comparison and expiration group.

The study found trading volume for the three expiration groups is significantly different from the three comparison groups at 95%

confidence level. We also found significant decrease in volume after the introduction Bank Nifty weekly option. However, the mean return is quite varied across the groups and the results are not statistically significant. However, after the introduction of Bank Nifty weekly option the mean returns for weekly and daily expiration group is greater than the comparison group.

The findings of the study suggest that weekly option have affected the Nifty Futures market. There is also existence of expiration effect for all the three samples. The study will help market participants and regulators to make informed decision related to derivatives market. We have used daily data for the study and it would be interesting to check for the expiration effect by using high frequency data to check for any market anomalies in derivatives or spot market during the day.

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APPENDIX 1

Table 6a: Expiration month effect: Pre BANK NIFTY weekly options

Expiration date	No. of trading days	Mean±Standard deviation
25-April-2013	55	−0.000558±0.008993
30-May-2013	60	0.000565±0.010361
27-June-2013	61	−0.001246±0.013696
25-July-2013	64	0.000584±0.012385
29-August-2013	63	−0.001376±0.013790
26-September-2013	62	0.001334±0.018906
31-October-2013	60	0.001125±0.016115
28-November-2013	60	−0.000545±0.022113
26-December-2013	60	0.000539±0.010316
30-January-2014	62	−0.000523±0.009821
26-Febraury-2014	43	0.000641±0.010725
27-March-2014	63	0.001000±0.008426
24-April-2014	54	0.000528±0.012111
29-May-2014	59	0.000970±0.012868
26-June-2014	60	0.000586±0.012435
31-July-2014	64	0.000464±0.015591
28-August-2014	63	0.000464±0.010802
25-September-2014	62	−0.000103±0.009729
30-October-2014	58	0.000567±0.008316
27-November-2014	57	0.000688±0.007197
24-December-2014	57	−0.000653±0.009498
29-January-2015	61	0.001467±0.009332
26-February-2015	62	−0.000483±0.009524
26-March-2015	62	−0.000784±0.010718
30-April-2015	60	−0.000479±0.013004
28-May-2015	60	0.000140±0.015922
25-June-2015	61	0.000157±0.010899
30-July-2015	64	0.000044±0.009977
27-August-2015	65	−0.000889±0.011958
24-September-2015	64	−0.000153±0.014960
29-October-2015	61	0.000500±0.017552
26-November-2015	59	−0.000493±0.009500
31-December-2015	60	0.000126±0.008761
28-January-2016	61	−0.001095±0.009233
25-February-2016	63	−0.001014±0.014866
31-March-2016	61	0.001722±0.021961
28-April-2016	59	0.000246±0.011937
K-W test	18.127	P-value 0.9943

Table 6b: Expiration month effect: Post BANK NIFTY weekly options

Expiration date	No. of trading days	Mean±Standard deviation
30-June-2016	61	0.001002±0.009129
28-July-2016	64	0.000695±0.009658
25-August-2016	63	−0.000121±0.009395
29-September-2016	61	−0.000015±0.007483
27-October-2016	60	0.000052±0.008101
24-November-2016	59	−0.001248±0.009308
29-December-2016	6	0.000343±0.014883
25-January-2017	62	0.001029±0.013200
23-February-2017	64	0.000611±0.008937
30-March-2017	62	0.000409±0.011926
27-April-2017	61	0.000308±0.008317
25-May-2017	60	0.000291±0.007359
29-June-2016	61	−0.000002±0.006020
27-July-2017	63	0.000839±0.005138
31-August-2017	62	−0.000175±0.006890
28-September-2017	63	−0.000242±0.007639
26-October-2017	61	0.000942±0.007748
30-November-2017	63	−0.000174±0.006713
28-December-2017	62	0.000402±0.007323
25-January-2018	64	0.000834±0.005395
22-February-2018	57	−0.001118±0.012574
28-March-2018	60	−0.000425±0.008235
26-April-2018	60	0.000791±0.015324
31-May-2018	61	0.000176±0.007712
28-June-2018	63	−0.000203±0.007886
26-July-2018	64	0.000821±0.005945
30-August-2018	63	0.000716±0.007543
27-September-2018	61	−0.001017±0.012732
25-October-2018	59	−0.001371±0.010556
29-November-2018	59	0.001187±0.022936
27-December-2018	60	−0.000111±0.011387
31-January-2019	62	0.000075±0.008164
28-Febraury-2019	64	−0.000057±0.008009
28-March-2019	63	0.001100±0.006911
25-April-2019	56	0.000128±0.009809
30-May-2019	59	0.000420±0.011604
27-June-2019	60	−0.000142±0.009096
K-W test	16.651	P-value 0.9976