

# Expiry day Impact on return on Indian Stock market (NSE)- an Empirical Study

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**ABSTRACT:** Derivative products are alleged to have a sharp affect on the stock market in various ways ever since their inception in June 2000. Currently, derivative trading constitutes approximately 90% of the total turnover of the NSE (National Stock Exchange). Launching of derivatives and their expiration (last Thursday of every month) in the Indian stock market has been perceived to have direct corollary on the return, volatility, efficiency and marketability of the stock market. This paper tries to analyze empirically the expiration day effect of stock derivatives on underlying securities. This study tests the presence of the last Thursday of the month effect on stock market volatility by using the S&P 500 market index during the period of January 2012 and December 2012 and sample companies which are trading on derivative market. The findings show that the last Thursday of the month effect on stock market volatility is not present in volatility and return equations.

**Keywords:** Expiry day, last Thursday impact, derivatives

## INTRODUCTION

In India, trading in derivatives started in June 2000 with the launch of futures contracts in the BSE Sensex and the S&P CNX Nifty Index on the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE), respectively. Options trading commenced in June 2001 in the Indian market. Since then, the futures and options (F&O) segment has been growing continuously in terms of new products, contracts, traded volume and value. At present, the NSE has established itself as the market leader in this segment in India, with more than 99.5 percent market share (NSE Fact Book, 2006, p. 85). The F&O segment of the NSE outperformed the cash market segment with an average daily turnover of Rs291.91 billion, as compared to Rs114.79 billion in the cash segment from 2006 to 2007 (Derivatives Updates on NSE website, www.nseindia.com, 2007). This shows the importance of derivatives in the capital market sector of the economy. Previous studies on the volatility effects of derivatives listing provide mixed results, suggesting case-based biases. In addition, in India, there is a lack of robust examination of the impact of derivatives on market volatility. In India, trading in derivatives contracts has existed for the last six years, which is an adequate time period to evaluate its major pros and cons. Against this backdrop, it is important to empirically examine the impact of derivatives on the stock market.

In this paper, we attempt to study the volatility implications of the introduction of derivatives on the cash market.

## LITERATURE REVIEWS

Literature that shows the impact of expiration day of derivatives (financial) on stock market to international market is as follows:

**Rahman (2001)** examined the impact of index futures trading on the volatility of component stocks for the Dow Jones Industrial Average (DJIA). The study used a simple GARCH (1, 1) model to estimate the conditional volatility of intra-day returns. The empirical results confirm that there is no change in conditional volatility from pre- to post-futures periods. Figuerola-Ferretti and Gilbert (2001) used error-correction models and the GARCH (1, 1) regression model to study the effect of futures trading on volatility. In addition, they reported the results of a VAR model and presented an impulse response analysis to track the effects of a shock to each of the volatilities. The results show that volatility decreases in the post-futures period. Bologna and Cavallo (2002) examined the effect of the introduction of stock index futures for the Italian market. Their empirical results show that the introduction of stock index futures affects the volatility of the spot market. In addition, the results from various GARCH (1, 1) models for pre-futures and post-futures sub-periods suggest that the index futures market reduces volatility.

**Chow Y.F., Yung H.M. and Zhang H (2003)** observed the impact of the expiration of HSI (Hang Seng Index) derivatives on the underlying cash market in Hong Kong for the period from 1990 to 1999. The study used an alternative setting for testing the expiration day and concluded that expiration days in Hong Kong might be associated with a negative price effect and some return volatility on the underlying stock market. But there was no evidence of the abnormal trading volume on the expiration day or price reversal after expiration. Hence, the existence of expiration-day effects could not be confirmed in the Hong Kong market.

**Lien D and Yang L (2005)** compared the expiration-day impact of the stock options traded on Australian Stock Exchange on return, volatility, trading volume, and temporary price changes of individual stocks with settlement method of individual stock futures contracts. The period of study was from 1993 to 1997. The study concluded that the options expiration has significant impact on return and volatility of the underlying stocks in absence of individual stock futures. After introduction of a cash-settled stock future contract, the effect decrease notably. And then the switch of a futures contract from cash settlement to physical delivery promotes the expiration effects on return and volatility and boosts temporary price change on expiration days. Finally, the study concluded that options expiration has little effect on trading volume.

**Chou HC, Chen NW, Chen HD (2006)** examined the expiration effects of TAIFEX index derivative on the underlying stock market between 1998 and 2002. The empirical findings showed no significant expiration day effect, but concluded that expiration effect has strengthened as more relative index derivatives are listed on the TAIFEX. In general, the research concluded that the expiration effects in Taiwan are not as significant as those in U.S. market but are stronger than those in the Hong Kong market. The special settlement procedures adopted by the TAIFEX may account for the difference.

**Drimbetas, Nikolaos and Porfiris (2007)** explored the effects of the introduction of futures and options into the FTSE/ASE 20 Index on the volatility of the underlying index using an EGARCH model. It is shown that the introduction of derivatives induces a reduction of conditional volatility in the FTSE/ASE20 Index and consequently increases its efficiency. Mallikarjunappa and Afsal (2007) studied the volatility behaviour of the Indian market by focusing on the CNX IT Index, which is a sectoral index, and found that underlying volatility increases with the onset of futures trading. Their result contradict many other studies carried out in India, and it is reasoned that the sectoral index showed different behaviour in terms of returns and volatility, especially during the 2001 period of market scam in India. They attributed these results to a sharp decrease in the prices of IT stocks after the stock market scam broke out in 2001. Since the sectoral index showed different results than those

of earlier studies, these results must be examined as to whether they hold for the Indian market when a broader market index is studied. Their study also pointed out that results depend on the time period as well as the country studied. These results indicate the needed scope for further research as well as suggest the relevance of different samples and methodologies.

Studies given below shows previous researches on expiration effect of derivatives on Indian Stock Market:

**Vipul (2005)** examined the future and option expiration effect on selected 14 stocks of Indian capital market. The study compared the price, volatility, and volume of the underlying shares in the cash market one day prior to expiration, on the day of expiration and one day after expiration with the corresponding values of these variables one week and two weeks prior to the expiration days by using the Wilcoxon matched-pairs signed-ranks test. It was found that prices in the cash market were depressed a day before the expiration on the derivative contracts, but got strengthened significantly the day after the expiration.

**Jindal and Bodla (2007)** analyzed the effect of expiration of stock derivatives on the volatility and marketability of Indian stock market as well as the underlying individual stocks. The results presented that the expiration days of financial derivative witnessed an abnormally high volume trading which was attributed to arbitrage activities in the market. This clearly shows that expiration day results into high volatility in the stock market.

**Bhaumik Sumon and Bose Suchismita (2007)** analyzed the impact of expiration of derivative contracts on the underlying cash market, trading volume, and volatility of returns. The tool used for analysis was AR-GARCH. The study concluded that trading volume were significantly higher on expiration days and during the five days leading up to expiration days (-expiration weeks), compared with non expiration days (weeks). The study also showed that expiration day has a significant effect on daily returns of market index and their volatility.

**Wats Sangeeta (2010)** examined the impact of expiration of spot market volatility using NSE Nifty as market proxy. The study indicated that due to the introduction of future and option, the spot market volatility has increased on the expiration days and expiration weeks. The study also concluded that expiration week effect on volatility of the spot market is more predominant than expiration day effect.

**Shembagaraman (2003)** explored the impact of the introduction of derivative trading on cash market volatility using data on stock index futures and options contracts traded on the Nifty Index. The results suggest that futures and options trading has not led to a change in the volatility of the underlying stock index, but the nature of volatility seems to have changed in the post-futures market. The study also examined whether greater futures trading activity in terms of volume and open interest was associated with greater spot market volatility. It found no evidence of any link between trading activity variables in the futures market and spot market volatility.

#### **RESEARCH METHODOLOGY:**

Expiration day effect of derivatives on the returns of the underlying stocks:

To analyze the expiration day effect on the returns of the underlying securities event study methodology has been adopted. The event in this case is defined as expiration of stock derivatives. Data for the share prices has been collected from the official website of National Stock Exchange ([www.nseindia.com](http://www.nseindia.com)). For calculation purposes the following steps has been followed:

The actual returns for individual securities and S&P CNX NIFTY have been calculated for estimation window. The following formulas have been used for this purpose:

$$R_t = (P_t - P_{t-1}) / P_{t-1} \quad (i)$$

$$R_{nifty} = (I_t - I_{t-1}) / I_{t-1} \quad (ii)$$

Where  $R_t$  and  $R_{nifty}$  are the returns of individual security and S&P CNX NIFTY respectively.  $P_t$  and  $P_{t-1}$  is the price of individual security at time  $t$  and  $t-1$  respectively.  $I_t$  and  $I_{t-1}$  is the value of S&P CNX NIFTY at time  $t$  and  $t-1$  respectively.

### **Expiration day effect of derivatives on the volatility of the underlying stocks:**

This part of the study evaluates the expiration day effect on the volatility of the underlying securities during the period ranging from 1st January 2012 to 31st December, 2012 for 10 selected scripts in the form of stock options. Stock option trading was allowed on 31 securities at the time of inception of derivatives trading. Out of these stocks, that created history by introducing derivatives for the first time in Indian capital market. The data has been collected from the official website of National Stock Exchange ([www.nseindia.com](http://www.nseindia.com)) and includes daily observations for the closing prices of the underlying stocks.

### **TOOL USED:**

#### **t-test:-**

In testing the null hypothesis that the population mean is equal to a specified value  $\mu_0$ , one uses the statistic

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

where  $\bar{x}$  is the sample mean,  $s$  is the sample standard deviation of the sample and  $n$  is the sample size. The degrees of freedom used in this test is  $n - 1$ .

For analyzing the volatility structure, Regression is used due varying nature of volatility, which also provides an avenue for verifying the presence of endogenous drivers of volatility shifts.

$$\text{Regression Equation} = a + bx$$

$$\text{Slope}(b) = (N\sum XY - (\sum X)(\sum Y)) / (N\sum X^2 - (\sum X)^2)$$

$$\text{Intercept}(a) = (\sum Y - b(\sum X)) / N$$

where  $r_a$  measures the rate of return of the asset,  $r_b$  measures the rate of return of the portfolio benchmark, and  $\text{cov}(r_a, r_b)$  is the covariance between the rates of return. The portfolio of interest in the CAPM formulation is the market portfolio that contains all risky assets, and so the  $r_b$  terms in the formula are replaced by  $r_m$ , the rate of return of the market.

Beta is also referred to as financial elasticity or correlated relative volatility, and can be referred to as a measure of the sensitivity of the asset's returns to market returns, its non-diversifiable risk, its systematic risk, or market risk. On an individual asset level, measuring beta can give clues to volatility and liquidity in the marketplace. In fund management, measuring beta is thought to separate a manager's skill from his or her willingness to take risk

### **EMPIRICAL RESULT:**

This paper has tried to examine the expiration day effect of derivatives on return and volatility of the underlying securities. To test this Regression test has been used.

Table 1(a) shows percentage change in return of selected stocks return on last Thursday of every month and return of nifty of last Thursday of every month.

Mont hs	COMPANY									
	AXIS	BOI	ACC	HDIL	HLL	INDIA INFO LINE	MARU TI	RCO M	TCS	GLEX O
<b>JAN</b>	2.392 2	- 0.407 0	- 0.356 5	4.213 8	0.012 7	2.4545	2.0527	0.627 6	0.283 1	0.2719
<b>FEB</b>	0.636 4	- 0.881 6	- 1.276 5	- 6.208 3	2.929 9	-2.4658	-0.8985	- 1.128 8	0.860 7	-1.5611
<b>MAR</b>	2.176 4	1.072 3	- 0.188 7	- 0.665 9	- 0.644 8	5.6098	2.0355	- 0.721 6	- 0.851 4	-0.1235
<b>APR</b>	- 0.853 1	- 2.759 0	1.995 8	- 1.283 6	- 0.813 2	-6.3149	0.1413	- 3.417 7	2.106 8	-0.9136
<b>MAY</b>	- 1.486 4	8.189 2	- 1.045 1	4.669 3	2.209 0	0.5030	-2.5465	2.297 9	1.994 3	0.2469
<b>JUNE</b>	- 0.244 6	- 0.432 4	1.266 5	0.117 6	- 0.187 8	-2.7027	-0.5413	- 1.198 1	0.954 3	-0.1443
<b>JULY</b>	- 3.164 4	- 3.614 5	- 1.726 4	0.481 1	- 0.677 4	-2.2031	-0.1306	- 5.507 0	0.847 7	-0.1949
<b>AUG</b>	- 0.661 8	- 0.426 4	- 0.274 3	- 0.791 4	1.859 2	-0.2732	-1.4180	- 1.833 0	- 0.976 4	0.5307
<b>SEPT</b>	- 0.458 6	2.297 1	1.205 9	1.785 7	1.481 4	0.1730	0.9978	0.543 1	1.337 2	-2.0485
<b>OCT</b>	1.487 8	- 0.535 0	- 0.391 0	- 2.318 8	- 1.226 0	0.1474	-0.0110	- 1.219 5	0.696 7	0.3079
<b>NOV</b>	1.479 4	0.988 3	0.794 2	5.282 8	1.471 7	2.7152	-0.7267	2.215 9	1.467 2	0.0438
<b>DEC</b>	0.760 7	- 0.619 5	- 1.183 3	- 0.724 6	- 1.295 2	-0.1202	-0.5369	- 0.745 3	1.076 6	1.2578

Table 1 shows figures for average returns for selected F&O scripts calculated by  $R_t = (Pt - Pt-1) / Pt-1$  and figures in table 1(b) shows average returns for Nifty returns for last Thursday calculated by  $R_{nifty} = (It - It-1) / It-1$ .

Table 2 Analyzing the Expiration Day Effect of Stock Derivatives on the Volatility of the Underlying Securities

Company	Regression
AXIS	0.187005413
BANK OF INDIA	0.397788964
ACC	0.000910665
HDIL	0.283723073
HINUDSTAN LEVER	0.019167668
INDIA INFOLINE	0.437000521
MARUTI	0.016790362
RCOM	0.601228648
TCS	0.038150422
GLE XO	0.002929146

Table 2 shows regression analysis of selected companies for the research. The test shows that whether companies are having impact on changes in the NIFTY returns or not. From the analysis it can be interpreted that company like RCOM having impact on last Thursday up to 60.12% i.e. changes in the NIFTY prices up to 60.12% can be directly identifiable because of RCOM, Indian Infoline is having 43.70% impact while Bank of India is having 39.77% impact on NIFTY return, while others are having quite less impact on NIFTY returns which can be called as negligible impact.

### **Results of T-test:**

Table 3 shows analysis of t-test calculation for the Expiration Day Effect of Stock Derivatives on the Volatility of the Underlying Securities

H<sub>0</sub>: there is no significance impact of F&O stocks on Nifty returns.

COMPANY	t calculated	t critical	accept/ reject
AXIS	0.247525	1.770933	accept
BANK OF INDIA	0.217946	0.217946	accept
ACC	-0.40573	1.75305	accept
HDIL	0.346873	1.782288	accept
HINUDSTAN LEVER	0.838963	1.770933	accept
INDIA INFOLINE	-0.28722	1.782288	accept
MARUTI	-0.44367	1.76131	accept
RCOM	-1.3712	1.782288	accept
TCS	2.457744	1.745884	accept
GLE XO	-0.81467	1.739607	accept

The above table shows analysis of t-test for the selected companies for impact of last Thursday on NSE India. By applying t-statistics it can be interpreted that there is no impact of trading activity of F&O companies on NSE returns. From the test its clear that returns on Nifty is statistically independent and having less impact of returns of F&O stocks.

**CONCLUSION**

The empirical study revealed the impact of expiration day on the return and volatility of underlying stocks. The study indicates a significant effect of expiration day on the returns of the underlying securities. This price effect of expiration can be due to the cash settlement mechanism of futures contracts which facilitate the unwinding of arbitrage positions causing price distortions and also position adjustments by the market makers. As a whole, it can be said that the returns and volatility in returns is higher on expiration days as compared to other days. But the changes in the prices are not because of only expiration impact, due to some other factors also. The results obtained also signify that on expiration day, not all the companies which are trading in futures and options are having impact on cash market, but changes in the cash market price it can also because of the arbitrageurs and speculators join the market to take advantage of price differentials and price discovery.

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