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THE EXPIRATION EFFECTS OF STOCK FUTURES ON THE PRICE OF UNDERLYING STOCKS WITH SPECIAL REFERENCE TO INDIAN STOCK MARKET

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Abstract
The introduction of financial derivative products in the Indian capital markets was brought with the objective of bringing about structural change in these markets. The primary objective of such a structural change in the financial market was to contain the risk involved in the financial investment strategies. The stock futures were introduced for trading in the NSE on November 9, 2001on a limited number of common shares. However, over the course of time, the spectrum of stock futures traded in the NSE has widened and as of now, more than 266 stocks are traded in the futures segment of the NSE. However, the increased acceptance of stock futures as an effective investment instrument raises many questions regarding the possible impact of stock futures trading on markets for other securities, especially on the market for underlying stocks.

This study is an attempt to find out the answer of this questions i.e. Does the derivative expiration day have any influence on the stock market? And How does the underlying stocks behave a week prior to the expiration day and during the first week at the beginning of the new contract.

Key Words: Expiration Effects, Derivative, Stocks, Futures.

INTRODUCTION

The National Stock Exchange (NSE) of India was ranked the first in terms of trading of individual stock futures in the year 2007. The financial derivatives have always been accused of causing instability in the spot market. Since the introduction of derivative markets in India, in June, 2000 there have been arguments put forward by the market participants regarding the affect which these markets are having on the Cash Market segments. Studies have shown that during the last 14 years one thing that is very clear is that the center of action has certainly shifted to the derivative segment from the Cash segment of the markets. Further they also put forward the view that it is due to the derivative segment that a minor problem in the capital market acquires significant proportion.
Even if we look into the developed markets of the world we can see that it is the derivative market segment, which has caused world over situations that have created panic situation for the fund managers. The recent stock market crash due to the financial crisis was also the result of the derivative segment. In fact the US markets were the first to suspend the trading in the derivative segment once the crisis started.

The introduction of financial derivative products in the Indian capital markets was brought with the objective of bringing about structural change in these markets. The primary objective of such a structural change in the financial market was to contain the risk involved in the financial investment strategies. The stock futures were introduced for trading in the NSE on November 9, 2001on a limited number of common shares. However, over the course of time, the spectrum of stock futures traded in the NSE has widened and as of now, more than 266 stocks are traded in the futures segment of the NSE. However, the increased acceptance of stock futures as an effective investment instrument raises many questions regarding the possible impact of stock futures trading on markets for other securities, especially on the market for underlying stocks.

One of the major concerns of both the investors and traders is the impact caused by these markets and that to on the expiration day of the futures contract. This effect of expiry day of late, have become a major source of risk for both the investors and trader. The expiration day effect may arise from several sources (Stoll and Whaley, 1997) such as price manipulation, stock market procedure, cash n carry arbitrage etc. under this background. This study tries to analyze firstly whether there is any impact on the Cash market on the expiry day of stock futures.

RESEARCH PROBLEM

Several researches have been done to analyze the impact of expiration day of derivative market on the underlying cash market but there are certain questions, which still remains unanswered or have not been analyzed to provide a substantial explanation for the expiration day effect. The research questions, which this study aims to answer, are:

- Does the derivative expiration day have any influence on the stock market?
- How does the underlying stocks behave a week prior to the expiration day and during the first week at the beginning of the new contract.

Hypothesis Set:

- Independent Variable: Stock Futures Price and Dependent Variable: Spot Price of underlying stocks
- H_0= There exists significant impact of Stock Futures on Spot Price of underlying stocks on expiration day.
- H_1= There exists no significant impact of Stock Futures on Spot Price of underlying stocks on expiration day.

METHODS OF DATA COLLECTION

For the study in hand, **Secondary method** of data collection has been used for accumulating high-frequency data of Index Derivatives.

The sources of collecting the data are as follows

Sources of Secondary Data: Present study is mainly based on secondary data, which were collected from the National Stock Exchage (NSE) database, published research reports, related websites and research organizations.

Data Source

The data has been obtained from the website of National Stock Exchange (NSE), i.e., www.nseindia.com. The daily data on the index has been used for the preliminary purpose that is readily available in the public domain.

The study has taken into consideration 5 sample stocks that are traded in the NSE that are selected on the basis of following criteria:

1. Stocks should be of high market capitalization. Thus, stocks constituted in CNX-Nifty are considered.
2. Data should be available for the study period, i.e., from April 2013 to December 2013.

The samples of ITC Limited, Infosys, Reliance Industries, ICICI Bank and HDFC Bank stocks are taken.

The above stocks come under the top 5 constituents in CNX-Nifty by weightage. These stocks represent diverse sectors of the economy. The data set consists of daily futures closing prices of the sample stocks. In order to calculate market return, daily closing values of CNX-Nifty are used.

METHODOLOGY

In order to examine the impact of stock futures expiration on the underlying market, an "Event Study" methodology is employed. Event study is an empirical study performed on a group of securities that has faced a substantial catalyst occurrence, i.e., expiration-day and has consequently changed considerably in value as an outcome of that catalyst. The event can have either a positive or negative effect on the value of the securities.

In this study, the event of concern is strictly defined as the expiration of stock futures contracts. The expiration of near-month contracts has been considered as the trading of both middle-month and far-month contracts are not as functional as that of near-month contracts in the NSE. The expiration of stock futures takes place on the last Thursday of every month. For this purpose, post-meltdown expiration days are considered, i.e., expiration day of April month, August month and December month of year 2013. An event window of 15 days, i.e., seven days each just before and after the day of event, i.e., expiration-day (denoted as t = 0) is considered. For the calculation of expected or normal return, an estimation window of 30 days prior to the event window is identified. When an

estimation window of 30 days is identified, all weeks in which other expiring days falls is excluded so as to control the effect of other expiration days on the estimated coefficients.

The actual return on each sample stock during both event window and estimation window is found as follows:

$$r_{i,t} = \frac{(P_{i,t} - P_{i,t-1})}{P_{i,t-1}}$$

Where,

- $r_{i,t}$= Return on stock i in the period t
- $P_{i,t}$= Price of security i in the period t
- $P_{i,t-1}$ =Price of security i in the period t-1

The actual market return on CNX-Nifty is found in the similar manner as follows:

$$r_{m,t} = \frac{(I_t - I_{t-1})}{I_{t-1}}$$

Where,

- $r_{m,t}$ =Market return in the period t
- I_t= Index value in the period t
- I_{t-1}= Index value in the period t-1

The following linear market model for stock i is estimated from the estimation window:

$$r_{i,r} = \alpha_i + \beta_i r_{m,t} + u_{i,r}$$

Where,

- $r_{i,t}$= Return on stock i on day t
- α_i= Intercept
- β_i= Beta of the stock i
- $r_{m,t}$= Market return of CNX-Nifty on day t
- $u_{i,t}$= Residual error term which is assumed to satisfy the usual assumptions of linear regression model

Then, the estimated coefficients of the market model, α_i and β_i, are used to find the expected return during the event window. The abnormal return (AR), if any, during the event window is defined as the difference between actual return and expected return which is given by:

$$AR_{i,t} = r_{i,t} - \hat{\alpha}_i - \hat{\beta}_i r_{m,t}$$

Average abnormal return is used to describe the returns generated by a given security or portfolio over a period of time that is different from the expected rate of return. The expected rate of return is the estimated return based on an asset pricing model, using a long run historical average or multiple valuation. Thus, it is a difference between the actual and expected rate of return.

Next, the average abnormal return on day 't' (AAR_t) for a portfolio of five stocks is calculated as shown below:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t}$$

Where,

- 'N'= number of sample securities

The t-statistic for the AAR_t is calculated cross-sectionally as given below:

$$t = \frac{AAR_t}{S_p}$$

Where,

- S_P is standard deviation of sample stocks. It is calculated as follows:

$$S_p = \sqrt{\frac{\sum_{i=1}^{N} S_i^2}{N}}$$

Where,

$$S_i = \sqrt{\frac{\sum_{t=1}^{k}(AR_{i,t} - \mu_i)^2}{k}}$$

- t = 1,...k is the length of event window and μ_i is the mean abnormal return of stock i.

The cumulative abnormal return (CAR_k) over 'k' days during event window is calculated as:

$$CAR_k = \sum_{t=1}^{k} AAR_t$$

LIMITATIONS OF THE STUDY

- The number of stocks studied for the purpose of the current research is 5, which may not be sufficient to give conclusive evidence about the expiration day effect on the underlying stocks.
- The scope of the study is also limited as the data used is for the period of 1 year.
- The study was bounded by a time constraint of 8 weeks, which is quite less for a detailed research.

SCOPE OF THE STUDY

The number of stocks studied for the purpose of this research is limited to 5, which provides an opportunity to extend this study by including more stock futures especially of those stocks, which have got higher weightage and are representative of the index being studied. Moreover, the study also provides an opportunity to carry out more comprehensive research by increasing the time frame of the study. Further research with high frequency data can throw more light on the expiration day effect, stock futures because the system of trading in stock futures is digital.

Event 1

Table 1: Price Effect of Futures Expiration (Event 1)

Date	Day	AAR	T-statistic	CAR
12-Apr-13	-7	-0.0147	-0.5836	0.1042
15-Apr-13	-6	0.0071	0.2813	0.1113
16-Apr-13	-5	-0.0068	-0.2695	0.1045

17-Apr-13	-4	0.0005	0.0180	0.1050
18-Apr-13	-3	-0.0046	-0.1835	0.1003
22-Apr-13	-2	0.0027	0.1083	0.1031
23-Apr-13	-1	0.0079	0.3141	0.1110
25-Apr-13	0	-0.0087	-0.3445	0.1023
26-Apr-13	1	-0.0013	-0.0514	0.1010
29-Apr-13	2	0.0048	0.1912	0.1058
30-Apr-13	3	-0.0021	-0.0834	0.1037
02-May-13	4	0.0041	0.1619	0.1078
03-May-13	5	0.0043	0.1688	0.1121
06-May-13	6	0.0037	0.1456	0.1157
07-May-13	7	0.0032	0.1268	0.1189

We can understand from the above table that the average abnormal returns (AAR) are insignificant for all the days of the event. It can also be seen that the average abnormal returns are becoming positive as soon as the expiration day is nearing. The abnormal return is negative and insignificant for the period -7, -5 and -3. However, it appears to be positive on -6, -4, -2 and -1. It is also visible that there is again no price distortion on the event day and average abnormal return is positive too. It is also visible that the AAR is negative soon after the expiration day. Thus, the result rejects the null-hypothesis.

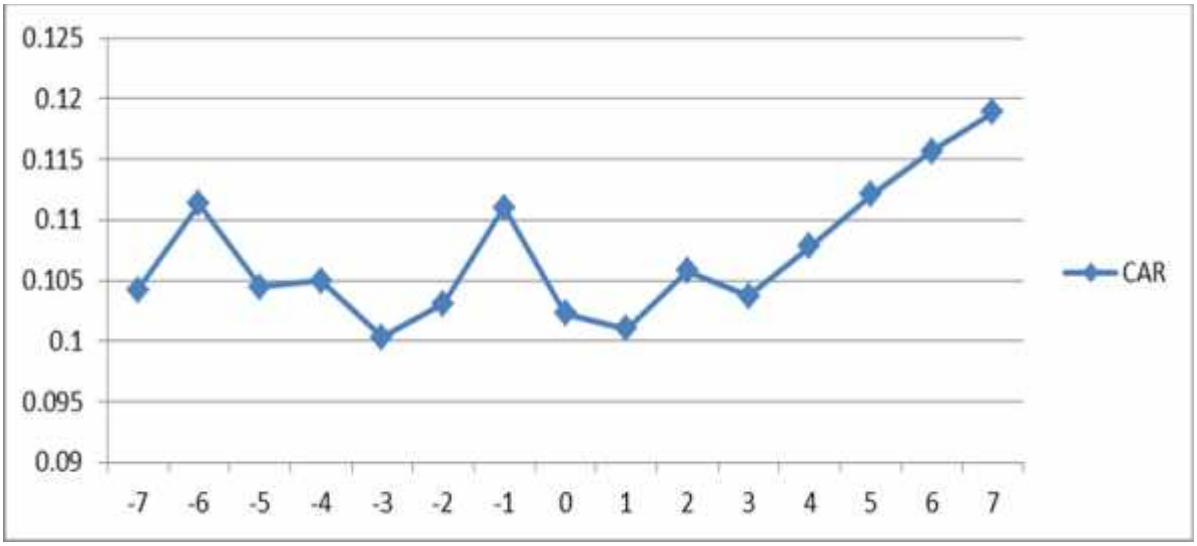

Figure 1: Cumulative abnormal Return (Event 1)

The cumulative abnormal return (CAR) is corroborating the average abnormal returns. It can be distinctly spotted that the cumulative abnormal returns are falling in the period -7, -5 and -3 that is same as the average abnormal returns trend. However, it is showing a rising trend for all the other days of the week of the expiration day. After expiration of the contract, the CAR is constantly rising for the next week except for the day 1 and 3.

Event 2

Table 2: Price Effect of Futures Expiration (Event 2)

Date	Day	AAR	T-statistic	CAR
20-Aug-13	-7	0.0082	0.4103	0.0141
21-Aug-13	-6	-0.0008	-0.0393	0.0133
22-Aug-13	-5	-0.0080	-0.4044	0.0052
23-Aug-13	-4	0.0013	0.0671	0.0066
26-Aug-13	-3	-0.0033	-0.1636	0.0033
27-Aug-13	-2	0.0039	0.1970	0.0072
28-Aug-13	-1	0.0048	0.2430	0.0121
29-Aug-13	0	-0.0064	-0.3229	0.0057
30-Aug-13	1	-0.0016	-0.0822	0.0040
02-Sep-13	2	0.0026	0.1284	0.0066
03-Sep-13	3	-0.0084	-0.4213	-0.0018
04-Sep-13	4	-0.0031	-0.1580	-0.0049
05-Sep-13	5	0.0106	0.5334	0.0057
06-Sep-13	6	0.0054	0.2707	0.0111
10-Sep-13	7	-0.0051	-0.2581	0.0059

This event shows the identical depiction in which all days of the event are insignificant. It is visible that the AAR is positive for the period -7, -4, -2 and -1 but negative for the period -6, -5 and -3. After the expiration of the contract, the AAR starts fluctuating for the next week. . It is also visible that there is again no price distortion on the event day and average abnormal return is positive too. Therefore, the result rejects the null-hypothesis.

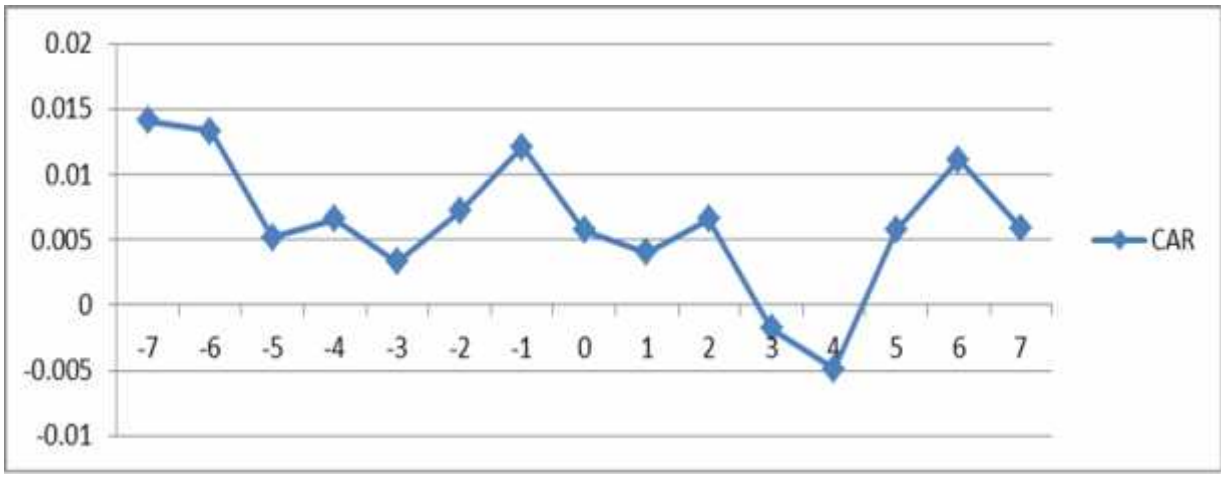

Figure 2: Cumulative abnormal Return (Event 2)

The result of the cumulative abnormal return (CAR) is verifying the result of the average abnormal result. The CAR is experiencing a downward trend till the period -3 with a slight inclination in the period -4. After the day -3, it is undergoing a continuous upward trend before the expiration of the contract. After the expiration day, the CAR is falling till the day 5 after which it is again gaining a momentum and rising.

Event 3

Table 3: Price Effect of Futures Expiration (Event 3)

Date	Day	AAR	T-statistic	CAR
16-Dec-13	-7	0.0022	0.8122	0.0404
17-Dec-13	-6	-0.0039	-1.4277	0.0365
18-Dec-13	-5	-0.0041	-1.4961	0.0324
19-Dec-13	-4	0.0012	0.4529	0.0337
20-Dec-13	-3	0.0031	1.1262	0.0367
23-Dec-13	-2	-0.0007	-0.2715	0.0360
24-Dec-13	-1	0.0027	0.9782	0.0387
26-Dec-13	0	0.0033	1.2216	0.0420
27-Dec-13	1	-0.0007	-0.2488	0.0413
30-Dec-13	2	0.0004	0.1425	0.0417
31-Dec-13	3	-0.0013	-0.4766	0.0404
01-Jan-14	4	-0.0013	-0.4671	0.0392
02-Jan-14	5	-0.0003	-0.0968	0.0389
03-Jan-14	6	0.0049	1.7961	0.0438
06-Jan-14	7	-0.0056	-2.0452	0.0382

The above table gives a depiction in which it implies that immediately before the expiration day, the average abnormal return is becoming positive. The abnormal return is positive and insignificant for the period -7, -4, -3 and -1. However, it appears to be negative on -6, -5 and -2. The average abnormal returns are again insignificant for all the days of the week in which the expiration day falls. It is also visible that there is again no price distortion on the event day and average abnormal return is positive too. Thus, the result rejects the null-hypothesis.

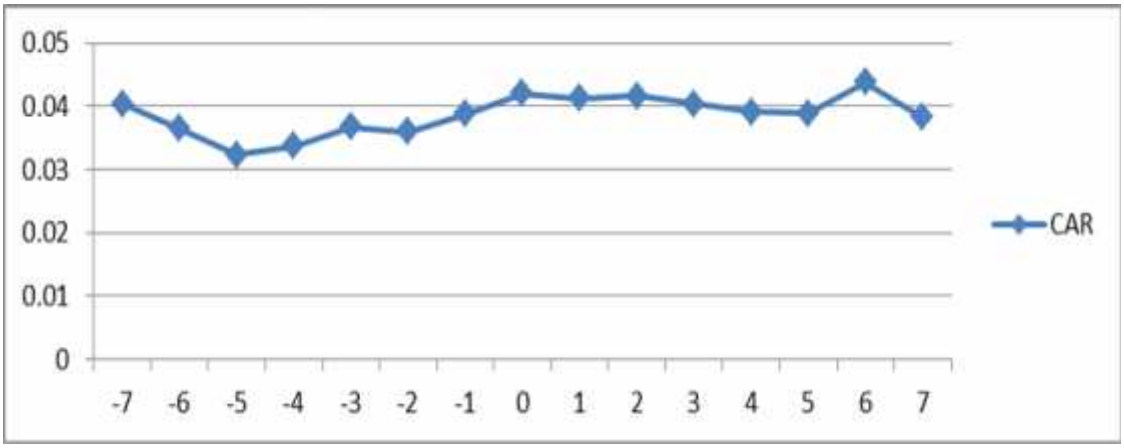

Figure 3: Cumulative abnormal Return (Event 3)

The cumulative abnormal return (CAR) result is aligned with the average abnormal returns. It clearly shows that the cumulated returns have declined from the period -7 to -5 with an inclination from the day -4. After the expiration, it is exhibiting fluctuation over the week with a rise during the end of the week.

CONCLUSION

Previous research on expiration-day effects has generally found that spot trading volume is abnormally high at expiration. However, in spite of the well-documented positive correlation between trading volume and stock price volatility, no higher volatility has been systematically reported. This study empirically examined the effect of stock futures expiration on both price of underlying stocks in the National Stock Exchange in India. Most of the studies done earlier, have shown significant impact of the expiration day on the Cash market segments. Based on the analysis performed during the course of this study we can conclude that:

1. It is shown that futures expiration has resulted in the positive price during the days leading to the expiration date. This result is at variance with the findings of studies on US where negative price effect before the expiration day was found. The reported expiration day effects may be due to the unwinding of arbitrage positions in the spot market.
2. The unwinding of arbitrage positions in an enormous scale in the same direction would stimulate price and volume effects.
3. Our results indicate that there is insignificant expiration day effect in India. To begin with, the volume of trading is higher on expiration days than on non-expiration days.
4. Average abnormal return implies that as the expiration day is approaching, the average abnormal returns are becomes positive. The abnormal return is positive and insignificant for most of the period the average abnormal returns are again insignificant for all the days of the week in which the expiration day falls.
5. It is also visible that there is again no price distortion on the event day and average abnormal return is positive too.
6. The results of this study is inconsistent with the results obtained from the other studies where it was concluded that there is a significant impact on price and volatility on the cash market segment of capital markets. But the findings of the current study suggests otherwise i.e., the results of t-statistics shows that the expiration day effect is insignificant.

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