A STUDY ON FUTURES PRICE BEHAVIOUR TOWARDS ITS EXPIRY IN INDIAN CONTEXT

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Abstract:

This research investigates the effect of stock future expiration effect on its price using the daily data of 5 companies of automobile industry with high market capitalization. The Indian automobile industry is 4th largest in the world, it contribute 12% in country's GDP. Automobile industry is growing at a very rapid pace. Automobile sector contribute about 12% of nations economy. It can be concluded from the findings of the study that there is an impact of future prices on the price of underlying stock towards the expiry of futures contracts.

Keywords: Futures price, Futures Expiry, Indian Stock Market.

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Introduction

Futures and Options contracts:

Derivatives that are traded on the exchange are of two types - Futures and Options. Both are contracts, which are traded in the exchange. The contract buyer agrees to buy or sell the underlying assets (stocks, in this case) at a fixed price at a future date. Now, if this is a futures contract, then the buyer has to fulfil the agreement at all costs. If this is an Options contract, however, the buyer can let the contract expire without fulfilling the terms of the agreement.

Derivatives:

Derivatives were created out of the need of financial markets. They can and do serve a wide variety of purposes and that is the reason that they exist.

Derivatives expiry:

The future date by which the contracts have to be fulfilled is called the derivatives expiry. To avoid confusion, the exchange has decided that the contracts can only expire on the last Thursday of every month. If this happens to be a trading holiday, then the previous trading day would be counted as the expiry date.

Expiry

1	First month	Near month
2	Second month	Next month
3	Third month	Far month

Derivatives settlement:

On the expiry day, the contracts are settled (or simply get expired in case of Options). This can be done by two ways - you can buy another contract which nullifies your contract, or you can settle in cash. Each contract is traded at a specific value. This is connected to the underlying stock's price in the secondary stock market (cash market)-where trader buy and sell stocks directly. So, the settlement value of each contract is tied to the closing price of the stock on the last day.

Effect on stock prices:

Futures and Options contracts derive their value from their underlying stocks or indices. However, over short periods of term, the derivatives contracts can affect stock prices too. For example, suppose investors are optimistic about the near future. So, the volume 'Buy' contracts increase in the derivatives market in comparison with the 'Sell' contracts. Investors in the cash market could start buying shares in anticipation of higher prices. When this buying increases in large quantity, the stock price actually rises.

Arbitrage trading on expiry:

A few days or a week before the expiry, traders take stock of their derivatives positions-whether they are truly profitable or not. Often, these traders have stock positions in both the secondary stock market as well as the derivatives market. Sometimes, they may buy from the stock market and sell through the derivatives market to make profits. This is called arbitrage trading. Around the expiry period, such traders may decide to cancel or unwind their positions to avoid losses.

Specification of the Nifty Index Futures contracts traded on the National Stock Exchange (NSE) 2018

Equity Derivatives		
Parameter	**Index Futures**	**Futures on Individual Securities**
Underlying Securities	6 Indices	206 securities
Instrument	FUTIDX	FUTSTK
Underlying Symbol	Symbol of Underlying Index	Symbol of Underlying Security
Trading Cycle	3 month trading cycle - the near month (one), the next month (two) and the far month (three)	
Expiry Day	Last Thursday of the expiry month. If the last Thursday is a trading holiday, then the expiry day is the previous trading day.	
Permitted Lot Size	Underlying specific	Underlying specific
Price Steps/ Minimum Tick Size	Rs.0.05	Rs.0.05
Price Bands	Operating range of 10% of the base price	Operating range of 10% of the base price

Review of literature

Bollen and Whaley (1999) investigated the price and volume changes during expirations of the Hong Kong Futures Exchange's HSI derivative contracts and observed no confirmation of augmented stock market volatility. They also established that volatility increased during expiration week but was not significantly dissimilar from non-expiration week.

Sadath and Kamaiah (2007) found that evidence from Indiafound that there is no unanimity on the expiration effect of derivatives. It is seen in the study that futures expiration has resulted in the positive price & volume effects during the days leading to the expiration date.

Redl& Bunn (2011) while studying determinants of the premium in forward contracts observe that considerations of the scale and determinants of the forward premium are at least as important as the market power effects in spot market price formation when evaluating the efficiency of wholesale power trading.

Nuruzzaman (2013) found that if the investor earn profit in future market they consider themselves very knowledgeable and capable but if they incur losses they consider it as bad luck. This tendency of investors motivate them to retain in the market after incurring losses.

Mahalwala (2016) Expiration-day effects may be a result of a mixture of factors, including presence of arbitrage opportunities, the cash settlement nature of index derivative contracts, the stock market process for accommodating the unwinding of arbitrage positions in the stocks, and the efforts to wittingly manipulate prices.

Stoll & Whaley (2016) while studying the expiration-day effects of the all ordinaries share price index futures, empirical evidence and alternative settlement procedures found that there is a relationship between future price and its expiry.

Wats (2017) derivative expiration affect on spot market volatility expiration day impact is primarily owing to increased volumes in near-month contracts and following the cash based settlement system.

Rationale of study

There were many loopholes in the earlier studies, not much has been done in the Indian automobile sector with respect to futures price behaviour. The present study is an attempt to fill the gap.

Another loophole covered in this research is that the data is collected for 5 years whereas in other previous researches no such large amount of data is used to calculate alpha i.e. slope and beta i.e. intercept.

Objectives of the Study

The objective behind this research is to study the futures price behaviour towards its expiry i.e. when there is expiry of any future contract how price behave, whether there is any normal returns or abnormal returns.

RESEARCH METHODOLOGY

a)   The Study

This study is descriptive in nature.

b)   The Sample

Secondary data (2014-2018)

- Nifty closing price from 02-01-2014 to 30-10-2018.
- Maruti closing price from 02-01-2014 to 30-10-2018.
- Mahindra and Mahindra closing price from 02-01-2014 to 30-10-2018.
- Eicher Motor corporation closing price from 02-01-2014 to 30-10-2018.
- Hero motor corporation closing price from 02-01-2014 to 30-10-2018.
- Bosch Ltd closing price from 02-01-2014 to 30-10-2018.
- Expiry for calculated month is also taken from the above data.

c)   The Tools

For Data Collection

The data was collected from the official website of NSE (www.nseindia.com).

Data Analysis

This research is about price behaviour. To determine the behaviour of price we will be using normal returns, abnormal returns, standard deviations etc. The event of interest in this study is formally defined as the expiration of stock futures contracts. Since stock futures expiration takes place on the last Thursday of every month right from its inception, only a particular expiration day, i.e., last Thursday, is considered. An event window of 21 days, i.e., ten days each just before and after the day of event (denoted as t = 0) is considered.

Top five companies with high market capitalization of automobile sector is considered. Five years data was used to compute alpha and beta for the companies. The selection of month from each year is taken in random manner (Using excel formula RAND). The following data is taken for year 2018.

Company Name	Market Capitalization Rs.(Cr.)	Ticker Code
Maruti Suzuki India Ltd.	221486.56	MARUTI
Mahindra & Mahindra Ltd.	95396.95	M&M
Bajaj Auto Ltd.	78037.31	BAJAJ-AUTO
Eicher Motors Ltd.	67408.17	EICHERMOT
Hero MotoCorp Ltd.	59002.36	HEROMOTOCO

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

$$r_{it} = \frac{p_{i,t} - p_{i,t-1}}{p_{i,t-1}}$$

Where,

$r_{i,t}$ = Return on stock i in the period

$p_{i,t}$ = 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:

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

$r_{m,t}$ = 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:

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

Where,

$r_{i,t}$ = Return on stock i on day t

α_i = Intercept

β_i = Beta of 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:

$$AR_{i,t} = r_{i,t} - \alpha_i - \beta_i r_{m,t}$$

Next,

The average abnormal return on day 't' (AARt) for a portfolio of forty two stocks is calculated as shown below :

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

Where,

'N' is the number of sample securities.

The t-statsic for the AARt is calculated cross-sectionally as given below:

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

Where,

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

$$S_P = \sqrt{\sum_{i=1}^{N} S_i^2 / N}$$

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

Where,

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

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

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

The cumulative abnormal return is calculated on returns of five companies by taking their aggregate of abnormal return on each day.

RESULTS AND ANALYSIS

Hypothesis

H0 – There is no effect of expiry of futures contract of automobile companies on their underlying stock.

H1 - There is effect of expiry of futures contract of automobile companies on their underlying stock.

Price Behaviour on Futures Expiration in 2014, October

Table: 1

Event Window	Standard deviation	T-Statistic	CAR
-10	0.0066	-1.592	-0.010
-9	0.0020	-0.149	0.000
-8	0.0044	-1.406	-0.006
-7	0.0067	1.657	0.011
-6	0.0031	1.347	0.004
-5	0.0065	-0.178	-0.001
-4	0.0037	4.721*	0.017

-3	0.0058	0.753	0.004
-2	0.0048	-0.788	-0.004
-1	0.0041	0.196	0.001
0	0.0025	-5.074*	-0.013
1	0.0038	-1.361	-0.005
2	0.0094	-0.607	-0.006
3	0.0044	-1.847**	-0.008
4	0.0034	-3.760*	-0.013
5	0.0031	1.549	0.005
6	0.0041	2.107*	0.009
7	0.0039	2.194*	0.009
8	0.0050	0.736	0.004
9	0.0086	1.396	0.012
10	0.0068	0.291	0.002
**Significance at the 1% level.			
*Significance at the 5% level.			

CAR for October 2014
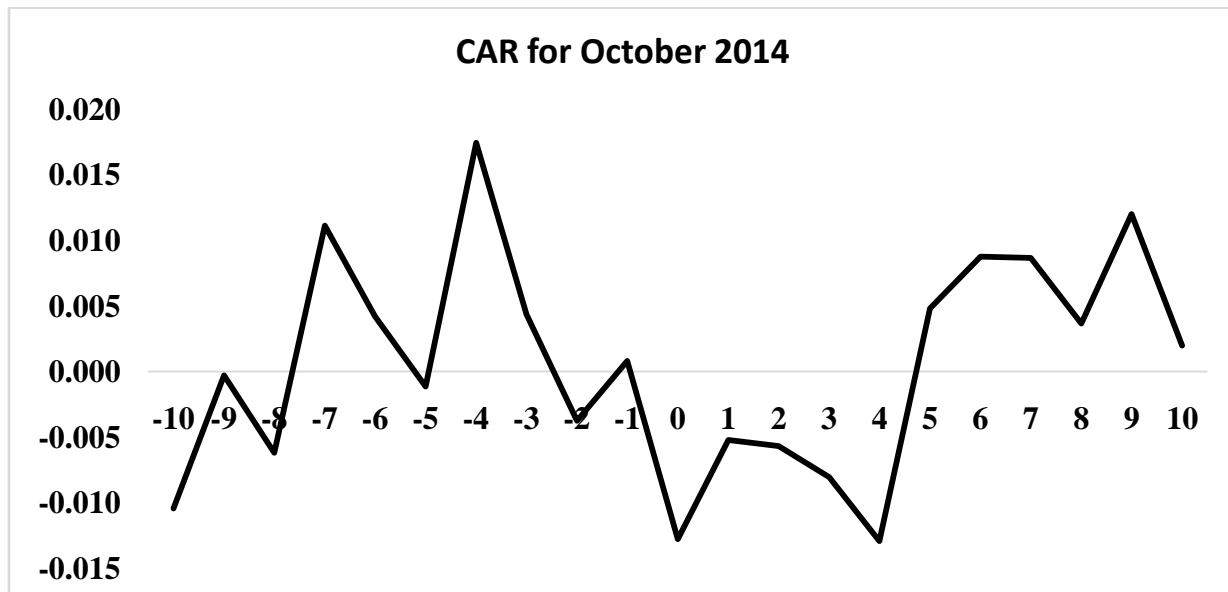
The following is the analysis of table 1 - price behaviour on futures expiration for 2014, October month which expired on 30-10-2014. Here at 1% level of significance the limit is ±2.528 and at

5% level of significance it is ± 1.725. The table shows that there are abnormal returns on 3rd day at 1% level of significance and there are abnormal returns on -4th, 0th, 4th, 6th & 7th day at level of significance of 5% whereas there are normal returns on rest of the days such as -10th, -9th, -8th etc.

Since the value of t-statics on 0th day is highest this shows that there highest chances of abnormal returns. The pattern of car which is shown in the above graph is irregular, this show that the decision taken by investors must also be based on given information at that point of time and not just the abnormal return.

Price Behaviour on Futures Expiration in 2015, May

Table: 2

Event Window	Standard deviation	T-Statistic	CAR
-10	0.0016	7.371*	0.012
-9	0.0051	1.074	0.005
-8	0.0031	-3.860*	-0.012
-7	0.0058	0.333	0.002
-6	0.0023	-1.947**	-0.005
-5	0.0025	0.014	0.000
-4	0.0031	-0.941	-0.003
-3	0.0050	3.359*	0.017
-2	0.0049	0.360	0.002
-1	0.0064	-2.179*	-0.014
0	0.0058	-0.745	-0.004
1	0.0066	2.766*	0.018
2	0.0052	0.243	0.001
3	0.0032	-1.266	-0.004
4	0.0055	-0.946	-0.005
5	0.0080	-1.208	-0.010
6	0.0034	1.072	0.004
7	0.0044	-1.021	-0.004
8	0.0035	-2.686*	-0.009

| 9 | 0.0034 | 0.802 | 0.003 |
| 10 | 0.0049 | -0.165 | -0.001 |

*Significance at the 1% level.

**Significance at the 5% level.

CAR for 2015, May
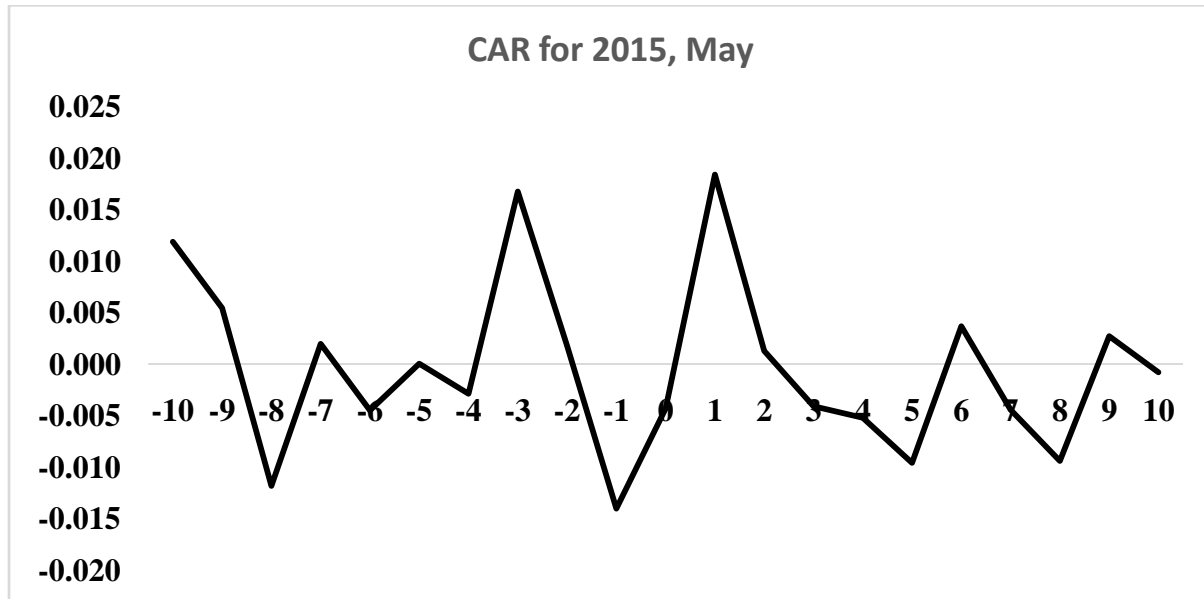
In 2015, through random number May was the month which arise for analysis and its expiry was on 28-05-2015. In table number 2 it can be seen that there is abnormal return on 1% level of significance are on -10th, -8th, -3rd, -1st (i.e. one day before the expiry), 1(i.e. one day after the expiry) and on 8th event day. 5% level of significance can only be seen on -6th day before the expiration of contract take place.

This shows that there most of the movement in the price behaviour or the abnormal return can be seen before the expiry of contract.

Price Behaviour on Futures Expiration in 2016, July

Table: 3

Event Window	Standard deviation	T-Statistic	CAR
-10	0.0045	-0.288	-0.001
-9	0.0030	4.002*	0.012

| -8	0.0016	3.779*	0.006
-7	0.0046	-0.880	-0.004
-6	0.0035	0.847	0.003
-5	0.0027	-1.764**	-0.005
-4	0.0018	-2.926*	-0.005
-3	0.0039	0.327	0.001
-2	0.0040	-1.795**	-0.007
-1	0.0034	0.846	0.003
0	0.0086	1.588	0.014
1	0.0091	2.218*	0.020
2	0.0042	0.471	0.002
3	0.0078	0.070	0.001
4	0.0048	-0.288	-0.001
5	0.0028	0.858	0.002
6	0.0080	1.347	0.011
7	0.0013	4.291*	0.006
8	0.0021	-3.140*	-0.007
9	0.0019	-4.345*	-0.008
10	0.0058	-0.641	-0.004
*Significance at the 1% level.			
**Significance at the 5% level.			

CAR for 2016, July
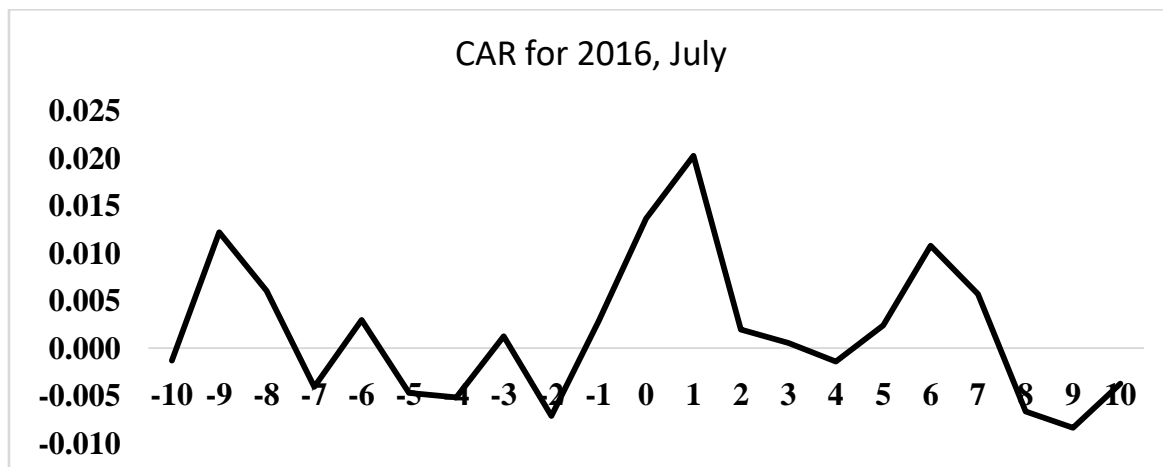
The expiry of July take place on 28-07-2016 and as given table shows that there on -9th, -8th,-3rd event day 1% level of significance can be seen. -5th & -1st on 5% level of significance abnormal return can be seen. After the expiration of the contract the abnormal return on continuous three days that might be news or result impact.

This shows that normal return and abnormal return that can be seen before and after expiration affect the price sensitivity and when contract gets expire than there is convergence of price of futures and price of spot market which signify that there is abnormal return on the day of expiry.

Price Behaviour on Futures Expiration in 2017, April

Table: 4

Event Window	Standard deviation	T-Statistic	CAR
-10	0.00491	0.961	0.005
-9	0.00247	-0.476	-0.001
-8	0.00215	0.477	0.001
-7	0.00318	-1.061	-0.003
-6	0.00222	-0.676	-0.001
-5	0.00220	0.418	0.001
-4	0.00319	-0.946	-0.003
-3	0.00345	-0.156	-0.001
-2	0.00670	0.728	0.005
-1	0.00489	0.916	0.004
0	0.00136	-3.290*	-0.004
1	0.00355	2.498*	0.009
2	0.00489	0.950	0.005
3	0.00247	0.431	0.001
4	0.00267	-2.703**	-0.007
5	0.00243	1.477	0.004
6	0.00594	1.290	0.008
7	0.00607	-0.817	-0.005
8	0.00303	2.428**	0.007
9	0.01118	1.643	0.018
10	0.00449	0.349	0.002
*Significance at the 1% level.			
**Significance at the 5% level.			

CAR for 2017, April
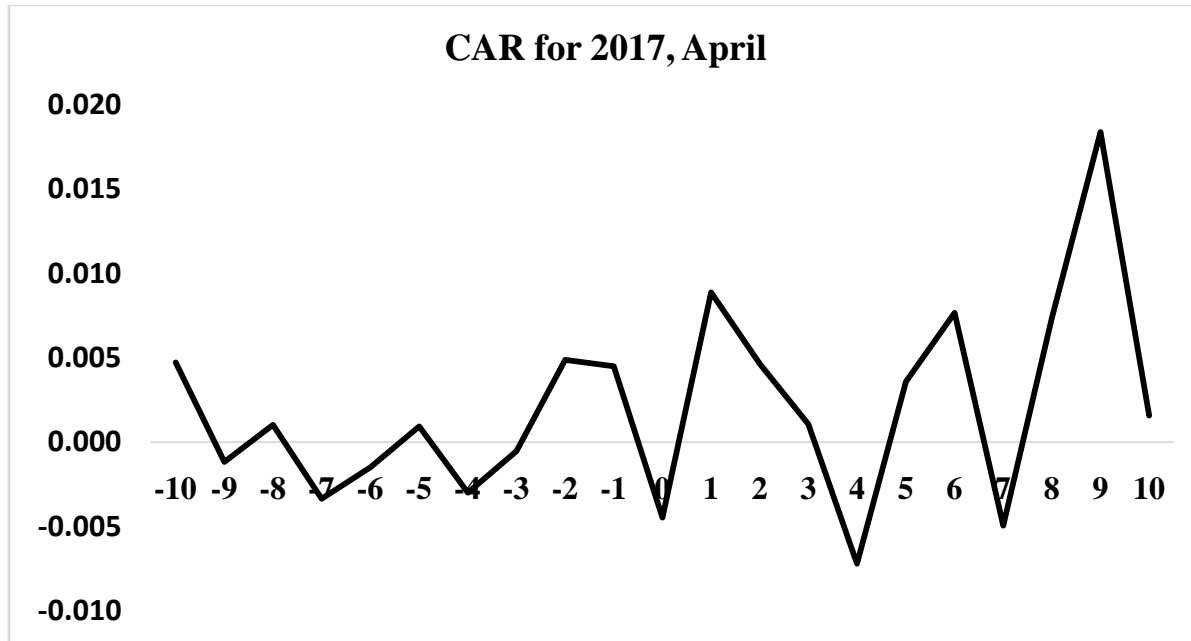
The expiry of April 2017 is on 27-04-2017 on the 0th event day this can be seen as abnormal returns (on the date of expiry). Analysis of table 4 shows that there are no abnormal return can be seen before the expiry of contracts. Abnormal returns can be seen after the expiry of contract such as 0th, 1st at 1% level of significance can be seen and on 4th, 8th day 5% level of significance can be seen.

Price behaviour on futures expiration in 2017 shows that on the expiry of a contract abnormal returns are observed and after the expiry of contract abnormal returns are observed. 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.

Price Behaviour on Futures Expiration in 2018, January

Table: 5

Event Window	Standard deviation	T-Statistic	CAR
-10	0.0037	0.180	0.001
-9	0.0034	-0.677	-0.002
-8	0.0034	-5.045*	-0.017
-7	0.0026	-1.702	-0.004

-6	0.0026	-2.899*	-0.007
-5	0.0039	0.129	0.001
-4	0.0017	-3.749*	-0.007
-3	0.0026	-4.295*	-0.011
-2	0.0059	-2.067*	-0.012
-1	0.0055	-1.500	-0.008
0	0.0046	-1.323	-0.006
1	0.0054	3.015*	0.016
2	0.0061	-0.219	-0.001
3	0.0022	0.202	0.000
4	0.0099	1.931**	0.019
5	0.0072	-0.115	-0.001
6	0.0056	2.012*	0.011
7	0.0038	0.560	0.002
8	0.0049	0.000	0.000
9	0.0021	-0.433	-0.001
10	0.0019	1.088	0.002
*Significance at the 1% level.			
**Significance at the 5% level.			

CAR for 2018, January
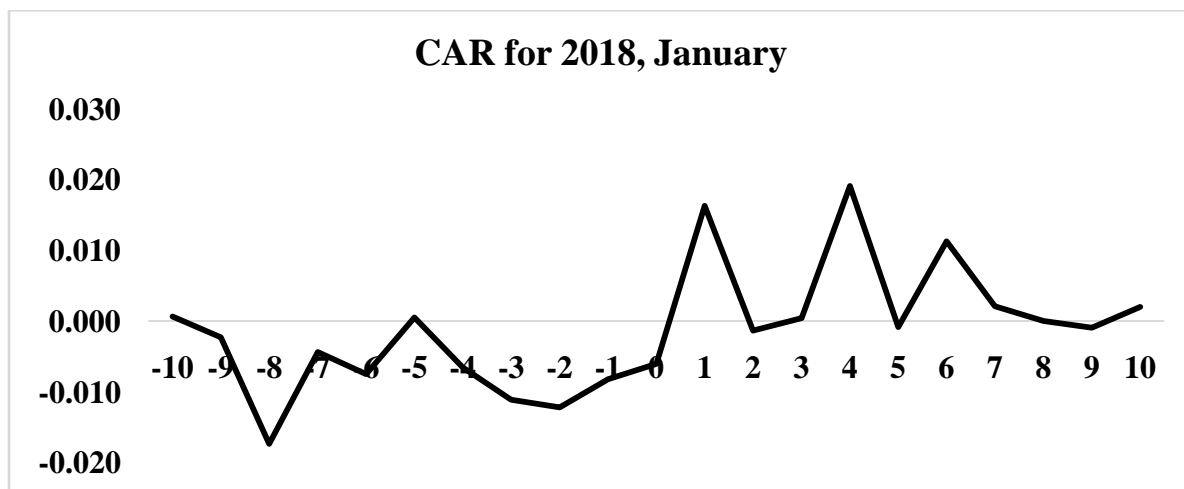
The contract for January 2018, expire on 25-01-2018 show high price distortion at 1% level of significance can be observed on -8th, -6th, -4th, -3rd, -2nd, 2nd and 6th and 5% level of significance can only be seen after expiration on 5th day.

Price behaviour on future expiration in 2018, January shows that abnormal returns can be seen before the expiry of January contract. Majorly normal returns can be seen after the expiration i.e. 0th day in the event window.

The cumulative abnormal return graph shows that there are negative cumulative abnormal returns before the expiry and positive cumulative abnormal returns after the expiry of futures contract.

SUGGESTIONS AND CONCLUSIONS

Suggestions

$\rightarrow$ The study can be used by the authorities for making policies related to futures market

$\rightarrow$ The study can also help authorities in the identification of scam

$\rightarrow$ It can also help various participants of financial market namely arbitrager's speculators and hedgers for earning higher returns.

Conclusions

$\rightarrow$ It can be concluded from the findings that there is an impact of future prices on the price of underlying stock towards the expiry of futures contracts.

$\rightarrow$ The study can further be replicated for pharmaceutical, telecom, infrastructure and other sectors and furthermore it can be done for other sectors of different stock markets of the world.

Implication

$\rightarrow$ The study can be used by fund managers and research analysts of mutual funds, stock broking firms, equity research firms for better analysis of financial markets.

Limitations

$\rightarrow$ The study could also have been done for a larger time period.

$\rightarrow$ The study could also have been done by using tick size data which is available for a fee.

Scope

$\rightarrow$ The study can be used at mutual funds, stock broking firms, equity research firms for better analysis of financial markets.

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