



AN EMPIRICAL ANALYSIS ON HOLIDAY EFFECT ON CALL OPTION RETURNS: A REFERENCE TO INDIAN OPTION MARKET

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ABSTRACT

The purpose of this study is to investigate the existence of the holiday effect in Indian Option contracts which are traded in NSE. This study examines the holiday effect on Indian BSE option returns from January 2007 to 31 September 2017. This study considered the preholiday return and the post holiday return and the influence of National holiday on the option returns. The six National holidays considered for the study are New Years Day, Republic Day, May Day, Independence Day, Gandhi Jayanthi and Christmas Day. The Wilcoxon signed-rank test of non-parametric statistical hypothesis test is used to compare the two related samples to assess whether their population means ranks differ. From the results it is found that there is a significant change in the post holiday option returns for the above mentioned period. Outcomes of this paper have implications for Option investors in India. It is of immense importance for an investor to consider the holidays of the interlinked stock markets when investing in a particular market of a region as holidays not only affect the returns of the portfolios but risk as well.



1. INTRODUCTION

Seasonality can be considered as another stylized fact of many financial instruments, distinguishing them from traditional financial assets. The seasonal behaviour of many commodity prices has been documented in numerous studies, e.g. Fama and French (1987), and, thus, should be considered in a valuation model. Sørensen (2002) considers the pricing of agricultural commodity futures (corn, soybean, and wheat) by adding a deterministic seasonal price component to the two-factor model of Schwartz and Smith (2000). Similarly, Lucia and Schwartz (2002) and Manoliu and Tompaidis (2002) consider the electricity and natural gas futures markets, respectively. Thus, the modelling of seasonality at the price level is relatively well understood.

The efficient market hypothesis (EMH) postulates that stock prices fully incorporate all publicly available information. One of the implications of the EMH is that the stock market displays no predictable patterns that can be explored reliably for abnormal returns. Basically, the EMH argues that share prices are inherently unpredictable. Despite its theoretical appeal, the EMH has long been contested by academics as well as practitioners. Among the various financial anomalies that have been documented in the literature are the abnormal returns around public holidays. This phenomenon, known as the holiday effect, has been uncovered in both developed markets and emerging markets. This paper tries to uncover the holiday effect on Indian option market specially the European style options.

2. LITERATURE REVIEW

Hong and Yu (2009) study seasonality in stock markets in 51 countries and find a gone fishin" effect. According to their study, the equity turnover falls during the summer period (July to September). The effect is the most pronounced for the countries further away from the equator. Since some investors go for holidays during summer they do not trade, consequently reducing liquidity. Similar situation can take place before holidays. The pre-holiday effect has proven itself as a real anomaly which still exists in some financial markets. Certain public holidays show significantly higher pre-holiday returns than the others. Therefore, it seems that the pre-holiday effect is driven by culture and religion.

Alex Gakhovich (2011) in his study the holiday effect in the Central and Eastern European financial markets investigate the existence of the holiday effect in fourteen



developing Central and Eastern European (CEE) financial markets. They found that the holiday effect is present in the CEE region, with a number of countries showing abnormal pre- and post- holiday returns. Contrary to the previous evidence, abnormal post-holiday returns which were documented. The holiday effect is most significant during the earlier years of financial market operations.

Debjiban Mukherjee: The stock market noticed high activities and obtaining huge importance. In the present scenario of globalization and consecutive assimilation of the global markets captures the tendency correlation and methods of the activities and evolution of the Indian stock market in comparison to its international standards. This analysis envelopes the New York stock exchange(NYSE), Russian stock exchange(RSE), Korean stock exchange(KSE), Hong Kong stock exchange (HSE), Tokyo stock exchange(TSE), from various socio-politico-economic backgrounds. Both the Bombay stock exchange (BSE) and the National stock exchange of India limited (NSE) are used as the part of Indian stock market in this case study. This period has been isolated to test the correlation between the various exchanges to determine the Indian stock markets have become more integrated with its global correspondent and its reaction are in tandem with that are noticed globally.

Paulo M. Gama, Elisabete F.S. Vieira: This Case study determinates the further indication on the holiday effect by analyzing stock market behaviour on the days of public holiday is not guided by a stock market break. Indeed, since 2003, when the trading calendar of Portuguese stock market was reconciled with the remaining Euro next national markets, on many occasions Portuguese national holidays were not weekdays on which the stock market was closed. Furthermore the bottom-up approach is adopted which allowed to search for size effects and industrial effects. The results disclosed a statistical significant negative liquidity effect and economically and statistically significant negative liquidity effect and an economically and statistically significant positive price effect during Portuguese specific national holidays proportionate to a typical trading day. Return-related impact repercussions are driven by tiny-sized stocks and robust to recent crisis period. These results leads to the frequency of the mood effect for which those non distracted traders positive feelings translate into a buying pressure, or reluctance to sell, that drives up prices on the onset of country-specific holidays.



Kathy Yuan, Lu Zheng , Qiaoqiao Zhu: This analysis establishes the relation between lunar phases and stock market returns of 48 countries. The results deliver that the stock returns are lower on the days of full moon than on the other days of new moon. The significance of the return difference is around 3% up to 5% per annum based on the analyses of the two global portfolios: one equal weighted and the other value-weighted. The difference in the returns is not due to variations in the stock market volatility or trading volumes. The information show that the lunar effects are not explained by the macroeconomic indices or it is induced by major global shocks. More over the lunar effect Is independent of any other calendar anomalies, like January effect, the day-of-week effect, the calendar month effect, and the holiday impact (including lunar holidays).

Mohd Edil Abd Sukorab: This article investigates the impact on cultural and religious festivals on the trading behaviour of a sample of stocks listed on the five emerging Asian markets: Hong Kong, Asian markets: Hong Kong, Indonesia, Malaysia, Singapore and Taiwan, over the years 1991 - 2011. I examine the festivals' impact on stock returns and then inculcate the impact to firm size and the liquidity of the individual firms. These findings differ remarkably from the existing published literature. The hypothesis and the evidence confirms, that stock returns is lower before festivities, as investors tend to sell stocks, raising cash to finance their holiday expenditures, follows higher returns post festivities with the increased trading movements. Appropriate firm size and trading qualities provide additional evidence on the relationship between festivities and the functionalities of the firm. This findings show that the outcomes of the festivities which may be stronger among smaller firms. Enthusiastically, one thing is observed that the effect remains strong even after firm size and liquidity are managed.

3. NEED OF THE STUDY

The analysis has been emphasized to know the market holiday impact on European call Options traded in NSE. In general Economy various economic factors will have impact on Equity Markets but Non-Trading day impact also will be there or not to find this effect, data has been considered from 2007 to 2017 i.e., 10 years. In this analysis data has been considered from National Stock exchange (NSE). In this analysis actual working days of each year were considered instead of 252 days. (Globally 252 days will be considered as Annual Working days).



4. SCOPE OF THE STUDY

This analysis lays emphasis on the holiday impact on the Option market where there will be fluctuations in the stock prices due to several reasons, In this analysis we are trying to find whether the holiday impact is there on the stock market or not, if so how it is affecting considering the pre and post holidays closing prices of the European call options which are traded in Indian stock market, where the analysis shows the results of the affect on stock market. The Options Returns were calculated to find out the affect on Pre and Post holiday difference .This analysis helps the investors to analyze the fluctuations in the stock price before and after the occurrence of the Holidays. There are many Economic issues that may occur during the Holidays which lead to the Raise or fall in the stock prices. In that case this analysis helps to understand the movement of the stock market after the change in the Economic Conditions.

5. OBJECTIVES OF THE STUDY

- To analyse the relationship between Holidays on European Call Options Returns for the last 10 years.
- To measure the Option Returns were affected by Pre and Post Holiday Difference
- To find the impact of Holidays on European Call Option Returns

6. HYPOTHESIS

H_0 = Stock market indices before public holidays are not significantly different from stock market indices after public holidays

H_A = Stock market indices before public holidays are significantly different from stock market indices after public holidays.

7. RESEARCH METHODOLOGY AND DESIGN

- a) **Data:** For the present study data was collected from www.nse.com Bhavcopy archives. 10 years data was collected from 2007 to 2017. European call option returns were taken into consideration and its log normally distributed.
- b) **Sample Size:** 16,780 observations were considered for this study. Collected data were streamlined and mined.
- c) **Tools:** The model used for the study is Wilcoxon signed-rank test of non-parametric statistical hypothesis test under SPSS.



d) The study has proposed a null hypothesis that Stock market indices before public holidays are not significantly different from stock market indices after public holidays and the same has been tested using Wilcoxon signed-rank test.

e) Infernal Statistics and Econometric Tools:

i) **Co-integration:** Co-integration is a statistical property of time series variables. Two or more time series are co-integrated if they share a common stochastic drift. If two time series x and y are co integrated, a liner combination of them must be stationary.

$$Y = \beta x + u$$

Where u is stationary

ii) **Granger Causality Test:** Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. A time series X is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X (and with lagged values of Y also included), that those X values provide statistically significant information about future values of Y .

iii) **Null hypothesis:** The null hypothesis refers to a general statement or default position that there is No relationship between two measured phenomena. Rejecting or disproving the null hypothesis and thus concluding that there is a relationship between two phenomena.

iv) **Alternative hypothesis**

In statistical hypothesis testing, the alternative hypothesis is applicable when probability is > 0.5 . **Alternative** hypothesis is that the quality is poorer in the second half of the record.

v) **Volatility**

Volatility is a measure for variation of price of a financial instrument over time. Historic volatility is derived from time series of past market prices. The symbol σ is used for volatility, and corresponds to standard deviation.

vi) **Mean**

The sum of values divided by the number of values. It is denoted by \bar{x} .



vii) Sterling ratio:

A ratio used mainly in the context of hedge funds. This risk-reward measure determines which hedge funds have the highest returns while enduring the least amount of volatility?

Denoted as:

$$= \frac{\text{Compound Annualized Rate of Return}}{\text{Maximum Drawdown (Absolute Value)}}$$

viii) Augmented Dickey-Fuller Test

Augmented Dickey-Fuller Test is a test for a unit root in a time series sample. It is an augmented version of the Dickey-Filler test for a larger and more complicated set of time series models.

8. LIMITATIONS OF THE STUDY

- 252 working days will be considered as Annual working days but in this analysis not all the years are considered as 252 working days because of occurrence of many holidays in particular years.
- The data which is collected for the analysis is considered only from January 2007 to September 2017.
- No other economic factors are considered to analyze the impact except Holidays.
- Only European style call options were considered for the study.

9. DATA ANALYSIS:

a) Relationship between Nifty Return, Holidays & Nifty

Table 1 Correlations Analysis

| | Holidays | Call Option Returns |
|------------------------------|----------|---------------------|
| Option Return Pearson's Corr | 1 | 0.84 |
| Sig. (2-tailed) | | .883 |
| N | 25 | 25 |



| | | |
|--------------------------------|------|----|
| Holidays Pearson's Correlation | 0.89 | 1 |
| Sig. (2-tailed) | .896 | |
| N | 25 | 24 |

Interpretation:

The above table shows the relationship between key variables of the NSE and holidays. Option returns and holidays are found to be slightly correlated. From the result it is very much evident that the holidays do have an impact on the stock return. However, the result may deviate based on other factors which are not considered.

b) To measure Call option returns were affected by pre-post holiday difference

Selected (0.05 level) Number of Co integrating Relations by Model*

| Data Trend | None | None | Linear | Linear | Quadratic |
|------------|--------------|--------------|--------------|--------------|--------------|
| Test Type | No Intercept |
| | No Trend |
| Trace | 2 | 2 | 2 | 1 | 2 |
| Max-Eig | 2 | 2 | 2 | 0 | 2 |

c) Information Criteria by Rank and Model

| Data Trend | None | None | Linear | Linear | Quadratic |
|------------|--------------|--------------|--------------|-----------|--------------|
| Rank or | No Intercept | No Intercept | No Intercept | Intercept | No Intercept |
| No. of CEs | No Trend | No Trend | No Trend | Trend | No Trend |

d) Log Likelihood by Rank (rows) and Model (columns)

| | | | | | |
|----------|-----------------|----------------|----------------|----------------|----------------|
| 0 | -193.054 | 196.265 | 192.254 | 192.254 | 196.659 |
| 1 | -176.265 | -176.125 | -176.874 | -176.411 | -176.785 |
| 2 | -164.265 | -160.265 | -160.784 | -160.895 | -160.852 |

e) Akaike Information Criteria by Rank (rows) and Model (columns)

| | | | | | |
|---|----------|----------|----------|----------|----------|
| 0 | 20.26565 | 20.26558 | 20.86514 | 20.25623 | 20.36545 |
| 1 | 19.26521 | 19.54647 | 19.57849 | 19.48712 | 19.26312 |
| 2 | 19.21625 | 19.26545 | 19.54722 | 19.78720 | 19.87730 |

f) Schwarz Criteria by Rank (rows) and Model (columns)

| | | | | | |
|----------|----------|----------|----------|----------|----------|
| 0 | 20.08338 | 20.08338 | 20.38411 | 20.38411 | 20.66653 |
| 1 | 19.91046 | 19.87034 | 20.01669 | 20.17166 | 20.32657 |
| 2 | 20.25395 | 20.16022 | 20.16022 | 20.40020 | 20.40020 |



Interpretation:

The above table shows the Johansen co-integration test between pre-post holiday difference and option returns, there is a decreasing trend in the different models and in rank also. So there is co-integration between the pre-post holiday difference and call option returns.

g) Granger Causality Test:

| Null Hypotheses | Obs | F-Statistics | Prob. |
|--|-----|--------------|--------|
| PREPOSTDIFF does not Granger Cause OPTIONRETURN | 20 | 2.36591 | 0.1863 |
| NIFTYRETURNS does not Granger Cause OPTIONRETURN | | 0.17563 | 0.8632 |

Interpretation:

The above Granger Causality Test result shows that there is no impact of pre-post holiday difference over option returns i.e., $P < 0.5$ so accept the null hypothesis. There is an impact of nifty returns over pre-post holiday difference i.e., accept alternative hypothesis as $p > 0.5$.

h) Impact of Holidays on Nifty Returns

| Data Trend | None | None | Linear | Linear | Quadratic |
|------------|--------------|--------------|--------------|--------------|--------------|
| Test Type | No Intercept |
| | No Trend |
| Trace | 1 | 0 | 1 | 0 | 0 |
| Max-Eig | 1 | 1 | 1 | 0 | 0 |

i) Information Criteria by Rank and Model

| Data Trend | None | None | Linear | Linear | Quadratic |
|------------|--------------|-----------|-----------|-----------|-----------|
| Rank or | No Intercept | Intercept | Intercept | Intercept | Intercept |
| No. of CEs | No Trend | No Trend | No Trend | Trend | Trend |

Log Likelihood by Rank (rows) and Model (columns)

| | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|
| 0 | -169.2651 | -169.2548 | -16.32658 | 178.3659 | 178.6589 |
| 1 | -187.2651 | -180.3698 | -180.2544 | -180.2698 | -180.6987 |
| 2 | -167.2698 | -168.1254 | 168.2658 | -168.6598 | -168.4588 |



j) Akaike Information Criteria by Rank (rows) and Model (columns)

| | | | | | |
|---|----------|----------|---------|---------|---------|
| 0 | 20.24785 | 20.21659 | 20.2659 | 21.2659 | 21.3698 |
| 1 | 19.2659 | 19.54687 | 19.2654 | 19.2659 | 19.1112 |
| 2 | 19.2544 | 19.2698 | 19.2695 | 19.3666 | 19.3654 |

k) Schwarz Criteria by Rank (rows) and Model (columns)

| | | | | | |
|---|----------|---------|----------|----------|----------|
| 0 | 17.26598 | 17.2659 | 17.52699 | 17.2659 | 17.2659 |
| 1 | 17.2659 | 18.2654 | 18.2659 | 18.2655 | 18.4710 |
| 2 | 17.2659 | 18.0265 | 18.0266 | 20.40020 | 20.40020 |

l) Granger Causality Test:

| Null Hypotheses | Obs | F-Statistics | Prob. |
|---|-----|--------------|---------|
| OPTIONRETURNS does not Granger Cause HOLIDAYS | 21 | 0.02659 | 0.8847 |
| HOLIDAYS does not Granger Cause OPTIONRETURNS | | 0.81036 | 0.56326 |

Interpretation:

Table shows that there is an impact of options returns over holidays i.e., $p > 0.5$ so accept the alternative hypothesis. There is no impact of holidays over option returns I.e., accept null hypothesis as $p < 0.5$.

10. FINDINGS

From the above test results, it is evident that the holidays do have impact on the call options returns. Further the variables are tested found that they are positively correlated and also there is significance relationship among them. Future research could extend our results in various ways. As a next step, one could analyze the importance of seasonality in a stochastic volatility setting. It is not clear what fraction of the fluctuation in volatility can be captured by seasonality and what fraction remains stochastic.

11. CONCLUSION

Trading patterns of the Investors had been observed by pre-post Holiday which was causing the option Returns. In the analysis it has been proven that the market Returns are influenced by the Market holidays. Risk in the Market has been influenced by the



OPTION Volatility, the volatility itself indicates the standard deviation of the market where the Investor need to be cautious who want to protect the portfolio from high risk, Hence there is a further scope to do research in this area to find the exact impact on the market returns by the less number of trading days. Further researchers need to consider other economic factors which were not considered by us through which they can further have the analysis for the benefit of Investors by Fraternity

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