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Evaluation of Options Trading Strategies in India

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Abstract:
The past decade has witnessed an explosive growth in the use of financial derivatives by a wide range of corporate and financial institutions. This paper evaluates two of the commonly used options trading strategies (i.e. Butterfly and Straddle strategies) for a sample of 10 stocks each over the period Oct-Feb 2008. Butterfly and Straddle strategies are opposite to each other. While Butterfly strategy applies to least volatile stocks, Straddle strategy applies to highly volatile stocks. The results show that both the butterfly and straddle strategies are not working well on consistent basis in Indian market.

Keywords*: Derivatives, options trading strategies, Straddle strategy, Butterfly Strategy, risk-return tradeoff*
JEL Classification No. – G14

1. Introduction

The past decade has witnessed an explosive growth in the use of financial derivatives by a wide range of corporate and financial institutions. The first step towards introduction of derivatives trading in India was the promulgation of the Securities Laws(Amendment)Ordinance,1995. It withdrew the prohibition on options in securities. SEBI set up a 24-member committee under the Chairmanship of Dr.L.C.Gupta on Nov18, 1996 to develop regulatory framework for derivatives trading in India. It recommended that derivatives should be declared as "securities" so that the regulatory framework applicable to trading of "securities" could also govern trading of derivatives. The Securities Contract Regulation Act [SC(R)A] was amended in Dec 1999 to include derivatives within the ambit of "securities". The Government also rescinded in March 2000 the three-decade old notification, which prohibited forward trading in securities. Derivatives trading commenced in India after SEBI granted the final approval to commence trading and settlement in approved derivative contracts on the NSE and BSE in June 2000.

There have been significant developments in the securities market in India during the past few years particularly with the introduction of derivative products. With the derivatives market now about eight years old, it would be appropriate to study the performance of options trading strategies in India. Hence this study undertakes the evaluation of Butterfly and Straddle strategies.

Bombay Stock Exchange created history on June 9, 2000 by launching the first Exchange traded Index Derivative Contract i.e. futures on the Sensex. It commenced trading in Index Options on Sensex on June 1, 2001. Stock options were introduced on 31 stocks (approved by SEBI) on July 9, 2001 and single stock futures were launched on November 9, 2002. The National Stock Exchange of India Limited commenced trading in derivatives with index futures based on S&P CNX Nifty on June 12, 2000. It introduced trading on index options based on S&P CNX Nifty on June 4, 2001. Trading in options commenced from July 2, 2001 on 31 individual securities approved by SEBI while trading in futures on individual securities commenced on November 9, 2001.

An *options trading strategy* is implemented by combining one or more options positions and possibly an underlying stock position that allows the trader to realize profits, in many cases, with limited risks. Some of the commonly used strategies are hedging using call and put options, hedging with writing call and put options, spreads and combinations. *Butterfly Spread* is one of the important spread strategies. *Straddle* is one of the important combination strategies (for details see Hull (2008)).

The literature on evaluation of options trading strategies is limited. Lalchandani, Subramanian and Rao (2008) have made an attempt to compare the returns of the strategy which involves trading in only the stocks which are part of the index basket (Nifty), on a monthly and bi-monthly basis, with the returns of the strategy which involves, in addition to the above strategy, writing call options on the Nifty on a monthly and bi-monthly basis. The study pertains to data within the period of 4th June 2001 to 25th May 2006. The empirical results shows that the strategies involving options have lower risks as compared to corresponding strategies of not using options. The relevance of covered calls to Indian stock markets is highly dependent on the trend the market is experiencing. The most significant strategy investigated with higher returns and lesser variability for the individual investor is to cover long position in Nifty basket by shorting two month expiry call options.

Doran and Hamernik (2006) have made an attempt to examine the historical time-series performance of 12 trading strategies involving options on the S&P 100/500 indices from an individual's perspective. The analysis is conducted over two time horizons, assuming monthly investing starting in 1984 and 1996. 12 options strategies using 3 months and 6 months options on the S&P 100 and one-year options on the S&P 500 have been examined over a 22-year and 10-year holding period, and compared to a long position in the index as a benchmark. The empirical results shows that investing in options as an enhancement to a buy and hold

portfolio can result in raw and abnormal returns that exceed the equivalent investment in the index. The study also provided the following conclusions for options investors. First, most option investments do not provide positive abnormal returns above the buy and hold position in the underlying index and many have significant negative returns. Second, selling short- term options can provide higher returns than the buy and hold portfolio, but does not provide significant abnormal performance. Third, certain strategies, such as combination strategies with long maturities, offer positive abnormal performance with successful market timing.

2. Research Objective

The research work carried out in respect of options trading strategies in Indian context is very limited. Hence, this acts as a motivating factor for this study. The objective of this paper is to conduct an empirical study for evaluating Butterfly and Straddle strategies in Indian options market in a recent time period.

3. Research Hypotheses

- Butterfly spread provides statistically significant positive net payoffs in Indian options market.
- Straddle option strategy provides statistically significant positive net payoffs in Indian options market.

4. Data and Their Sources

Data used in the study comprises of (i) daily closing adjusted prices for 209 stocks (on which options are available on NSE) over the period April 2007 – September 2007. (ii) Call and put options premiums and strike prices for one month, two months and three months contracts as on 1-10-2007, 1-11-2007 and 3-12-2007 for 20 stocks (iii) opening adjusted stock prices for 20 stocks as on 1-10-2007,
1-11-2007 and 3-12-2007 (iv) closing adjusted stock prices for 20 sample stocks as on different expiration dates i.e. 25th Oct 2007, 29th Nov 2007, 27th Dec 2007, 31st Jan 2008 and 28th Feb 2008.
The stock price data has been collected from PROWESS, the online database maintained by the Centre for Monitoring of Indian Economy (CMIE). Also NSE website, www.nseindia.com has been used for the purpose of obtaining exercise prices and put and call option premiums. Additionally, The Economic Times, one of the leading financial dailies, has been referred to whenever necessary.

5. Research Methodology

Following methodology has been used for evaluation of options trading strategies.

5.1. Step I. Forming samples for the evaluation of Butterfly and Straddle strategies

- Finding daily closing adjusted prices of 209 NSE stocks on which options are traded for the period 1-04-2007 to 30-09-2007.
- Finding daily returns for all these stocks by using the formula $(P_2-P_1)/P_1$
  Where, P_1 is the previous day's closing adjusted price
  P_2 is the current day's closing adjusted price.
- Calculating standard deviation, a measure of volatility, of returns for all these stocks.
- Selecting 10 most volatile stocks and 10 least volatile stocks on the basis of standard deviation of returns. The sample containing 10 highly volatile stocks is used for evaluation of Straddle strategy while the sample containing 10 least volatile stocks is used for the evaluation of Butterfly strategy.

5.2. Step II. Evaluation of Butterfly Strategy

The dates of butterfly strategy formation are taken as 1st Oct 2007, 1st Nov 2007 and 3rd Dec 2007.
In butterfly strategy, three different exercise prices are involved. E_1 is the exercise price at which first call option is bought. E_3 is the exercise price at which second call option is bought. E_2 is the exercise price at which these two call options are sold in such a way that $E_1<E_2<E_3$.
Steps involved when the strategy is formed on 1st Oct 2007:

- E_2 is chosen in such a manner that it is nearest to the spot price (opening adjusted price) as on 1st October, 2007 mentioned above.
- E_1 and E_3 are chosen on the basis of E_2 in such a manner that E_2 is equi-distant from E_1 and E_3.
- Finding corresponding call premiums for the call options purchased and call options sold as on 1st October, 2007.
- Calculating the payoffs on the expiration date (last Thursday of the expiration month) by comparing the exercise price with the closing adjusted stock price on that date. Since we have considered one month, two months as well as three months options contracts, the respective expiration dates are 25th Oct 2007, 29th Nov 2007 and 27th Dec 2007.
- Finding net payoffs (adjusted for initial cost which is the sum of call premiums paid on two call options purchased *minus* the call premiums received on the two call options sold as on the date of strategy formation).

The same procedure has been followed for evaluating butterfly strategy on two other dates of strategies formation i.e.1st Nov 2007 and 3rd Dec 2007.
While evaluating these strategies we have assumed that options are of European style i.e. they can be exercised only on expiration date.

5.3. Step III. Evaluation of Straddle Strategy

Here also the dates of strategy formation are 1st Oct 2007, 1st Nov 2007 and 3rd Dec 2007.

In this case a call option and a put option is bought on the same stock at same exercise price (E) and expiring on same date.

Steps involved when the strategy is formed on 1st Oct 2007:

- E is chosen in such a manner that it is nearest to the spot price (opening adjusted price) as on 1st October, 2007 mentioned above.
- Finding corresponding call and put premiums for the call options and put options purchased on 1st October respectively.
- Calculating the payoff on the expiration date (last Thursday of the expiration month) by comparing the exercise price with the closing adjusted stock price on expiration date.
- Finding net payoffs (adjusted for initial cost which is the sum of call premium and put premium paid on purchase of these options on the date of strategy formation).

The same procedure has been followed for evaluating straddle strategy on two other dates of strategies formation i.e.1st Nov 2007 and 3rd Dec 2007.

6. Empirical Results

6.1. About Butterfly Spread

Date of Strategy Formation	**1st Oct 2007**			**1st Nov 2007**			**3rd Dec 2007**		
Stock Option	**Net Payoffs**			**Net Payoffs**			**Net Payoffs**		
	One Month	**Two Months**	**Three Months**	**One Month**	**Two Months**	**Three Months**	**One Month**	**Two Months**	**Three Months**
Dr. Reddy'S Laboratories Ltd.	29.85	2.2	-1.65	-12.95	-2.15	-1.75	-42.35	-6.4	-6.95
Amtek Auto Ltd.	11.35	-2.65	-2.65	14.1	17	19.35	36.8	-1.15	-9.1
Bharat Forge Ltd.	-10.6	-9.85	-7.65	-8.05	-7.2	-8.35	-10.9	-2.3	-1.8
Tata Consultancy Services Ltd.	29.3	-36.85	-7.55	-2.9	-1.9	-1.75	-65.15	-16.3	-83.35
Infosys Technologies Ltd.	15.4	-1	-0.9	11.1	-203.8	-0.75	8	-51.9	19.65
Wipro Ltd.	-19.9	-0.5	-0.5	20.8	9.45	-0.4	6.8	-8.8	-0.4
Wockhardt Ltd.	-0.7	-3.6	-2.65	9	-0.65	-0.55	39.65	10.1	-3.55
Indian Hotels Co. Ltd.	-7.8	3	-0.4	-1.4	1.35	-0.3	-5.1	2.8	-0.3
Lupin Ltd.	-32	-5.3	15.3	-1.3	0.35	-1.05	-1.5	-7.05	15.85
Ashok Leyland Ltd.	-0.75	2.35	-0.45	-1.25	-1.05	-0.8	0.95	-2.8	-0.4

Table 1: Net payoffs (adjusted for initial cost) of the stock options on which Butterfly Spread is applied, for one month, two months and three months, when the strategy is formed on 1st Oct 2007,1st Nov 2007 and 3rd Dec 2007 (in Rs.)

As shown in Table 1(when the strategy is formed on 1st Oct, 2007), Dr. Reddy's Laboratories Ltd. gives the highest net payoff (Rs. 29.85) in case of one month contract and the payoff is very low (Rs. 2.2) when expiration period is two months and is negative for three months contract. Amtek Auto Ltd. gives positive net payoff for one month contract only. Bharat Forge Ltd. gives negative net payoffs for all the three different expiration contracts. TCS Ltd. gives positive net payoff only for one month contract. Negative net payoff is greater for two months contract than three months contract. Infosys Technologies Ltd. gives positive net payoff only in case of one month contract. Wipro Ltd. gives negative net payoffs for all the three different expiration contracts though the amount of loss is much smaller for longer term contracts. Wockhardt Ltd. gives negative payoffs for all the three different expiration contracts. Indian Hotels Co. Ltd. gives net positive payoff only in case of two months contract. Lupin Ltd. has proved profitable only when the expiration period is three months. Last in the sample, Ashok Leyland has proved profitable only when the expiration period is two months.

Similarly analysis can be done for the **stock options** when the strategy is formed on 1st Nov 2007 and 3rd Dec 2007.

Thus we can say that ***butterfly strategy is working moderately for one month options contract only when the strategy is formed on 3rd Dec 2007 but not on other dates and is not working at all for two months and three months contracts and that the loss is increasing as the time to expiration is increasing. Hence, the analysis reveals that the butterfly strategy has proved highly dissatisfying for investors specially those who have entered into longer term contracts as compared to shorter term contracts.***

This can be observed by noticing the fact that when the strategy is formed on 1st Oct 2007, only four out of ten stocks, three out of ten stocks and one out of ten stocks give net positive payoffs to investors; four out of ten stocks, four out of ten stocks and one out of ten stocks give net positive payoffs to investors when the formation date is 1st Nov 2007; five out of ten stocks, two out of ten stocks and two out of ten stocks give net positive payoffs to investors when the formation date is 3rd Dec 2007 in case of one month, two months and three months expiration period respectively.

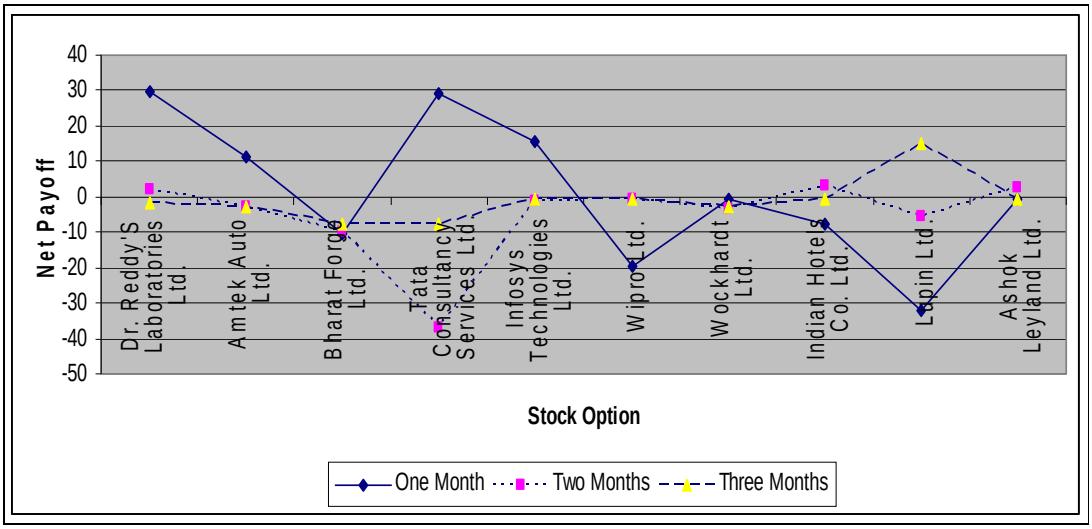

Figure 1: Net payoffs (adjusted for initial cost) of the stock options on which Butterfly Spread is applied, for one month, two months and three months, when the strategy is formed on 1st Oct 2007

Figure 1 represents the chart drawn on the basis of net payoff table of butterfly strategy when the strategy is formed on 1st Oct 2007. Similarly charts can be drawn for other strategy formation dates as well.

6.2. About Straddle Strategy

Date of Strategy Formation	**1st Oct 2007**			**1st Nov 2007**			**3rd Dec 2007**		
Stock Option	**Net Payoffs**			**Net Payoffs**			**Net Payoffs**		
	One Month	**Two Months**	**Three Months**	**One Month**	**Two Months**	**Three Months**	**One Month**	**Two Months**	**Three Months**
Nagarjuna Fertilizers & Chemicals Ltd.	-7.2	-12.55	-5.1	-9.1	-11.9	-2.15	-8.85	11.8	-12.55
Reliance Natural Resources Ltd.	-13.4	18.8	23.5	5.7	-2.6	-48.3	-28.6	-70.3	-38.9
India Infoline Ltd.	-78.6	68.8	597.95	-204.15	217.65	-437.7	143.4	-283.75	-372.3
Triveni Engineering & Inds. Ltd.	3.05	-20.75	13.45	-11.95	-14.25	-45.55	-7.75	-49.45	-55.6
Lanco Infratech Ltd.	20.1	63.35	351.4	-57.35	207.45	-142.7	161.9	-77.55	-107.25
Educomp Solutions Ltd.	-88.4	-354	1051.6	-861.4	-25.65	-1408.6	-284.75	-696.25	-349.75
I F C I Ltd.	-12.1	-12.2	-15.75	-17.85	-23.85	-5.05	5.3	2.4	4.95
Jaiprakash Hydro Power Ltd.	-10.45	12.15	12.15	7.65	-0.6	-24.75	-8.2	2.1	-2.15
Balrampur Chini Mills Ltd.	-6.15	-1.95	12.85	-6.65	0.25	-18.2	-18.75	-6.1	-29.35
Unitech Ltd.	-7.4	-10	60.25	-56.4	-17.25	-109	25.1	-65.1	-68.45

Table 2: Net payoffs (adjusted for initial cost) of the stock options on which Straddle Spread is applied, for one month, two months and three months, when the strategy is formed on 1st Oct 2007,1st Nov 2007 and 3rd Dec 2007 (in Rs.)

Table 2 (when the strategy is formed on 1st Oct 2007) shows that Nagarjuna Fertilizers & Chemicals Ltd. gives negative net payoffs in all the three different expiration contracts. RNRL Ltd. gives positive payoffs in case of two and three months contracts. Though India Infoline Ltd. gives negative net payoff for one month contract but it satisfies investors' expectations in case of longer term contracts specially three months contracts. Triveni Engineering &Inds. Ltd. fails to satisfy investors' expectations

only in case of two months contracts. Lanco Infratech Ltd. satisfies all the investors giving higher positive net payoffs as the time to expiration increases. Educomp Solutions Ltd. highly satisfies only those investors who have entered into three month contract. IFCI Ltd. fails to give positive payoffs in case of all the three different expiration contracts. Jaiprakash Hydro Power Ltd. fails to satisfy investors' expectations only in case of one month contract. Balrampur Chini Mills Ltd. proves profitable only in case of three months contracts. Last in the sample, Unitech Ltd. gives satisfying payoffs only in case of three months contracts.
Similarly analysis can be done for the **stock options** when the strategy is formed on 1st Nov 2007 and 3rd Dec 2007.
Therefore we can say that ***Straddle strategy is working strongly for three months options contracts only when the strategy is formed on 1st Oct 2007 but not on other dates and is not working at all for one month and two months contracts.*** This can be seen from the fact that when the strategy is formed on 1st Oct 2007, two out of ten stocks, four out of ten stocks and eight out of ten stocks give net positive payoffs; two out of ten stocks, three out of ten stocks and zero out of ten stocks give net positive payoffs when the formation date is 1st Nov 2007; four out of ten stocks, three out of ten stocks and one out of ten stocks give net positive payoffs when the formation date is 3rd Dec 2007 in case of one month, two months and three months expiration period respectively.

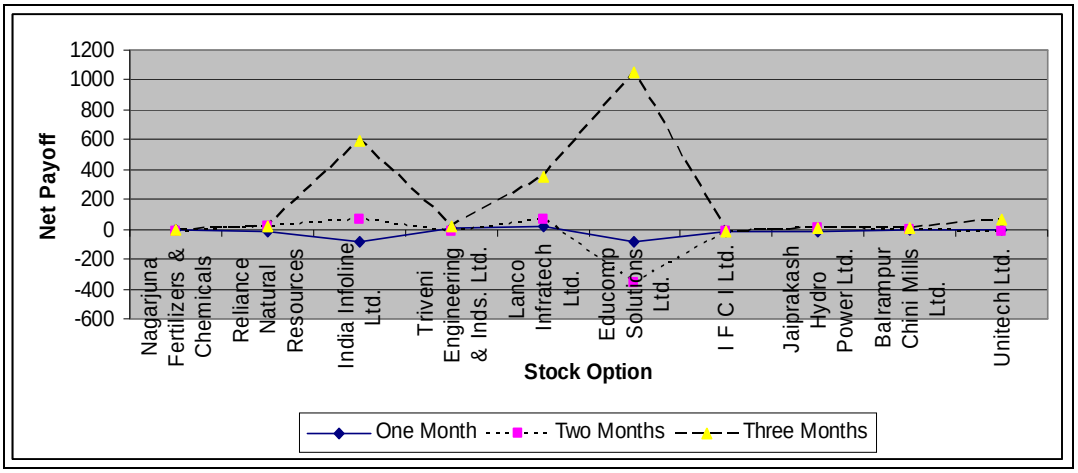

Figure 2: Net payoffs (adjusted for initial cost) of the stock options on which Straddle Spread is applied, for one month, two months and three months, when the strategy is formed on 1st Oct 2007

Figure 2 represents the chart drawn on the basis of net payoff table of straddle strategy when the strategy is formed on 1st Oct 2007. Similarly charts can be drawn for other strategy formation dates as well.
However the results of this study cannot be generalized due to limited sample size and few limitations like evaluation of only two strategies (Butterfly and Straddle) using only 20 NSE stocks (limited number of stocks) has been undertaken, options contracts have been assumed as European style (although the results may change if we take options as American style), only three dates of strategy formation i.e. 1st October, 2007, 1st Nov 2007 and 3rd Dec 2007 have been taken, evaluation of the strategies has been done on the basis of secondary data only (primary data as regards usefulness of the strategies has not been collected).

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