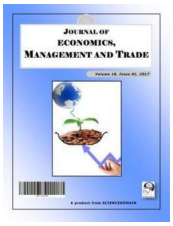

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Payoffs from Neutral Option Strategies: A Study of USD-INR Market

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Authors' contributions

This work was carried out in collaboration between all authors. Authors AK and SK designed the study. Authors AK and MG performed the statistical analysis. Author AK wrote the protocol and wrote the first draft of the manuscript. Authors AK, SK and MG managed the analyses of the study. Author AK managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The present study has tried to assess the profitability of payoffs from adopting neutral option strategies on USD-INR.
Study Design: The study was carried out using daily closing values of the US Dollar-Indian Rupee current future rate available on National Stock Exchange of India (NSE) for the period starting from 29th October 2010 (the start of currency options market in NSE) to 30th June 2016.
Methodology: The present study has tried to fill the gap of assessing the profitability of payoffs from adopting neutral options strategies on USD-INR. Strategies namely long and short straddle; long and short strangle were employed on USD-INR for 68 months starting from October 2010 to June 2016.
Results: The payoffs are highly variable but fail to achieve any statistically significant results on the individual and comparative basis
Conclusion: Results of the study are therefore significant for traders, hedgers and have academic value especially in the domain of foreign exchange neutral options strategies.

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Keywords: Long straddle; short straddle; long strangle; short strangle; USD-INR.

1. INTRODUCTION

With the appreciation or depreciation of the currency, various firms, investors and speculators are exposed to foreign exchange risk, which eats away their profits. The increase in the international business has led to an increase in fluctuation in exchange rates. This has led to a higher need for hedging strategies. At present, there are various financial instruments like short-selling, futures, options which can help investors in minimizing the foreign exchange risk. Currency futures and currency options are the two relatively modern hedging instruments under the currency derivative segment of the National Stock Exchange of India (NSE). Between the financial years 2005 and 2017, cash market turnover has increased by 11.4% on the annual compounding basis, while future and options turnover has risen by 35% compounded annually [1] The turnover in currency options has also increased by 81% to USD 0.2 trillion, or 9% of the total forex (FX) segment [2]. There are three types of options strategies namely bullish, bearish and neutral. Along with bullish and bearish option strategies, the performance of a neutral options strategy has also been gaining importance in the literature. Neutral options trading strategies are employed when the options trader does not know whether the price of the underlying asset will rise or fall. These strategies are also known as non-directional strategies. There are various kinds of neutral options strategies namely straddles, strangles, guts, butterflies, iron butterflies and condors. Strangles and straddles have low transaction cost as compared to other four trading strategies. Amongst straddle and strangle option strategies, traders tend to choose the strategy which has low delta value [3]. The uses for strangles are the same as those for straddles, but at a lower cost since at least one of the options is not at-the- money [4]. The four type of neutral strategies are explained in the following paragraphs.

An investor purchase straddle (long straddle) when he believes there will be a large price movement in the underlying asset but is uncertain of the direction. If the price of the underlying asset increases significantly, the call option will generate income and the put option will expire uselessly. If the price of the underlying asset decreases significantly, the put option will generate income and the call option will expire uselessly.

A short straddle is just the opposite of long straddle. An investor sells straddle when the underlying asset's price at expiry is expected to be near the exercise price. This strategy is used when the trader expects less volatility in the market in the near future. If the underlying asset moves around the same price level, then both the options will expire worthlessly and the option writer will get the premium. However, this is a very risky strategy. If the price of the underlying asset goes up or down sharply then the losses will be significant for the option writer. A short straddle is useful when the underlying asset is expected to remain stable [5].

A long strangle is simultaneously buying a call and a put option with different exercise prices. A long strangle offers a profit when the profit of exercising either the call or the put exceeds the option premium of the call plus the option premium of the put [5].This strategy will decrease the entry cost for a trader and it is also cheaper than a straddle. A trader will make profits if the market moves sharply in either direction and gives extra-ordinary returns in the near future so that either of the options will make money. In case of low volatility, a trader will lose his entire investment i.e. the premium he paid for buying the options. For this strategy to yield profit the volatility should be on the higher side. Also, the volatility required for strangle to make profits should be more than the volatility required for straddle to make profits.

A short strangle is simultaneously selling a call and a put option with different exercise prices. A short strangle is profitable when the option premium received on the call and the put exceed the difference between either the strike price of the call and the stock price at maturity or the strike price of the put and the stock price at maturity [5]. In this strategy, the chances of making a profit are more because of the spread between the two strike prices. If the markets remain less volatile, then this strategy will start generating profits. The trader expects that the market will not be much volatile in the near future and the volatility is expected to lie between the two strike prices.

Various textbooks and industry articles have given attention to straddles, strangles, spreads

and combinations, but the researchers have largely ignored them. Very little research work has been done on practically employing the neutral options strategies and reviewing its performance from retail investor's point of view, especially in Indian currency market. This paper focuses on risk and returns characteristics of option strategies with particular reference to the neutral scenario of US dollar (USD). The particular neutral strategies that have been studied and referred in this paper are namely long straddle strategy, short straddle strategy, long strangle strategy and short strangle strategy.

2. LITERATURE REVIEW

Several studies have been conducted highlighting the mixed results on the return performance of option strategies. But most of these studies are limited to stocks, indices and some of them relate to commodities. In fact, the studies on the performance of options in the currency market are very few and rarely published. Nevertheless, the option payoff in any kind of assets is similar, so the findings become a kind of universal learning.

Regarding contract volume, the most heavily traded combinations are straddles, ratio spreads, vertical (i.e., bull and bear) covers, and strangles. The contract volume attributable to straddles and ratio spreads exceeds that accounted for by naked puts and calls. Amongst various neutral option based strategies like straddles, strangles, guts, butterflies, iron butterflies and condors, straddle (73%) is the most popular volatility trade followed by strangles (21%) and butterflies (4.7%) [3].

The performance of straddles has received a considerable amount of attention in the literature. According to the study by [5], returns on the long straddle trading strategy exceeds the returns on the underlying stocks Straddles have also been used in empirical market microstructure research on [6,7]. Also [8], examined straddles in an asset-pricing context. Copeland and Galai [6] employed straddles as a proxy for the cost of a dealer's bid-ask spread, while [9] reported that movements between straddle prices, the best ask and the best bid was highly correlated with inventory changes.

Some researchers analyzed the straddles with reference to volatility forecasting. Buying a straddle option is similar to investing in volatility as the price of a straddle option depends on the volatility of the underlying asset. Several researchers have used straddle strategies to evaluate volatility forecast. Noh et al. [10] employed straddle trading strategy, the motive of which was to make profits from volatility forecast. Engle and Rosenberg [11] assessed the effectiveness of hedging with a straddle options strategy. More recently, straddles were examined without reference to volatility forecasting. Coval and Shumway [12] demonstrated that at-the-money (ATM) straddle option consistently produced negative returns. Independent of the volatility movements, holding the straddles yielded losses on average, during the holding period. They interpreted that straddles hedge against changes in volatility, but this hedge comes at a cost. Straddles eliminate the need to accurately pick a directional bias for the underlying so straddles can be a great relief to the options traders. Spreads like straddles can be beneficial if the implied volatility of options increases [13].

Goyal and Saretto [14] found that the difference between implied and historical volatility can predict the returns on a straddle option. They claimed that implied volatility was incorrect when it moved too away much from historical volatility, as volatility tends to be quickly mean-reverting. As a result, returns on straddle options strategy tend to be positive when implied volatility was lesser than historical volatility, and returns tend to be negative when implied volatility was higher than historical volatility.

Several researchers [12,15,16] concluded that selling straddles on the S&P 500 offered unusually high returns for their level of risk. In contrast, [12] studied return on index option and found that zero cost at-the-money straddle positions on the S&P 500 produced an average loss of approximately 3% per week. Goltz and Lai [8] extended the study of [12] and concluded that straddles display significantly negative and positively skewed returns. Therefore, from an investor's perspective, a straddle options strategy does not seem to be an attractive tool to capture the volatility risk premium. It was found that for generating significant returns and portfolio benefits a high rebalancing frequency was crucial.

Recent studies have shown that zero-beta or delta neutral options strategies constantly yielded negative returns; however, they should yield the risk-free rate of return if options were found to be

redundant [12,16] Strangles and straddles have low transaction cost as compared to other four trading strategies. Amongst straddles and strangles traders tend to choose the strategy which has low delta value [3].

Long straddles exceeded the returns on the underlying stocks [17]. A study by Sepp [18] showed that the profit and loss on the straddle got little affected by the implied volatility parameterisation but it was most sensitive to the ATM volatility and the realized variance and profit and loss of butterfly was most sensitive to day-to-day changes in the skew and convexity parameters.

Long strangles exceed the returns on the underlying stocks [17]. Studies depict that options strategies lead to higher returns than investing in stocks [5]. Strangle performs best in non-trending markets and simply selling put options or call options works best in trending market The investor by selling far out of the puts and calls out of these price range may be able to gain the greater rewards over the long haul [19].

The straddle and strangle strategies were found to be more profitable when longer-term options were used [20]. Also, the authors observed that straddle positions that were insensitive to market risk (zero-beta straddles) have negative average returns, in contrast to the prediction from existing asset-pricing models that these securities should have an expected return equal to the risk-free rate, raising questions about the efficient pricing of options contracts.

Concluding, the results of the researches by the above authors have been found to be mixed. Practically there is a complete dearth of studies on foreign exchange options, especially in the context of neutral options strategies. This paper has tried to fill this gap and has studied the payoffs in USD-INR option contract by employing neutral options strategies. The various option strategies that have been employed are namely long straddled, short straddle, long strangles and short strangle. Next section discusses the research methodology applied to achieve the objectives of the study.

3. RESEARCH METHODOLOGY

Neutral options trading strategies are employed when the options trader does not know whether the price of underlying stock/asset will rise or fall. These strategies are also known as non-directional strategies. It is necessary to assess how high the price of an underlying currency can go and the timeframe in which the rally will occur to select the optimum trading strategy. Four neutral options strategies namely long straddle strategy, short straddle strategy, long strangle strategy and short strangle strategy have been covered in the present paper and the objective of the study is to select the best options strategy and among the strategies deciding upon which moneyness to choose.

In long straddle strategy, an investor enters into two positions i.e. buying of one call option and one put option of the same underlying asset, same strike price, and of the same expiry date.

$$C_T = MAX (S_T - K, 0)$$

$$P_T = MAX (0, X - S_T)$$

Where,

C_T = payoff to a call option at maturity
X= strike price
S_T = price of the underlying at maturity
P_T = payoff to a put option at maturity

In short straddle, an investor enters into two positions i.e. selling of one call option and one put option of the same underlying asset, same strike price, and of the same expiry date.

$$P_T = MAX (0, X - S_T)$$

$$C_T = MAX (0, S_T - X)$$

Where,

C_T = payoff to a call option at maturity
X= strike price
S_T = price of the underlying at maturity
P_T = payoff to a put option at maturity

In long strangle, an investor will enter into two, i.e. buying one OTM call option and one OTM put option of the same underlying asset and the same expiry date, but at different strike prices.

$$C_T = MAX (0, X - S_T)$$

$$P_T = MAX (0, S_T - X)$$

Where,

C_T = payoff to a call option at maturity
X= strike price
S_T = price of the underlying at maturity
P_T = payoff to a put option at maturity

In short, strangle an investor will enter into two positions i.e. selling one OTM call option and one OTM put option of the same underlying asset and of the same expiry date and of different strike prices.

$C_T = MAX (0, S_T - X)$

$P_T = MAX (0, X - S_T)$

Where,

C_T = payoff to a call option at maturity
X = strike price
S_T = price of the underlying at maturity
P_T = payoff to a put option at maturity

4. DATA ANALYSIS

The study was carried out using daily closing values of the US Dollar-Indian Rupee current future rate available on National Stock Exchange of India (NSE) for the period starting from 29 October 2010 (the start of currency options market) to 30th June 2016. Also, the closing values of call and put options on USD-INR were collected for the same time period as above. Only European style options are available on the indices like Nifty on NSE. The straddle and strangle strategies were executed in three different ways using out-of-the-money (OTM) calls, using in-the-money (ITM) calls and using at-the-money (ATM) calls. Specifically five types of moneyness namely ATM (at-the-money), 2% ITM (in-the-money), 5% in-the-money, 2% out-of-the-money and 5% out-of-the-money were taken up in the study. 2%OTM call options are defined as an option with an exercise price greater than 102% of the prevalent spot price and 2%ITM calls have an exercise price less than 98% of the prevalent spot price. For put options, 2%OTM options have an exercise price 98% below the current spot price and 2%ITM put options have an exercise above 102% of the currency spot price. Similarly, 5%OTM call options are defined as an option with an exercise price greater than 105% of the prevalent spot price and 5%ITM calls have an exercise price less than 95% of the prevalent spot price. For put options, 5%OTM options have an exercise price 95% below the current spot price, and 5%ITM put options have an exercise above 105% of the currency spot price. For calls and puts, the option is considered as ATM if the exercise price of the underlying currency is close to the spot price. In case strike price as mentioned were not available, nearest strike prices were utilized (as per methodology adopted by Bhuyan and Chaudhary, 2005). The study was restricted to one-month expiry options only due to volume considerations.

Using the above five moneyness options 5 combinations were formed for long straddle and short straddle and 4 combinations were formed for long strangle and short strangle. Table 1 shows the combinations formed using different moneyness options.

For the execution of neutral options strategies, on starting of every month call/put options on USD-INR were bought/sold at different

Table 1. Combinations of options formed

Long straddle	Short straddle	Long strangle	Short strangle
Buy ATM Call	Short ATM Call	Buy 2%OTM Call	Short 2%OTM Call
Buy ATM Put	Short ATM Put	Buy 2%OTM Put	Short 2%OTM Put
Buy 2% ITM Call	**Short 2%ITM Call**	**Buy 2% OTM Call**	**Short 2% OTM Call**
Buy 2% OTM Put	**Short 2% OTM Put**	**Buy 5% OTM Put**	**Short 5% OTM Put**
Buy 5% ITM Call	Short 5% ITM Call	Buy 5% OTM Call	Short 5% OTM Call
Buy 5% OTM Put	Short 5% OTM Put	Buy 2% OTM Put	Short 2% OTM Put
Buy 2% OTM Call	**Short 2% OTM Call**	**Buy 5% OTM Call**	**Short 5% OTM Call**
Buy 2% ITM Put	**Short 2% ITM Put**	**Buy 5% OTM Put**	**Short 5% OTM Put**
Buy 5% OTM Call	Short 5% OTM Call		
Buy 5% ITM Put	Short 5% ITM Put		

(Source: Author's own calculation)

moneyness. At the end of the month, all the positions were squared–off at the closing prices and a new cycle was started, which was squared-off on the next trading month and so on. The strategy was applied on the combinations formed in Table 1 and thereafter squared-off every month. For each currency-option combination, returns were computed as the excess of the payoff from the investment spent on entering in currency option. Percentage returns were calculated on monthly basis. However, keeping in mind the high frequency of trade, transaction costs have been ignored. Further, the results were compared using t-test, ANOVA F test.

5. EMPIRICAL FINDINGS

This section includes discussion on returns from four neutral strategies namely long straddle strategy, short straddle strategy, long strangle strategy and short strangle strategy using different moneyness of the options.

Table 2 depicts frequency distribution of returns, descriptive statistics and inferential statistics on returns from long straddle strategy. The strategy was applied on 5 strike prices namely at the money call (ATMC) at the money put (ATMP), 2% in the money call (2%ITMC) 2% out of money put (2%OTMP), 5% in the money call (5%ITMC) 5% out of money put (5%OTMP), 2% out of money call (2%OTMC) 2% in the money put (2%ITMP) and 5% out of money call (5%OTMC) 5% in the money put (5%ITMP). In each case the strategy was applied for 68 months that is from 29th October 2010 to 30th June 2016. In 4 out of 5 moneyness options, the frequency of negative returns has been found to be more than the frequency of positive returns. The frequency of positive returns was more than the frequency of negative returns for 5%OTMC 5%ITMP. There was no incidence of no profit and no loss. Amongst all the 5 long straddle strategies, the frequency of negative returns (73.53%) was highest for 5%ITMC 5%OTMP long straddle strategy and frequency of positive return (57.35%) was highest for 5%OTMC 5%ITMP long straddle strategy. In all five long straddle strategies, the mean return was found to be positive but the median return was found to be negative in 4 out of 5 strategies, depicting a larger number of high positive returns. The distribution of returns in all the 5 cases was found to be non-normal as depicted by the results from Kolmogorov-Smirnov test statistics and Shapiro-Wilk test statistic. Kurtosis is more than 3 for 2%ITMC 2%OTMP, 5%ITMC 5%OTMP, 2%OTMC 2%ITMP which means distribution is leptokurtic. Among all the five moneyness options, 5%ITMC 5%OTMP was found to yield highest mean return (M = 71.92, SD = 430.55) and the lowest return occurred in 2%OTMC 2%ITMP strategy (M= 9.76, SD = 89.45). ATMC ATMP offers the best risk/reward ratio and the lowest volatility percentage per unit of return (CV = 3.06) and 2%OTMC 2%ITMP strategy offers highest volatility percentage per unit of return (CV= 6.37). 5%ITMC 5%OTMP performs better than the other 4 long straddle strategies with the highest mean return (M = 71.92, SD = 430.55) and coefficient of variation was found to be 5.98.

Further, the returns from all the 5 moneyness options were compared against the assumed mean of zero and corresponding t-values and p-values have been presented. It was found that returns from all the strategies were not found to be significantly different from zero at 5% level of significance. The returns from all the strategies were further compared with the help of one way ANOVA. It was found that there was no significant difference at 5% level of significance (F=.828, p=.508) between the returns of all the 5 long straddle strategies at different strike prices. The results regarding the short straddle strategy are presented in Table 3.

Table 3 depicts the frequency distribution of returns, descriptive statistics and inferential statistics on returns from short straddle strategy. The strategy was applied on 5 strike prices namely ATMC ATMP, 2%ITMC 2%OTMP, 5%ITMC 5%OTMP, 2%OTMC 2%ITMP and 5%OTMC 5%ITMP. In each case the strategy was applied for 68 months that is from 29th October, 2010 to 30th June, 2016. In 4 out of 5 moneyness options, the frequency of positive returns was found to be more than the frequency of negative returns. There was no incidence of no profit and no loss. Amongst all the 5 moneyness options, the frequency of negative return (57.35%) was highest for 5%OTMC 5%ITMP and frequency of positive return (73.53%) was highest for 5%ITMC 5%OTMP short straddle strategy. In all the 5 moneyness option, the mean return was found to be negative but the median return was found to be positive depicting a larger number of high negative returns. Since this is a short straddle strategy, minimum return in all the 5 cases varied to a large extent and maximum return was found to be 100%. The distribution of returns in all the 5 cases was found to be non-normal as depicted by the results from Kolmogorov-Smirnov test

statistic and Shapiro-Wilk test statistic. Kurtosis is more than 3 for 2%ITMC 2%OTMP, 5%ITMC 5%OTMP, and 2%OTMC 2%ITMP which means distribution is leptokurtic.

Among all the five moneyness options, 2%OTMC 2%ITMP was found to yield highest mean return (M = -9.76, SD = 89.45) and the lowest return occurred in 5%ITMC 5%OTMP strategy (M= -71.92, SD = 430.55). 2%OTMC 2%ITMP performs better than the other 4 short straddle strategies with highest mean return (M = -9.76, SD = 89.45) and coefficient of variation was observed to be 5.99.

Table 2. Returns from long straddle strategy (N=68)

Measures	**ATMC ATMP**	**2%ITMC 2%OTMP**	**5%ITMC 5%OTMP**	**2%OTMC 2%ITMP**	**5%OTMC 5%ITMP**
Negative return	36(52.94)	42 (61.76)	50 (73.53)	45 (66.18)	29 (42.64)
Positive return	32(47.06)	26 (38.24)	18 (26.47)	23 (33.82)	39 (57.35)
No Profit/Loss	0	0	0	0	0
Mean Return	19.26	27.30	71.92	9.76	19.44
t-test (H_0 = 0)	1.50	1.15	1.13	.90	2.65
P-value	.136	.254	.173	.371	.010
F test (H_0 = Returns from all Moneyness are equal) *(P-value)*	.828(.508)				
Median Return	-6.61	-18.87	-39.68	-8.80	12.5565
Std. Deviation	105.34	195.69	430.55	89.45	60.57
Minimum Return	-99.11	-98.37	-100.00	-98.97	-96.09
Maximum Return	426.19	1412.79	2257.14	585.80	173.02
Skewness	1.52	5.60	3.87	4.31	.262
Kurtosis	2.72	38.23	15.42	25.68	-.51
Coefficient of Variation	3.06	4.35	5.98	6.37	5.42
Kolmogorov-Smirnov Test	0.155	0.26	0.409	0.233	0.081
Statistics (*P-value*)	(.00)	(.00)	(.00)	(.00)	(.00)
Shapiro-Wilk (*P-value*)	0.862 (.00)	0.473 (.00)	0.419 (.00)	0.618 (.00)	0.984 (.00)

*(Source: Author's own calculations) *P <.05, Figures in parentheses represents percentages*

Table 3. Returns from short straddle strategy (N=68)

Measures	**ATMC ATMP**	**2%ITMC 2%OTMP**	**5%ITMC 5%OTMP**	**2%OTMC 2%ITMP**	**5%OTMC 5%ITMP**
Negative return	32(47.06)	26 (38.24)	18 (26.47)	23 (33.82)	39 (57.35)
Positive return	36(52.94)	42 (61.76)	50 (73.53)	45 (66.18)	29 (42.65)
No Profit/Loss	0	0	0	0	0
Mean Return	-19.26	-27.30	-71.92	-9.76	-19.44
t-test (H_0 = 0)	-1.50	-1.15	-1.13	-.90	-2.65
P-value	.136	.254	.173	.371	.010
F test (H_0 = Returns from all Moneyness are equal) *(P-value)*	.828(.508)				
Median Return	6.61	18.87	39.68	8.80	-12.55
Std. Deviation	105.34	195.69	430.55	89.45	60.57
Minimum Return	-426.19	-1412.79	-2257.14	-585.80	-173.01
Maximum Return	99.11	98.37	100	98.97	96.09
Skewness	-1.52	-5.60	-3.87	-4.31	-0.26
Kurtosis	2.72	38.23	15.42	25.68	-0.51
Coefficient of Variation	-3.06	-4.35	-5.98	-6.37	-5.42
Kolmogorov-Smirnov Test	0.155	0.26	0.409	0.233	0.081
Statistics (*P-value*)	(.00)	(.00)	(.00)	(.00)	(.00)
Shapiro-Wilk (*P-value*)	0.862 (.00)	0.473 (.00)	0.419 (.00)	0.618 (.00)	0.984 (.00)

*(Source: Author's own calculations) *P =.05, Figures in parentheses represents percentages*

Further, the returns from all the 5 moneyness options were compared against the assumed mean of zero and corresponding t-values and p-values have been presented. It was found that returns from all the moneyness options were not found to be significantly different from zero at 5% level of significance. The returns from all the moneyness options were further compared with the help of one way ANOVA. It was found that there was no significant difference at 5% level of significance (F=.828, p=.508) between the returns of all the 5 short straddle strategies at different strike prices. The results regarding the long strangle strategy are presented in Table 4.

Table 4 depicts frequency distribution of returns, descriptive statistics and inferential statistics on returns from long strangle strategy. The long strangle strategy which was applied on 4 strike prices namely 2%OTMC 2%OTMP, 2%OTMC 5%OTMP, 5%OTMC 2%OTMP and 5%OTMC 5%OTMP. In each case, the strategy was applied for 68 months that is from 29th October 2010 to 30th June 2016. In all the cases, the frequency of negative return has been found to be more than the frequency of positive returns. There is no incidence of no profit and no loss. Amongst all the 4 moneyness options under long strangle strategies, the frequency of negative returns (94.12%) was highest for 5%OTMC 5%OTMP long strangle strategy and frequency of positive return (35.29%) were highest for 2%OTMC 2%OTMP long strangle strategy. In 3 out of 4 cases, the mean return was found to be positive but the median return was found to be negative in all cases depicting a larger number of high positive returns. The distribution return in all the 4 cases was found to be non-normal as depicted by the results from Kolmogorov-Smirnov test statistic and Shapiro-Wilk test statistic. Kurtosis is more than 3 for all the 4 moneyness options which mean distribution is leptokurtic.

Among all the four long strangle strategies, 5%OTMC 2%OTMP strategy was found to yield highest mean return (M= 50.66, SD= 376.95) and lowest mean return occurred in 2%OTMC 5%OTMP (M= -15.82, SD= 156.94). 2%OTMC 2%OTMP offers the best risk/reward ratio and the lowest volatility percentage per unit of return (CV=7.31) and 5%OTMC 5%OTMP strategy offers highest volatility percentage per unit of return (CV=23.09). 2%OTMC 5%OTMP carries the least risk/reward ratio, but the mean return is not favorable (CV = -9.92). 5%OTMC 2%OTMP performs better than the other 3 moneyness options under long strangle strategies with highest mean return (M= 50.66, SD= 376.95) and least coefficient of variation (7.44).

Returns from all the 4 long strangle strategies at different strike prices were compared against the assumed mean of zero and corresponding t-values and p-values have been presented. It was found that returns from all the moneyness options were not found to be significantly different from zero at 5% level of significance. The return from all the moneyness options was further compared with the help of one way ANOVA and it was found that there is no significant difference at 5% level of significance (F = .365, p = .778) among the returns of all the 4 long strangle strategies at different strike prices.

The results regarding the short strangle strategy are presented in Table 5. The short strangle strategy was applied on 4 strike prices namely 2%OTMC 2%OTMP, 2%OTMC 5%OTMP, 5%OTMC 2%OTMP and 5%OTMC 5%OTMP. In each case, the strategy was applied for 68 months that is from 29th October 2010 to 30th June 2016. In all the cases, the frequency of positive return has been found to be more than the frequency of negative returns. There is no incidence of no profit and no loss. Amongst all the 4 moneyness options, the frequency of negative returns was highest (35.29%) for 2%OTMC, 2%OTMP short strangle strategy and frequency of positive return (94.12%) were highest for 5%OTMC 5%OTMP short strangle strategy. In 1 out of 4 moneyness options, the mean return was found to be negative but the median return was found to be positive for all cases depicting a larger number of high negative returns. The distribution return in all the 4 cases was found to be non-normal as depicted by the results from Kolmogorov-Smirnov test statistic and Shapiro-Wilk test statistic. Kurtosis is more than 3 for all the 4 cases which means distribution is leptokurtic.

Among all the four moneyness options under short strangle strategies, 2%OTMC 5%OTMP strategy was found to yield strategy highest mean return (M= 15.82, SD= 156.94) and lowest mean return occurred in 5%OTMC 2%OTMP (M= -50.66, SD= 369.95). 2%OTMC 5%OTMP offers the best risk/reward ratio and the lowest volatility percentage per unit of return (CV=9.92). 5%OTMC 5%OTMP carries the least risk/reward ratio, but the mean return is not favorable (CV = -23.09). 2%OTMC 5%OTMP performs better than the other 3 moneyness options under short strangle strategies with highest mean return (M=

15.82, SD= 156.94) and coefficient of variation (9.92).

Returns from all the 4 short strangle strategies at different strike prices were compared against the assumed mean of zero and corresponding t-values and p-values have been presented. It was found that returns from all the moneyness options were not found to be significantly different from zero at 5% level of significance. The return from all the moneyness options was further compared with the help of one way ANOVA and it was found that there is no significant difference at 5% level of significance (F = .365, p = .778) among the returns of all the 4 short strangle strategies at different strike prices.

Table 4. Returns from long strangle strategy (N=68)

Measures	**2%OTMC 2%OTMP**	**2%OTMC 5%OTMP**	**5%OTMC 2%OTMP**	**5%OTMC 5%OTMP**
Negative return	44 (64.71)	50 (73.53)	53 (77.94)	64 (94.12)
Positive return	24 (35.29)	18 (26.47)	15 (22.06)	4 (5.88)
No Profit/Loss	0	0	0	0
Mean Return	32.13	-15.82	50.66	26.18
t-test (H_0 = 0)	1.13	-.83	1.11	.36
P-value	.064	.213	.322	.338
F test (H_0 = Returns from all Moneyness are equal) *(P- value)*	.365 (.778)			
Median Return	-35.95	-54.44	-100	-100
Std. Deviation	234.77	156.94	376.95	604.61
Minimum Return	-100	-100	-100	-100
Maximum Return	1110.44	963.30	1827.59	3916.67
Skewness	3.10	4.30	3.07	5.45
Kurtosis	9.95	23.39	9.60	30.80
Coefficient of Variation	7.31	-9.92	7.44	23.09
Kolmogorov-Smirnov Test Statistics	.331	0.296	0.391	0.502
(*P-value*)	(.00)	(.00)	(.00)	(.00)
Shapiro-Wilk	0.561	0.536	0.471	0. 219
(*P-value*)	(.00)	(.00)	(.00)	(.00)

*(Source: Author's own calculations) *P < .05, Figures in parentheses represents percentages*

Table 5. Returns from short strangle strategy (N=68)

Measures	**2%OTMC 2%OTMP**	**2%OTMC 5%OTMP**	**5%OTMC 2%OTMP**	**5%OTMC 5%OTMP**
Negative return	24 (35.29)	18 (26.47)	15 (22.06)	4 (5.88)
Positive return	44 (64.71)	50 (73.53)	53 (77.94)	64 (94.12)
No Profit/Loss	0	0	0	0
Mean Return	-32.13	15.82	-50.66	-26.18
t-test (H_0 = 0)	-1.13	.83	-1.11	-.36
P-value	.064	.213	.322	.338
F test (H_0 = Returns from all Moneyness are equal) *(P-value)*	.365 (.778)			
Median Return	35.95	54.44	100	100
Std. Deviation	234.77	156.94	369.95	604.61
Minimum Return	-1110.44	-963.3	-1827.59	-3916.67
Maximum Return	100	100	100	100
Skewness	-3.101	-4.303	-3.07	-5.452
Kurtosis	9.95	23.39	9.60	30.80
Coefficient of Variation	-7.31	9.92	-7.44	-23.09
Kolmogorov-Smirnov Test Statistics	0.331	0.296	0.391	0.502
(*P-value*)	(.00)	(.00)	(.00)	(.00)
Shapiro-Wilk	0.561	0.536	0.471	0. 219
(*P-value*)	(.00)	(.00)	(.00)	(.00)

*(Source: Author's own calculations) *P < .05, Figures in parentheses represents percentages*

6. CONCLUSION

The present study was attempted to analyze the payoffs from adopting neutral options strategies using USD-INR as the underlying asset. Neutral option strategies namely long straddle, short straddle, long strangles and short strangle were employed on USD-INR for 68 months starting from October 2010 to June 2016. Various combinations of options using ATM, ITM and OTM calls and puts were formed and analyzed. The results indicate that there is wide variation in payoffs, but none of the moneyness studies yielded significantly different returns from zero because of huge volatility in the returns. In addition, no significant difference was found among the payoffs of different option combinations in the respective strategies. It can, therefore, be inferred that as far as the financial instrument of USD-INR is concerned, neutral strategies fail to deliver any significant payoffs.

This study can be furthered by studying more neutral options strategies and by using more moneyness options. To enhance the practicability of results; transaction costs can also be incorporated while examining the returns from different strategies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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