Protective Put Strategy in the Indian Stock Market: An Empirical Study

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A survey conducted by Eurex (Major European exchange for derivatives) and Financial News on the use of derivatives in the European fund industry reveals that the general trend points to an increase in the use of options in the professional portfolio management among institutional investors. During volatile markets, investors tend to favor value-safeguarding investment products. Index-based option strategies, such as protective put strategy, are especially suitable for this purpose. An index-based option strategy combines a passive equity index investment with an options portfolio, which is also passively managed. Other empirical studies also have demonstrated that such strategies achieve a risk-return ratio that is significantly more attractive than that of the underlying security. In order to understand the effectiveness of Protective Put for the Indian scenario, this paper examines the performance of the two trading strategies: (1) Having a long position in the S&P CNX Nifty basket; and (2) Having a long position in stocks combined with buying put options on the Nifty Index. Each option strategy is examined over different maturities and option series. The analysis was constructed by assuming a long position in European style options on Nifty from the time they were introduced in India on June 4, 2001. The returns using put options are compared to the returns on S&P CNX Nifty index. The analysis revealed significant profitability in investing in the one-month expiry Volume-based Protective Put strategy.

Introduction

Derivatives—particularly options—have come a long way. Once considered as 'niche products' are now well-established and proven investment tools. Asset management firms can use options as professional tools to manage their investments.

Correctly selected and deployed, they make it possible for investors to achieve a net yield risk profile that can be exactly tailored to their particular expectations and chosen risk appetites.

The most important use of derivatives is hedging. Hedging is a process of reducing the risk of adverse price movements in a security, by taking an offsetting position (elimination or reduction of a current long or short position by making an opposite transaction of the same security) in a related security, such as an option or a short sale.

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An equity option is a contract which gives its holder the right, but not the obligation, to buy (in the case of a call) or sell (in the case of a put) shares of the underlying security at a specified price (the strike price) on or before a given date (expiration day).

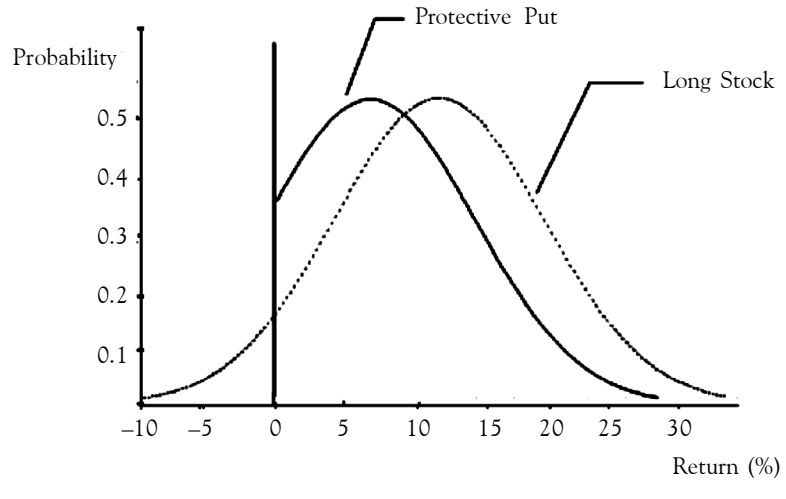
An investor who is holding a portfolio and who is worried about the value of portfolio falling down over a period, has two options. The first option is that the investor can sell part of his holdings and buy them back later at a lower price. But if the investor wants to protect himself during the downturn and participate during the uptrend, he can use the protective put strategy. An investor who purchases a put option while holding shares of the underlying stock from a previous purchase is employing a 'protective put'.

Protective Put Strategy

An investor buying a put option in combination with a long position in the underlying asset provides protection against major losses, for a fixed cost. A put option acts very much like an insurance policy. For a fixed price, the initial option premium, the investor obtains the right to sell his holding in the risky asset for the option's exercise price at the expiration date. This guarantees a floor on the total value of the portfolio, no matter how far the underlying asset's price may fall in the market.

If the stock price falls, the maximum potential loss is equal to the initial put premium *P* plus the amount the stock has to fall before the put goes in the money (S-X). After that point, all further price drops are covered. If the puts are in-the-money when they are purchased, the most that can be lost is their time premium. On the other side, if the asset's price rises and the 'insurance' proves to be unnecessary, only then the initial cost of the put is given up. In a large rally, the investor still makes most of the possible profit from price appreciation. It is this property of limiting risk on the downside while not limiting the possible profit on the upside that makes the protective put strategy so attractive to a defensive investor (Figure 1).

Figure 1: Return Distribution Using Protective Put



The protective put leads to the truncation of the left tail of the portfolio return distribution and a leftward shift of the distribution. The truncation reflects the protection from the downside loss, and the shift reflects the cost of the insurance. Covered call writing has the opposite effect of the put option. It truncates the right tail of the distribution while shifting the distribution to the right. The truncation is the result of selling off the upward potential to the call buyer, and the shift reflects the premium received from that sale.

Figlewski *et al.* (1993) evaluated the performance of protective put strategy. They used simulation approach to examine the performance of several types of protective put strategies with short-maturity options.

Types of Protective Put Strategies

There are three types of protective put strategies, which are in use:

1. **Fixed Strike Strategy**: The investor selects a desired strike level, which is fixed for the whole period. This means that, if the stock price rises sharply in the early months, rolling over put protection becomes very cheap; it is not very protective, however, because as the current market price increases, the strike price remains far below the current market price.

2. **Fixed Percentage Strategy**: In this strategy, the strike price is set at a given percentage of the current stock price at the time of a rollover. For example, when the stock price is 100, 95% strategy would be the purchase of a 95-strike put. This strategy allows the investor to protect his/her gains, if the stock price rises in the early months, but the floor is not firm.

   A fixed percentage strategy, which always rolls into a new put with a strike at a specified percentage discount or premium to the current market price, may be a more accurate description of the protective put strategy used by actual investors. But the fixed percentage strategy is much less protective than the fixed strike strategy in a prolonged bear market.

3. **The Ratchet Strategy**: This strategy is a kind of combination of the first two. The strike price of the risen initial put is set to a given percentage of the stock price, as in the fixed percentage strategy. If, when that put matures, the stock price has, the striking price is raised to lock in some of the gain, and the roll over is into a new put with a higher strike, equal to the chosen percentage of current stock price. If the stock has dropped over the month, the strike is not lowered. This strategy allows the investor to lock in early gains without accepting the downside risk of the fixed percentage strategy.

   The results showed that the ratchet has the lowest mean returns of the three strategies at each strike, but also the lowest standard deviation. The percentile analysis showed that the ratchet does better against 5th percentile disasters than the other two

strategies, but less well on the upside. The ratchet has the highest percentage of options that are ultimately exercised.

The ratchet's advantage is not a higher mean, but its protectiveness, especially against a 'disaster' (value at 5th percentile). The 5th percentile value indicates that there is a 5% chance that the value of portfolio falls below that level.

Data and Methodology

In order to carry out the study of the performance of protective puts, it requires the following data:

- The composition of various securities forming the Nifty for the last Thursdays of all the months for the period June 4, 2001-October 25, 2007.
- Company name, open, high, low and close price and market capitalization of the various securities listed on Nifty for the last Thursdays of all the months for the period June 4, 2001-October 25, 2007.
- The closing index values of Nifty for the last Thursdays of all the months for the period June 4, 2001-October 25, 2007.
- The strike price, open, high, low, close and settle price, number of contracts traded and turnover for nifty put options being traded on NSE's F&O exchange for the last Thursdays of all the months for the period June 4, 2001-October 25, 2007.

Data were required for only last Thursday of every month, since options traded on NSE expire on the last Thursday of every month and all the strategies studied here are executed on the day of expiry.

Data Extraction

The composition of Nifty for the last Thursdays of all the months for the period June 4, 2001-October 25, 2007 was not directly available, and hence, had to be reconstructed manually. In order to do so, the file containing the latest Nifty composition was used along with the file containing the information regarding all the changes that have occurred in Nifty for the given period. These files were downloaded from NSE's website: www.nseindia.com. These two files were used to reconstruct the compositions of Nifty for the last Thursday of the required months.

Once the historical compositions of Nifty were known for the specific dates, next the company name, open, high, low and close price and market capitalization of the various securities listed on Nifty was required which was available from Capitaline Plus. The closing index values of Nifty for the last Thursdays of all the required months were obtained from www.nseindia.com. The strike price, open, high, low, close and settle price, number of contracts traded and turnover for nifty put options being traded on NSE's F&O

exchange for the same period was also obtained from the same site. It was found that the data for volume-based options for two-month expiry was not available, since for most of the days, none of the two-month expiry options were traded.

Few of the required Thursdays were holidays being Independence day, Republic day or holidays due to heavy deluge of rains in the city of Mumbai, where NSE's main office is located. Hence, as per the information available on NSE's website, for a foreseen holiday falling on Thursday, the previous day, i.e., Wednesday is considered as the date of expiry whereas for an unforeseen holiday on Thursday, the following day, i.e., Friday is considered as the date of expiry, provided exchanges are operational on this day.

Data Processing

To study the performance of protective put, the portfolio is fully covered using:

- One-month expiry Nifty European style index options that have the maximum number of contracts/volumes and the other using Ratchet strategy. The investment is rolled over every month.
- Two-month expiry Nifty European style index options that are 5% Out-of-the-Money (OTM) and options that are 5% In-the-money (ITM). The investment is rolled over every two months.

These strategies are compared with:

- Uncovered investment in the Nifty portfolio which will be revised every month; and
- Uncovered investment in the Nifty portfolio which will be revised in every two months.
- Return was then calculated on monthly basis on the investment done. This return:

R_{st}, thus was calculated as:

$$R_{st} = (S^* - S)/S \qquad ...(1)$$

where

R_{st} = Return on the Nifty portfolio for period t;

S^* = value of the Nifty portfolio at the end of the current period;

S = value of the Nifty portfolio at the start of the current period.

- The investment in index put options was done such that the overall exposure was not more than Rs. 10 lakhs.
- The lot size for Nifty European style options is 100 units.
- The number of contracts thus written was calculated as:

  N = Exposure/(strike price × lot size)

N was rounded to the nearest integer.

- The short position in the options led to the payment of the premium amount. Thus, the return due to short position in nifty put options is given as:

$$R_{pt} = (S^* - S - P)/(S + P) \quad ...(2)$$

where

R_{pt} = Return on protective put for period t;

S = value of the share portfolio at the start of the current period;

P = Put premium paid at the start of the current period.

- The value of S^* is different for the option expiring ITM and OTM. In case of option expiring ITM, the buyer of the put would exercise his option, and hence, the value of S^* would be,

S^* = (strike price × lot size × number of contracts);

whereas, if the option expired OTM, the option would remain unexercised, and hence, the value of S* would be,

S^* = value of the Nifty portfolio at the end of the current period;

- The put premium is assumed not to appreciate during the period, and hence, it continues to remain same till the end of the period.
- The returns do not include the dividends on the index basket. Also, the transaction costs for trading shares and the margin requirements were not included.
- The use of profits and losses instead of return ratios on the above strategy would ignore the fact that the sums invested differ for the various periods. Hence, return ratios were considered.

Analysis and Findings

Analysis Summary for the Entire Period of Study

Seventy sever monthly returns and 40 bimonthly returns were computed for both the uncovered index basket and the protective put strategies. Summary statistics for the monthly and bimonthly return distributions are presented in Tables 1 and 2.

As can be seen from Table 1, the mean return of the nifty basket on a monthly basis is slightly higher than the put option returns. This justifies the fact that put options lower returns by the amount of premium paid. The variance values indicate that there is a reduction in variance in the returns using put options, which justifies the theory that protective put limits downside loss. Mean-variance analysis does not give accurate results when using options. Since options generate asymmetric return distributions, VAR values have been found for comparison. They are calculated for monthly returns. The 5th and the

Table 1: Summary Statistics for Annualized Monthly Returns Distribution			
Particulars	**Nifty Stocks**	**Options-Based on Volume**	**Options-Based on Ratchet Strategy**
Mean Return (%)	27.79530	26.78690	27.010500
Variance	0.05364	0.04024	0.051743
Skewness	–0.34200	–0.07900	–0.271200
Percentiles			
5 (Disaster)	–0.09440	–0.05651	–0.060040
25 (Bad Year)	–0.03210	–0.00901	–0.014750
75 (Good Year)	0.07610	0.05430	0.070400
95 (Great Year)	0.12040	0.12110	0.116200

Table 2: Summary Statistics for Annualized Bimonthly Return Distribution			
Particulars	**Nifty Stocks**	**Options Using 5% ITM Options**	**Options Using 5% OTM Options**
Mean Return (%)	26.8400	24.64000	26.60000
Variance	0.0460	0.04560	0.04866
Skewness	–0.2008	–0.27760	0.20500
Percentiles			
5 (Disaster)	–0.0848	–0.10060	–0.08000
25 (Bad Year)	–0.0228	–0.01149	–0.03060
75 (Good Year)	0.1241	0.12310	0.11890
95 (Great Year)	0.1785	0.18020	0.16550

25th percentile values indicate the downside risk. The 5th percentile value indicates that there is a 5% chance that the monthly return falls below –9.44% in case of nifty and –5.651% in case of volume-based put options. The options based on volume has much better 25th percentile value than the other two. Since Nifty has a 25% chance of losing more than –3.21%, whereas using volume-based put options, there is a chance of losing –0.91%, one-fourth of the time compared to –1.475% in case of the ratchet strategy.

For one-month put options, it has been found out that the strategy using volume-based options is superior to the one using ratchet strategy. The volume-based options also have better performance in case of VAR values.

Statistical analysis has been done to confirm the superiority of protective put strategy. One tailed *t*-test for comparing the means has been done comparing Nifty with Volume-based put options and also Nifty with Ratchet strategy. The *p*-value obtained for

t-test in the former case is 0.4667, which is significantly greater than α (0.05). Hence, the null hypothesis that the means are same cannot be rejected. In the latter case, the *p*-value obtained is 0.4747, which is much greater than 0.05. Hence, the null hypothesis is accepted. *F*-test for two samples for variances has been performed comparing Nifty with volume-based put options and also Nifty with the Ratchet strategy. The *p*-value for *F*-test at $\alpha = 0.1$ is 0.105 in the former case and 0.206 in the latter case. Hence, in the former case, the null hypothesis is rejected, i.e., volume-based put options have lower standard deviation than Nifty at $\alpha = 0.1$. In the latter case, the null hypothesis is rejected, i.e., Nifty and Ratchet strategy have similar standard deviation.

Table 2 shows the summary statistics for bimonthly return distributions.

As can be seen from Table 2, for two month put options, it has been found out that the strategy using 5% OTM options is superior to the one using 5% ITM options. This is because it has less variance and also positive skewness value achieving the purpose. Positive skewness indicates that the right tail is more than the left tail of the distribution. The options-based on 5% OTM also have better performance in case of VAR values. It provides better protection than the 5% ITM in case of 5% loss (–8% compared to –10.06%). But the 5% put options provides worse than the nifty in case of 25 percentile values.

Statistical analysis has been done for bimonthly returns has been done to confirm the results. One tailed *t*-test for comparing the means has been done comparing Nifty with ITM put options and also Nifty with OTM put options. The *p*-value obtained for *t*-test in the former case is 0.4821, which is significantly greater than α (0.05). Hence, the null hypothesis that the means are same cannot be rejected. In the latter case, the *p*-value obtained is 0.4855 which is much greater than 0.05. Hence, the null hypothesis is accepted. *F*-test for two samples for variances has been performed comparing Nifty with ITM put options and also Nifty with OTM put options. The *p*-value for *F*-test at $\alpha = 0.1$ is 0.2793 in the former case and 0.4344 in the latter case. Hence, in both the cases, the null hypothesis is accepted, i.e., both ITM and OTM option strategies do not provide standard deviation that are significantly lower than Nifty at $\alpha = 0.1$.

The results in the case of bimonthly returns are not significant enough to say that the performance of put options is better.

Comparison of Monthly and Bimonthly Returns on Nifty

Figures 2 and 3 show the monthly and bimonthly returns on investment in the Nifty basket. It can be seen that on monthly basis, the maximum return is 13.33% and the minimum return is –16.36% respectively for the period of study. On the other hand, for the bimonthly returns, the maximum return is 19.90% and the minimum return is –16.51%.

Thus, comparing both monthly and bimonthly returns, one can state that the bimonthly returns have more variability compared to monthly returns, i.e., they are riskier compared to monthly returns.

Figure 2: Payoffs to Monthly Investments in the Index Basket

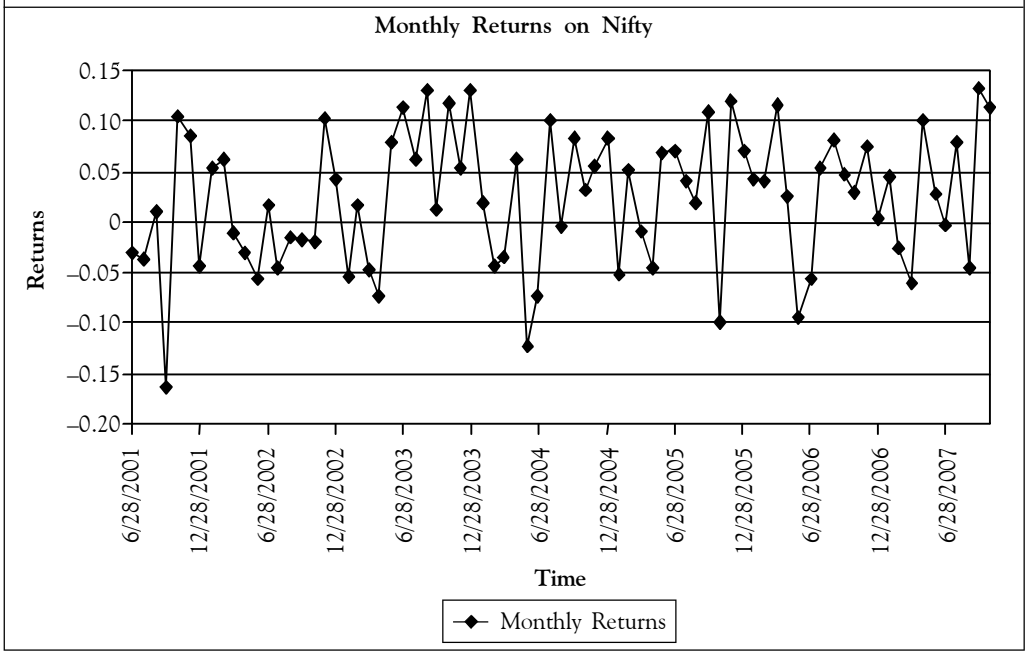
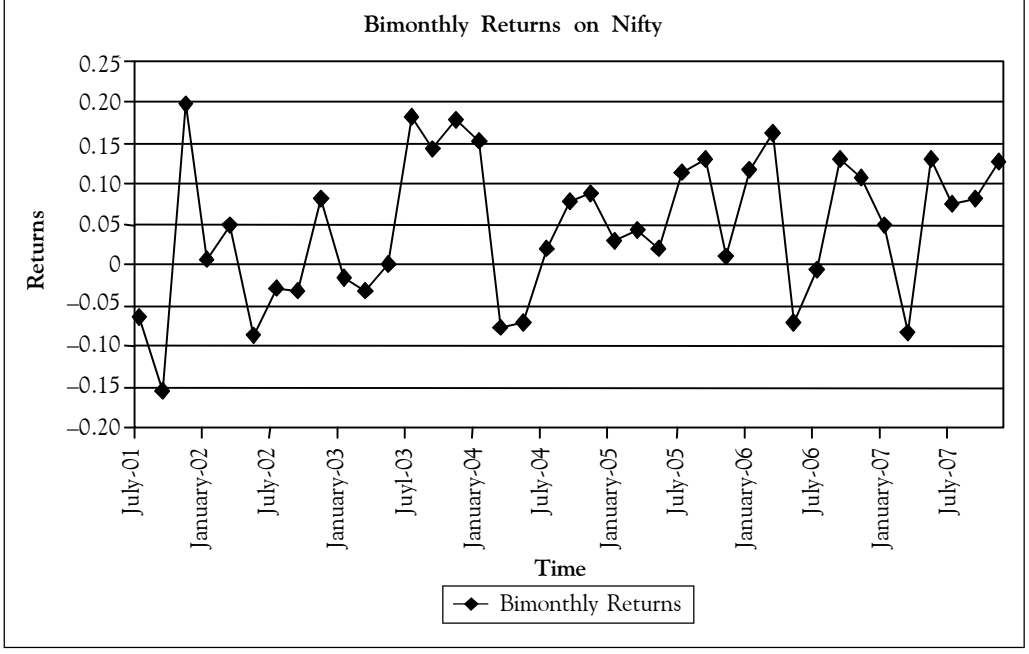


Figure 3: Payoffs to Bimonthly Investments in the Index Basket

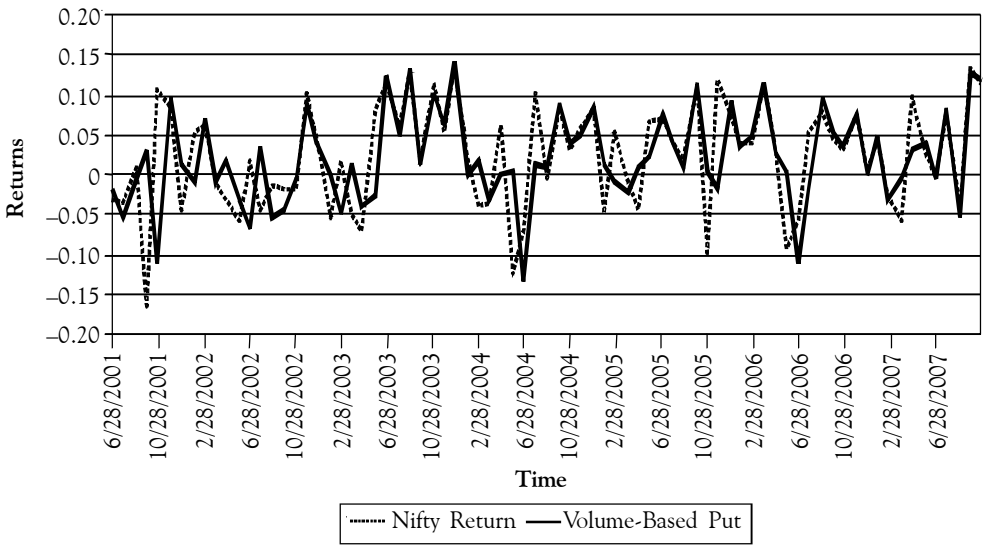


Comparison of Monthly Returns of Nifty and Protective Put Strategies

From Figure 4, it can be observed that the returns using volume-based put options have lower downside risk. But the returns during the uptrend follow the returns of Nifty. This shows that the volume-based put options limit the downside loss, but participate during

the uptrend. The downside protection is not that significant because of the lack of put options with corresponding strike price.

Figure 4: Comparison of Monthly Nifty and Volume-Based Option Returns



From Figure 5, we can see that the protective put buying using the ratchet strategy has performed worse than the Nifty itself. This may be because of the higher premium values in the case of ratchet strategy.

Figure 5: Comparison of Monthly Nifty and Ratchet Strategy Returns

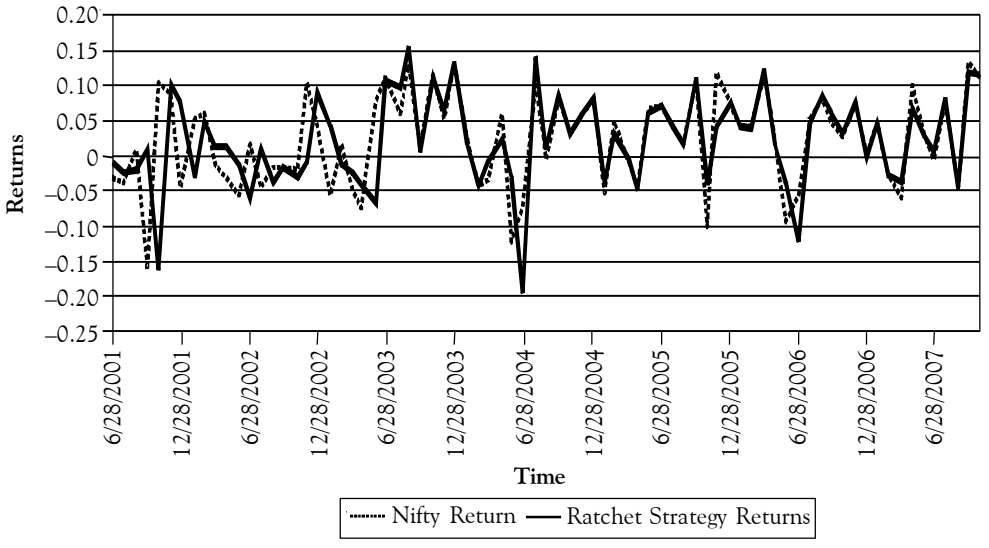


Figure 6 shows the comparison of returns of the two protective put strategies, viz., put options based on the Ratchet strategy and put options based on volume of trading. It can be seen that put options based on volume has lower downfall than the returns using the Ratchet strategy.

Figure 6: Comparison of Volume-Based Put Option Returns and Ratchet Strategy Returns

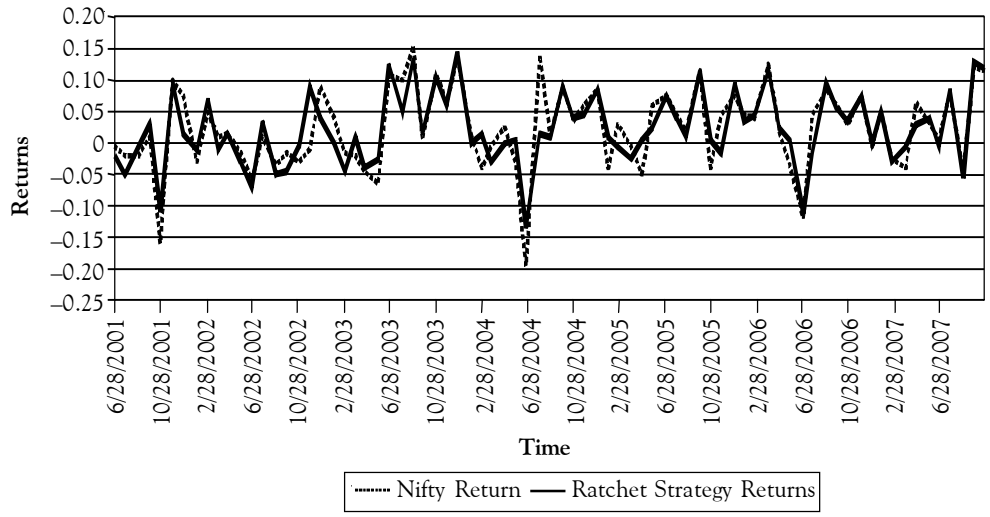


Figure 7 shows the comparison of premiums paid for the two types of put options on monthly basis. It can be seen that the premiums paid in the case of Ratchet strategy is high during the early months and then decreased during the closing months of the period under study. In case of the volume-based options, the premiums paid were low in the initial months and then increased significantly. This explains the reason for the higher in the returns of the ratchet strategy.

Figure 7: Comparison of Premiums of Volume-Based Put Options and Ratchet Strategy Options

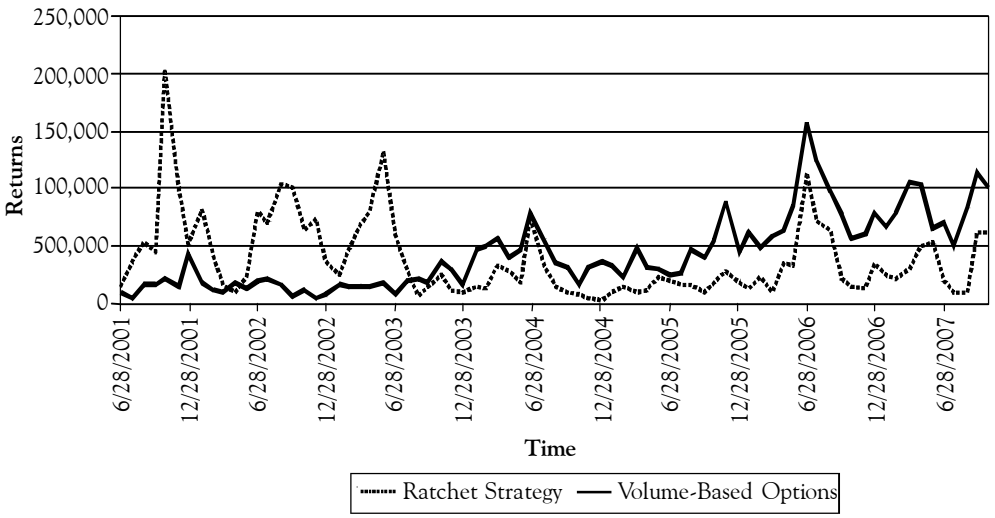
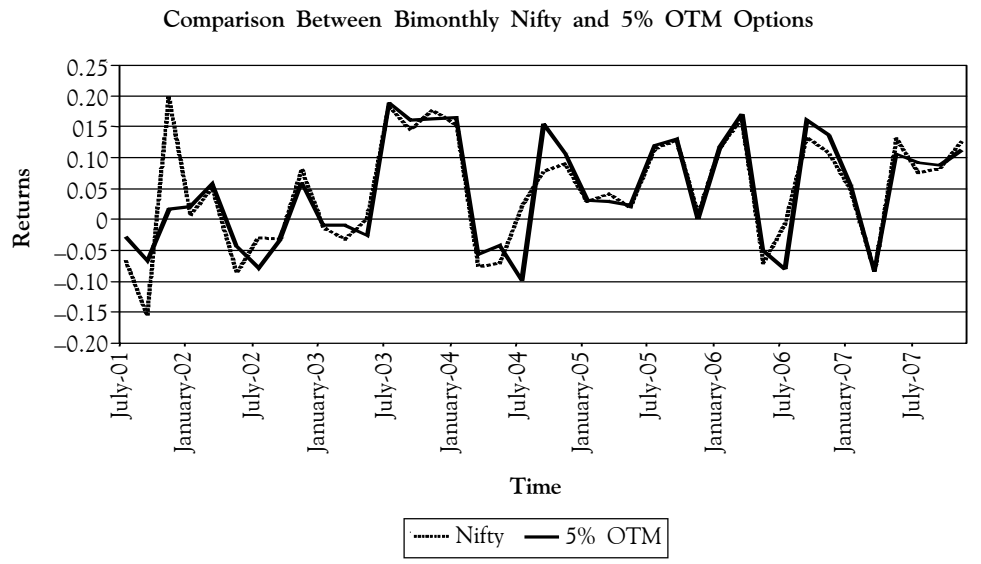


Figure 8 shows the Comparison of bimonthly Nifty & OTM based option returns. It can be seen that, the peak returns of OTM based protective puts is almost equal to the

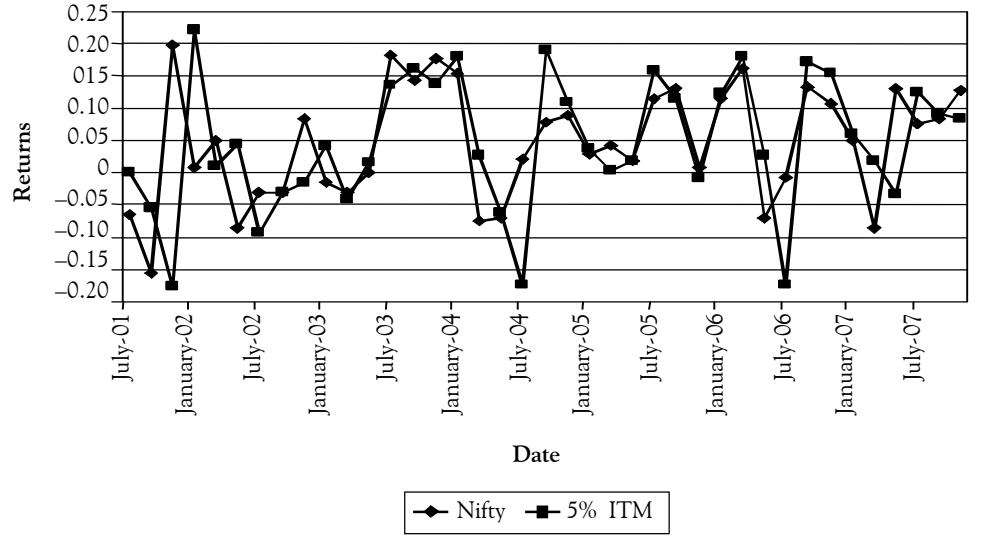
corresponding Nifty returns. This justifies the fact that put option provides unlimited gain during the uptrend of the market. At the same time, we can see from the graph that downside loss is less than that on the Nifty.

Figure 8: Comparison Between Bimonthly Nifty and OTM-Based Option Returns



From Figure 9, it can be observed that the 5% ITM strategy has more volatility than the Nifty and also does not provide any downside protection as is expected for strategies using options.

Figure 9: Comparison of Bimonthly Nifty and ITM-Based Option Returns



Conclusion

The results of the analysis has shown that the one-month volume-based options (maximum number of contracts) strategy performs better than the other option strategies. This has also been confirmed by the statistical tests like the *t*-test and *F*-test. The *p*-values for one-tailed *t*-test for comparing the means did not show any significant improvement in the mean return by using put options. But the *F*-test for variances has shown that the volume-based put options provide significantly lower standard deviation in returns than Nifty. The results are more profound during bearish phase than the bull phase of the market. The cost of a protective put strategy that requires rolling over short-term options is 'path-dependent', that is, it depends on the actual, random path taken by the stock price over time. There is not a one-to-one correspondence between realized stock return (which depends only on the final stock price) and the return on the put strategy (which is a function of the price path). Because of path dependence, it is not possible to make statements such as, "The protected strategy beats holding the stock alone, whenever the realized stock return is below x%, while if the return is above that level, the protected strategy does worse". We can only compare the two strategies in terms of the fraction of time each will exhibit returns below x%. A protected strategy involves a tradeoff that lowers returns in the upper tail of the distribution in order to gain protection at the low end. The analysis revealed significant profitability in investing in the one-month expiry volume-based protective put strategy.

The results of the study will be more profound during the current bearish trend of the market and the protective put strategy would have proven highly beneficial in limiting the downside loss.❖

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