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HEDGING PERFORMANCE OF PROTECTIVE PUTS AND COVERED CALLS PORTFOLIO: A STUDY OF NSE NIFTY OPTIONS

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Abstract

This paper aims at analyzing the return and risk characteristics of covered call and protective puts portfolios based on NSE Nifty index and to find out the factors responsible for the variation in returns on covered call and protective put portfolios. The factors which have been considered as the main determinants of returns on covered call and protective put portfolios are: the return on unhedged portfolio based on NSE nifty; the extent to which option is in the money or out of the money; time to maturity of the option; number of contracts traded; and Open Interest. The results indicate that the performance of covered call and protective put portfolios is better than the performance of unhedged portfolio both in terms of risk and returns. When the performance of covered call portfolio is compared with the performance of protective put portfolio, the results indicate that covered call portfolio provides higher average returns than protective put portfolio but both the total risk as well as market risk of protective put portfolio is lower than that of covered call portfolio. The results of estimated regression models indicate that covered call portfolio provides higher rate of return if call option included in covered call portfolio: is written with higher exercise price; has shorter time to maturity; enjoys high degree of liquidity; and has less number of outstanding contracts. The protective put portfolio provides higher returns if put option included in protective put portfolio: is written with lower exercise price; has longer time to maturity; has low degree of liquidity; and has large number of outstanding contracts.

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INTRODUCTION

Reforms during the 1990s brought significant development in the Indian securities market. Reforms modernized the operations by making them more capital intensive and have also given more investment preferences to the investors. The market has been highly volatile both in terms of price and volume during this period. As the market became more risky due to significant fluctuations in securities prices, there was a need on the part of the Indian investors to hedge the risk. As a result of this, in June 2000, there was another development in the Indian securities market that is, trading in derivative of securities was permitted by Securities and Exchange Board of India (SEBI). Derivative in securities is a relatively recent but extremely important class of financial assets. These are securities which do not have a value on their own but the prices of which are derived from the prices of other securities. That is, payoffs of derivative securities depend on the prices of other securities. Option contract is one of the variants of derivative contracts. Derivatives today constitute the most important segment of the Indian securities market since the inception derivatives trading in June 2000. In June 2000, Securities and Exchange Board of India (SEBI) permitted two stock exchanges, viz., National Stock Exchange (NSE) and Bombay Stock Exchange (BSE), and their clearing houses to commence derivatives trading with the introduction of index futures contracts based on S&P NSE Nifty index and BSE-30 (Sensex) index. This was followed by the introduction of trading in options based on these two indices, options on individual securities and futures on individual securities. Trading in index options commenced in June 2001 while trading in options and futures on individual securities commenced in July 2001 and November 2001 respectively. Interest rate futures in the Indian stock market was introduced in June 2003. In spite of the fact that it is less than five years since derivatives trading was introduced in the Indian stock market, there has been spectacular growth in the Indian derivatives market. The futures and options (F&O) segment of NSE reported a total turnover of Rs.73,56,242 during 2006-07 as against Rs.48,24,175 crores during 2005-06, Rs.25,46,986 crores during 2004-05, Rs.21,30,612 crores during 2003-04, Rs.4,39,863 crores during 2002-03, Rs.1,01,925 crores during 2001-02 and only Rs.2365 crores in 2000-01. lthough futures are more popular than options and contracts on individual securities are more popular than those on indices, even then there has been massive growth in the turnover of index options. The F&O segment of NSE reported an index

option turnover of Rs7,91,906 crores during 2006-07 as against Rs.3,38,467 crores (call index option: Rs.1,68,622 crores; put index option: Rs.1,69,845 crores), Rs.1,21,943 crores (call index option: Rs.69,371 crores; put index option: Rs.52,572 crores), Rs.52,816 crores (call index option: Rs.31,794 crores; put index option: Rs.21,022 crores), Rs.9246 crores (call index option: Rs.5669 crores; put index option: Rs.3577 crores) and only Rs.3766 crores (call index option: Rs.2466 crores; put index option: Rs.1300 crores) during 2005-06, 2004-05, 2003-04, 2002-03 and 2001-02 respectively.

Option contract is one of the variants of derivative contracts. Option contacts give its holder the right, but not the obligation, to buy or sell a specified quantity of the underlying asset for a certain agreed price (exercise/strike price) on or before some specified future date (expiration date). The underlying asset may be individual stock, stock market index, foreign currency, commodities, gold, silver or fixed-income securities. A call option gives its holder the right to buy whereas put option gives its holder the right to sell. The call option holder (purchaser of call) exercises the option only if the value of the underlying asset on the maturity of the option is more than the exercise price, otherwise the option is left unexercised. The put option holder exercises the option if the value of the underlying asset on the maturity is less than the exercise price; otherwise the option is left unexercised. To purchase the right to buy or sell the underlying asset, the option holder has to pay a certain price for purchasing the right, called option premium. Call option holder purchases the right to purchase the underlying asset and pays call premium as the purchase price of the right to buy. Put option holder purchases the right to sell and pays put premium as the purchase price of the right to sell the underlying asset. The person who sells the option to give the buyer the right to buy or sell the underlying asset is called as writer or seller of the option. The option writer receives the option premium for selling the option. The payoff of option holder on expiration is positive or zero whereas payoff of option writer on expiration is always negative or zero. It gives the profit to the option holder if the payoff of option holder on expiration is more than the option premium that he pays to purchase the option. It gives the profit to the option writer if the premium that he receives for selling the option is more than the amount (negative payoff) that he pays to the option holder on expiration.

The profit to the option holder is the value of the option at expiration minus price originally paid for the right to buy or sell the underlying asset at the exercise

price. The profit to the option writer is the value of the option at expiration plus price he receives for selling the right.

In the Indian stock market, the underlying assets are 3 stock market indices and 154 individual securities. As far as the present study is concerned, the underlying asset is the broad stock market index based on NSE. Thus, for the present study the underlying asset is S&P CNX NSE Nifty. The option may be either of American style or of European style. An American option allows its holder to exercise the right to purchase (if a call) or sell (if a put) the underlying asset on before the expiration date. European option can be exercised only on the maturity date. In the Indian stock market, index options are of European style where as individual stock options are of American style. Since the present study is concerned only with index option, a European option is only relevant to us as far as the present study is concerned. Four years have passed since the index option was introduced in the Indian stock market, yet there are very few studies which have examined the behavior of the Indian derivatives market. The present study is one step in that direction.

There are three kinds of participants in the index options market: speculator, hedger and arbitrageur. Hedgers use index options to eliminate the price risk associated with an underlying asset. Speculators use index futures to bet on future movement in the price of the underlying asset. Arbitrageurs use index futures to take advantage of mispricing. This paper has been analyzed from the point of view of hedgers.

As an investment strategy, puts and calls may be used to hedge equity portfolios against price risk by constructing covered call or protective put portfolios. A covered call position is the purchase of a share of stock with simultaneous sale of a call on that stock. The sale of covered calls may be used to protect against the possibility of stock price decline to the extent of premium received. Protective puts may also be used to hedge equity portfolios against decline in stock prices. A protective put is the purchase of a put option on a stock that is already owned. The protective put strategy provides protection against the possibility of a price decline while still preserving the possibility of participation in the event of an upward movement in the price of the underlying stock.

The main objective of this paper is to examine the return and risk

characteristics of covered call and protective puts portfolios based on NSE Nifty index. The paper aims to answer the following questions:

a. Whether the performance of protective put and covered call portfolio is better than unhedged portfolio based on NSE Nifty.

b. Whether protective put portfolios offer more insurance than covered call portfolios.

c. Whether risk and return data support the use of protective put portfolios or of covered call portfolios.

While investigating the return and risk characteristics of covered call and protective puts portfolios based on NSE Nifty index, the following determinants of returns on protective put and covered call portfolios – return on unhedged portfolio, moneyness, time to maturity, liquidity, kind of option (in the money call or out of the money call) and open interest – have been considered.

This paper is divided into five sections. Section 1 deals with the theoretical framework while Sections 2 and 3 deal with the empirical model and the data base of the study respectively. Section 4 discusses the empirical results and section 5 gives summary and conclusion.

THEORETICAL FRAMEWORK

In option contract, there are two parties involved – the writer (seller) of the contract and the buyer of the contract (option holder). The writer of the contract receives the premium paid by the buyer of the contract. The buyer of call option and writer of put option believe that the asset prices will increase in the future. The writer of call and buyer of put believe that the asset prices will decline in the future. The option buyer may earn unlimited profits but will incur only limited losses. This is the reason, they pay premium. The option writers can earn only limited profits but may incur unlimited losses. This is the reason why they receive premium. Option contract gives its holder the right, but not the obligation, to buy or sell a specified quantity of the underlying asset for a certain agreed price on or before some specified future date. A call option gives its holder the right to buy whereas the put option gives the right to sell. In the discussion in the present section, stock has been assumed as the underlying asset.. The payoff and profits of the options writers and buyers are as follows:

Payoff to call holder = Max $(S_T - X, 0)$

Payoff to call writer = Min $(X - S_T, 0)$

Payoff to put holder = Max $(X - S_T, 0)$

Payoff to put writer = Min $(S_T - X, 0)$

Profit to call holder = Max $(S_T - X, 0) - C$

Profit to call writer = Min $(X - S_T, 0) + C$

Profit to put holder = Max $(X - S_T, 0) - P$

Profit to put writer = Min $(S_T - X, 0) + P$

Where:

X: exercise price of the option

S_T: the market price of the underlying asset on the maturity of the option

C: current market price of European call option (call premium)

P: current market price of European put option (put premium)

An option is described as 'in the money' when its exercise would produce profits for its holders. An option is 'out of the money' when exercise would be unprofitable. A call option is 'in the money' when the exercise price is below the asset's value because purchase at the exercise price would be profitable. It is 'out of money' when the exercise price exceeds the asset value, no one would exercise the right to purchase at the exercise price an asset worth less than that price. Conversely, put options are 'in the money' when the exercise price exceeds the asset's value, because delivery of the lower-valued asset in exchange for the exercise price is profitable for the holder. A put option is 'out of money' when the exercise price is below the asset's value Options are 'at the money' when the exercise price and asset price are equal.

Options can be used by investors who desire to tailor their risk exposures in a creative way. There are several option strategies that provide other novel risk profiles that might be attractive to hedgers and other investors [see Hull (2002); Bodie, Kane and Marcus (2002)].

As an investment strategy, puts and calls may be used to hedge equity portfolios against price risk by constructing covered call or protective put

portfolios. A covered call position is the purchase of a share of stock with simultaneous sale of a call on that stock. The call is covered because the potential obligation to deliver the stock is covered by the stock held in that portfolio. Writing an option without an offsetting stock position is called naked option writing. The writing of options contracts on portfolio holdings has received particular attention from institutional investors because of its ability to provide increased returns with reduced risk. Becker, Degler and Szala (1984) argued that the primary institutional use for option is writing call or buying put on stocks they hold. Pasmantier (1992) mentioned option strategies to hedge foreign exchange risk can use any combination of four fundamental positions: buying a call, buying a put, selling a call, and selling a put. Foreign currency options allow users to gain from fluctuations in exchange rates while limiting the risk of adverse currency movements. They are useful when the hedger is uncertain about the date the foreign currency will be needed. Yates and Kopprasch (1980) showed that a passive program of writing at-the-money covered calls has yielded far more than a buy-and-hold the market-index approach. Zeikel (1980) showed that common stock, as measured by S&P 500 stock price averages, are expected to produce a return of 8.8%, while the covered call would increase the return to 9.8%. Merton, Scholes and Gladstein (1978) argued that because fully covered strategies are less risky than holding the underlying stock, one should not expect as high a return on average as from holding the stock. Trennepohl and Dukes (1981) compared return distribution of 12 option strategies and a buy-and-hold portfolio. The results showed that the portfolio standard deviation was lowered by covered option writing in every comparison. Portfolio returns were improved in 4 of the 6 comparisons. Buying out-of-the money option was highly risky and unprofitable. In the money, long term option, however, gave the largest mean return, but with the highest risk. The other studies which have analysed the performance of covered call strategy are: Arnott (1980); Bookstaber and Clarke (1981); Dawson (1979); Grube, Panton and Terell (1979); Mueller (1981); Pounds (1978) and Slivka (1980).

Value of Covered Call position at option expiration:

	$S_T \leq X$	$S_T > X$
Payoff of stock	S_T	S_T
Payoff of written call	0	$-(S_T - X)$

Payoff of Covered Call	S_T	X
Profit	$S_T - S_0 + C$	$X - S_0 + C$

Thus, the payoff of covered call portfolio = $Min\ (S_T, X)$

Profit from covered call portfolio = $Min\ (S_T, X) - S_o + C$

Cost of establishing covered call portfolio = $S_o - C$

Rate of return on covered call portfolio = $\frac{Min(S_T, X) - (S_0 - C)}{S_0 - C} x100$

The sale of covered calls may be used to protect against the possibility of stock price decline to the extent of premium received.

Protective puts may also be used to hedge equity portfolios against decline in stock prices. A protective put is the purchase of a put option on a stock that is already owned. Imagine you would like to invest in a stock, but you are unwilling to bear potential losses beyond some given level. Investing in stock alone seems risky to you because in principle you could loose all the money you invest. You might consider instead investing in stocks and purchasing a put option on the stock. Whatever happens to the stock price, you are guaranteed a payoff equal to put option's exercise price because put gives you the right to sell for the exercise price even if stock price is below that value. Merton, Scholes and Gladstein (1982) argued that put option may be viewed as term insurance, insuring against a loss in value of underlying stock; investors can sell insurance by using the uncovered put-writing strategies and buy insurance protecting the value of stocks in a portfolio by using protective put-buying strategies. The other studies which have analysed the performance of protective put strategy are: Pozen (1978); and Droms (1986).

VALUE OF PROTECTIVE PUT PORTFOLIO AT OPTION EXPIRATION:

	$S_T \leq X$	$S_T > X$
Payoff of Stock	S_T	S_T
Payoff of Put Purchased	$X - S_T$	0

Payoff of Protective Put	X	S_T
Profit	$X - S_0 - P$	$S_T - S_0 - P$

Thus, the payoff of protective put portfolio = $Max(S_T, X)$

Profit from protective put portfolio = $Max(S_T, X) - S_0 - P$

Cost of establishing protective put portfolio = $S_0 + P$

Rate of return on protective put portfolio = $\frac{Max(S_T, X) - (S_0 + P)}{S_0 + P} x100$

The protective put strategy provides protection against the possibility of a price decline while still preserving the possibility of participation in the event of an upward movement in the price of the underlying stock. Thus, the protective put strategy can also be used for hedging.

The present study aims at analysing the return and risk characteristics of covered call and protective put portfolios based on NSE Nifty index. The paper aims to finding out whether the performance of protective put and covered call portfolio is better than unhedged portfolio based on NSE Nifty. The paper also aims at analyzing the factors responsible for variation in returns on covered call and protective put portfolios. The different factors considered are: return on unhedged portfolio; the extent to which options are in the money or out of the money; time to maturity; number of contracts traded and open interest. This follows in the following sections.

MODEL

As mentioned earlier, the objective of this paper is to analyse the return and risk characteristics of covered call and protective put portfolios based on NSE Nifty index and to find out the factors responsible for the variation in returns on covered call and protective put portfolios. To analyse the return and risks characteristic of covered call, protective put and unhedged portfolios, the daily returns on each portfolio have been computed on the assumption that the investors hold the portfolio until the maturity of the options. For example, suppose today is 1st March 2007 and options will expire on 29th March 2007, we assume that an

investor holds the portfolios from 1st March 2007 to 29th March 2007. The same assumption is applied for trading dates 2nd March 2007, 3rd March 2007 and so on. The rate of return on unhedged portfolio has been computed as follows:

$$r_t^{UH} = \frac{1}{T-t}\ln(\frac{V_{Nifty,T}}{V_{Nifty,t}}), T > t$$

Where,

r_t^{UH} : daily return (with continuous compounding) on unhedged portfolio on the investment made on day t.

$V_{Nifty,t}$: value of NSE Nifty on day t.

$V_{Nifty,T}$: value of NSE Nifty on day T (maturity of the option).

$T-t$: holding period of the portfolio in terms of number of days.

The rate of return on covered call portfolio has been computed as follows:

$$r_{i,t}^{CC} = \frac{1}{T-t}\ln[\frac{Min(V_{Nifty,T}, X_i)}{V_{Nifty,t} - C_{i,t}}], T > t$$

Where,

$r_{i,t}^{CC}$: daily return (with continuous compounding) on covered call portfolio on the investment made on day t. The call option is written on day t with exercise price of X_i and will expire on day T.

X_i : exercise price

$C_{i,t}$: call premium for NSE Nifty call option with an exercise price of X_i and time to maturity of (T - t) days on day t.

The rate of return on protective put portfolio has been computed as follows:

$$r_{iT,t}^{PP} = \frac{1}{T-t}\ln[\frac{Max(V_{Nifty,T}, X_i)}{V_{Nifty,t} + P_{i,t}}], T > t$$

Where,

$r_{iT,t}^{PP}$: daily return (with continuous compounding) on protective put portfolio on the investment made on day t. The put option is purchased on day t with exercise price of *Xi* will expire on day T.

X_i : exercise price

$P_{iT,t}$: put premium for NSE Nifty put option with an exercise price of X_i and time to maturity of (T - t) days on day t.

The rate of return earned on each portfolio are compared with each other to assess out of three portfolios which portfolio provides the maximum returns. The standard deviation of rate of return and beta (with respect to NSE Nifty) of each portfolio are compared to assess out of three portfolios which portfolio has minimum total risk and market risk, respectively. The beta of covered call and protective put portfolios have been computed using the following regressions:

$$r_{CC,t} = \alpha_{CC} + \beta_{CC} r_{Nifty,t} + u_t$$

$$r_{PP,t} = \alpha_{PP} + \beta_{PP} r_{Nifty,t} + u_t$$

Where,

$r_{CC,t}$: rate of return on covered call portfolio on day t.

$r_{PP,t}$: rate of return on protective put portfolio on day t.

$r_{Nifty,t}$: rate of return on portfolio based on NSE Nifty.

$\alpha_{CC}, \alpha_{PP}, \beta_{CC}, \beta_{PP}$: constants

u_t, v_t : random disturbance terms

If the estimated values of β_{CC} and β_{PP} are less than one, it means that covered call and protective put portfolios are having lower market risk than unhedged portfolio based on NSE Nifty and vice versa. If the estimated values β_{CC} of is less than β_{PP}, it means that covered call portfolio has lower market risk than protective put portfolio and vice versa.

The next objective of this paper is to analyze the factors responsible for the variation in the returns on covered call and protective put portfolios. The variables which have been considered as the determinants of returns on covered call and protective put portfolios are:

a. The return on unhedged portfolio based on NSE Nifty.

b. The extent to which option is in the money or out of the money. That is, the ratio of value of NSE Nifty to exercise price.

c. Time to maturity of the options. That is, number of days after which the options will expire.

d. Number of contracts. In case of NSE Nifty options, 100 index options is equal to one contract.

e. Open Interest. That is, number of outstanding contracts.

To analyze the determinants of returns on covered call portfolio, the final model which has been considered for the present study is:

$$r_{iT,t}^{CC} = \alpha + \beta r_{T(Nifty),t} + \gamma(\frac{S_t}{X^C_{iT,t}}) + \delta(T-t)^C_{i,t} + \lambda NOC^C_{iT,t} + \mu OI^C_{iT,t} + U_t$$

Where,

$r_{iT,t}^{CC}$: daily return (with continuous compounding) on covered call portfolio on the investment made on day t. The call option in covered call portfolio is written on day t with exercise price of X_i and will expire on day T.

$r_{T(NIFTY),t}$: daily return (with continuous compounding) on unhedged portfolio on the investment made on day t and the holding period of which is (T-t) days.

S_t : closing value of NSE Nifty on trading day t.

$X^C_{iT,t}$: ith exercise price of call option with time to maturity of (T-t) days available for trading on day t.

$(T-t)^C_{i,t}$: time to maturity of call option with an exercise price X_i of on day t

$NOC^{C}_{iT,t}$: number of contracts of NSE Nifty call option with an exercise price of X_i and time to maturity of (T-t) days traded on day t.

$OI^{C}_{iT,t}$: open interest of NSE Nifty call option with an exercise price of X_i and time to maturity of (T-t) as on day t.

$\frac{S}{X}$ measures the extent to which an option is in the money or out of the money.

If estimated β is less than one (and is also significant) it means that covered call portfolio has lower market risk as compared to unhedged portfolio and vice versa.

If estimated γ is positive and significant it means that covered call portfolio provides higher returns if call option included in the covered call portfolio is deeply in the money. If estimated δ is positive and significant it means that covered call portfolio provides higher returns if call option included in the covered call portfolio has longer time to maturity. If estimated λ is positive and significant it means that covered call portfolio provides higher returns if call option included in the covered call portfolio has high liquidity. If estimated μ is positive and significant it means that covered call portfolio provides higher returns if call option included in the covered call portfolio has large number of outstanding contracts.

To analyze the determinants of returns on protective call portfolio, the final model which has been considered for the present study is:

$$r_{iT,t}^{PP} = \alpha' + \beta' r_{T(Nifty),t} + \gamma' \left(\frac{S_t}{X^{P}_{iT,t}}\right) + \delta' (T-t)^{P}_{i,t} + \lambda' NOC^{P}_{iT,t} + \mu' OI^{P}_{iT,t} + V_t$$

Where,

$r_{iT,t}^{CC}$: daily return (with continuous compounding) on covered call portfolio on the investment made on day t. The put option in protective put portfolio is written on day t with exercise price of X_i and will expire on day T.

$r_{T(NIFTY),t}$: daily return (with continuous compounding) on unhedged

portfolio on the investment made on day t and the holding period of which is (T-t) days.

S_t : closing value of NSE Nifty on trading day t.

$X^P{}_{iT,t}$: ith exercise price of put option with time to maturity of T available for trading on day t.

$(T-t)^P{}_{i,t}$: time to maturity of call option with an exercise price of X_i onday t.

$NOC^P{}_{iT,t}$: number of contracts of NSE Nifty call option with an exercise price of X_i and time to maturity of (T-t) days traded on day t.

$OI^P{}_{iT,t}$: open interest of NSE Nifty call option with an exercise price of X_i and time to maturity of (T-t) as on day t.

If estimated β' is less than one (and is also significant) it means that protective put portfolio has lower market risk as compared to unhedged portfolio and vice versa.

If estimated γ' is positive and significant it means that protective put portfolio provides higher returns if put option included in the protective put portfolio is deeply out of money. If estimated δ' is positive and significant it means that protective put portfolio provides higher returns if put option included in the protective put portfolio has longer time to maturity. If estimated λ' is positive and significant it means that protective put portfolio provides higher returns if put option included in the covered call portfolio has high liquidity. If estimated μ' is positive and significant it means that protective put portfolio provides higher returns if put option included in the protective put portfolio has large number of outstanding contracts.

The model discussed above has been tested for NSE Nifty options. This follows in the following sections.

DATA

The basic data for this study have been collected from www.nseindia.com, an official website of National Stock Exchange. The hedging performance of

covered call and protective put portfolios has been investigated using daily data on exercise prices available for trading; value of NSE Nifty; call premium for different exercise prices and time to maturity; put premium for different exercise prices and time to maturity; time to maturity for different exercise prices available for trading; number of contracts traded for different exercise prices and time to maturity; and open interest for different exercise prices and time to maturity.

To analyze hedging performance of covered call and protective put portfolios, the sample carrying one year time period from 1st January 2004 to 31st December 2004 has been chosen. From 1st January 2004 to 31st December 2004, there were total 254 days available for trading and the number of observations for which trading was available with different exercise prices and/or time to maturity were 21,122 for each call and put options. On an average, there were 80 observations per day for each call and put options for which trading was available for different exercise prices and/or time to maturity.

At any point of time, there were only three contracts available with 1 month, 2 months and 3 months to expiry. The expiry date for these contracts is last Thursday of expiry month and these contracts have a maximum of three months expiration cycle. A new contract is introduced on the next trading day following the expiry of the near month contract. On the date of the start of the new option contract, there are minimum of seven exercise prices available for trading – three 'in the money', one 'at the money' and three 'out of the money' for every call and put option. The new exercise prices can be added in between for each contract. The minimum increment in exercise prices in case of NSE Nifty option is 10 or in multiples of 10 thereof. Out of the total observations of 21,122 for each call and put options, there were 13,875 and 14,416 observations for calls and puts respectively, on which there was no trading with different exercise prices and/or time to maturity. As far as the present study is concerned, only those options were included in the sample, the trading on which was for at least 100 contracts.

Thus, there were total 2507 and 1978 observations for call and put options respectively, trading on which was on at least 100 contracts with different exercise prices and/or time to maturity. Thus, as far the present study is concerned, 2507 observations for call options and 1978 for put options were used to analyze the performance of covered call and protective put portfolios.

EMPIRICAL RESULTS

The model described above has been tested for NSE Nifty options. NSE Nifty option is of European style. At any point of time, there are three contracts available for trading with one month, two months and three months to expiry. If today is 15th June 2005, three contracts are available for trading: June option, July option and August option. June option will expire on last Thursday of June. A new contact (September option) will be introduced on the next trading day following the expiry of June option (near month contract). For each expiry date, NSE Nifty option trading is available with different exercise prices. Some are in the money, some are out of the money and some are at the money. The objective of this paper is to analyze the return and risk characteristics of covered call and protective puts portfolios based on NSE Nifty index and to find out the factors responsible for the variation in returns on covered call and protective put portfolios. The factors which have been considered as the main determinants of returns on covered call and protective put portfolios are: the return on unhedged portfolio based on NSE Nifty; the extent to which option is in the money or out of the money; time to maturity of the option; number of contracts traded; and open interest.

The rate of return and risk for covered call, protective put and unhedged portfolios have been shown in Table 4.1.

The results of Table 1 show that the average rate of returns on covered call and protective put portfolios are higher than that of unhedged portfolio whereas

Portfolio	Alpha	Beta	R^2	Standard Deviation of Rate of Return	Average Rate of Return	Maximum Rate of Return	Minimum Rate of Return
Covered Call	0.012 (3.73)	0.63 (78.53)	0.71	0.301	-0.018	1.764	-1.510
Protective Put	-0.02 (4.91)	0.48 (41.78)	0.59	0.262	-0.039	1.621	-1.748
Unhedged		1.00		0.405	-0.049	1.690	-1.630

Table 4.1: Risk and Return Summary Statistics

standard deviation of rate of return of two hedged portfolios are lower than that of unhedged portfolio. The results further show that betas of covered call and protective put portfolios are less than one. Thus, the performance of covered call and protective put portfolios is better than the performance of unhedged portfolio both in terms of risk and return. When we compare the performance of covered call portfolio with that of protective put portfolio, we find that covered call portfolio provides higher average returns than protective put portfolio but both the total risk as well as market risk of covered call portfolio is higher than that of protective put portfolio.

Another objective of this paper is to analyze the different factors responsible for the variation in the returns of covered call and protective put portfolios. The models specified in section 2 have been used to find out different variables responsible for explaining the variation in returns of covered call and protective put portfolios. The independent variables which have been chosen as the determinants of returns of covered call and protective put portfolios are: the return on unhedged portfolio based on NSE nifty; the extent to which option is in the money or out of the money; time to maturity of the option; number of contracts traded; and Open Interest.

The estimated regression model showing the determinants of returns on covered call portfolio has been shown in Table 4.2 and the model showing the determinants of returns on protective put portfolio has been shown in Table 4.3.

The results of the estimated regression models show that all the coefficients have come out to be significant except the degree of moneyness in case of protective put portfolio which has come out to be significant only at 14% level. Thus, on the basis of the estimated coefficients shown in Tables 4.2 and 4.3, the overall results can be summarized as follows:

a. Covered call portfolio has lower market risk as compared to unhedged portfolio.

b. Covered call portfolio provides higher return if call option included in covered call portfolio is written with higher exercise price. That is, out of the money call option contract should be preferred to in the money call option contract while constructing covered call portfolio.

c. Covered call portfolio provides higher returns if call option included in covered call portfolio has shorter time to maturity. That is, near the month

call option contract should be preferred to far the month call option contract while constructing covered call portfolio.

α	β	γ	δ	λ	μ	R^2	N
0.406	0.640	-0.332	-0.0026	$2.82\text{x}10^{-5}$	$-1.31\text{x}10^{-7}$	0.73	2507
(5.12)	(80.75)	(4.20)	(8.89)	(5.01)	(7.83)		

$$r_{iT,t}{}^{PP} = \alpha' + \beta' r_{T(Nifty),t} + \gamma' \left(\frac{S_t}{X^P{}_{iT,t}}\right) + \delta' (T-t)^P{}_{i,t} + \lambda' NOC^P{}_{iT,t} + \mu' OI^P{}_{iT,t} + V_t$$

Table 4.2: Regression Model: Covered Call Portfolio

α'	β'	γ'	δ'	λ'	μ'	R^2	N
-0.208**	0.477*	0.153	0.002*	$-3.01\text{x}10^{-5*}$	$5.63\text{x}10^{-8*}$	0.73	2507
(1.97)	(49.79)	(1.44)	(5.69)	(4.01)	(3.55)		

$$r_{iT,t}{}^{CC} = \alpha + \beta r_{T(Nifty),t} + \gamma \left(\frac{S_t}{X^C{}_{iT,t}}\right) + \delta (T-t)^C{}_{i,t} + \lambda NOC^C{}_{iT,t} + \mu OI^C{}_{iT,t} + U_t$$

Table 4.3: Regression Model: Protective Put Portfolio

d. Covered call portfolio provides higher returns if call option included in covered call portfolio enjoys high degree of liquidity. That is, high liquid call option should be preferred to less liquid call options while constructing covered call portfolio.

e. Covered call portfolio provides higher returns if call option included in covered call portfolio has less number of outstanding contracts. That is, low open interest call option contracts should be preferred to high open interest call option contracts while constructing covered call portfolio.

f. Protective put portfolio has lower market risk as compared to unhedged portfolio.

g. Protective put portfolio provides higher return if put option included in protective put portfolio is purchased with lower exercise price. That is, out of the money put option contract should be preferred to in the money put option contract while constructing protective portfolio. The coefficient of moneyness in case of protective put portfolio has come out to be significant only at 14% level.

h. Protective put portfolio provides higher returns if put option included in

covered call portfolio has longer time to maturity. That is, far the month put option contracts should be preferred to near the month call option contracts while constructing protective put portfolio.

i. Protective put portfolio provides higher returns if put option included in protective put portfolio has low degree of liquidity. That is, less liquid put options should be preferred to more liquid put options while constructing protective put portfolio.

j. Protective put portfolio provides higher returns if put option included in protective put portfolio has more number of outstanding contracts. That is, high open interest put option contracts should be preferred to low open interest put option contracts while constructing protective put portfolio.

CONCLUSION

Options have constituted an important segment of the Indian derivatives market. In the Indian securities market, trading in index options commenced in June 2001. It is less than six years since index options trading was introduced in the Indian stock market, yet there has been spectacular growth in the turnover of index options. The index option (based on NSE Nifty) turnover increased from Rs. 3766 crores during 2001-02 to Rs 1,21,943 crores during 2004-05 (www.nseindia.com). There have been very few studies dealing with the behaviour of the Indian derivatives market, inspite of it being six years since inception of derivatives trading in the Indian stock market. This study is an attempt to bridge this gap. There are three kinds of participants in the index options market: speculator, hedger and arbitrageur. Hedgers use index options to eliminate the price risk associated with an underlying asset. Speculators use index options to bet on future movement in the price of the underlying asset. Arbitrageurs use index options to take advantage of mispricing. This paper has been analysed from the point of view of hedgers.

The objective of this paper is to analyse the return and risk characteristics of covered call and protective puts portfolios based on NSE Nifty index. The results indicate that the performance of covered call and protective put portfolios is better than the performance of unhedged portfolio both in terms of risk and returns. When the performance of covered call portfolio is compared with the performance of protective put portfolio, the results indicate that covered call portfolio provides higher average returns than protective put portfolio but both the total risk as well as market risk of protective put portfolio is lower than that of protective put portfolio.

Another objective of this paper is to find out the factors responsible for the variation in returns on covered call and protective put portfolios. The factors which have been considered as the main determinants of returns on covered call and protective put portfolios are: the return on unhedged portfolio based on NSE nifty; the extent to which option is in the money or out of the money; time to maturity of the option; number of contracts traded; and Open Interest. The results of estimated regression models indicate that covered call portfolio provides higher rate of return if call option included in covered call portfolio: is written with higher exercise price; has shorter time to maturity; enjoys high degree of liquidity; and has less number of outstanding contracts. The protective put portfolio provides higher returns if put option included in protective put portfolio: is written with lower exercise price; has longer time to maturity; has low degree of liquidity; and has large number of outstanding contracts.

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