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A Study on Option Greeks – Properties Effecting Stock Option Premium

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ABSTRACT:

Derivative is a financial instrument whose value is determined by the value of underlying assets. Option is type of derivative contract where call or put purchasers are given right to execute the contract. Holders of option contract will get right by paying premium charges quoted on exchange. Option premium is not fixed. There are few factors which will affect option premium charges. Factors that are affecting options prices are time to maturity, implied volatility, prices of underlying asset, interest rates and strike price. When market value quoted is less than the theoretical value in case of call premium then it is considered premium is undervalued and is suggested to purchase option. Purpose of study is to check the effect of change in properties on theoretical option price. For the purpose of study data is collected through primary data and secondary data. Primary data is collected through website and secondary data is collected through journals, periodicals, text books, notifications. It is concluded from the study that when there is change in the properties values will have impact on theoretical option premium. This concept is being explained by taking Greeks and affect of changes of values on option premium.

Key words: option , Greeks , premium, properties.

INTRODUCTION:

Derivative is a financial instrument which derives its value from underlying asset. Underlying assets could be commodity, equity, interest rates, currency value, bonds etc. Option is a type of contract where It could be exchange traded or over the counter exchange contract. In case of contract two parties enter into contract for a value, for a specified asset, for a specified time, quality, quantity. In case of call option or put option by paying premium charges purchasers will have right to execute contract [5]. These parties are called as call holders and put holders . Call holders will have right to buy and are not obligated to purchase.

In case of put, holder will pay premium charges thereby gets right to sell but not obligated to sell. The decision of purchasing option depends on comparison of theoretical option value and value quoted on exchange. If the value of call option is less than value computed then it is suggested to purchase and if the value of put option is more then it is suggested to sell. Greeks is concept built on valuation of option premium [6].

It is checking of impact of price changes , strike price change, interest rate change, volatility change on call or put option premium. Stock prices change is matched with Gamma or Delta, rate of interest is matched with rho, change in value of volatility is matched with Vega.

Review of literature:

Gurdip Bakshi Charles Cao Zhiwu Chen (2000) in their article presented empirical results of some properties being checked . The conclusion is given on intraday call and put prices and expressed that though normally effect of price increase will influence in increase of call premium their study proves that there is increase in option premium though stock prices are not increased [1].

Gurdip Bakshi Nikunj Kapadia,(2015) In their article tested volatility and its effect on option premium [2]. Study was based on empirical though empirical tests it was observed that delta-hedged strategy was underperformed to zero. At times it was observed that underperformance was greater at times of higher volatility. Results of study favoured a negative market volatility risk premium [4]. Paul Dawson David Blake Andrew, JG Cairns Kevin Dowd (2007) in their working paper Options on normal underlyings has explained importance of option premium.

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Working paper described about valuation of option model by black and scholes and paper also derives option premium models and also derived Greeks. Paper also describes about option pricing model its importance in pricing of swaptions [3].

Limitations:

For the study not all greek letters are used . Kappa , Lambda are not considered for study. For the analysis and observation only 2 IT companies are taken [9]. For the purpose of study only short period is considered. Valuation of Greeks and its effect is shown only on 5 factors.

Objectives of Study:

- To find out theoretical option price
- To observe sensitivity of call option premium when underlying features change.
- To study impact of change in properties of option premium on buy prices both call and put option premium.

Research Methodology:

For the purpose of study primary and secondary data is taken for analysis. Primary data is taken from NSE . Secondary data is collected from various sources like journals, books , websites , working papers [7]. Analysis is based on observations made on single stock and impact of changes in properties on option premium.

Data Analysis:

In case of valuation of option premium out of two models black and scholes and binomial option pricing model black and scholes model is considered for valuation of option premium by considering all five properties [8].

Table : 1 Calculation of option Premium by-Black and Scholes Model

S	273.6
X	280
R	6%
Sigma	24%
T	0.164384
D1	-0.08761
D2	-0.18492
N(d1)	0.465093
N(d2)	0.426647
Call	8.960722
Put	12.61265

It is observed that value of option premium is Rs. 8.9. If value quoted on stock exchange is 1.23 or lower than theoretical value of option then it is suggested to buy call but if value quoted is high then it is suggested to sell call and buy put.

Table 2 : Effect of change in stock price on option premium other factors remaining same

Stock Price	Existing	Increase	Decrease
Wipro	273.6	290	260
Intrinsic Value	0	10	0
Call Premium	8.9	18.53	3.99
Put Premium	12.6	5.78	21.24

From Table 2 it is observed that as stock price is increasing call premium is observed to be increasing and when stock prices are reduced in market chances of execution being less option premium is drastically observed to be falling to 3.99 a change by 4.91 which indicates chances of execution might come down. When price is moved from 273.6 to 290 Intrinsic value is chance of execution being high call premium charges are observed to be increasing where as in case of put premium it is reduced as chance of backing out from contract is high. This concept is matched with concept of Gamma

Table 3: Effect of change in strike price on option premium other factors remaining same

Strike Price	Existing	Increase	Decrease
Wipro	273.6	290	270
Call Premium	0.03	0.00	3.89
Put premium	6.34	16.3	0.23

From the table 3 it is observed that as strike price is reduced chance of execution in case of call option will be high resulting in more demand there by resulting in increase in option premium. In case of put option chance of execution will be minimized since he can sell in market at high rate hence premium charges is observed to be reduced. If strike price is increased market charges being minimized chance of execution in case of call will be reduced where as chance of execution in case of put is high hence premium is high . Put buyer can sell at high strike price ending up with more intrinsic value.

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Table 4: Effect of change in interest rates on option premium other factors remaining same

Strike Price	Existing	Increase	Decrease
Wipro	6%	8%	5%
Call Premium	8.96	9.36	8.77
Put premium	12.61	12.1	12.88

Table : 5 Effect of change in time to maturity on option premium other factors remaining same

Strike Price	Existing	Increase	Decrease
Wipro (Maturity dates)	60 Days	90 Days	30
Call Premium	8.96	12.56	5.51
Put premium	12.61	13.49	10.07

From the table no. 5 it is observed that when the maturity date is increased as the chance of execution is increasing call premium and put premium is observed to be increasing. When date of maturity is reduced both call and put premium is observed to be reducing.

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Stock Price	2844.85
Strike Price	2750
Volatility	22%
Rate of Interest	6%
Time to maturity	0.166667
C	172.4834
P	50.27043

Table : 2 showing effect of change in stock price on call premium and put premium

Strike Price	Existing	Increase	Decrease
Stock Price	2844.85	3000	2700
Call Premium	184.7179	304.0215	99.3987
Put premium	62.50496	26.6585	122.0357

From table 2 it is observed that as stock price increasing, chance of contract being executed is high call option premium is observed to be increasing, in case of put option premium it will reduce. When stock price is reduced chance of execution being less call option premium is observed to be reduced as chance of execution is less.

Table : 3 showing effect of change in rate of interest on call premium and put premium

	Existing	Increase	Decrease
Rate of interest	6%	7%	5%
Call Premium	184.7179	187.6684	181.7901
Put premium	62.50496	60.92149	64.11861

From table 3 it is identified with the increase in interest call premium will decrease and with decrease in interest option premium will increase.

Table : 4 showing effect of change in volatility on call premium and put premium

	Existing	Increase	Decrease
Volatility	25%	26%	24%
Call Premium	184.7179	188.8582	172.4834
Put premium	62.50496	66.64529	50.27043

Rate of interest on risky assets is directly related with rate of interest expectations on risk free assets. From table no. 4 it is observed that as rate of interest is increased it has direct influence on stock there by as demand for stock increase it results in increase in market price hence increase in market price will have positive impact which reflects in the form of increase in call option premium and will have negative reflection on put option premium. Out of all Greeks interest rate is observed to have flattest change as far as equity options is concerned. From table no. 4 it is observed that increase in volatility influence in increase in call premium but if it is reduced it is observed that call premium is observed to be reduced.

Conclusion:

Greeks are influencing factors on an option premium. Most influencing factor amongst Delta, theta, vega, interest rate is current market price. Theta is high when option is at the money. If one day is reduced or brought to near to maturity date it is observed that value of option premium is increased irrespective of call or put option. In case of vega change by 1% then vega of call is equal to vega of put. If interest rates changes by 1 basis points it will not have much effect on call option or put option Premium. one of the most flattest kind of impacts as far as equity option is concerned is rho. If quoted premium is higher than theoretical option premium then it is suggested to sell call and buy put.

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