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REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

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APPENDIX/ANNEXURE

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- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

UNPUBLISHED DISSERTATIONS AND THESES

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, KurukshetraUniversity, Kurukshetra.

ONLINE RESOURCES

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

WEBSITES

- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

AN EMPIRICAL STUDY ON THE DETERMINANTS OF CALL EUROPEAN OPTION PRICES AND THE VERACITY OF BLACK-SCHOLES MODEL IN INDIAN OPTIONS MARKET

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ABSTRACT

Call European Option is a derivative which confers the holder of the instrument the right but not the obligation to buy the underlying asset at strike price on a pre-determined date. Since the writer of the option is at the mercy of the holder, the former is entitled to compensation from the latter. This compensation is called Premium. Premium is also called the price of the option. The prices of call European options are governed by four important factors – strike price, current market price, time to expiry and volatility of underlying stock. This paper seeks to explore the strength of these factors across call European options having the underlying stocks from five major industries individually as well as collectively. Black-Scholes model is the most acclaimed theory in the determination of option prices. This paper also attempts to empirically examine the validity and veracity of that model in terms of whether this model undervalues or overvalues the option prices, and the degree of undervaluation and overvaluation.

KEYWORDS

Black-Scholes model, Call European Options, Current Market Price, Strike Price, time to expiry, Volatility of underlying stock.

INTRODUCTION

The ever increasing interest of humans in increasing the wealth has led to the growth of a fascinating discipline called Financial Engineering. Financial Engineers have continuously involved themselves in churning out new financial instruments with varied risk and return combinations attached to them. One such new type of instrument is *Derivative.* Derivatives are the financial securities whose value is determined from the value of some underlying asset. These are the contracts that are designed to minimize risk for the investors on their investments. Derivatives transfer the risk from those who wish to avoid risk to those who wish to accept the risk. The various derivatives are **Futures and Options**.

Futures refer to agreement between a buyer and a seller to exchange the commodity or instrument for a pre-determined future date at a certain price agreed today. While futures hedge the risk of adverse movement in the price of underlying assets, but they concurrently preclude the writer of futures contract from any favorable movement in the latter. To overcome this drawback, *options* have been evolved.

An *Option* is a financial derivative, which confers a right without obligation, to the holder of the instrument to buy or sell an asset at a specified price called *strike price/exercise price* on or before a certain date. Like Futures contracts, option contracts too are derived from an underlying asset, which could be a security, a commodity, or an index. And like financial futures, financial options are based on financial assets such as shares, indices, bonds/debentures, T-bills, etc. In fact, option contracts may be traded for any financial asset for which there is an active secondary market. The major distinction between options and futures arise from the phrase *without obligation.* While the holder of an option need not exercise his right if the price movement of the underlying asset is adverse, the holder of a futures contract has to honour the contract even if it means incurring loss. Of course, since nothing in the world is free, the price (which is also known as *premium*) of an option is much higher than the price of a comparable futures contract. In other words, by locking in the future buying or selling price, options provide investors with the opportunity to insure the risk arising from price fluctuations. However this comes at a price, which is also referred to as *premium*.

There are two major classification of options – Call and Put; European and American. Crossing these two classification types, we arrive at four major types of options. The explanation pertaining to all these types is beyond the scope of this paper. So, for the sake of this paper, only Call European Option is defined. A *Call European Option* is a type of option which confers the right, but not obligation on the holder to purchase the underlying asset, say, stock at a pre-determined price, *Exercise price or Strike Price,* only on a pre-determined date.

Call European option *premiums* pertaining to different options on the same underlying asset or security exhibit large variations. Like all securities traded on stock exchanges the options premium are governed by several fundamental factors. Prominent among them are *Strike Price, Current market price of underlying stock, Volatility of underlying stock, Time to Expiry.*

Each of these factors impact call European option prices impacts differently. The impact of determinants on Call European Option Prices may be summarized as below:

TABLE – 1: IMPACT OF DETERMINANTS ON CALL EUROPEAN OPTION PRICES

Factor	*Effect of an increase of factor on Call Price*	*Effect of an decrease of factor on Call Price*
Strike Price	Decrease	Increase
Current price of underlying stock	Increase	Decrease
Time to Expiry	Increase	Decrease
Volatility of underlying stock	Increase	Decrease

Thus, it is clear that call European option price shares direct proportionality with market price, time to expiry and volatility of underlying stock and inverse proportionality with Strike Price.

BLACK-SCHOLES MODEL

Black-Scholes model (B&S model), as we all know, is a model that seeks to establish the OPTION PRICE. The model takes determinants of option prices as independent variables and OPTION PRICE as a dependent variable. We will know about B&S model in some detail later.

LITERATURE REVIEW

Since Black and Scholes published their seminal article on option pricing in 1973, there has been vast explosions of theoretical and empirical investigation on option pricing. While Black and Scholes' assumption of geometric Brownian motion still maintained in most papers, the possibility of alternate distributional

hypotheses was soon raised later. Cox, Ross and Rubenstein (1979) derived the tree methods of pricing options, based on risk-neutral valuation, the binomial option pricing model pricing European option prices under various alternatives, including the absolute diffusion, pure-jump, and square root constant elasticity of variance models.

After stochastic interest rate extensions first appeared in Merton (1973), Merton (1976) proposed a jump-diffusion model. Models for pricing options under stochastic volatility appeared in Hull and White (1987), Johnson and Shanno (1987), Scott (1987), and Wiggins (1987). New models for pricing European options under alternate distributional hypotheses continue to appear; for instance, Naik's (1993) regime-switching model and the implied binomial trees model of Derman and Kani (1994) and Rubinstein (1994).

NEED AND IMPORTANCE OF STUDY

Options have become the most sought-after derivatives. But given the complexity of the mechanisms and factors involved in determining the option prices, it is becoming extremely difficult for investors as well as academicians to forecast option prices. In this regard, it becomes all the more important to study the factors behind determination of option prices and checking the veracity of the existing models of option price determination. This paper is a sincere attempt in this direction.

STATEMENT OF THE PROBLEM

Option Prices or *premiums* differ widely for different options on the same underlying asset or stock. This clarifies that *option premiums* are governed not just traditional factors of demand and supply but also by the multiplicity of other factors. This would bewilder many investors. In this research, an attempt has been made to understand/establish a few important factors that significantly affect the option prices and the magnitude of such effects. Also an attempt has been made to measure the degree of interrelationship among these factors. The Factors considered include – the market price of the underlying asset, the volatility of the market price of the underlying asset, the strike price, and the time to expiry.

Black-Sholes model is regarded to be the most scientific model determining the option prices. An attempt has been made to examine the veracity of this model with respect to the actual option premiums quoted in options market.

OBJECTIVES

1. To explore the strength of relationship between Call European Option Price on the one hand and the each of the important determinants on the other across five prominent industries of Indian Options Market separately.
2. To explore the strength of relationship between Call European Option Price on the one hand and the each of the important determinants on the other for Indian Options market as whole.
3. To empirically examine the veracity of Black-Scholes model in terms of degree of overvaluation or undervaluation of call European option prices by the model.

RESEARCH METHODOLOGY

SAMPLE DESIGN

The study is carried out on the NSE listed- call European options (of expiry date February 23, 2012) of sampled companies from five prominent industries and the findings have been generalized to Indian Options market.

Five industries – Banking, Energy, FMCG, Information Technology and Pharmaceuticals- have been assumed to be the representative of the Indian Options market. Five companies have been chosen from each of the five sectors and are assumed to be representative of their sectors. The list of companies is given below. Convenient Sampling technique has been adopted. The companies which have traded well in the respective industries have been considered on the basis of our individual judgment.

Banking	Energy	FMCG	Information Technology	Pharmaceuticals
State Bank of India	Oil and Natural Gas Corporation	ITC	Patni Computer Systems ltd	Ranbaxy
Vijaya Bank	National Thermal Power Corporation	Hindustan Unilever	Tata Consultancy Services	Dr Reddy's Laboratories
Indian Overseas Bank	Gas Authority of India Ltd	Dabur	Infosys	Cipla
Punjab National Bank	Indian Oil Corporation	Godrej India Ltd	Wipro	GlaxoSmithkline
Bank of India	Coal India Ltd	Tata Global Beverages Ltd	Tech Mahindra	Piramal Healthcare

DATA COLLECTION

Secondary data has been used to carry out the research. The data pertaining to the call European option prices for a period of 10 weeks has been considered. The call European option prices have been collected from *www.nseindia.com.* The data pertaining to the theoretical understanding of the phenomena have been collected from the relevant books.

TOOLS OF ANALYSIS

Correlation has been used to establish relationship between the call European option prices on the one hand and the factors influencing options prices on the other hand. This tool helps in ascertaining the strength and direction of relationship and helps us understand which factor influences the option prices substantially. *Regression* analysis has been used to build a model that will help in the determination of call European option prices. *Percentage* has been used to analyze the extent to which actual call European option prices differ from those arrived at by *Black-Sholes Model.*

LIMITATIONS

The study has been limited to the call European options of only 25 companies from five sectors. The quality of the research is subject to the sampling error i.e. the extent to which these companies do not represent the Indian Options market.

DATA ANALYSIS AND INTERPRETATION

For the sake of convenience, data analysis and interpretation has been divided into 3 sections on the basis of 3 objectives mentioned above.

Analysis of relationship between call European options Price and each of the determinants across five industries separately

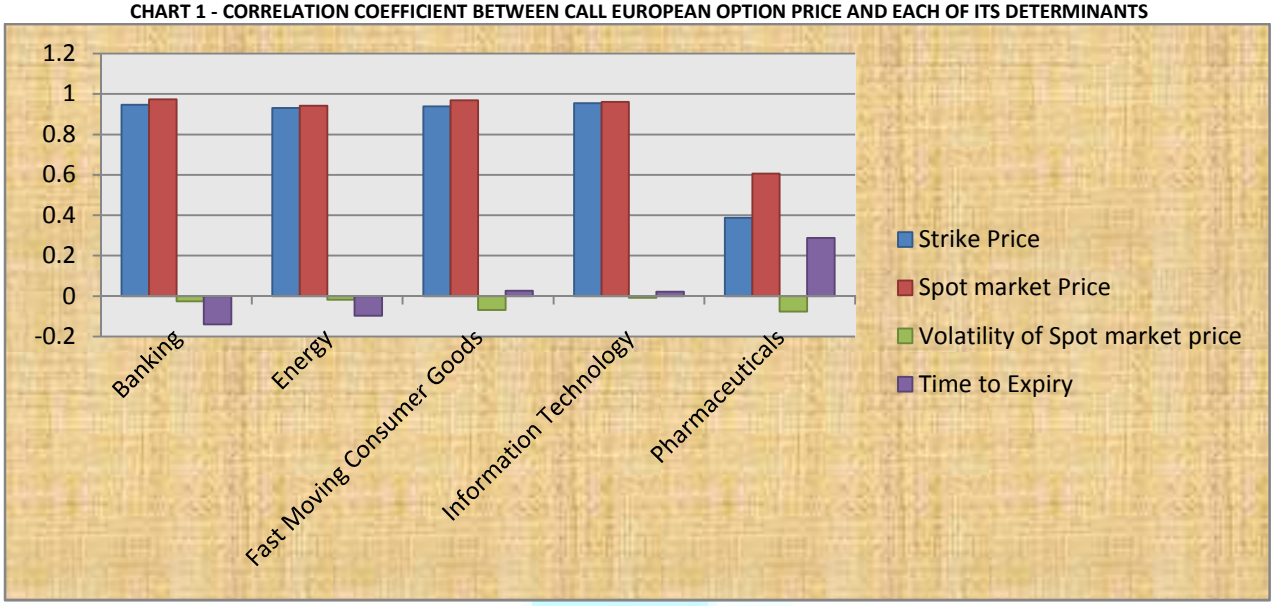
The relationship between call European option price on the one hand and the strike price, the spot price, volatility of the underlying asset and time to expiry of option on the other hand across the five industries, taken for study, separately has been analyzed and interpreted.

The Karl Pearson's Co-efficient of Correlation has been computed between the call European option prices and each of the determinants for all the five companies in each of the five industries taken for study. The findings may be summarized as below:

TABLE 2 – CORRELATION COEFFICIENT BETWEEN CALL EUROPEAN OPTION PRICE AND EACH OF ITS DETERMINANTS

Correlation Coefficient between Call European option price and…..	Banking	Energy	Fast Moving Consumer Goods	Information Technology	Pharmaceuticals
Strike Price	0.946	0.930	0.939	0.954	0.387
Spot market Price	0.973	0.942	0.968	0.961	0.606
Volatility of Spot market price	-0.026	-0.018	-0.069	-0.008	-0.077
Time to Expiry	-0.140	-.097	0.027	0.022	0.287

CHART 1 - CORRELATION COEFFICIENT BETWEEN CALL EUROPEAN OPTION PRICE AND EACH OF ITS DETERMINANTS



ANALYSIS

Karl Pearson's Coefficient of Correlation indicates the strength of relationship between two variables i.e. call European option price and each of the determinant as the case may be. A positive coefficient indicates the direct relationship, whereas a negative coefficient indicates the inverse relationship. From table-2, it is clear that *Spot Market Price* of the underlying stock of call European option wields the highest direct relationship with call European option price in all the five industries. However it is to be noted that the relationship is the strongest in case of Banking, Energy, FMCG and IT industries where the co-efficient stands over 0.94, implying that out of 100 instances, in more than 94 instances *Spot Market Price* and the call European option premium vary in the same direction with same magnitude. But, in case of Pharmaceuticals industries, the strength of relationship between call European option prices and spot price is relatively lower at 0.606, implying that the chances of variance of the two being same is 60.6 out of 100.

The influence of *Strike price* on the call European option price comes second with slightly lower correlation coefficient in the options having underlying stocks of the industries except those of Pharmaceuticals. However, the impact of strike price on call European option price in case of options having stocks of Pharmaceuticals industry is pretty less at just 0.387 denoting that in only 38.7 cases out of every 100 cases do the *Strike Price* and call European option prices vary with the same magnitude.

The *volatility of underlying stock prices* shares an inverse relationship with call European option prices in all the industries. However, its impact is negligible since the correlation coefficient is less than 0.1 in all the options of all the industries.

The *time to expiry*, like volatility of underlying stock prices do not wield significant influence in the cases of options of Banking, Energy, FMCG and IT industries. But in the case of options of Pharmaceuticals industry, it does wield some influence with correlation coefficient standing at 0.287, meaning that in only 28.7% of the cases do the *time to expiry* and call European option Price share common variance. Contrary to the popular perception of time to expiry sharing an inverse relationship with call European option prices, it is observed direct relationship, though insignificant, is found with respect to call European options of FMCG, IT and Pharmaceuticals industries.

In a nutshell, *Spot price and Strike Price* influence the premium of Call European options of all the industries except Pharmaceuticals. The influence of *time to expiry and volatility of stock prices* is rather less. In case of Pharmaceuticals industry options, the influence of Spot price is high but not as strong as in the cases of other industry options. The influence of *strike price* is well below that of other industry options. But, the influence of time to expiry is relatively higher.

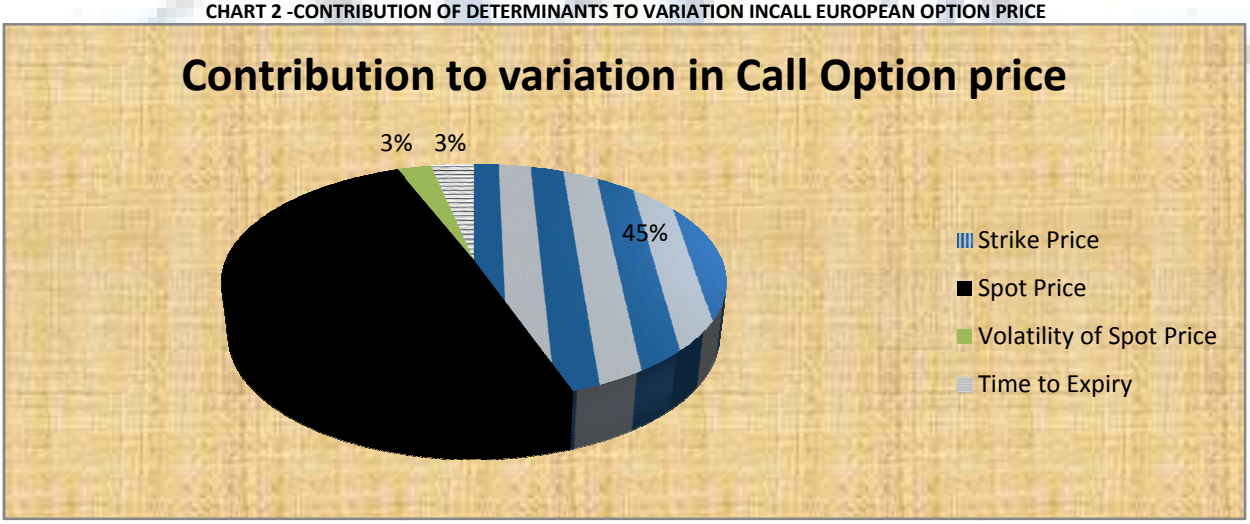
Analysis of the strength of relationship between call European option Price and each of the determinants for Indian Options market as a whole

The relationship between the call European option price on the one hand and each of the determinants separately on the other for the entire call European options market (as represented by all the five industries under study) has been analyzed and interpreted.

TABLE 3 - CORRELATION COEFFICIENT BETWEEN CALL EUROPEAN OPTION PRICE AND EACH OF DETERMINANTS FOR CALL EUROPEAN OPTIONS MARKET AS A WHOLE

Determinant	Correlation Coefficient
Strike Price	0.776
Spot Price	0.859
Volatility of spot price of underlying stock	-0.045
Time to expiry	0.057

CHART 2 -CONTRIBUTION OF DETERMINANTS TO VARIATION INCALL EUROPEAN OPTION PRICE



ANALYSIS

The Chart-2 shows the break-up of the influence of various factors on the call European option prices. Here only the strength of the relationship is considered, ignoring whether the relationship is positive or negative.

It can be deciphered from the above chart that the maximum contribution to the variation of the call European option prices is made by the *Strike Price,* followed by *Spot Price.* Both these factors jointly account for 94% of variation. So it becomes all the most clear that the holder of the call European option must take these two factors predominantly into consideration while ascertaining the likely call European option price that he must quote or be quoted.

In relation to the *Strike Price* and *Spot Price*, the volatility of spot price and time to expiry contributes minimally to the variations in the call European option prices. Jointly they account for just 6% of variation with each of the volatility of spot price and time to expiry contributing just 3%.

This analysis brings us close to one inference: *Only the visible factors wield power to bring about variation in the call European option prices while the invisible factors which indirectly influence the call European option prices cannot influence the call European option prices significantly.*

EMPIRICAL EXAMINATION OF THE VERACITY OF BLACK-SCHOLES MODEL

The call European option price under B&S model is given by,

$$C(S,t) = N(d_1)\, S - N(d_2)\, Ke^{-r(T-t)}$$

$$d_1 = \frac{\ln(\frac{S}{K}) + (r + \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}$$

$$d_2 = \frac{\ln(\frac{S}{K}) + (r - \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}} = d_1 - \sigma\sqrt{T-t}.$$

- $N(\cdot)$ is the cumulative distribution function of the standard normal distribution
- $T - t$ is the time to maturity
- S is the spot price of the underlying asset
- K is the strike price
- r is the risk free rate (annual rate, expressed in terms of continuous compounding)
- σ is the volatility of returns of the underlying asset

The call European options are valued as the difference between the current value of the money to be paid to purchase underlying stock in stock market and the discounted value of the exercise price to be paid to purchase stock on maturity. $N(d_1)\, S$ and $N(d_2)\, Ke^{-r(T-t)}$ represent the former and latter respectively. The underlying stock prices are assumed to follow the pattern of normal distribution.

As mentioned earlier, the call European option prices for 10-weeks have been considered. The data have been averaged on weekly basis. The Call European Option Prices have been calculated as per the above equation for 10 weeks. This B&S option price has been compared with the respective weekly average actual call European option premium. The call European option is considered *undervalued* if the latter is less than the former. On a reverse token, the call European option is considered *overvalued* if the latter is more than the former.

The extent to which the call European option has been *overvalued* or *undervalued* is computed by the percentage of instances of *overvaluation* or *undervaluation* respectively.

The computation of overvaluation/undervaluation of call European option prices of Tata Global Beverages Ltd options is produced as under:

The table-4 calculates the call value (B&S model) of Tata Global Beverages Ltd call European options for 10 weeks and compares the same with the respective weekly average of actual call European option premium. The *remark* row indicates overvaluation (O)/ undervaluation (U).

The same procedure has been followed to arrive at overvaluation/undervaluation of call European option prices of all the 25 companies taken for study. The paucity of space has made the production of all those tables here impossible.

TABLE 4 - OVERVALUATION/UNDERVALUATION OF CALL EUROPEAN OPTION PRICES OF TATA GLOBAL BEVERAGES LTD OPTIONS BY B&S MODEL

	TATA GLOBAL BEVERAGES LTD									
Inputs/Weeks	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Standard Deviation	**2.0735**	**1.0905**	**1.3711**	**0.5435**	**2.3942**	**1.934**	**6.7766**	**2.7008**	**0.7802**	**1.4707**
Maturity	0.192308	0.173077	0.153846	0.134615	0.115385	0.096154	0.076923	0.057692	0.038462	0.019231
Risk-free rate	0.084364	0.084364	0.084364	0.084364	0.084364	0.084364	0.084364	0.084364	0.084364	0.084364
Stock Price	**86.94759**	**88.89096**	**93.4365**	**93.41205**	**95.07771**	**94.425**	**109.5462**	**118.8209**	**120.6783**	**119.5119**
Exercise Price	**89.93976**	**89.75904**	**89.95**	**89.93976**	**89.81928**	**90**	**95.81522**	**102.3256**	**101.6162**	**99.49153**
Outputs										
d1	**0.435277**	**0.237601**	**0.363741**	**0.346618**	**0.488562**	**0.393413**	**1.014454**	**0.56225**	**1.221336**	**1.008894**
d2	**-0.47401**	**-0.21607**	**-0.17405**	**0.147208**	**-0.32471**	**-0.20629**	**-0.86504**	**-0.08646**	**1.068326**	**0.804944**
n(d1)	**0.668319**	**0.593905**	**0.641974**	**0.635561**	**0.687424**	**0.652993**	**0.844817**	**0.713027**	**0.889021**	**0.843487**
n(d2)	**0.317745**	**0.414465**	**0.430914**	**0.558516**	**0.372701**	**0.41828**	**0.193509**	**0.46555**	**0.857313**	**0.789574**
Call Value (B&S MODEL)	**-30.3836**	**52.62349**	**-28.8063**	**59.06062**	**-23.5905**	**61.4853**	**-2.64895**	**84.50688**	**5.998499**	**100.1843**
Actual Call Value	**8.944578**	**9.044578**	**8.853**	**8.889157**	**8.966265**	**9.263235**	**10.65543**	**11.23721**	**11.63182**	**11.50169**
VARIANCE	**-39.3282**	**43.57891**	**-37.6593**	**50.17147**	**-32.5567**	**52.22206**	**-13.3044**	**73.26967**	**-5.63332**	**88.68261**
REMARK	**U**	**O**	**U**	**O**	**U**	**O**	**U**	**O**	**U**	**O**

TABLE 5 - MASTER CONSOLIDATION OF UNDERVALUATION AND OVERVALUATION OF CALL EUROPEAN OPTIONS ACROSS INDUSTRY AND OPTIONS MARKET

	Banking	**Energy**	**FMCG**	**Information Technology**	**Pharmaceuticals**	**TOTAL**
Overvaluation	37	11	6	49	43	**146**
Undervaluation	13	39	44	1	7	**104**
TOTAL	**50**	**50**	**50**	**50**	**50**	**250**

CHART 3 - OVERVALUATION AND UNDERVALUATION OF CALL EUROPEAN OPTIONS ACROSS INDUSTRIES SEPARATELY

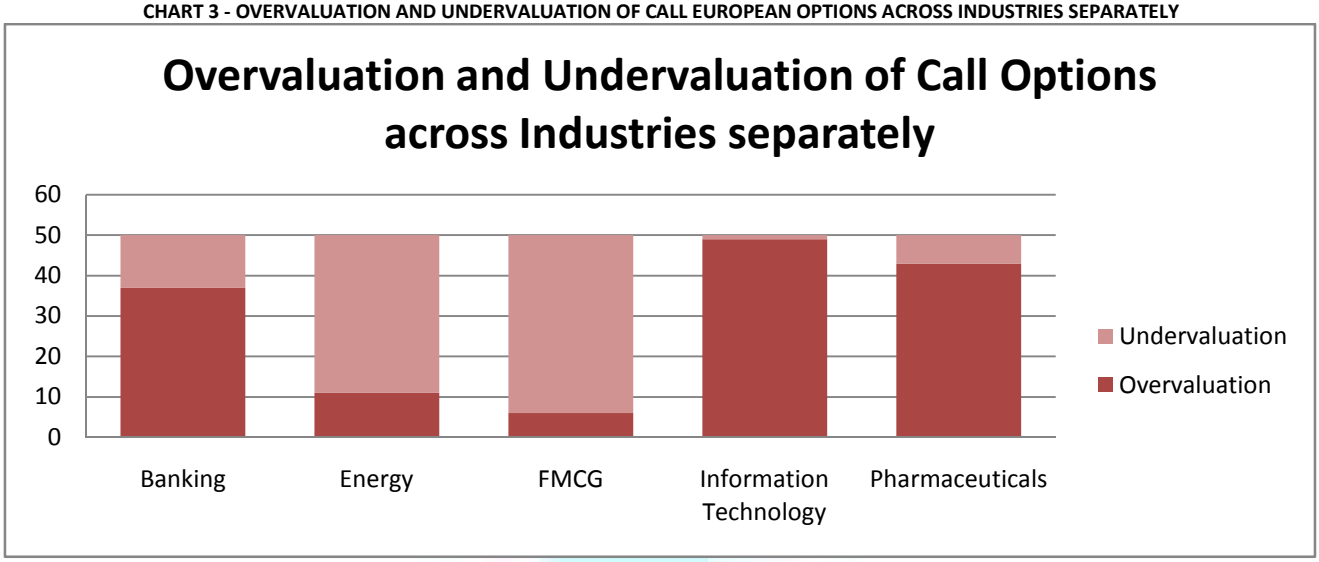
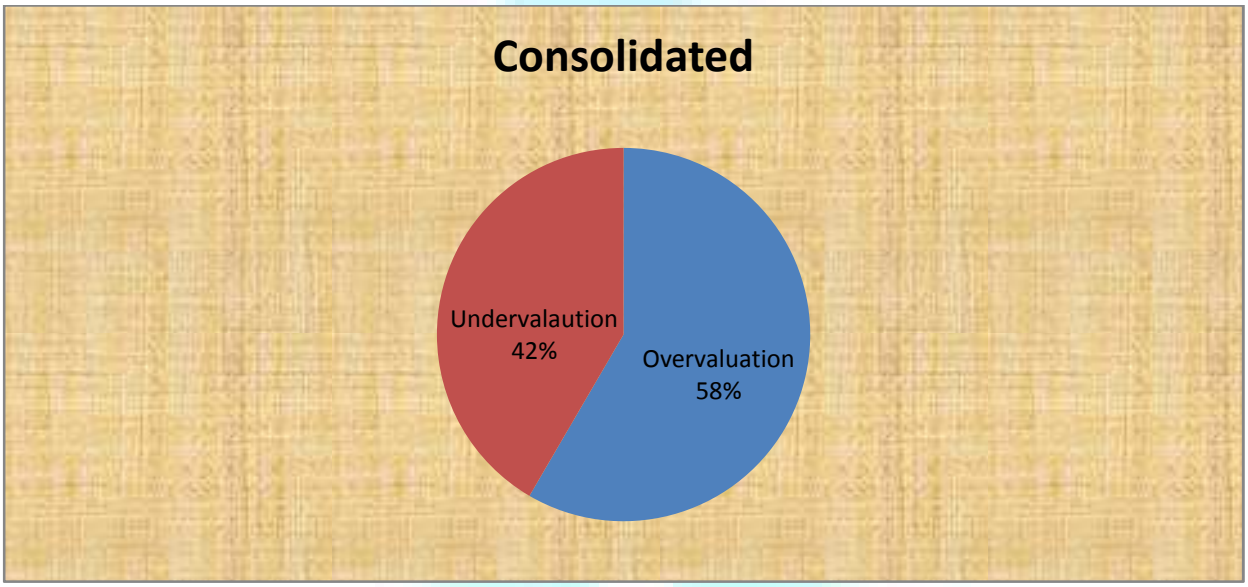


CHART 4 - CONSOLIDATED OVERVALUATION AND UNDERVALUATION OF CALL EUROPEAN OPTIONS



ANALYSIS AND INTERPRETATION

From the table-5 and Chart – 3&4, it can be observed that in 58% of cases the call European options are *overvalued.* And in the remaining 42% of cases, the call European options have been *undervalued.*

It can also be observed that the *overvaluation* is mostly with respect to call European options having the stocks of Information technology, Pharmaceuticals and Banking industry. It is to be noted with significance that Information technology call European options are *undervalued* only once.

With respect to *undervaluation,* the call European options having the stocks of Energy and FMCG industry as underlying stocks are mostly *undervalued.* In case of FMCG call European options, they have been *undervalued* in 88% of cases i.e. in 44 out of 50 cases.

It can be concluded that call European options of IT, Pharmaceuticals and Banking stocks are likely to be *overvalued* and the call European options of FMCG and Energy stocks are likely to be *undervalued* by Black-Scholes model.The reasons for *undervaluation* or *overvaluation* of stocks by Black-Scholes model can be summed up as below:

- The B&S model takes into account standard deviation of underlying stock as a measure of stock's volatility and prices the call European options of more volatile stocks high and vice versa. However, call European option holders may not be rational enough to measure the volatility of the stock and they price the call European options according to their whims and fancies.
- The B&S model assumes that the prices of underlying stocks resemble normal distribution. However, in reality this may not be true. The *Random-Walk theory* states that the stock prices do not follow any fixed pattern. So the call European option holders may not perceive the prospects from call European options as done by B&S mode.
- The B&S model assumes that the risk-free rate of return and payment of dividends are constant and do not have any implication on the pricing of call European options. However, both these factors will have their influence on call European option prices. The payment of dividend will lead to reduction in stock prices and thus, obviously, call European option holders intend to pay less for call European options with underlying stocks whose dividends are likely to be announced. B&S model does not take this into account.

Given the assumptions behind Black-Scholes model and the relevance of those assumptions in real world, it can be concluded from the above analysis, B&S model hardly helps in determining the call European option prices as being traded in options market. Nevertheless, B&S model has great academic utility. No other model is more scientific and efficacious in the determination of call European option prices as B&S model. Thus, its academic importance and relevance cannot be ruled out.

FINDINGS

Scrupulous analysis of subject-matter has yielded valuable insights. They can be meticulously summarized as below:

- The influence of top three determinants on prices of call European options of various industry options can be summarized as below:
-

	Banking	Energy	FMCG	Information Technology	Pharmaceuticals
Rank 1	Spot Price	Spot Price	Spot Price	Spot Price	Spot Price
Rank 2	Strike Price	Strike Price	Strike Price	Strike Price	Strike Price
Rank 3	Time to Expiry	Time to Expiry	Time to Expiry	Time to Expiry	Time to Expiry

- The determinants of call European option prices for the Indian Options market as a whole can be arranged in the descending order of the strength of their influence on option prices as: *Spot Price, Strike Price, Time to Expiry and Volatility of spot price of underlying stock prices.*
- The empirical examination of the veracity of B&S model has yielded rich insights which can be summarized as below:
  - The B&S model is likely to *overvalue* the call European options to the extent of 58%. The model is likely to *undervalue* the call European options to the extent of 42%.
  - It can also be observed that the *overvaluation* is mostly with respect to call European options having the stocks of Information technology, Pharmaceuticals and Banking industry as underlying assts.
  - The call European options having the stocks of Energy and FMCG industry as underlying assets are mostly *undervalued*.
  - No generalization can be made whether B&S model *undervalues* or *overvalues* the call European option prices since the difference between the extent of *overvaluation* and *undervaluation* is minimal (16%)

SUGGESTIONS

Any research work will lose significance if it fails to have any practical utility. The motive behind choosing this research topic is to equip call European option holders and prospective call European option holders with a few valuable tips necessary to make gainful investment.

- The quoting of premium in call European options need not be crudely decided upon. There is a scientific logic behind the determination of call European option premium. Investors are suggested to take stock of the factors – *spot price of underlying stock, strike price, time to expiration of call European options and volatility of underlying stock price (in order of priority as found in research)* – in quoting the premium.
- The call European option holders are advised to examine the performance of the stocks of their choice for about six months. They are advised to undertake *technical analysis* to forecast the future stock price and buy the call European options whose strike price is considerably less than the sum of forecast stock price and quote the premium.
- The investors are also advised to predominantly base their premium decision on *spot price of underlying stock and strike price*. The other two factors - *time to expiration of call European options* – do not wield much influence and can be conveniently ignored.
- The academic utility of *Black-Scholes Model* can hardly be overemphasized. But the research has established that it barely estimates the call European option premium exactly. So the call European option holders are advised not to base their investment decisions on B&S model.

CONCLUSION

To end, the prospective and present call European option holders should evaluate the influence of spot price and strike price before quoting the premium and should not depend on Black-Scholes model in deciding their premium.

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