Hedging The Portfolio Using Options Strategies

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Abstract—In this modern era, Option Trading emerges as the most flexible and convenient ways for Hedging the Portfolio. Trading in financial derivatives has become popular in India. In this scenario, the principles of different options are applied on historic data of various stock option segments to realize the meaningful knowledge. This paper will comprise of various option strategies for hedging purpose. All these strategies will be compiled using Python as the programming language along with NumPy and Matplotlib libraries. Trails are conducted to show the profitability of our strategies in real world. The motive of this research is to help the Retail Investors of the Share Market, as they are the individuals who are most prone to losses because they don’t take a hedge to their portfolio. So by using these strategies he can mitigate his risks and ensure safety of his funds.

Keywords—Hedging; Option Strategies; Call Option; Put Option; Nifty Options; Stock Market; Option Spread Trading

I. INTRODUCTION

Options are an important type of derivative that provides their owner with the right but not an obligation to a payoff determined by the future price of the underlying asset. But the real purpose is not just to take a speculative view on Stocks and Indices, rather the real purpose of Options is to help you mitigate and manage your risk more precisely. The main aim of Options is to provide the ability to precisely define the risk of your Portfolio and also work out your risk under different market scenario. The most worthwhile use of options is to use them as hedging against your assets. Insuring your Stock Investments is no different from insuring your car or mobile. But when it comes in context of investing, hedging can safeguard your assets.

The main aim of this work is to help Retail Investors who are subjected to the speculations in the share market, as they will use the Options Trading so their portfolio will ensure that their hard-earned invested fund stays safe amid various market scenarios. Playing with Options will also make an extra amount of money which can be reinvested in the stock market again. It’s better to be safe with your portfolio, so as to avoid unnecessary loss.

In this paper, we study the use of Hedging utilizing Options systems gauging the different philosophies. The rest of the paper is coordinated as follows. Section 2 presents the foundation information on Option Trading Terminologies. In Section 3, we exhibit the philosophy of this research. Section 4 is given to the Results of utilizing different option techniques that we will use for hedging. We sum up our decisions by providing the Conclusions in Section 5.

II. BACKGROUND KNOWLEDGE OF OPTIONS

This section contains the basic background concepts used in this paper. To recognize the concept, we will first be familiar with some keywords which are being used throughout this paper.

A. Option Terms and Concepts

- **Hedging:** [1] Hedging is referred to as purchasing a resource intended to decrease the danger of misfortunes from another resource. Supporting in money is a danger the executives system that manages diminishing and dispensing with the danger of vulnerabilities. It assists with confining misfortunes that may emerge because of obscure changes in the cost of the venture. It is a standard practice followed by speculators in the financial exchange to protect their ventures from misfortunes. Hedging through Options, it includes options of calls and puts of assets, which facilitate to secure your portfolio directly. In Hedged Positions Profit is limited, but loss is also limited which is the main motive.

- **Option:** Options are contracts that give the bearer the proper, but not the requirement, to either buy or sell an amount of some underlying asset at a pre-determined price at or before the contract expire. Options are powerful because they will enhance an individual’s portfolio. They are doing this through added income, protection, and even leverage. A well-liked example would be using options as an efficient hedge against a declining stock exchange to limit downside losses.

- **Call Option:** Option, which give purchaser an option to purchase the fundamental resource, are called Call Option. Call Options Contract is a purchaser of a call option has the option to purchase the basic resource at a specific cost.

- **Put Option:** Option which gives purchaser an option to sell the basic resource, is called Put Option.
Figure 3 depicts the size of the derivative market in India compared to rest of the world. We can clearly see that the derivative segment in India [2] has grown immensely over the years and most traded contracts happen in National Stock Exchange of India. Hence, we have chosen Future & Option segment for designing schemes for our work.

<table>
<thead>
<tr>
<th>Exchange</th>
<th>2019 volumes (billion contracts)</th>
</tr>
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<tbody>
<tr>
<td>NSE</td>
<td>5.96</td>
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<tr>
<td>CME Group</td>
<td>4.83</td>
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<tr>
<td>E3</td>
<td>3.88</td>
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<tr>
<td>Intercontinental Exchange</td>
<td>2.26</td>
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<tr>
<td>Eurex</td>
<td>1.95</td>
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<td>Source: Futures Industry Association</td>
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**B. Existing Systems**

The Kelly [3] standard is a strategy to find the ideal offering part for seeking after the maximal resource developing rate. Nevertheless, the Kelly standard may not be pertinent to reasonable situations because of the hole between its suspicions furthermore, the business sectors. The Kelly model accepts that the games can be rehashed limitlessly, which is illogical. Kelly basis may not be pertinent to genuine monetary instruments. This work gives an alternatives exchanging system which can apply the hypothetical streamlining for cash the board. In light of the statements, they compute the experimental benefit and misfortune dissemination, and use Kelly measure to get the ideal offering division on alternative portfolio. Subsequently, the exhibition of their strategy relies upon the assessed market conveyance what not the work about contributing techniques is to foresee the market circulation as opposed to contributing customary exchanging methodologies.

The options supporting is frequently acknowledged by reproducing the changes of alternative costs with the [4] delta-gamma Approximation. It is generally utilized by specialists because of its effortlessness also, its great exhibition for little changes of the basic resource cost. New choice supporting strategies that can beat the DGA in any event, for enormous charges of fundamental resource costs for different estimations of moneyness, strike. These techniques comprise first of determining the change of the hidden resource value utilizing the useful information examination and assessing the suggested unpredictability utilizing the Markov chain Monte Carlo. At that point, the alternative cost is anticipated utilizing the privately weighted relapse. The paper expressed that the two techniques can conquer the limitlessly utilized supporting instrument known as the delta gamma approximation in any event, for enormous estimations of the change of the hidden resource costs.

The utilization of [5] GARCH model in determining the option cost. Despite the fact that GARCH model is definitely not a well known option for alternative evaluating, it has been as often as possible utilized in monetary assessment as of late. A period arrangement is a bunch of information gathered over the long haul. To examine time arrangement information, it must be fixed. Something else, the insights worth will be non-standard appropriation, which can’t be utilized to contrast and the standard dissemination table. In the event that they contrast and the table, it might give critical qualities higher than the real world. The Black Scholes differential condition which is a condition that should be fulfilled by the cost of any subsidiary depending on a stock delivering no profit was inferred. As per the outcomes, on account of call option, GARCH what's more, Black-Scholes give very comparative gauging costs but they are totally different from the actual cost. Then again, in the put option case, Black-Scholes gives the better assessment. The outcomes from analysis are simply a contextual investigation so they couldn't demonstrate which model is better.

**III. METHODOLOGY**

Data mining and investigation is utilized in various business sectors to get the pretty good results. In our project, we chose to build up a framework on option segment in derivative market, which will investigate the previous memorable information and induced information from it by inducing different options strategies and recommending various procedures to the client [6]. The client has substitutes to select the procedures, which he feels is the most appropriate according him to acquire most extreme benefit from venture. The purpose behind choosing options segment is that, in Options we know our greatest disadvantage misfortune ahead of time and our potential gain benefit is hypothetically boundless. We have thought about the dangers which don't have impressive effect on the system as our position are hedged. Python’s ease in modeling capabilities makes it a superb tool for researchers, analysts, and traders. Python is straightforward to write down and deploy, making it
an ideal candidate for handling financial related applications that the majority of times are incredibly complex.

Constructing a trading methodology with Python is now possible. Stock markets generate very impressive amounts of knowledge that need tons of study and that is where Python helps also. Software Engineers can utilize it to make arrangements that distinguish the easiest trading systems and offer noteworthy, prescient logical experiences into the state of explicit business sectors. Once more, financial exchanges require tons of examination and Python can deal with it better than others. To create the software with such capabilities can be used not only Python but Django framework based on Python.

All the methodologies are applied to the information from 2015-2021. The approach with the best yield is endorsed to the end user. We have in like manner applied the endorsed frameworks to the long stretches of January, February of the year 2021 to validate if the option philosophies work suitably and we have came to sensational results.

A. System Architecture

The system architecture is a three tier architecture i.e. first segment is of User, second segment is of Data Rendering, third segment is of Option Data Engine [8]. User is supposed to fill the price of the stock with respect to the expiry of that options contract. The created procedures are shortlisted dependent on viability furthermore, stable returns. At long last, the shortlisted procedure is reenacted on late information for figuring result. In the event that the result is reliably certain, at that point the methodology is considered effective. This suggested system is shown as an output, which helps the client in settling on excellent choice. To do as such, it separates the crude information and inferred information of recent long periods of alternative fragment and spot Nifty from the data set and utilized for the handling. We saw that various procedures works amazing over the span of the month. It at that point analyzes the estimations of calls and puts of the equivalent strike cost and finds a point where most extreme contrast is found.

B. Different Options Strategies

- Call Option Buyer Strategy: It bodes well to be a purchaser of a call option when you anticipate that the basic cost should increment. In the event that the fundamental value stays level or goes down, at that point the purchaser of the call option loses cash. The cash the purchaser of the call option would lose is comparable to the exceptional (understanding charges) the purchaser pays to the seller of the call option. The maximum loss the purchaser of call option encounters is to the degree of the premium paid.

- Call Option Seller Strategy: The option seller chooses to sell a call option. The main highlight note here is – the option seller is selling a call option since he accepts that the cost of stock won't increment sooner rather than later. Hence he accepts that, selling the call option and gathering the premium is a decent methodology. At the point when you are bearish on a stock you can either sell the stock in the spot (although on an intraday premise), short futures, or short a call option. The computation of the intrinsic value for call option is standard; it doesn't change dependent on whether you are a option buyer or option seller.

Fig.4. System Architecture

Fig.5. Call Option Buyer Strategy Plotted by the system

The call option purchaser can possibly make limitless profits given the spot value moves higher than the strike cost. Despite the fact that the call option should make a profit when the spot value moves over the strike value, the call option purchaser first needs to recover the premium he has paid.

Fig.5. Call Option Buyer Strategy Plotted by the system

The call option purchaser can possibly make limitless profits given the spot value moves higher than the strike cost. Despite the fact that the call option should make a profit when the spot value moves over the strike value, the call option purchaser first needs to recover the premium he has paid.

Fig.6. Call Option Seller Strategy Plotted by the system

The call option seller can possibly make limitless profits given the stock value moves lower than the strike cost. Despite the fact that the call option seller may lose if the stock value moves over the strike value, the call option seller first needs to recover the premium he has paid.

Fig.7. Call Option Seller Strategy Plotted by the system
Fig. 6. Call Option Seller Strategy Plotted by the system

- **Put Option Buyer Strategy**: [7] A put option buyer purchases the option to offer the hidden to the put option seller at a Strike cost. This implies the put option seller, upon expiry, should purchase if the 'put option buyer' is selling him.

Fig. 7. Put Option Buyer Strategy Plotted by the system

The objective behind purchasing a put option is to profit by a falling cost. As should be obvious, the benefit increments as and when the value diminishes in the spot market. Buyers of Put Options are beneficial as and when the spot cost goes beneath the strike cost. The Put option buyer encountered a loss just when the spot cost goes over the strike cost. Nonetheless, this loss is restricted to the degree of the premium paid. The Put Option purchaser will encounter an outstanding profit as and when the spot cost exchanges beneath the strike cost, these gains can be possibly limitless.

- **Put Option Seller Strategy**: In the event that the Put option buyer is bearish about the market, at that point plainly the put option seller should have a bullish view on the business sectors. The choice to either purchase a consider choice or sell a put choice truly relies upon how appealing the premium are. At the hour of taking the choice, in the event that the put option is exchanging at a high excellent, at that point selling the put option (and consequently gathering the premium) bodes well. Sellers of the Put Options are productive as long as long as the spot value stays at or higher than the strike cost. As such sell a put option just when you are bullish about the fundamental asset.

Fig. 8. Put Option Seller Strategy Plotted by the system

- **Bull Call Spread Option Strategy**: A bull call spread procedure is worked by going long accessible if the need arises choice and all the while selling a higher strike call alternative.

Fig. 9. Bull Call Spread Strategy Plotted by the system
The point of this technique is to profit by little sure developments in the stock/index. Accordingly, this procedure is appropriate when your standpoint is modestly bullish on the basic security. The bull call spread system includes choices on a similar fundamental security, with a similar termination date, however with various strike costs. Accordingly, this technique is otherwise called a "Vertical Spread". We purchase 1 OTM Strike Call and Sell 1 OTM Strike Call.

- Option Strategy Defined by Hybrid Combination: We created this strategy by selling 1 Put option, selling 1 Call option and buying 1 Call option. Max. Profit expected while fundamental option lapses between the sold put and sold call of the spread. Loss: If credit is lesser than the width of the Call spread, and there is upwards move in that particular underlying security. This technique that we have made is used when the market remains range bound custom option system which is explicit in nature. This system is most advantageous while basic option stays or floats towards the strike that we have selected in the system.

The methodology which we have used in this research work has resulted into the following outcomes i.e. The Call Option Buyer strategy performs the best out of all the strategies that we have analyzed so far giving the profit returns of 89.51%. Also during this research, we designed our own hybrid strategy by combining two to three options strategies. And to our amaze our Hybrid Option Strategy is giving the profit returns of 64% which is quite acceptable as this strategy is combination of various strategies. Also, all the strategies are automated using python thereby reducing any human errors that can occur. Hence, the accuracy is increased drastically.

IV. RESULT

To scrutinize the viability of the techniques proposed by our framework, we tried it on the long stretches of January, February furthermore. The methodology recommended by our framework dealt with all the 2 months. The danger has been counterbalanced by the hedging options proposed to the client by the techniques created by the system and hence the client is consistently hedged which is our main motive, so the client doesn't make tremendous misfortunes on non trending days.

The different techniques plotted by the framework gave a mean ROI of 11%, which is considered very acceptable and furthermore there was least danger taken while plotting.

V. CONCLUSION

Option Trading Strategies are a major player across the stock market and will continue to dominate markets to replace human intensive tasks. Implementation of various strategies with the help of Python works well when the tasks are repetitive, frequent, human labor intense and can be expressed in crisp, unambiguous steps. This is proven by taking real world five Options Trading Strategies and one Option trading strategy created by us. The results in Chapter 4 are an indicator of the excellent gain the technology provides in terms of time saving and Profit rate thereby reducing the number of Losses incurred in trading. In this project, we have created the strategies that are providing hedged positions and substantially reducing the risks. So in this manner, we have mitigated the essence of gambling. By using this research work, one can gain significant exposure to the Option Segment and minimize the speculation risk. Once these strategies are tested rigorously for a longer duration, then these strategies can also be used for Currency Options Contract, Cryptocurrency Options Contract. So in this manner these strategies can be modified or upgraded further to take open interest, implied volatility, world market cues, and volume into examination. After all one should prefer to invest in slow compounders, focus should be on consistent returns. Option Hedging should be done against your portfolio as and
when stocks look weak as per your study, at that time hedging is needed. Irrespective whether you are a buyer or a seller in the stock market, only trading with Hedging saves you in any kind of adverse situations.

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