



## A Model for Calculating the Effectiveness of Writing and Hedging SBI Derivatives

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**Abstract:** Options in the stock market are a form of risk management that can help protect investors from various potential liabilities. Increased demand for derivatives is reflected in higher trading volumes every day. Over time, it has been easier for regular investors to get their hands on derivatives. The major Indian exchanges trade a wide range of financial goods, including stock derivatives. This article explains how to trade F&O on the National Stock Exchange (NSE) in India. To write options, the NSE typically employs call-and-put options. It may be able to design ways to achieve this goal by studying the State Bank of India (SBI) options chain for the first quarter of fiscal years 22 and 23. Based on the current stock price, the suggested computational approach writes call (CE) and put (PE) options for the upcoming month's settlement date. CE and PE were written at prices twenty rupees higher and lower than the stock options strike price, respectively. Furthermore, the pricing for both products has been reduced to zero rupees. According to our research, selling options to firms with minimal volatility is a good idea.

**Keywords:** ANOVA, Derivatives, Option-chain, Regression, Residual normality

### 1. Introduction

Studies in machine learning, data science, cyber security, and other related fields are becoming increasingly popular [1-3]. The study uses data science or a computational model to monitor performance for hedging and writing on the SBI derivatives option chain. A financial market, as opposed to a market, is an online platform where brokers assist consumers in buying and selling exchange rates, stocks, shares, and derivatives. On exchanges or over-the-counter, shareholders of publicly traded firms can be acquired. When the stock market rises, individuals are more likely to engage in equity trading [4]. Individuals with minimal financial resources can create a substantial income and live comfortably by investing a small quantity in low-risk portfolios. People can also make money through stock trading, which may be more lucrative than getting a high-paying job or starting a business. Nonetheless, stock market investments are susceptible to foreseeable and unanticipated risks. Politics, the economy, trends, the seasons, investor psychology, and other variables may all contribute to these dangers [5, 6]. Due to the difficulty of profit forecasting and the stock market volatility, those who dislike taking risks do not invest in capital market assets. When this occurs, it is essential to comprehend how the stock market functions. The purpose of stock market forecasts is to predict a stock's future value or another financial instrument [7]. If investors could adequately predict the future value of equities, they

could invest smartly and generate substantial profits. Finally, the significance of the study in that field was acknowledged, and it received the necessary attention to relieve investors' anxieties regarding stock market investment [8, 9]. Numerous experts from different fields have performed the study and made substantial contributions, despite the difficulty of predicting the stock market. However, few studies have been done to study and explain the relationship between the stock market and the option chain [10, 11]. Investors might choose between a call option and a put option depending on their demands. The first provides the investor with the right, but not the obligation, to acquire a set number of shares at a specified price. The second option gives the investor the right, but not the obligation, to sell shares at a specified price. The seller enters an option contract that allows the buyer the right, but not the obligation, to buy (in the case of a call option) or sell (in the case of a put option) a specific asset at a specified price in the future (the "Strike price" or "exercise price"). In exchange for allowing the buyer to choose, the buyer pays a "premium" to the seller. Exchange-traded options are offered on public markets with the same contract terms as regular options. It facilitates trading for numerous investors. They guarantee that the liquidator will pay, so minimizing the risk for the other party. Options are utilized for hedging, predicting the market's direction, arbitrage, and adopting strategies that enable investors to benefit under various market scenarios. As part of this

investigation, we will analyse the SBI option chain to discover how to attain our objective. Based on the results of our fundamental study, we want to write a call option (CE) and a put option (P) as a hedge or strategy trade if the underlying price rises by 20 rupees at the future settlement date. It is how we feel (PE). It was also determined that both prices converged at the same point, which was zero. Based on our data, we may determine that selling options to companies with minimal volatility are optimum. The experiment gathers data from three consecutive months and applies an ANOVA, a regression, and a profit-and-loss statement [12]. The data may be edited manually or with any other application for the next three months. Nevertheless, we employ machine learning to increase our research's accuracy and manage additional stocks and historical data [13]. The following data will be utilized to guide the study's next steps: The second section describes what a Systematic Review is and how it operates. In Section 3, the literature review will be discussed. The methodology is discussed in Section 4, while Section 5 discusses the analysis of the results. Section 6 ends with recommendations for the future.

## 2. Literature Review

The focus of the study was on the laws individuals are required to follow to prevent derivatives abuse. Many analysts consider the exponential growth and introduction of financial derivatives to be the most significant change in finance over the past few decades. According to some researchers, a derivative, a revolutionary financial instrument, was developed to protect against past threats [14-16]. It is because the history of financial markets is replete with catastrophes. Using the CNX 100 as a case study, several experts evaluated the effect of futures trading on the productivity and volatility of the Indian stock market [17]. According to the data, futures trading had a minimal effect on the market's functionality. Numerous Indian academics compared equity, commodity, and currency derivatives. They also compared trading on the cash market to trading on the futures market. Researchers also examined the profitability and cost of trading futures contracts on several Indian commodity futures marketplaces. They determined that the futures market for all five commodities is functional. Real-world equity futures on the NSE were compared to discover if there were any discrepancies [18]. They accomplished this by researching the history of derivative trading, the evolution of laws and regulations, the development and evolution of derivative products, and the potential and challenges of India's derivative market. The increasing price volatility of financial assets, the development of more complex tools, the increasing integration of national financial markets with global financial markets, new developments in financial engineering, and the fact that economic agents must access more ways to reduce risk all influence the global and Indian growth of financial

derivatives. Academics endorse derivatives, the most remarkable financial innovation, just partially. This article should describe the history of derivatives and the derivatives market's most significant financial effects. Additionally, there are steps for determining the advantages and disadvantages of derivatives. Some academics have also recommended an introduction to equity derivatives and an introduction to derivatives. This study focuses on all equity derivatives traded on stock exchanges [19]. The author describes the evolution of the stock derivatives market over time. In addition, the benefits of taxation, the structure of the equity derivatives market, and how to trade stocks are discussed. In their scholarly writings, derivatives are hardly discussed. From July 1959 through December 2004, Facts and Myths About Commodity Futures compiled an index of the monthly returns of commodity futures. Each response was given an identical weighting [20]. It examined commodity futures and how they operate as a class of assets. According to the data, returns and Sharpe ratios for fully collateralized commodities futures have been equivalent to those of stocks. In contrast, commodity futures risk premiums are comparable to stock risk premiums [21]. The returns on futures contracts for commodities differ from those on stocks and bonds. The analysis also demonstrates that the fundamental cause for the negative correlation between commodity futures and other asset classes is the key difference between how commodity futures and other asset classes behave during the business cycle. In addition, commodity futures exhibit a positive correlation with inflation, changes in anticipated inflation, and unexpected inflation [22]. Because the history of financial markets is riddled with disasters, derivatives, a novel financial instrument, were allegedly developed to protect against past dangers. Events such as Black Monday in October 1987, the US bond crisis in 1994, the breakdown of the fixed exchange rate regime in 1971, and the Nikkei's shocking loss in 1989 have occurred because financial markets are volatile and complex to predict [23, 24]. Due to these types of catastrophes, global economies have become more interdependent. Since derivatives were created to hedge against fluctuations in commodity prices and commodity-linked derivatives were the only ones available for a while, some analysts feel they have changed their perspectives [25]. Trading regulations are a crucial aspect of how derivative markets function.

## 3. Methodology

This project's primary objective is to accurately estimate performance measurement for hedging and writing on the SBI derivatives option chain. The first three months of fiscal year 22-23 are now included in the data collection process. Since the suggested technique utilized the most recent trade price, the NSE data was filtered to obtain the precise data necessary for the next step. It was done to collect the essential data for the next

phase. The information was then applied. Before getting started, the study must examine the SBIN strike price. It is essential to identify the most effective line of action. The company in question is SBI on June 30, 2022. All transactions must be completed by the last Thursday of each month; otherwise, late fees will be assessed. In this scenario, the key focus will be April, May, and June of fiscal year 22-23 (April, May, and June 2022). Following the last day of each of these three months will be the first day of the subsequent month. Find the suitable underlying option chain, CE, and PE by adding twenty Indian currencies to the stock's current price to determine the proper underlying option chain, CE, and PE. It allows the study to decide which underlying option chain to utilize. Previously, the price of the shares was determined, but it will now be recalculated using twenty distinct Indian currencies. The pricing was changed to be more comparable to the recently sold. Examine the offered strike price for the call option. The call strike price is the price that meets the conditions most closely. Twenty Indian rupees will be subtracted from the current price to identify which put option corresponds to the strike price. So that a decision may be made, this will be accomplished. It provides the closest put strike price that meets the study's conditions, which is helpful. Each dataset consists of six cases: case 1, case 2, case 3, case 4, case 5, and case 6. If example 1 represents 530 CE, then example 2 represents 490 PE, example 3 represents 510 CE, example 4 represents 470 PE, example 5 represents 490 CE, and example 6 represents 450 PE. The investigation will be suspended until the final transaction of the month is completed. It is necessary to enter the CE and PE values into the linear regression model. Before computing the monthly total price, the study must wait until the final transaction of the month has been processed. It is essential for the validity of the study. The investigation extensively used the analysis of variance (ANOVA) model, the regression model, and the profit and loss model. An analysis of variance, often known as an ANOVA, is necessary to evaluate the degree of dissimilarity between specific statistical data. Regression can also be viewed as a statistical technique that seeks to establish a relationship between a dependent variable and one or more independent variables. The goal of the regression is to identify this connection. Figure 1 depicts the process using a flowchart. It can also be accomplished through a multitude of unique, unconnected parameters. Equations of ANOVA and regression are:

Equations of ANOVA,

$$F_p = \frac{T_R}{T_A} \tag{1}$$

$$F_p = \frac{\sum_{q=1}^r \sum_{a=1}^s (\bar{m}_q - m_q)^2}{f_n} \tag{2}$$

$$F_p = \frac{\sum_{q=1}^r \sum_{a=1}^s (\bar{m}_q - m_q)^2}{c - 1} \tag{3}$$

Where,  $F_p$  Is Anova Coefficient,  
 $T_R$  Is the mean sum of all the squares for treatment and  
 $T_A$  Is the mean sum of all the squares for error  
 $m_q$  mid data point  
 $\bar{m}_q$  is the mean of data points  
 $f_n$  Is the degree of freedom of data points within a range

$$B_a = f(T_a, \alpha) + \beta_a \tag{4}$$

$T_a$  independent Variable

$\alpha$  unknown parameter

$\beta_a$  error term

Linear regression equation,

$$Q = p_0 + p_1A + \vartheta \tag{5}$$

Where,  $Q$  is a dependent Variable (Target Variable)

$A$  is an independent Variable (predictor Variable)

$p_0$  is the intercept of the line (Which gives an additional degree of freedom)

$p_1$  implies linear regression coefficient (scale factor to each input value).

$\vartheta$  Is random error

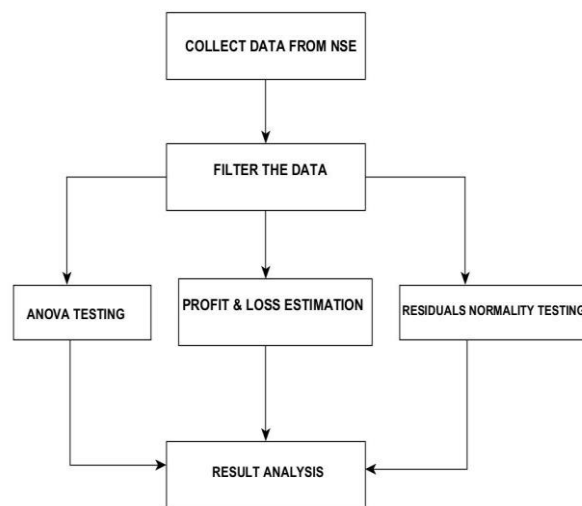


Figure 1. Methodology diagram

### 4. Results and Discussion

Three distinct computational portions are inside the section discussing the results or findings. The analysis commences with a discussion of the analysis of variance (ANOVA), continues with a discussion of Profit and loss, and closes with a discussion of residual normality.

4.1 ANOVA

The findings of the analysis of variance (ANOVA) for all six examples are shown in Table xxx. In the analysis of variance, The F-value in an analysis of variance (ANOVA) is the larger of the sample means' difference or the sample variance. A bigger F-value in an ANOVA implies that the difference between sample means is more significant than between samples. When the F-value is larger, the corresponding p-value is smaller. Suppose the p-value is less than a predetermined threshold. In that case, we can conclude that the difference between group means is statistically significant (for example, if it is less than.05). This indicates that the null hypothesis of the ANOVA can be rejected. Table 1 reveals that the p-value for every plausible scenario is less than 0.05, indicating that the null hypothesis must be rejected with absolute certainty. This study component examines the null hypothesis, which asserts that the policy is unsuccessful. Consequently, the results of the ANOVA test support the alternative hypothesis that both hedging and writing on the SBI derivatives option chain result in a profit.

Table 1. ANOVA result of 6 different cases

CASE	Source	DF	F Statistic	P-value
1	Regression	1	15.9888	0.001
	Residual	16		
	Total	17		
2	Regression	1	0.1285	0.7247
	Residual	16		
	Total	17		
3	Regression	1	44.0499	0.0001
	Residual	17		
	Total	18		
4	Regression	1	29.9407	0.0001
	Residual	17		
	Total	18		
5	Regression	1	22.9119	0.0007
	Residual	23		
	Total	24		
6	Regression	1	21.5766	0.0001
	Residual	23		
	Total	24		

Table 2. Profit & Loss statement

Debit		Credit	
To Loss on	Nil	By Profit on 530CE	12750
		By Profit on 490PE	12525
		By Profit on 510CE	18975
		By Profit on 470PE	11925
		By Profit on 490CE	13050
		By Profit on 450PE	12525
Net Loss		Net Profit	81750
Total			81750

4.2 Profit and loss Statement

Call and put option writing is either unprofitable or must be reported as a profit. According to the data, the April call option had an opening price of 8.55 on April 1, 2022, and a closing price of 0.05 on April 28, 2022. On April 1, the put option for the same month had an initial price of Rs. 8.4 and a closing price of Rs. Consequently, the same investor who purchased a put option will receive Rs. 12525 in profit Study must multiply by 1500 in each situation because the lot size of SBI is 1500. Aside from that, we should be able to earn revenue if we use April-June prices as a baseline. The price of the May call option began at 12.7 on April 29, 2022, and ended at 0.05 on May 26, 2022. On April 29, the put option for the same month had a beginning price of 8.3 rupees and a closing price of 0.35 rupees. Therefore, the put option will yield a profit of Rs 1,8840. In addition, the call option for June had an opening price of 8.75 on May 27, 2022, and a closing price of 0.05 on June 30, 2022. On April 27, the put option for the same month opened at Rs. 8.4 and closed on June 30 at Rs. 0.05. Consequently, the same investor who purchased a put option will earn Rs. 1,350. Therefore, the total Profit for the first quarter of the 22-23 fiscal year is Rs. 81,750. The Profit or Loss Account for the first quarter of fiscal year 22-23 is presented in **Error! Reference source not found.**

4.3 Residual Normality:

The correlation between opening and closing ranks in students' Open Category (Unreserved or General Category) shows strong correspondence as measured by Pearson's product-moment metric (p). Table 1 shows the correlation between the opening and closing of six different cases. Figure 2, **Error! Reference source not found.**, and Figure 3 show the Residual histogram, Residual QQ plot, and Regression Line of all cases, respectively.

$$\hat{Y} = -201.8255 + 0.4066X \tag{6}$$

$$\hat{Y} = -12.1617 + 0.03209X \tag{7}$$

$$\hat{Y} = -99.0697 + 0.218X \tag{8}$$

$$\hat{Y} = 234.6351 - 0.4662X \tag{9}$$

$$\hat{Y} = -90.6451 + 0.2047X \tag{10}$$

$$\hat{Y} = 145.8652 - 0.3015X \tag{11}$$

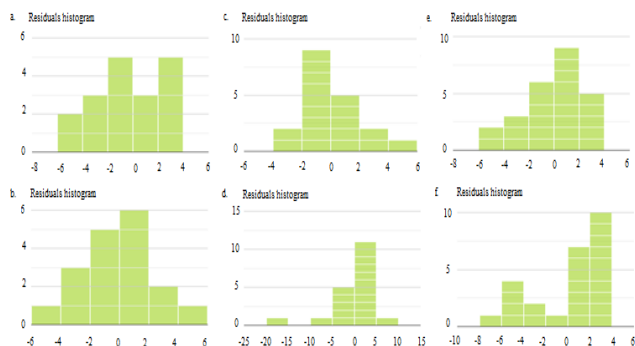


Figure 2. Residual histogram

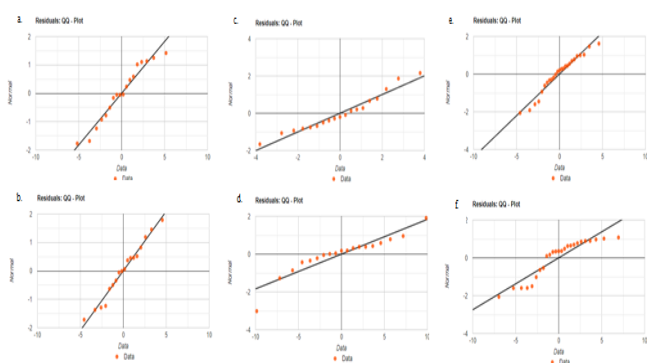


Figure 3. Residual QQ plot

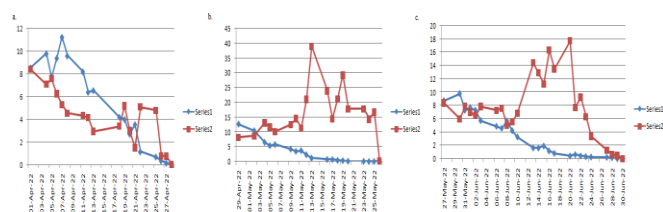


Figure 3. Regression Line a. CE & PE of April 22 b. CE & PE of May,22 c. CE & PE of June, 22

### 5. Conclusion

Considering how well the SBI derivatives option chain performed in terms of hedging and writing during the first quarter of F&O transactions in fiscal year 22-23, the current strategy might result in a profit of Rs. 81,750. The F&O transaction occurred during the first three months of the 22-23 fiscal year. It is explained in the phrase immediately preceding this one. Therefore, the study's data could support this view. What precipitated what? The transaction with F&O was finalized at the beginning of the first quarter of fiscal year 22-23. This aspect of the scenario was essential to our reaching this verdict. The fact that the transaction occurred in F&O was a necessary component of the case and aided the

claim significantly (in Indian currency). Even if each month concludes with a profit, there is still a chance that the study will incur a loss on any given day. It occurs when the strike price exceeds the underlying asset's worth when the option expires. If the survey intends to retain a certain level of financial stability, the study should examine the concept of "stop-loss." Traders needed a method to safeguard their funds. Thus, they developed the notion of "stop losses." The stop loss was implemented to prevent traders from losing more money than necessary in the event of a loss. It is expected that an advanced machine learning model and natural language processing (NLP) will be required to study the stop loss size. NLP has made accessing information from real-time news sources more convenient. It was previously inconceivable. People can now continue their education after graduating from high school. The belief that the publicly traded corporation will achieve financial success in the future is not illogical. The results of this investigation suggest that this perspective is accurate. Nonetheless, there is no promise that the company will enjoy the same level of success in the future. The company will likely be successful based on the current situation, but this cannot be guaranteed. Given that the corporation is the present market leader, it is reasonable to assume this.

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**Conflict of interest**

The Authors has no conflicts of interest to declare that they are relevant to the content of this article.

**Does this article screened for similarity?**

Yes

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