European Science Review 2025,
No 9–10
ISSN 2310-5577

PREMIER Publishing
ppublishing.org

DOI:10.29013/ESR-25-9.10-17-36

MEDIUM-TERM OPTION STRATEGY SIMULATION AND EVALUATION IN THE VOLATILITY MARKET: THE POST-PANDEMIC ERA

Vishal Kumar [1]***, Dhruv Chaudhary*** [1]***, Xu Yaoyao*** [1]

[1] National Research University – Higher School of Economics, Saint Petersburg

Cite: *Vishal Kumar, Dhruv Chaudhary, Xu Yaoyao. (2025). Medium-term option strategy simulation and evaluation in the volatility market: The Post-Pandemic Era. European Science Review 2025, No 9–10.* https://doi.org/10.29013/ESR-25-9.10-17-36

Abstract

This investigation examines the performance and risk-adjusted efficiency of five medium-term option trading strategies, such as Covered Call, Protective Put, Straddle, Iron Condor, and Strangle, on three high-volatility stocks: AMD, NVIDIA, and Tesla, from the time period 2021 till 2024. In the investigation of profitability, volatility, and consistency under a multitude of market situations, including post-pandemic volatility and volatility regime shifts, the study simulates 90-day holding strategies with rolling 30-day periods using the Black-Scholes-Merton model. However, in the result, the iron condor performed better than all the investigated strategies at all times. In the overall conclusion, the findings provide practical suggestions for institutional investors and investment professionals looking for the most advantageous risk-return trade-offs, highlighting the Iron Condor's resilience as the most balanced and risk-efficient trading strategy for medium-term trading in volatile markets.

Keywords: *Option Trading, Volatile Market, Trading Strategies, Simulation*

1. Introduction

Since the global financial market has grown exceptionally volatile in recent decades, investors have become increasingly interested regarding utilizing derivatives as tools rather than solely focusing on the stocks and bonds for risk management and speculation. The volatility of the global financial market has become one of its defining distinctive characteristics, especially in the post-COVID period, which was followed by geopolitical tensions and trade/tariff wars among the main economies, including the United States, China, India, and the European Union. Although option trading has been around since centuries ago and used in different market, it emerged in popularity in the global financial market after the establishment of Chicago Board Options Exchange (CBOE) (Smith Jr. C. W., 1976). Option has been defined by several researchers but most acceptable definition has been given by Black & Scholes, (1973), and defined as

"Financial derivative contract that grants the buyer the right but not the obligation, to buy or sell an underlying asset at predefined price (strike price) on or before the predefined date."

However, researchers also outlined certain difference between the American options and European Options based on the right to sell the option on specified dates. Although, options are one of the most complicated derivatives of the financial market. Options derives their values from different keys factors which includes assets' price, time period of contract, risk free interest rate, volatility and dividend yields (Black & Scholes, 1973; Merton R. C., 1976). The duration of the contract can be used to categorize option trading; in recent years, professionals and researchers have conducted in-depth research on short-term option trading.

Nevertheless, medium-term option trading strategies have not been well investigated; for this reason, this study paper focuses on medium-term option strategies, which usually last between thirty and one hundred sixty days. This research study contributes to understanding the behavior and correlation of equity medium-term options strategies with the volatility of the market. Considering medium term option trading strategies gives a balanced approach between the rapid growth of short-term trading and the patience needed for long-term investing, medium-term option strategies appeal to traders with a risk appetite and patience. These strategies are appropriate for traders those intend to profit from fluctuations in the market without taking on excessive risk or time commitment because they offer flexibility, cost effectiveness, and less stress. Option trading strategies are of greater interest to institutional investors, asset managers, and hedge funds who must balance the trade-offs of time decay, volatility, and transaction cost (Bollen, & Whaley, 2004). Their performance is quite susceptible to market fluctuations, though, which makes them an important subject to research, particularly during erratic market times.

In the previous literature, researchers provided valuable insights into the pricing and performance of various option strategies. However, there remains a gap in comprehensive empirical analyses of multiple medium-term option strategies under the Black-Scholes framework, particularly in volatile market conditions. This study addresses that gap by simulating the performance of covered call, protective put, straddle, iron condor, and butterfly spread strategies using historical data and Black-Scholes pricing. The analysis is conducted across different assets and benchmarked against VIX indices, offering a practical and robust evaluation of strategy effectiveness in medium-term, volatile market contexts. In this paper, we explore how medium-term options strategies behave in a volatile market. By testing different strategies on real historical data and evaluating their outcomes, we aim to find which approaches are more effective and under what conditions they provide the most effective outcomes.

2. Theoretical Background

In the changing landscape of the financial market, investors and institution are looking for the versatile financial instruments of the risk management. Option is such instruments that reduce the risk of the direct exposure to underlying assets but get influenced by the market volatility, which multiplies the opportunities but mutually impose higher risk. If we analyzed the trend in the option trading, during the covid pandemic sharp upward trends has been observed peaking at 48% in the July, 2022 (NYSE), moreover, similar pattern has been observed in the consecutive years. However, in the 2025, markets face recurring structural volatility driven by geopolitical tension, tariff wars, supply chain disruption and so forth, which drives uncertain risk but come up along with the opportunities. Thus, analysis and modeling of the medium-term option trading become more crucial in the current time, which helps the investors and investing institution in the maximization of the investment's outcomes. The foundation of options analysis lies upon pricing models which helps in determining the theoretical and statistical value of the options. There have been several models used by the researchers in the literature. In this section we will discuss the Black Scholes Model introduced by Fischer Black, Myron Scholes (1973).

Black Scholes Model also known as Black-Scholes-Merton Model developed by Fischer Black, Myron Scholes (1973), primarily used to calculate the theoretical price of European-style options and further for the other financial derivatives, but later expanded by Robert Merton. It provides a formula to determine the fair price of an option based on various factors like the underlying asset price, strike price, time to expiration, interest rates, and volatility (Coelen, N. 2002). Moreover, Robert C. Merton irrespective contributed no-arbitrage rules and continuous-time finance to the mathematical rigor which helps in the minimization of the risk (Janková, Z. 2018). A crucial assumption in the Black-Scholes model's derivation was the absence of arbitrage. This model is predicated on frictionless markets, lognormal asset prices, and constant volatility. Despite criticism for its oversimplifying assumptions, the Black-Scholes model is still an efficient instrument in both academic and industrial settings, especially for strategy, simulation and benchmarking. However, this model also has certain drawback as the differential equation that simulates the pricing process of the underlying asset of a particular option serves as the foundation for the Black-Scholes model. When compared to actual market data, it is immediately evident that the simplifying features suggested by these assumptions such as a continuous process or normal distribution frequently fail inadequate to compare (Embrechts et al., 1999).

2.1 Review on Option Strategies

Options strategies engage with call and put options to achieve certain investing objectives, such as generating income and profit, speculating on fluctuations in the markets, and hedging risk. As stated by previous research, several scholars have examined the performance of various choice strategies under diverse market circumstances (Shalini & Duraipandian, 2014; Guo & Loeper, 2020; Kawadkar & Kadu, 2022; Shivaprasad et al. 2022). Table 1 lists some of the most popular tactics employed by different investors with varying degrees of expertise, along with a definition. Evaluating the performance, theoretical foundations, and empirical efficiency of the various options strategies is crucial for researchers and investors.

Table 1. *Definitions of the major common option strategies*

Option trading Strategies	Definition	Reference
Covered Call	Investors to create premium income and lower cost basis, buy the underlying stock and sell a call option against it. This strategy is appropriate for neutral to slightly positive viewpoints with capped upside. It is described as providing equity like return with lower volatility.	Diaz & Kwon, 2017; Israelov, et al. 2017
Married Put (Protective Put)	To protect against downside risk, buy shares and a put option; losses are limited to the premium cost and rewards are calculated as stock gains less the premium.	Bates, D. S. 2000
Bull Call Spread	It is a vertical options strategy that involves buying a call option with a lower strike price and selling a call option with a higher strike price at the same time. Both options have the same expiration date and resulting in a net debit.	Bakshi et al. 1997; Heinemann, A., 2008
Bear Put Spread	It is a vertical options strategy where a put option with a higher strike price is bought and a put option with a lower price for the strike is traded at the same time. Both options have the same expiration date and result in a net debit.	Figlewski, S. 1989; Slivka et al., 2020
Protective Collar	It is strategies that investor has to offset expenses, sell an out-of-the-money (OTM) call, hold the underlying stock, and purchase an OTM put for protection. It limits downside risk and locks in possible profits by creating a range-bound position.	Merton, R. C. 1971; Santa-Clara, & Saretto, 2009

Option trading Strategies	Definition	Reference
Long Straddle	It is type of a non-directional options strategy in which two options are concurrently acquired on the precise same underlying asset, with a single expiration date and strike price (usually at-the-money, or ATM).	Cheffa, & Shamsa, 2022; Rustamov et al. 2024
Long Strangle	An out-of-the-money (OTM) call and an OTM put option on the same underlying asset are simultaneously purchased using the long strangle non-directional options strategy. The options have the same expiration date but different strike prices.	Nawalkha, & Chambers, 1995; Hebert, A., 2018
Long Call Butterfly Spread	It is a neutral strategy in option trading where one ITM call option is purchased, two ATM call options are sold, and the one OTM call option is purchased. All the options have the same expiration date and are equal distance apart in price.	Black, & Scholes,1973; Bakshi, et al., 1997; Hebert, A. 2018
Iron Condor	It is a neutral options strategy that involves selling an OTM (out of the money) put spread and an OTM call spread on the same underlying asset with the same expiration date.	Figlewski, S. (1989); Hebert, A. (2018); Kownatzki, & Sabouni,(2019).
Iron Butterfly	It is a neutral options strategy that involves selling an ATM straddle, which consists of an ATM call and an ATM put with the same strike price, as well as an ONM call and an OTM put for protection, all of which have the same expiration.	Figlewski, S. (1989); Hebert, A. 2018

A substantial number of options strategy research has focused on daily or short-term option strategies. The scientific research on options based on a medium-term time frame is far less extensive. Institutional investors frequently select options with monthly or quarterly expiration dates because they offer the best combination of reduced costs, improved liquidity, and flexibility to respond to changing market conditions. By avoiding the rapid fluctuations in prices (gamma risk) of less-than-weekly options, an institutional investor can employ medium-term options to predict overall market movement.

In conclusion, the literature highlights concern within the absence of thorough empirical research on a number of medium-term option strategy structures under the Black-Scholes price framework in volatile markets. The research question "*Which medium term options trading strategy performed the best in the medium-term volatile market?*" was naturally prompted by discussion.

3. Methodology

3.1 Data Collection

We construct our dataset from historical daily closing prices for five different assets for NVIDIA (NVDA), AMD, and Tesla (TSLA) volatility index. The data spans from January 1, 2021 to December 31, 2024, covering a period with noticeable market volatility. The data was gathered for both the pandemic and the post-pandemic recovery periods. The majority of businesses underperformed and saw unfavorable fluctuations during the pandemic. Stock data was collected from reliable financial sources such as Yahoo Finance and http://investing.com/, and all data was cleaned to remove missing or inconsistent values. To analyses strategy performance, we also calculated rolling historical volatility using a 30-day window and used it as an input for option pricing.

3.2 Historical Volatility, Log Returns and Annualized Volatility Analysis

To evaluate the behaviour of the underlying assets, it is essential to analyse their logarithmic returns and historical volatility over time. These measures help quantify both the direction and the magnitude of asset price movements, which are critical inputs for options pricing and strategy simulations.

- **Log returns** (or continuously compounded returns) are preferred in financial modelling due to their time-additive property and their ability to handle large variations in asset prices;
- **Historical volatility** measures the dispersion of returns over a specific period (e.g., 30 days), offering a backward-looking estimate of how volatile the asset has been;
- **Annualized volatility** is a standardized measure of the dispersion of returns, scaled to a yearly horizon. While historical (or realized) volatility is typically computed over a short-term rolling window (e.g., 30 days), annualizing this measure allows for easier comparison across assets and strategies, regardless of the time frame used for analysis.

The daily log returns were computed as:

$$Log\ \mathrm{Re}turn_t = \ln\left(\frac{P_t}{P_t - 1}\right)$$

where P_t is the closing price on day t. Visual inspection of the time series of log returns reveals:

- Frequent short-term fluctuations with occasional extreme spikes (both positive and negative);
- Clustering behaviour – periods of high volatility tend to be followed by similar periods;
- No clear upward or downward trend, indicating returns are centred around a mean close to zero.

To analyse short-term market risk, we computed the 30-day rolling historical volatility, defined as:

$$\sigma = std(\log\ returns) \times \sqrt{252}$$

Annualized volatility expresses how much an asset's price is expected to fluctuate over a year, based on its recent short-term return behaviour.

$$\sigma_{annual} = \sigma_t \times \sqrt{T}$$

Where:

- σ_t = Rolling standard deviation of daily log returns;
- T = Number of trading periods in a year (252 for daily data).

3.2.1 Lack Scholes Option Pricing Model

The **Black-Scholes Model (BSM)**, developed by Black, Scholes, and Merton, provides a closed-form method for pricing European options. In this study, BSM is applied to strategies like Covered Call, Protective Put, Straddle, Iron Condor, and Strangle for AMD, NVIDIA, and TESLA. Historical volatility (σ) is derived from daily stock prices, and the risk-free rate from U. S. Treasury yields. Option prices are programmatically computed using the BSM to simulate trades, evaluate returns, and compare strategy performance across varying volatility regimes.

3.3 Implementation of the Black Scholes Model

To practically apply the Black-Scholes Model (BSM) in this research, the pricing formula was implemented in Python using standard libraries such as numpy, scipy.stats, and pandas. The model was used to compute theoretical prices for both **call** and **put options**, which then served as the foundation for simulating returns across different option trading strategies.

The Black-Scholes formulas for pricing European call and put options are given by:

$$C = S_0 \cdot N(d_1) - Ke^{-rT} \cdot N(d_2)$$

$$P = Ke^{-rT} \cdot N(-d_2) - S_0 \cdot N(-d_1)$$

Where:

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}},$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

- *C, P*: Call and put option prices;
- S_0: Current stock price;
- *K*: Strike price;
- *r*: Risk-free interest rate;
- *T*: Time to maturity (in years);
- *σ*: Annualized volatility of the underlying asset;

- *N(d)*: Cumulative distribution function of the standard normal distribution.

4. Result

AMD (Advanced Micro Devices) – AMD's log returns range about zero, indicating neutral daily performance, as seen in Figure 1.1. Sharp spikes indicate market events that cause short-term volatility, whereas volatility clustering represents normal financial behaviour. Variable market risk is shown by the 30-day rolling and annualized volatility, which alternates between stable and stormy periods and peaks above 75%.

NVIDIA – Time-varying risk could be seen in Figure 1.2, where the log returns of NVDA exhibit clear volatility clustering and oscillate around zero. The 30-day rolling and annualized volatility (30–80%) show periods of calm and turbulence that alternate, with peaks occurring during significant market occurrences. NVDA exhibits a high-growth, high-risk pattern overall, with notable spikes in volatility and returns.

TESLA – With apparent volatility clustering and spikes associated with significant events, Figure 1.3 displays TSLA's log returns varying strongly around zero. TSLA's high-risk, event-driven character is reflected in the 30-day rolling and annualized volatility (30–90%), which show sudden regime transitions between stable and tumultuous phases.

Figure 1.

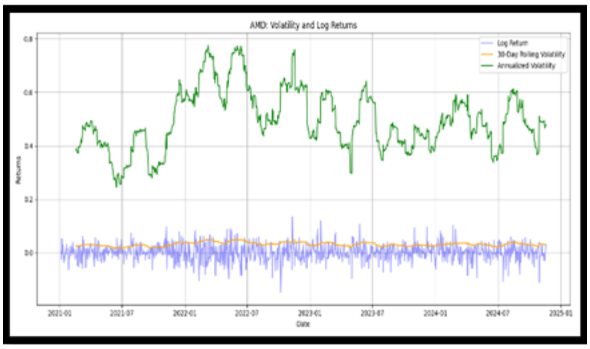


Figure 2.

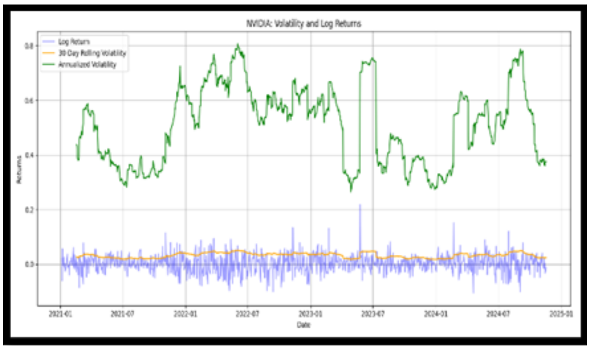
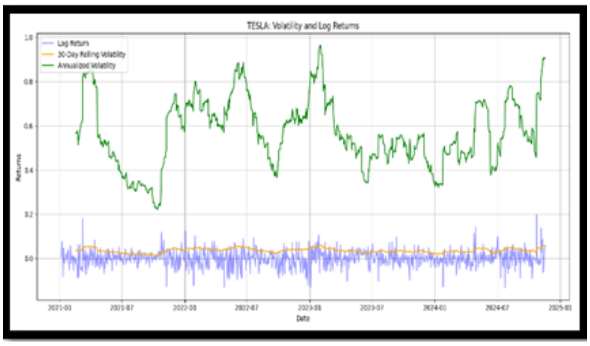


Figure 3.



4.1 Options Strategy Simulation

This section describes how the Black-Scholes Model was used to simulate and model option strategy trading on AMD, NVIDIA, and Tesla based on synthetic prices. The necessary inputs, which included the spot price, ATM strike, risk-free rate, time to maturity, and volatility, were taken from historical data. The simulation parameters and rules were as follows:

- Holding Period: All positions were held for 90 calendar days;
- Rolling Window: A new transaction was created every 30 days;
- There are no taxes, transaction costs, or slippage.

4.1.1 AMD Covered Call Strategy Simulation Analysis

During situations of moderate market volatility, the AMD Covered Call strategy generated consistent gains; nevertheless, during market downturns, it experienced significant losses. It has a left-skewed return distribution, with regular modest gains and sporadic steep declines. When the VIX was low, performance was at its best since time decay and stable markets increased returns. Premiums were unable to compensate for equity losses under high-VIX regimes, which resulted in larger and frequently negative returns. All things considered, the strategy performs best in quiet markets, and its negative risk is shown by volatility surges. The analysis categorizes the strategy returns into two regimes:

- **High VIX**: Periods of elevated market volatility and fear (typically VIX > 20);
- **Low VIX**: Periods of stable or bullish market sentiment (typically VIX ≤ 20).

Figure 4.

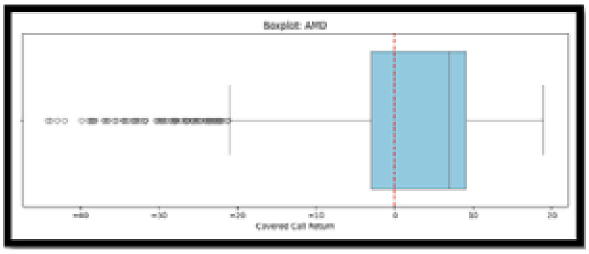


Figure 5.

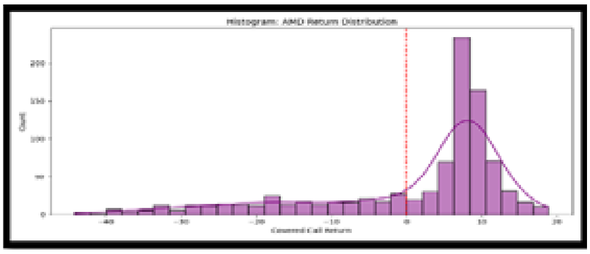


Figure 6.

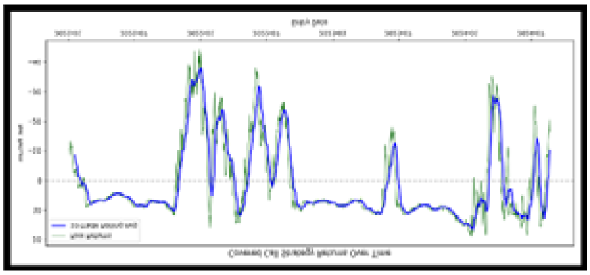
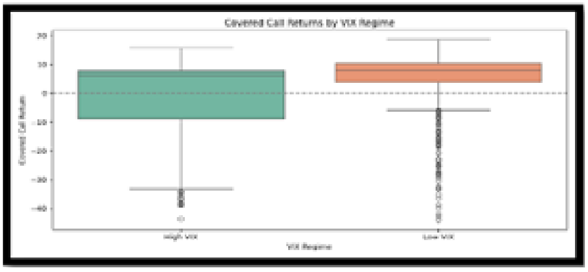


Figure 7.



1.1.2 NVIDIA Covered Call Strategy Simulation Analysis

The returns with the NVIDIA Covered Call strategy were consistently positive biased, with minor drawdowns and frequent profits. It functioned well in bull markets characterized by low volatility, especially the AI-driven rise in 2023, when it recorded significant returns from option premiums and stock appreciation. large-VIX periods, on the opposite side, were erratic and included little losses in the midst of large premiums. Overall, the strategy performed well in controlled, rising markets, demonstrating the importance of strategically selected and volatility-timed stock selection.

Figure 8.

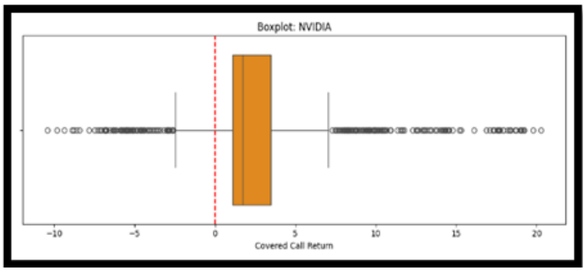


Figure 9.

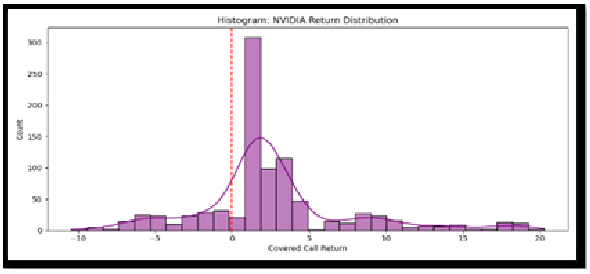


Figure 10.

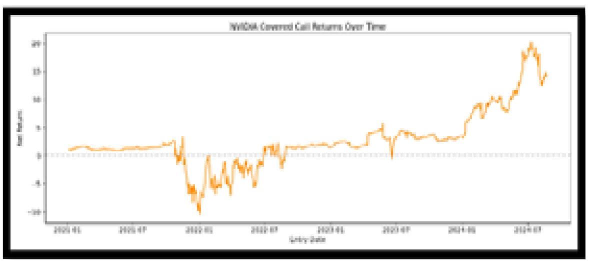
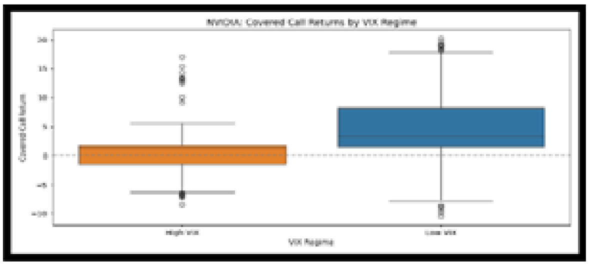


Figure 11.



1.1.3 TESLA Covered Call Strategy Simulation Analysis

In addition to Tesla's extreme volatility, the Tesla Covered Call strategy had a broad, asymmetric return distribution with several small successes and a few large losses of more than –150%. In times of market stress and falling stock prices, such as late 2021 and late 2023, it performed well. However, in 2022 and early 2024, it saw significant drawdowns. Returns in low-VIX regimes were more stable, while downside risk was higher in high-VIX regimes. Although low-volatility markets help the approach overall, hazardous activist management – such as timing entries, hedging, or employing further OTM strikes – is required to curb Tesla's speculation and volatile nature.

Figure 12.

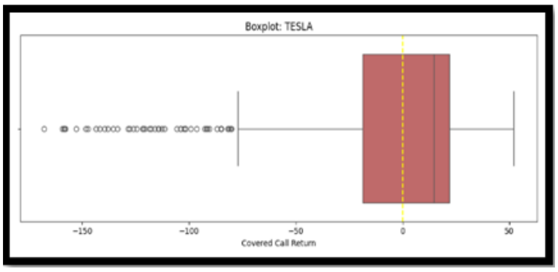


Figure 13.

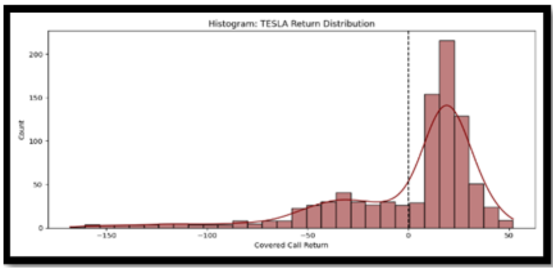


Figure 14.

1.1.4 AMD Protective Put Strategy Simulation Analysis

Figure 15.

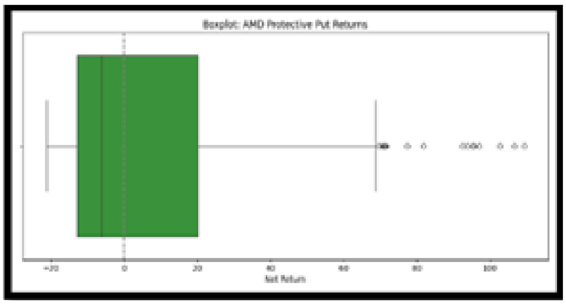


Figure 16.

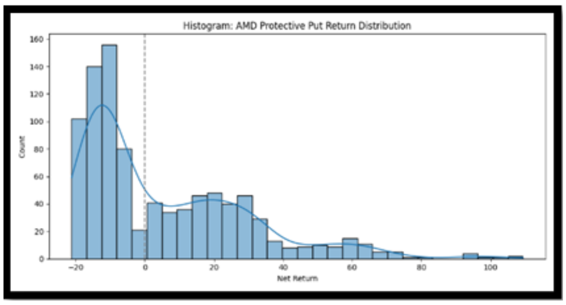
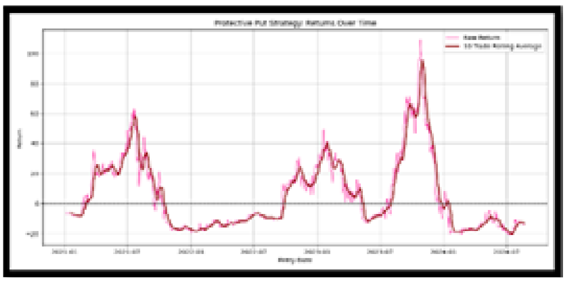


Figure 17.



All things considered, Protective Put works best as a defensive, crisis-hedge tactic rather than as a regular tactic. The AMD Protective Put method is effective in reducing downside risk and distributing gains. Its payouts are right-skewed, with large gains during downtrends and mostly minor losses on the put premium.

The strategy trailed in steady markets due to its premium cost, but it did very well in tumultuous times like late 2021-mid-2022, offering fantastic protection. According to VIX-based study, it functions well in situations with high volatility but inefficiently in those with low VIX. Generally speaking, it works best as a tactical hedge before significant risk occurrences or expected volatility surges.

4.1.5 NVIDIA Protective Put Strategy Simulation Analysis

A right-skewed distribution of returns, with frequent modest gains and few losses, was produced by the Protective Put on NVIDIA, suggesting excellent downside protection and significant upside potential. The majority of returns were between 0% and 20%, with a few losses below –10% and sporadic profits up to 60%. Put costs were helpful insurance during volatility surges, even though they somewhat decreased returns during calm times.

VIX-based strategies demonstrated that, in low-VIX regimes, lower-cost options permitted better returns, while in high-VIX regimes, returns were steady but modest due to the increased cost of protection. Overall, when implemented dynamically in accordance with volatility regimes, NVIDIA's protective put approach offered an alluring risk-return compromise – capital preservation during tumultuous times and return enhancement during stable markets.

Figure 18.

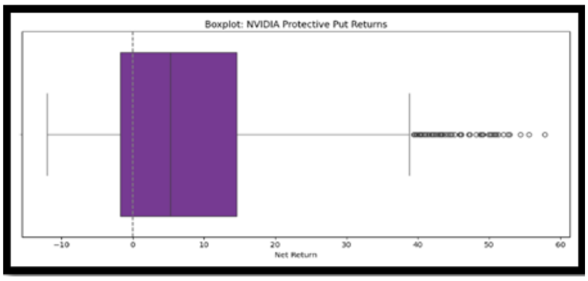


Figure 19.

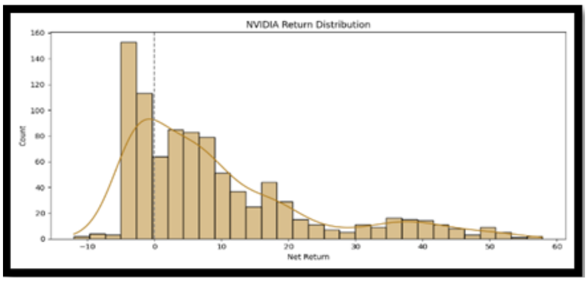


Figure 20.

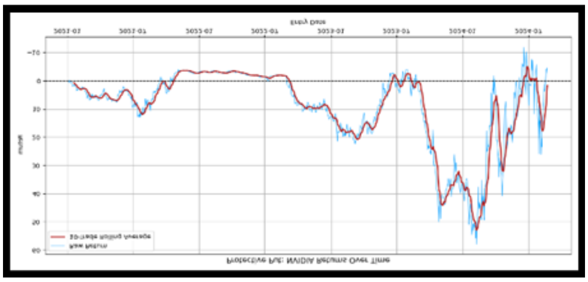
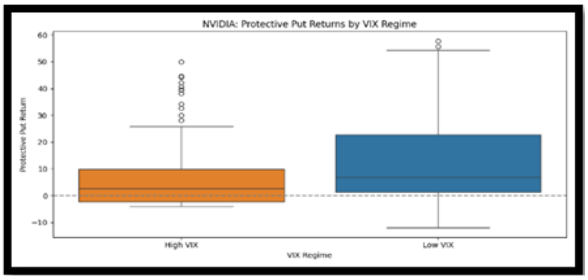


Figure 21.



4.1.6 TESLA Protective Put Strategy Simulation Analysis

A highly volatile, positively skewed return distribution was produced by the Protective Put on Tesla; put costs frequently saw modest losses, but during big rallies, there were sporadic, massive profits of over +200%. It achieved strong upside during rallies like the 2021 EV boom and the 2023–2024 AI-driven rally, and it successfully reduced downside risk during market downturns.

Results varied depending on the VIX regime: low-VIX regimes provided greater, more consistent returns because of less expensive hedging, whereas high-VIX regimes provided robust protection but constrained earnings. All things considered, Tesla's Protective Put strategy, which offers an alluring balance between risk protection and growth participation, worked best when entered ahead of volatility spikes.

Figure 22.

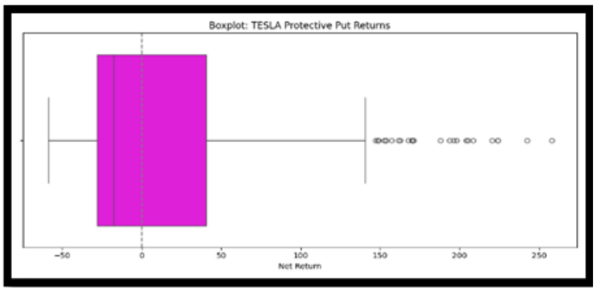


Figure 23.

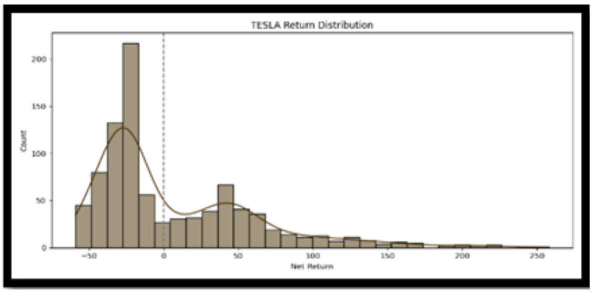


Figure 24.

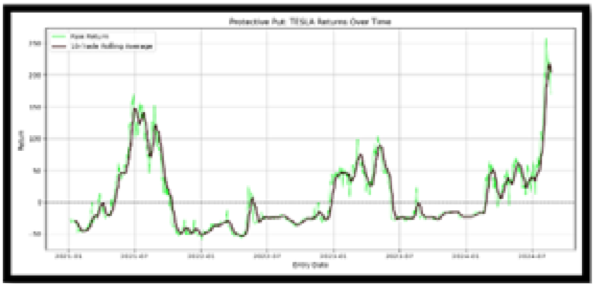
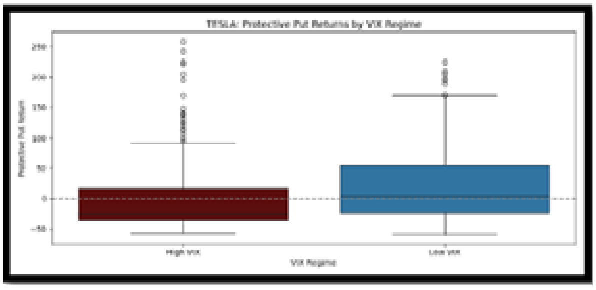


Figure 25.



4.1.7 AMD Straddle Strategy Simulation Analysis

With regular small declines and infrequent significant gains above +60%, the AMD Straddle strategy – both a put and a call held long – had a positively skewed profile of returns. However, it lost money in steady or low-volatility conditions due to option decay, but it did best in turbulent price action, such as the 2023–2024 AI bubble and significant corporate announcements. VIX-based study produced contradictory findings: straddles were less expensive and had greater upside potential when volatility increased in a shock-like fashion during low-VIX periods, while returns were constrained during high-VIX times since volatility was already priced in, resulting in medians of almost zero. All things considered, the straddle strategy for AMD performed best when it was used to take advantage of volatility surges during major earnings, the announcement of new products, or unexpected market shocks.

Figure 26.

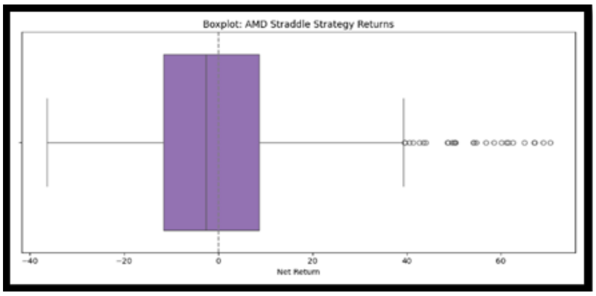


Figure 27.

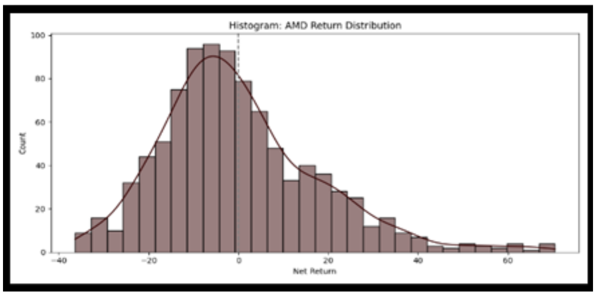


Figure 28.

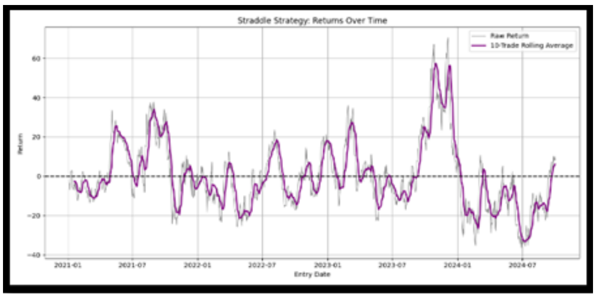
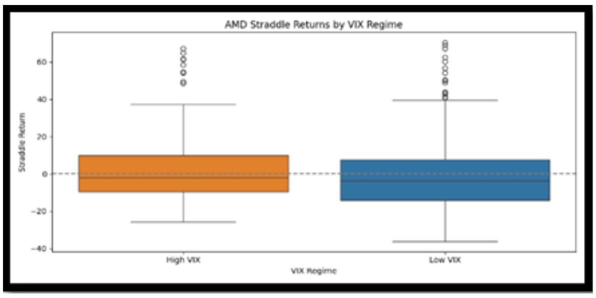


Figure 29.



4.1.8 NVIDIA Straddle Strategy Simulation Analysis

Consistent with symmetric reward behavior, the NVIDIA Straddle method showed symmetric, near-breakeven returns with a moderately positive median and manageable volatility. Returns were mostly between –10% and +10%, with the rare spike beyond +40% due to significant catalysts like GPU releases or advancements in AI. The AI boom of 2023–2024 saw the best performance when actual volatility exceeded forecasts but then decreased following volatility compression.

According to VIX analysis, when volatility was already built into the price, high-VIX periods offered consistent but moderate returns, while low-VIX times offered more upside potential since options were less expensive and surprise rising volatility produced good profits. In general, NVIDIA's straddle strategy performed best as an event-driven short-term approach when it was used in advance of significant announcements or during periods of market calm when volatility spiked.

Figure 30.

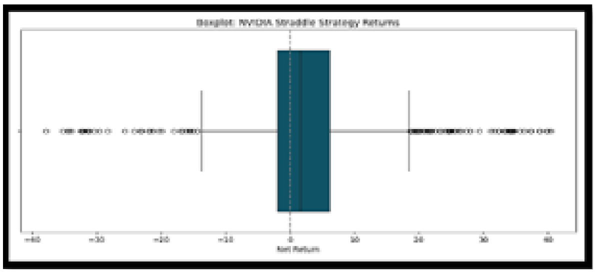


Figure 31.

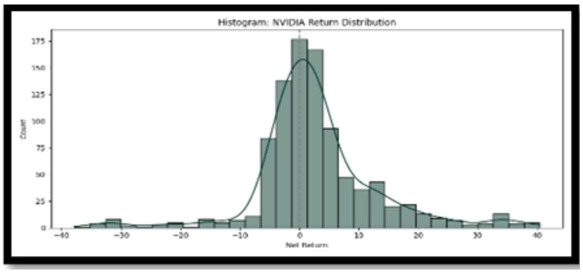


Figure 32.

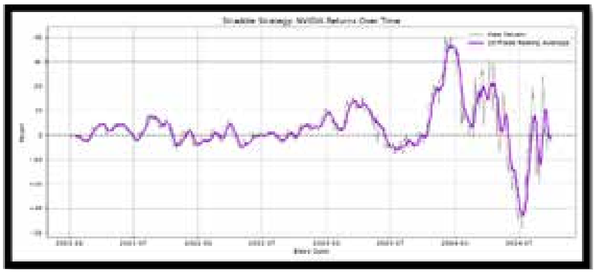
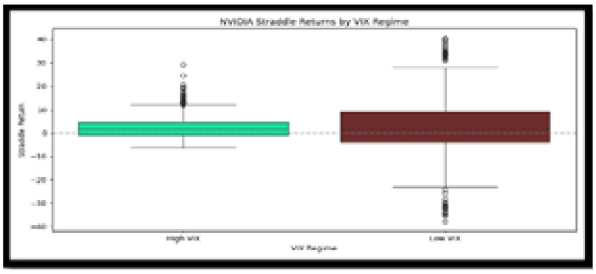


Figure 33.



4.1.9 TESLA Straddle Strategy Simulation Analysis

With a median close to zero, Tesla's Straddle method yielded wildly erratic results, with too many minor excess losses offset by irregular massive gains of more than +150%.

Figure 34.

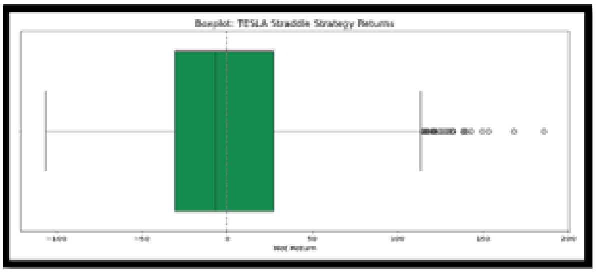


Figure 35.

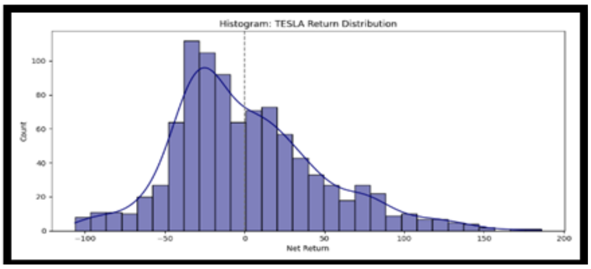


Figure 36.

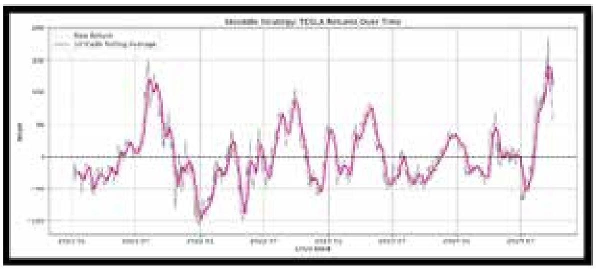
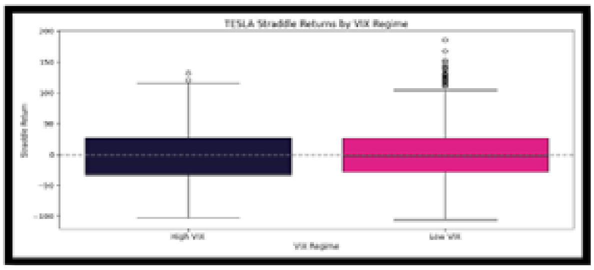


Figure 37.



In flat markets, the majority of transactions resulted in losses ranging from 20 to 70%; however, notable catalysts such as the Tesla founder's remarks, new product launches, or earnings generated sizeable profits. Low-VIX times produced better results with less expensive options and higher reward potential when surprise volatility surfaced, whereas high-VIX periods produced overpriced options and limited upside across all volatility regimes. In general, Tesla's straddle approach performed best prior to significant events when low-VIX conditions produced excellent gains with a remote possibility of a decline.

4.1.10 AMD Iron Condor Strategy Simulation Analysis

Through taking advantage of stable, low-volatility situations, the AMD Iron Condor strategy produced consistent, low-risk gains. On average, gains fluctuated between 1% to 6% and around 3%, while losses were moderate and contained. Performance was unsatisfactory at volatile times, such as late 2021-early 2022, but it significantly improved in 2023–2024 when volatility subsided and AMD fluctuated within a more constrained range.

According to VIX-based statistics, periods with high VIX generated smaller and less reliable returns because of the constant price volatility, whereas periods with low VIX generated more substantial and reliable gains (median 3.5–4%, peak 13%). The Iron Condor generally performed best in calm markets, which supports its use as a cautious income strategy in situations with low volatility and constrained price volatility.

Figure 38.

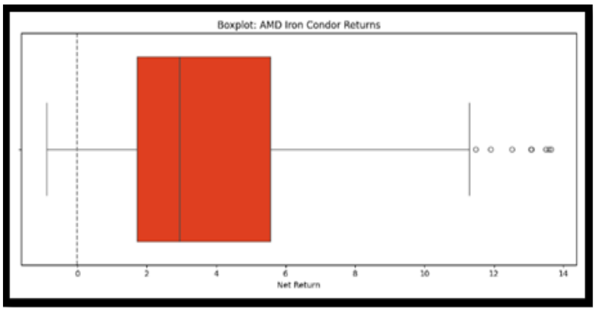


Figure 39.

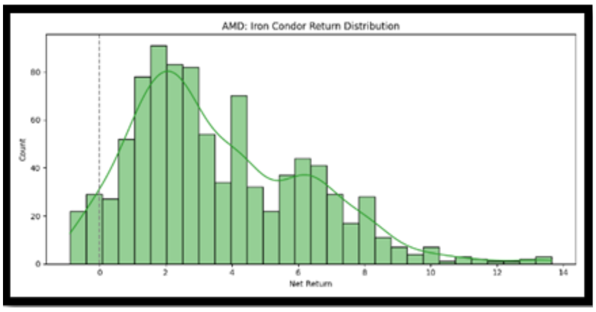


Figure 40.

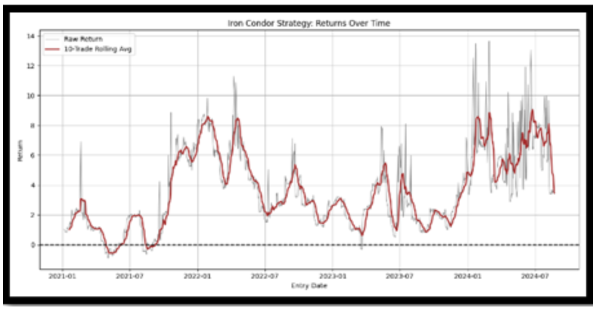
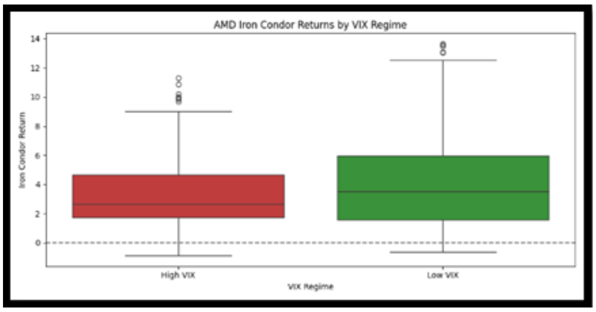


Figure 41.



4.1.11 NVIDIA Iron Condor Strategy Simulation Analysis

The NVIDIA Iron Condor approach led to consistent, low-risk revenues with a limited range and minimal downside. With a median of roughly 1% and occasional outliers exceeding 8%, most trades made between 0.2% and 2% when prices were stable during periods of high implied volatility. The minor losses indicated that exposure caps and risk management were working.

When markets were quiet from 2021 to mid-2024, returns remained stable. However, during NVIDIA's AI-driven rise, when substantial premiums along with regulated fluctuations in prices enhanced profits, returns dramatically improved. Low-VIX periods produced somewhat higher medians (1.3–1.5%) and more upside potential, but they also increased risk from unexpected volatility spikes, according to a VIX-based analysis. On the other hand, more steady but slightly higher profits (around 1%) were generated during high-VIX periods. Overall, NVIDIA's Iron Condor strategy outperformed other low-risk income strategies due to its reliable operation in stable conditions and careful strike management throughout volatility regimes.

Figure 42.

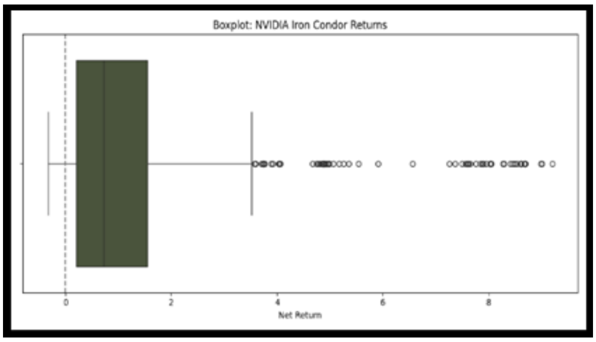


Figure 43.

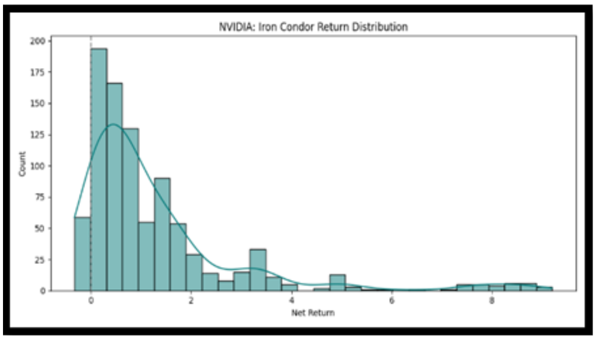


Figure 44.

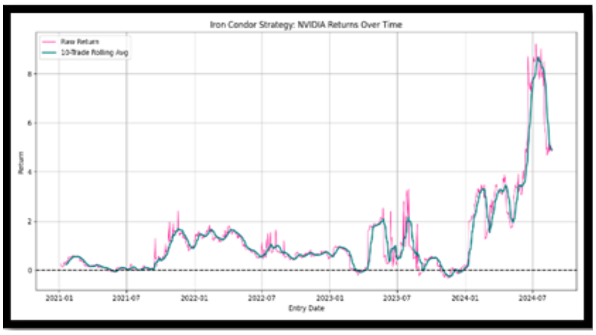
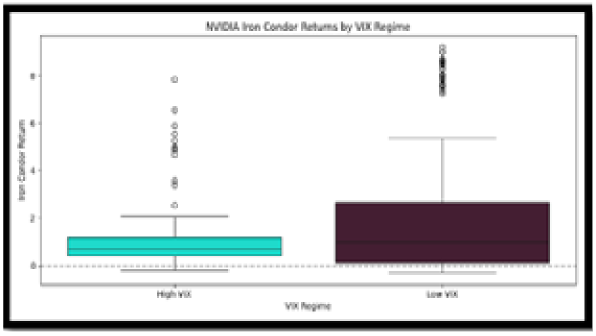


Figure 45.



4.1.12 TESLA Iron Condor Strategy Simulation Analysis

The Tesla Iron Condor strategy brought strong, significantly skewed gains with consistent profitability and limited negative risk. Outliers of 20–30% happened when volatility fell precipitously following trade entry, while the majority of deals made between 4% and 12%, with a median of roughly 7–8%. The tiny and inconsistent losses were indicative of the defined risk attribute of the methodology.

Figure 46.

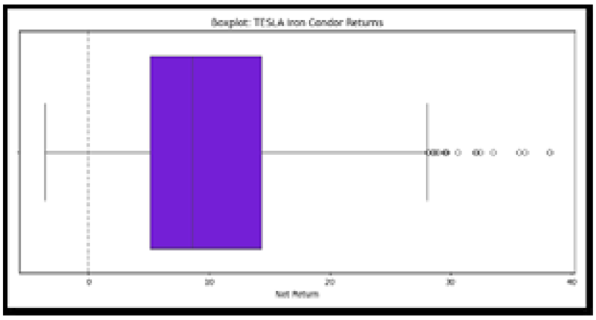


Figure 47.

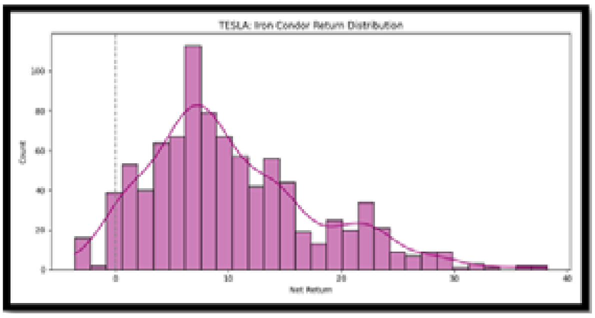


Figure 48.

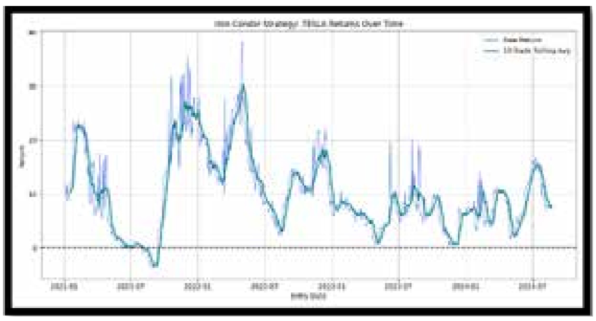
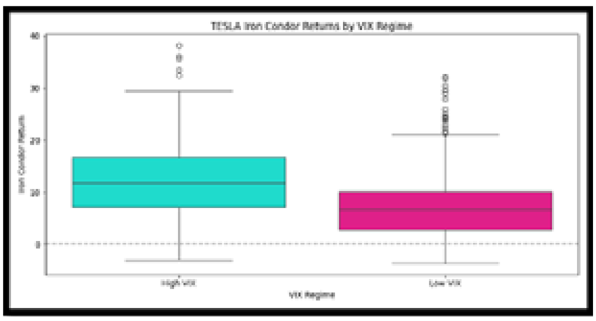


Figure 49.



Performance fluctuated depending to market periods from 2021 to 2024, with losses during 2022 volatility spikes following extraordinarily high returns in early 2021 and late 2021-early 2022 during post-earnings stability. As Tesla fluctuated in shorter ranges, the approach recovered through 2023–2024, yielding a consistent 5–15% return. With all aspects considered, Tesla's Iron Condor strategy performed optimally whenever structured around volatility reversals, providing predictable profits during quiet, range-bound periods and high-income potential in extremely volatile markets. According to VIX-based analysis, low-VIX periods generated lesser but more consistent gains (median ~6%), but carried a higher breach risk during unexpected volatility spikes. In contrast, high-VIX periods generated larger but more variable profits (median ~12%, IQR 6–18%) because of higher premiums and wider strike ranges, which benefited from volatility mean reversion.

4.1.13 AMD Strangle Strategy Simulation Analysis

The AMD Strangle strategy executed an extremely beneficially skewed return profile with limited downside and significant upside potential. The majority of trades were profitable and with a positive average and regular moderate gains between 0% and 50%, while there were a few exceptions during notable price spikes, such as the 2023–2024 AI chip bubble, that saw prices rise by over 600%. The option premium restricted small and marginal losses. From 2021 to 2024, performance varied according to market conditions, with large gains during bullish or volatile market times, poorer results in range-bound markets, and peak profitability during times that included substantial volatility expansions.

Low-VIX periods enabled more feasible entries and more upside potential, but premium decay was more probable when volatility was light, according to VIX-based study. High-VIX periods, on the other hand, yielded more reliable but moderate results, necessitating large price swings to offset expensive premiums. AMD's strangle strategy, which balanced breakout potential and cost effectiveness using VIX filters, typically worked best when applied before notable catalysts or volatility expansions.

Figure 51.

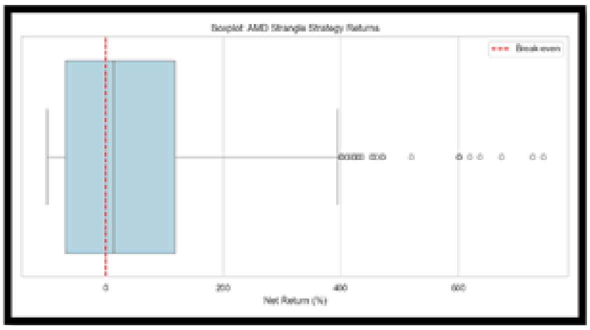


Figure 52.

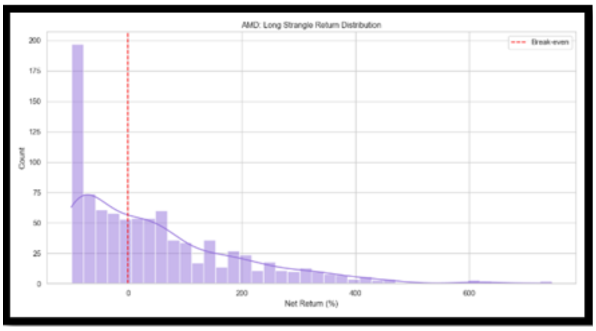


Figure 53.

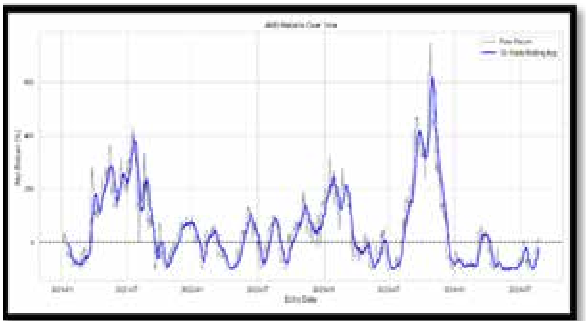
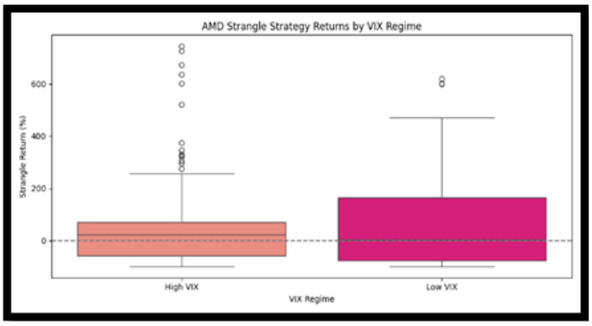


Figure 54.



4.1.14 NVIDIA Strangle Strategy Simulation Analysis

The NVIDIA Strangle strategy generates a highly unpredictable, right-skewed return distribution with substantial upside potential and relatively little risk. While the majority of transactions resulted in moderate gains or losses, a few rare outliers – some exceeding 1,000%—driven overall performance, especially around important triggers like earnings and AI-related announcements. Performance increased during high-volatility and event-driven stages, particularly the 2023–2024 AI boom, while returns dropped during low-movement periods as option premiums decreased between 2021 and 2024.

According to VIX-based analysis, low-VIX circumstances generated the optimum cost-reward ratio; in the event of an unexpected volatility surge, lower-priced options offered a bigger potential profit. Conversely, high-VIX eras produced lower and less reliable returns since inflated premiums required disproportionately significant price swings for profit. According to research, NVIDIA's strangle strategy – which combined rigorous risk management with volatility analysis to capitalize on unforeseen market expansions performed best when deliberately implemented during low-volatility times before major catalysts.

Figure 55.

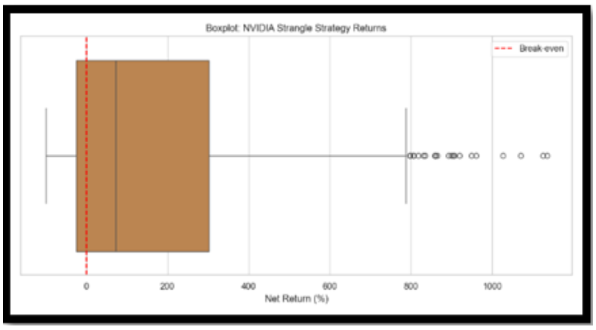


Figure 56.

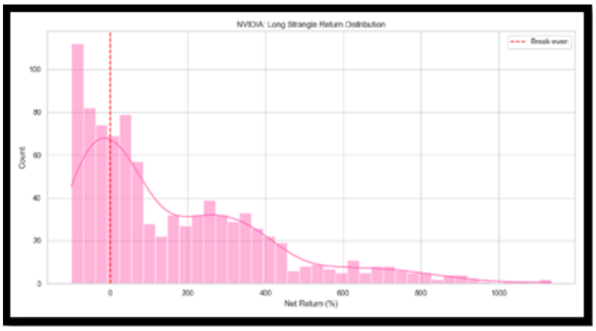


Figure 57.

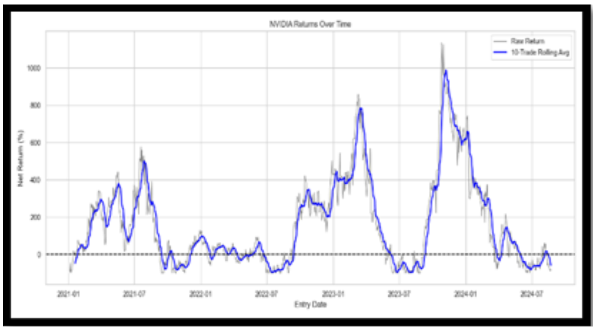
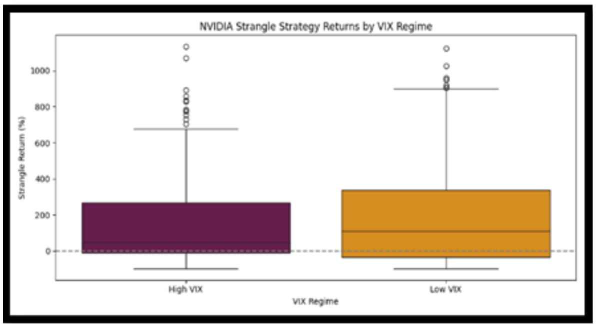


Figure 58.



4.1.15 TESLA Strangle Strategy Simulation Analysis

The Tesla Strangle strategy generated a slightly skewed return distribution with a moderately positive median, and multiple slight losses or breakeven transactions offsetting occasionally enormous profits over 700%. Considering Tesla's volatility and asymmetric dividend approach, most returns ranged from –75% to +200%. Profits were concentrated around important events like Musk's statements, product upgrades, or earnings reports, whereas time decay losses were caused by range-bound periods.

VIX-based research indicates that whereas high-VIX times generally resulted in negative returns resulting from expensive premiums and post-volatility decreases, low-VIX periods offered better performance with less expensive options and more potential from unanticipated volatility fluctuations. Generally speaking, Tesla's strangle strategy performed best when applied strategically at times of low volatility, ahead of important triggers. This reduced the chance of dropping prices and enabled traders to profit from large, event-driven price changes.

Figure 59.

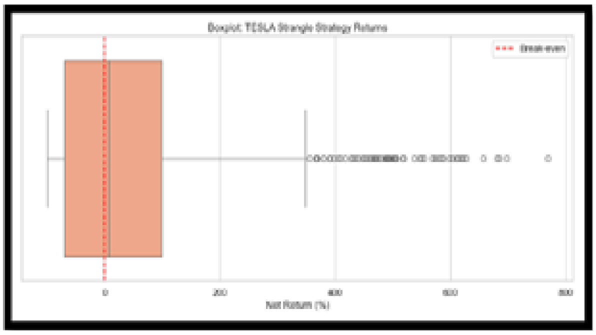


Figure 60.

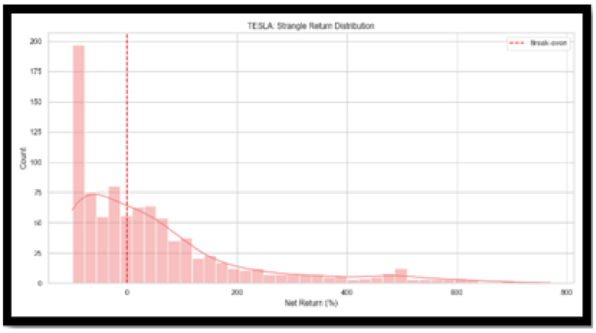


Figure 61.

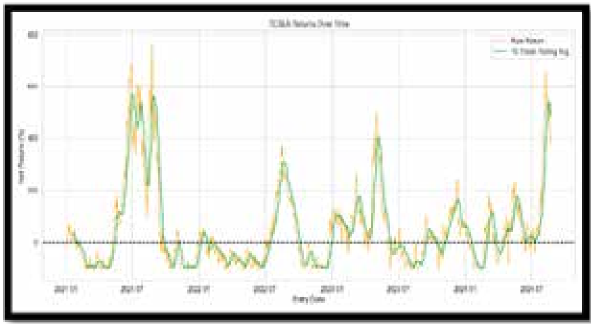
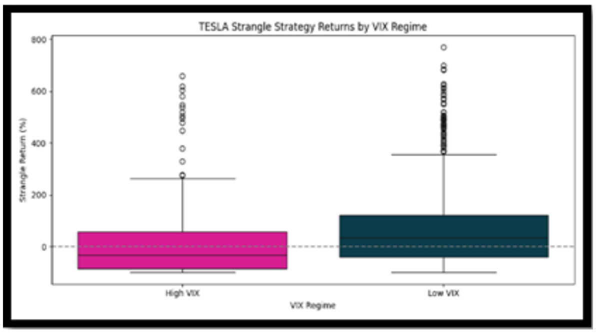


Figure 62.



4.2 Performance Metrics

Several critical performance indicators have been used to assess the efficacy of the strangle, iron condor, and straddle strategies throughout different stock markets and volatility regimes. These offer an equitable assessment of consistency, risk, and profitability.

Table

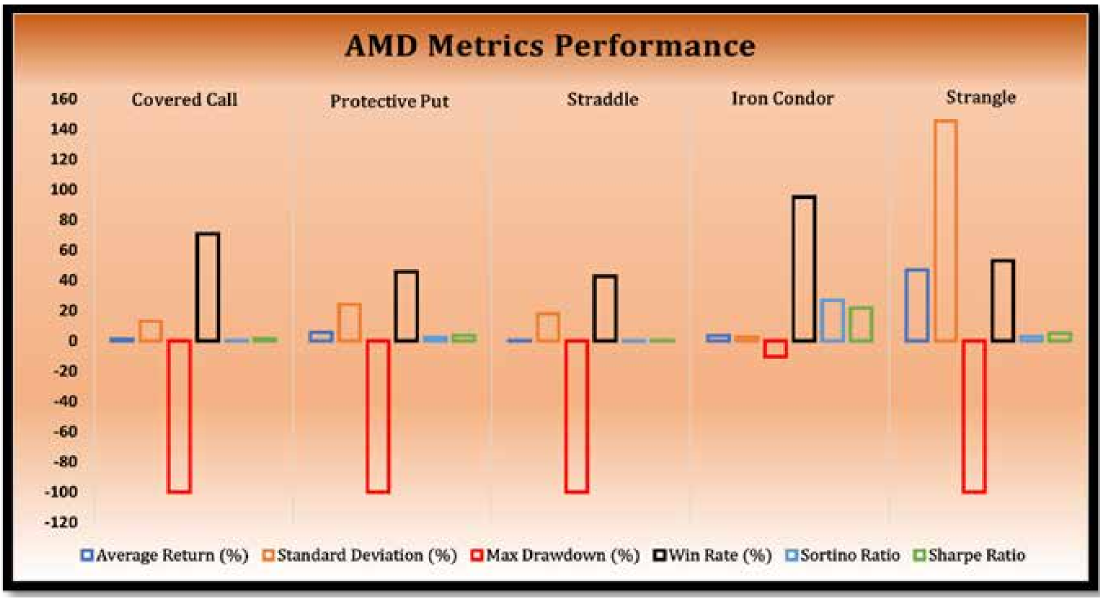
Average Return	The average percentage return across all trades has been referred to as the «average return.» Overall profitability is displayed, but the constancy of returns is not.
Standard Deviation	Measures the volatility of returns. A higher value indicates greater risk and uncertainty in performance.
Maximum Drawdown	Shows the greatest drop in value and possible money at risk, and it collects the largest loss from peak to trough.
Win Rate	Indicates the percentage of profitable trades among all trades and the consistency with which a strategy produces gains
Sharpe Ratio	Risk-adjusted returns determined by dividing total volatility by excess return. The higher the ratio, the more successful it is in producing returns for the risk assumed.
Sortino Ratio	since it only considers downside volatility, it is comparable to the Sharpe Ratio and is therefore better suited for asymmetric return techniques such as options. Better management of downside risk is indicated by a greater ratio.

4.3 AMD Performance Metrics Analysis

The Iron Condor proved among the most balanced and stable of the five methods that were investigated: Covered Call, Protective Put, Straddle, and Strangle. With consistent and effective performance, it offered the highest possible risk-adjusted values (Sharpe 21.6, Sortino 27), a foremost 95.2% winning ratio, and modest returns (3.61%) with exceptionally low volatility (2.65%).

Although market-exposed on the downside, the Covered Call is a reliable income strategy that consistently generated modest returns (1.09%) with little volatility. The Protective Put, an effective approach for risk-averse investors seeking hedged exposure, performed well in terms of downside protection and offered fair risk-adjusted returns with a reduced win rate. A high-risk, significant-reward strategy predicated on recurring significant swings, the Strangle generated very high average returns (47%) but also extremely high volatility (145%) and total drawdowns. Subsequently, the Straddle showed poor performance with excessive volatility and low returns (0.14%), proving its worthlessness without accurate volatility estimates.

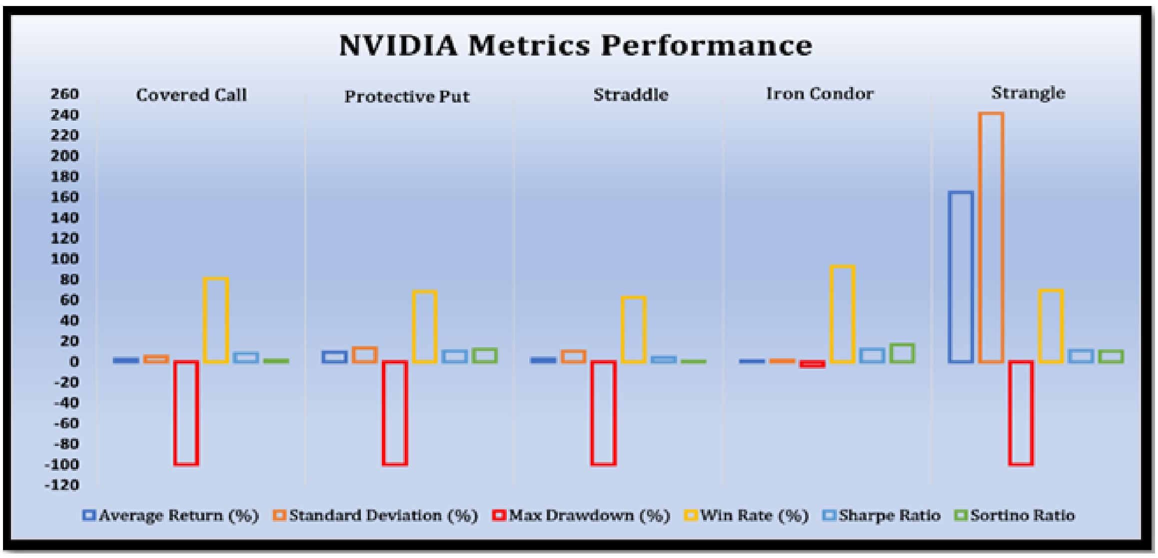
Figure 63. *AMD Metrics Performance*



NVIDIA Performance Metrics Analysis

Considering the five strategies Strangle, Iron Condor, Protective Put, Covered Call, and Straddle NVIDIA is the best company for strategic options trading considering it is more accurate over AMD on a risk- adjusted basis. Through constant returns (1.27%), extremely low volatility (1.69%), and a very satisfactory 93% win rate, the Iron Condor is consistently the most reliable and effective strategy. It is further supported by excellent Sortino (16.83) and Sharpe (11.86) ratios.

Figure 64. *NVIDIA Metrics Performance*



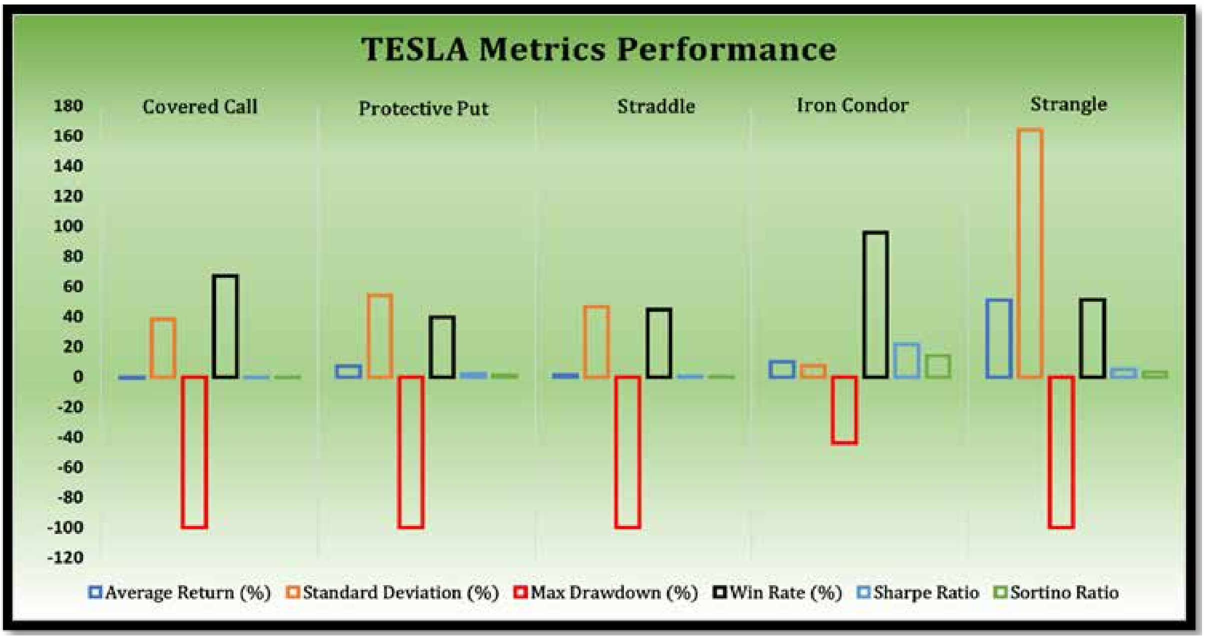
The Protective Put is an effective choice for conservative investors because it offers strong downside protection, risk-adjusted performance, along with substantial returns (9.16%) with modest risk. Although it is exposed during steep stock drops, the covered call generates steady income (2.64%) through low volatility and great dependability. The Strangle is a highly risky unpredictable strategy for traders who trade speculation considering its high volatility (241.7%) and complete drawdowns, despite its exceptionally high returns (164.45%). For steady market conditions, the Straddle continues to be the least desirable option due to its poor returns (2.95%) and negative risk efficiency.

TESLA Performance Metrics Analysis

In the context of risk-return results, Tesla's option strategies' return performance fluctuates greatly throughout the five techniques. With a 10.18% average return, low volatility (7.47%), a 95.85% win rate, and the highest Sharpe (21.62) and Sortino (14.17) proportions, the Iron Condor strategy is the most successful and reliable. This is in line with its exceptionally good synthesis of stability, efficiency, and profitability. The Strangle generated the most lucrative unadjusted return (50.96%), yet although extremely risk-tolerant, speculative traders should take it into consideration considering its tremendous volatility (164.15%) and –100% drawdown, combined expose it to extreme downside risk. Though it offered significant protection on the downside, the Protective Put's –100% drawdown and low risk-adjusted ratios demonstrate effectiveness in comparison to the Iron Condor, despite its inadequate returns (7.21%).

With low returns (1.14%) and poor risk-adjusted performance, the Straddle underperformed, indicating a limited prospective to profit from Tesla's volatile price movement. Furthermore, the Covered Call exhibited uncontrollable volatility (38.21%) and negative returns (–1.01%), demonstrating the possibility price increases were insufficient to offset the underlying market instability of Tesla.

Figure 64. *TESLA Metrics Performance*



5. Conclusion and Discussion

From the result obtained during the analysis, we can conclude here the Iron Condor continually outperformed each of the other five option strategies, which were used in this study to analyse the best-performing strategies among Covered Call, Protective Put, Straddle, Iron Condor, and Strangle on the three companies selected AMD, NVIDIA, and Tesla for the period from the beginning in 2021 to 2024. immediately after the epidemic, it provided consistent returns, minimal risk, and substantial win rates for all three companies. For instance, you might say Tesla's Iron Condor exhibited exceptional stability and risk management with an average return of 10.18% and a 95.85% win rate. In spite of its range-bound nature, this strategy performed well in quiet or comparatively volatile markets, and AMD and NVIDIA also produced strong and reliable outcomes.

Specifically for NVIDIA, the Strangle strategy contributed to the highest single-trade gains; nevertheless, it was less dependable due to its high volatility, significant losses, and dependability on timing precisely. The Protective Put had lower average returns due to high option costs, but it performed well in erratic markets. Out of all the strategies that had been selected for investigation, the Straddle and Covered Call strategies did exceptionally poorly overall partly because of time decay and a lack of protection during fluctuations in the market.

In overall performance, the Iron Condor was the most efficient and well-balanced strategy over the chosen data period, providing steady income with controlled risk, whereas the Strangle was only beneficial for aggressive traders during significant market fluctuations.

References

Bakshi, G., Cao, C., & Chen, Z. (1997). Empirical performance of alternative option pricing models. *The Journal of finance*, – 52(5). – P. 2003–2049.

Bates, D. S. (2000). Post-'87 crash fears in the S&P 500 futures option market. *Journal of econometrics*, – 94(1–2). – P. 181–238.

Black, F., & Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of political economy*, – 81(3). – P. 637–654.

Bollen, N. P., & Whaley, R. E. (2004). Does net buying pressure affect the shape of implied volatility functions? The Journal of Finance, – 59(2). – P. 711–753.

Cheffa, S., & Shamsa, K. (2022). Profitability Analysis of the Straddle Strategy in Trading One-Month Options. *WIJARW*, – 40.

Coelen, N. (2002). Black-Scholes Option Pricing Model. *Recuperado de http://ramanujan. math. trinity. edu/tumath/research/studpapers/s11. pdf.*

Cox, J., Ross, S., & Rubinstein, M. (1979). Option Pricing: A Simplified Approach, Journal of Financial Economics.

Diaz, M., & Kwon, R. H. (2017). Optimization of covered call strategies. *Optimization Letters*, – 11(7). – P. 1303–1317.

Embrechts, P., Kluppelberg, C., & Mikosch, T. (1999). Modelling extremal events. British actuarial journal, – 5(2). – P. 465–465.

Figlewski, S. (1989). Options arbitrage in imperfect markets. The journal of Finance, – 44(5). – P. 1289–1311.

Guo, I., & Loeper, G. (2020). Designing all-weather overlays – a study on option-based systematic strategies. Available at SSRN.

Hebert, A. (2018). Strategies for Trading Volatility Using Options.

Heinemann, A. (2008). A BULL CALL SPREAD AS A STRATEGY FOR SMALL INVESTORS?. *Journal of Personal Finance*, – 6 (2/3). – 108 p.

URL: https://finance.yahoo.com

URL: https://finance.yahoo.com

URL: https://people.umass.edu/~nkapadia/docs/buy_write_Jan5.pdf

URL: https://www.cboe.com

URL: https://www.optionmetrics.com

URL: https://www.quandl.com

Israelov, R., Klein, M., & Tummala, H. (2017). Covering the world: global evidence on covered calls. *Available at SSRN 2990522*.

Janková, Z. (2018). Drawbacks and limitations of Black-Scholes model for options pricing. Journal of Financial Studies and Research, 2018. – P. 1–7.

Kawadkar, H., & Kadu, T. (2022). Options Trading Strategies-A Guide for New Investors. SAMRIDDHI: A Journal of Physical Sciences, Engineering and Technology, – 14(01 SPL). – P. 156–168.

Kownatzki, C., & Sabouni, H. (2019). Option strangles: An analysis of selling equity insurance. *Available at SSRN 3315014*.

Merton, R. C. (1971). Theory of rational option pricing.

Merton, R. C. (1976). Option pricing when underlying stock returns are discontinuous. Journal of financial economics, – 3 (1–2). – P. 125–144.

Natenberg, Sheldon. Option Volatility and Pricing: Advanced Trading Strategies and Techniques.

Nawalkha, S. K., & Chambers, D. R. (1995). The binomial model and risk neutrality: Some important details. *Financial Review*, – 30(3). – P. 605–615.

Rustamov, O., Aliyev, F., Ajayi, R., & Suleymanov, E. (2024). A New Approach to Build a Successful Straddle Strategy: The Analytical Option Navigator. *Risks*, – 12(7). – 113 p.

Santa-Clara, P., & Saretto, A. (2009). Option strategies: Good deals and margin calls. *Journal of Financial Markets*, – 12(3). – P. 391–417.

Shalini, H. S., & Duraipandian, R. (2014). Analysis of Option Trading Strategies as an Effective Financial Engineering Tool. The International Journal of Engineering and Science (IJES), – 3(6). – P. 51–58.

Slivka, R. T., Liang, Y., & Xue, J. (2020). An Empirical Study of Nifty 50 Option Time Spreads. *Indian Journal of Finance*, – 14(8–9). – P. 8–19.

Smith Jr, C. W. (1976). Option pricing: A review. Journal of Financial Economics, –3(1–2). – P. 3–51.

SP, S., E, G., Acharya, R., G, V. B., & Matha, R. (2022). Are Options Trading Strategies Really Effective for Hedging in the Indian Derivatives Market? Cogent Economics & Finance, – 10(1). – 2111783 p.

submitted 10.10.2025;
accepted for publication 24.10.2025;
published 27.11.2025

Contact: vishalkumar041996@gmail.com v.kumar@hse.ru; chdhruv31@gmail.com; xuyaoyao22446688@gmail.com