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INTRADAY COMMODITY TRADING OPTIMIZATION USING S.A.R. CHANNELS ON NSE

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Abstract

The advancement of AI-based ALGO-TRADE technology has prompted enterprises worldwide to adapt their operational strategies. This novel technological advancement empowers investors to increase their chances of success and reduce their reliance on luck. In certain situations, traders use the buy-or-write approach when they have only one remaining commodity. The research methodology employed here is the "buy-and-sell maximization study design," which generates subjective evaluations. In this study, we developed ALGO-TRADE programs using Stoller Average Range Channels (S.A.R.). In finance, S.A.R. is a technical indicator visually representing a trading range's upper and lower boundaries. It constructs price-bounding envelopes by drawing lines one standard deviation above and below a simple moving average of prices. The standard deviation utilization determines the Band's magnitude, making it responsive to market fluctuations. Employing S.A.R. assists in determining whether the current price significantly deviates from the expected range. Many individuals commonly use both upper and lower bands in conjunction with a moving average. Furthermore, their design intended for these bands to complement each other, and using them independently may compromise their functionality. It is essential to incorporate supplementary indicators that exhibit strong compatibility and thoroughly verify their findings. The investigation also analyzed the financial gains and losses the commodity trading account incurred during the fiscal years 2021 and 2022. According to the results, an individual who trades with an initial investment of Rs 1,00,000 has the potential to generate a profit of Rs 60,000.

Keywords: ALGO-TRADE, A.I., S.A.R, GARCH model

1. INTRODUCTION

Trading and investing have always attracted the attention and financial involvement of people from diverse backgrounds. The appeal of financial markets has attracted individuals from various backgrounds, including experienced professionals, novices, and retail traders, to buy and sell assets [1]. Nevertheless, the journey towards success in these particular marketplaces has been characterized by a meandering and frequently perilous trajectory, fraught with obstacles that have compelled numerous individuals to search for a more efficient approach to manoeuvring through the intricacies of diverse market sectors.

A notable paradigm shift has occurred recently, propelled by artificial intelligence technology breakthroughs. As mentioned, the transition has significantly altered how trading is executed, resulting in a redistribution of influence within finance. In finance, prominent entities such as Foreign Institutional Investors (F.I.I.) and Domestic Institutional Investors (DII) have effectively utilized artificial intelligence to enhance their operations [2].

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They have acquired the capacity to swiftly make decisions based on data and carry out commands for significant amounts with accuracy and effectiveness. The unmistakable influence of this technological revolution is evident in its ability to equalize opportunities for institutions and endow them with a clear edge in the realm of finance [3][4].

Nevertheless, these technological advancements have bestowed unparalleled powers upon major institutions, but the situation contrasts for small-scale and retail dealers. These individuals frequently have difficulties achieving profitability in the financial markets. Emotional attachments to investments and prolonged decision-making processes can impede individuals' capacity to capitalize on opportunities and make the most advantageous choices.

The disparity in trading capabilities between institutional giants and individual traders has become increasingly evident. Within financial markets, algorithmic trading has emerged as a promising prospect, presenting a possible resolution to the challenges traders and investors encounter. This technique demonstrated its longevity before the advent of advanced trading platforms and intricate algorithms. Fundamentally, algorithmic trading is predicated on the capacity to forecast forthcoming asset prices through the analysis of historical price data, with a focus on identifying patterns and trends.

The strategy has garnered significant attention and widespread adoption because it offers a systematic and evidence-based methodology for conducting trades [5]. Algo-Trade, a widely recognized algorithm, has gained significant attention among traders globally, positioning itself as a prominent player in algorithmic trading. Algorithmic trading, called ALGO-TRADE, can analyze historical price movements alongside present news items and advancements. Utilizing a multi-dimensional strategy allows for predicting the probable trajectory of assets, equipping traders with significant insights. One notable characteristic of ALGO-TRADE is its ability to execute orders accurately, enabling timely trade placements from various locations [6].

The tool's adaptability and ability to promptly respond to changing circumstances have favoured it highly among traders aiming to optimize their trading efficiency and efficacy. The significance of algorithmic trading extends beyond the domain of equities. This method has been widely used in futures markets that involve commodities, equities, and currencies. As mentioned, price fluctuations occur regularly in the markets, subject to many causes encompassing supply and demand dynamics and geopolitical events.

Algorithmic trading systems have exceptional proficiency in adapting to dynamic market conditions, promptly responding to alterations, and executing deals with a level of accuracy that is challenging for human traders to replicate. The transformational potential of algorithmic trading resides not only in its predictive capabilities but also in its capacity to diminish the temporal and financial resources necessitated for trading activities.

Algorithmic trading accomplishes two crucial objectives: eliminating the human factor and implementing automation. First and foremost, the use of algorithmic trading minimizes the presence of emotional biases that frequently impede traders' judgement, hence promoting the objective decision-making process [7][8]. Additionally, it facilitates the swift execution of deals, allowing for prompt responses to market dynamics with unparalleled flexibility. In an

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environment where time is of utmost importance, the ability to act swiftly can significantly impact the outcome of a trade, differentiating between a profitable transaction and a lost chance. Algorithmic trading has emerged as a democratizing force in the financial markets, benefiting small and retail traders.

It provides individuals with the opportunity to utilize resources and methods that were previously only accessible to large institutions. Nevertheless, the journey towards achieving success in algorithmic trading is not without obstacles. Developing robust trading strategies, implementing efficient risk management practices, and continuously acquiring knowledge regarding the newest breakthroughs in artificial intelligence and algorithmic techniques are crucial to succeed in algorithmic trading. In summary, algorithmic trading, driven by artificial intelligence technology breakthroughs, has significantly transformed the trading and investment domains [9].

The availability of diverse tools has equipped traders with a formidable set of resources to navigate the complex landscape of financial markets effectively. While significant institutions have effectively utilized this technology for their benefit, independent traders have increasingly adopted algorithmic trading to achieve a more equitable market environment. With the continuous expansion of technology and the increasing sophistication of algorithms, the finance industry is on the brink of further transformation.

Algorithmic trading is expected to assume a prominent position in this ongoing revolution. The following details are essential for the study's next steps: Section 2 provides a more comprehensive literature review analysis. The methodology of the proposed system is outlined in Section 3 of the paper, followed by a discussion of the results in Section 4. Section 5 summarises the findings and offers recommendations for future endeavours.

2. LITERATURE REVIEW

Derivative contracts are essential in financial markets as they enable investors to effectively manage risk through hedging or engage in speculative activities by capitalizing on price fluctuations. Nevertheless, the termination of these contractual agreements may give rise to a certain degree of instability and unpredictability within the market. The present study examines the dynamics surrounding the expiration of derivative contracts in the Indian market, which always takes place on the final Thursday of the month [10].

Our objective is to comprehensively examine the impact of various expirations on trading activity, daily returns, and market volatility. One of the primary findings in this research is the notable surge in trading volume during the period surrounding the expiration date of derivative contracts [11]. A discernible increase in trading volume is observed in the Indian market over the five days preceding a contract's expiration.

The increased level of trading activity is particularly noticeable on the expiration day. It is imperative to acknowledge that this problem is not confined solely to the Indian market but is a pervasive global phenomenon. The research also emphasizes the notable influence of derivative contract expirations on the daily returns and volatility of the market index. During

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expiration days, it is seen that the market exhibits more significant price movements and increased levels of volatility. The observed phenomenon can be ascribed to uncertainty and heightened trading activity concerning contracts nearing their expiration date. The cash market is analyzed in detail, focusing on the weeks leading up to contracts' expiration and the effects those weeks have on share prices, volatility, and trading volume.

One important thing to remember is that the day before futures contracts expire, cash market prices tend to drop. Nevertheless, it is seen that there is a subsequent increase in values on the day following expiration. It is crucial to underscore that this phenomenon does not signify a comprehensive alteration in the valuation of stocks [12].

On the contrary, it demonstrates the transient impact of derivative contract expirations on the dynamics of the cash market. This study elucidates the phenomenon known as the "triple witching hour," wherein the concurrent extinction of futures, options, and index contracts occurs. This occurrence increases trading activity, amplifies volatility, and has a prospective influence on stock prices.

In the Indian market, a notable intricacy arises with a "quadruple witching hour" on the final Thursday of every month, wherein the expiration of options on both indexes and individual equities co-occurs. The study uses less frequent daily data to look at the effects of expiration dates on market conditions in more depth. This methodology enables us to ascertain how much the maturity date influences returns' conditional mean and variance.

The analysis reveals that the maturity date does not substantially impact these statistical indicators, suggesting that the market's overall behaviour stays reasonably steady even when there is more trading activity surrounding expiration dates. In brief, this research offers significant insights into the influence of derivative contract expirations on the financial market in India.

The significance of comprehending the mechanics of contract expirations for market players is underscored by the heightened volatility and variations in market index returns and the increased trading activity observed on and around expiration days. The behaviour of the cash market, characterized by a decline in values before the expiration of futures contracts and subsequent recovery, underscores the importance of conducting thorough analysis and implementing risk management methods during these specific timeframes [13][14].

Furthermore, the phenomenon known as the "triple witching hour" and "quadruple witching hour" serve as cautionary reminders of the intricate nature that can emerge when numerous categories of contracts reach their expiration concurrently. Notwithstanding the transient volatility witnessed during expiration, our study utilizing infrequent data indicates that the underlying market fundamentals are steady. This study enhances the comprehension of derivative contract expirations in the Indian market. It provides vital insights for investors, traders, and policymakers seeking to manage these moments of increased market activity [15][16].

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3. METHODOLOGY

This study focuses on streamlining the trading and investment procedures while mitigating the strain of manual order placing. The primary methodology entails automating these tasks using state-of-the-art artificial intelligence techniques. In this particular context, Figure 1 offers a graphical depiction of the method utilized, while Table 1 includes a pseudo-code that outlines the fundamental features of the algorithm. Significantly, this method demonstrates the capacity to execute entry orders, generate stop-loss orders, and set target orders concurrently. This impressive accomplishment is attained by accessing up-to-date information from the commodity trading of the National Stock Exchange (NSE) and utilizing the Broker's APIs to react to signals produced by the algorithm promptly.

The workflow of the algorithm is organized around a series of critical steps. The first step involves the acquisition of market data from the NSE API. The preliminary data collection is paramount since it establishes the foundation for subsequent actions. Subsequently, the algorithm filters and processes the data, eliminating extraneous or inconsequential information.

The data is systematically organized and stored in a local database, assuring its accessibility for future reference and comprehensive examination. The algorithm's functionality relies heavily on utilizing the S.A.R. (Stop and Reverse) indication, configured with a predetermined standard deviation value of 1.5. This indication is applied methodically, considering the current candle is Open, High, Low, and Close prices. It allows for calculating the S.A.R. indicator's upper and lower bands.

Examining the S.A.R. indicator's underlying mathematical equation is the only way to understand the indicator's upper and lower band formations fully. As mentioned above, the equation is the foundation for the algorithm's capacity to make well-informed decisions about entry, stop-loss, and target orders following real-time market conditions. To Understand the formation of the upper Band and lower Band of the S.A.R., one can investigate its Mathematical Equation. Equation 1 represents the mathematical formula for the S.A.R. upper band, while Equation 2 represents the formula for the Lower S.A.R. Band.

The perception of S.A.R assumes that given a data set $A:=\{a_1, a_2, a_3 \dots \dots \dots \dots \dots \dots \dots a_n \subset \mathbb{C}^r\}$ involving points rooted in Euclidean space, each data point accurately fitting into one of two conceivable classes. For $1 \leq p \leq n$ we let $\alpha_p \in \{0,1\}$ denotes the class to which the occurrence of a_p fit in, and the study refers to these as the class labels for the guides as the class labels for the data set. The study understands and perceives the entire data set A but can observe a subset of the labels $\alpha_1, \alpha_2 \dots \dots \dots \alpha_t$ for some $1 \leq t \leq n$.

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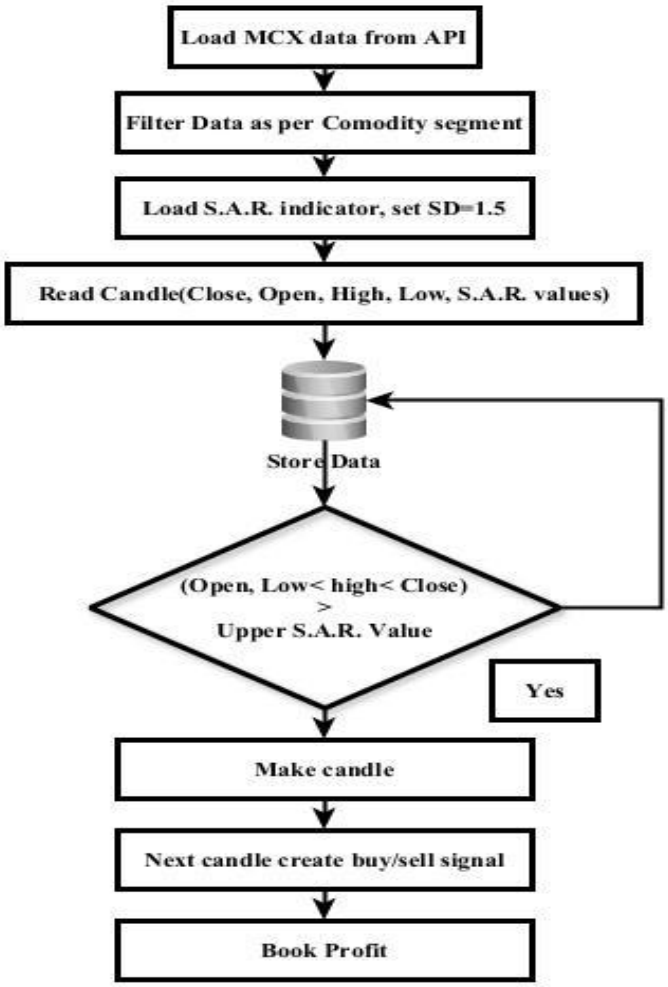

Figure 1: Propose methodology for Algo trading

The goal of transductive semi-supervised learning is to use these observations to predict the remaining class labels $\alpha_{t+1} \ldots \ldots . \alpha_n$. Laplace Learning is a classical graph-based method for solving a semi-supervised learning problem. Denote by $£ \coloneqq \{a_1, a_2 \ldots \ldots \ldots \ldots \ldots \ldots . . a_t\}$ the labelled subset and by $\upsilon: = \{a_{t+1,} a_{2,} \ldots . a_n\}$ the unlabelled subset. The study begins by constructing an affinity matrix $M \epsilon P_{n\,x\,n}$, which will be a nonnegative, symmetric matrix whose entry M_{cd} records the affinity (or similarity) between the instances a_c and a_d. The study remarks that, given its nonnegativity and symmetry, such an affinity matrix can be interpreted as the adjacency matrix of a weighted, undirected graph whose nodes correspond with the elements of the point cloud A. A popular way to construct affinity matrices, which we will employ, is by using a Gaussian kernel shown in Equation 1

$$M_{cd} = \exp\left(-\frac{\|a_c - a_d\|_2^2}{\tau}\right) - - - - - - - - - - (1)$$

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for some bandwidth hyperparameter $\tau > 0$. The study then forms the degree matrix $C \in P^{n\,x\,n}$, a diagonal matrix with diagonal entries given by $C_{cd} = \sum_{d=1}^{n} M_{cd}$, and use this to form the (unnormalized) Laplacian matrix $K = C - M$. Laplace Learning makes predictions for the labels. $\alpha_{t+1} \ldots \ldots \alpha_n$ by first obtaining the solution $x \in \mathbb{C}^n$ to the problem shown in Equation 2

$$\begin{cases} (K_x)c = 0, & \text{if } A_c \in \upsilon \\ x_c = \alpha_{c,} & \text{if } A_c \in £. \end{cases} \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ (2)$$

The study remarks that the solution to (2) has a natural interpretation as the solution to a discrete Dirichlet problem on the graph determined by the labelled instances. $A_c \in £$, serving as boundary points. We then define $\widehat{\alpha_c} = ar_{\alpha\in\{0,1\}} |\alpha - x_c|$ for $a_c \in \upsilon$ (breaking ties arbitrarily) and use these for our label predictions.

Figure 1 represents the research process,. In conclusion, this study advocates for an innovative methodology in trading and investment through artificial intelligence automation. By meticulously integrating data gathering, filtering, storage, and applying technical indicators, the algorithm mitigates the arduous physical labour and psychological strain commonly experienced by traders and investors. This automated system enables individuals to effectively and accurately navigate financial markets, offering the potential to significantly transform how players interact with the intricate nature of contemporary trade. With the evolution of technology, automated trading systems may become essential instruments for individuals aiming to enhance their trading methods and reduce the difficulties and pressures associated with manual trading. To comprehend the development of the upper and lower bands of the S.A.R., an examination of its mathematical equations might be undertaken.

4. RESULT

Figure 2: Buying trade

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The objective of this study is to conduct a comprehensive assessment of the potential economic outcomes of a trading approach by employing a rigorous analysis of several charts, such as the "target achieved chart," the "stop loss hit chart," and the critical "trigger candle identification chart." The main aim of this study is to evaluate the overall efficacy and feasibility of the trading technique. At the core of this trading methodology is recognizing "trigger candles," crucial indicators for prospective entry or exit positions inside the market.

The trigger candles are identified based on their price movement that diverges from the range established by the S.A.R. (stop and reverse) indicator, a commonly employed instrument in technical analysis. The core of this trading method is centred around the skill to identify trigger candles that demonstrate price swings beyond the boundaries of the S.A.R. range. Trigger candles are crucial for identifying favourable opportunities to initiate or terminate trading positions. A trigger candle is recognized when there is a deviation in either of its open, high, low, or closing prices from the range of the S.A.R.

This Deviation renders the trigger candle a point of considerable interest for traders. Figure 1 acts as an instructive exemplification of the implementation of this trading technique. In the given scenario, point "a" represents a candle indicating a buying opportunity, while point "b" denotes the execution of a buy order at a rate of 22500. As the transaction advances, the exit point 24500 is characterized by point "c." As mentioned earlier, the trade significantly increased by 2000 points, comparable to a monetary value of Rs. 60,000 per silver lot.

Figure 3: Selling trade

Similarly, Figure 2 illustrates another scenario wherein point "a" denotes a candle indicating a sell signal, while point "b" signifies the placement of a sell order at the price level of 23500. The trade is finalized at point "c" with a profit-taking price of 22500, resulting in a gain of

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1000 points or Rs. 30,000 per silver lot. In summary, this research extensively examines a trading technique that identifies trigger candles by applying candlestick analysis, particularly highlighting deviations from the S.A.R. range. This technique aims to enhance trading outcomes for market players by generating accurate buy and sell signals, implementing efficient stop-loss orders, and defining well-defined profit-taking goals. The precise identification and thorough examination of trigger candles play a crucial role in establishing the foundation of this trading methodology.

Moreover, this approach places significant importance on risk management, as indicated by using stop-loss orders, which are crucial in mitigating prospective financial losses. In conjunction with a clearly defined profit-taking plan, this method boosts its overall efficacy and attractiveness to traders who aim to optimize their profits while mitigating risks. This study highlights the significance of thorough candlestick analysis and the capacity to distinguish between favourable trigger candles and those that should be disregarded.

The profound level of analysis offered by this approach equips traders with essential knowledge of a potentially lucrative trading strategy that integrates meticulous technical research, effective risk management, and intelligent use of trigger candles to effectively navigate the intricate landscape of financial markets. The utilization of data-driven trading approaches demonstrates their efficacy and the possibilities they offer for improving trading results within the dynamic realm of financial markets.

5. CONCLUSION

The global business landscape has seen significant transformations due to the proliferation of AI-driven solutions such as ALGO-TRADE. By employing this state-of-the-art methodology, investors can enhance their likelihood of generating profits and reduce their dependence on chance. In specific circumstances, one may need to decide whether to purchase or create an asset or good when only a single unit of that product or support is currently available.

The study uses "buy-and-sell maximization" methods to conclude real-world empirical investigations. Researchers enhanced a simulation model using synthetic aperture radar (S.A.R.) to create the ALGO-TRADE program. S.A.R. visually represents a trading range's upper and lower boundaries, functioning as price envelopes with a one-standard-deviation separation. The susceptibility of the Band's breadth to market swings is notably high due to its reliance on the Standard Deviation. This metric quantifies the degree of dissimilarity within the data. The rationale for this assertion is that the standard deviation serves as a metric for quantifying the variability or volatility inherent in the dataset.

Employing the stock-to-asset ratio (S.A.R.) makes it possible to ascertain whether the current price is reasonably elevated or undervalued. Traders might use this signal to assess whether the current value is high or low. Occasionally, traders augment a moving average with higher and lower bands to provide additional data. Using individual bands in isolation does not produce the same results as their combined use. Achieving optimal outcomes involves merging the bands, incorporating different indicators, and conducting further experiments based on the

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insights gained from the initial trials. The present analysis examined three distinct charts to assess the profitability of the commodity trading account throughout the years 2021 and 2022. The system's graphical representations, such as the "Target Achievement Chart," "Stop Loss Hit Chart," and "Trigger Candle Detection Chart," exhibited remarkable efficacy, potentially enhancing a trader's professional proficiency by facilitating intraday trade execution.

Conflict of interest

To the best of their knowledge, the authors of the manuscript entitled “Intraday Commodity Trading Optimization Using S.A.R. Channels on NSE” declare that there is no conflict of interest in the present work.

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