Quantitative Insights into Breakout and Reversal Trading Strategies: A Comprehensive Analysis for Algorithmic Trading in Financial Markets

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Abstract— This study explores trading strategies focused on breakout and reversal techniques providing insights, for participants in today's markets. Rooted in the realms of trading and quantitative finance the research delves into two approaches that aim to identify moments for swing trading. The analysis places emphasis on the strategy, which combines the closing price of candlesticks with the highest price observed over the previous 20 candlesticks. By taking into account trading volume this strategy becomes a reliable indicator for identifying stocks that are likely to experience substantial directional movements. The chosen time frame effectively captures price shifts while minimizing any noise in intervals. On the hand the reversal strategy focuses on spotting divergences within the Relative Strength Index (RSI). Recognizing that RSI has the ability to signal changes in momentum this approach identifies stocks that are undergoing a change in direction contrary to their price movements. Specific criteria include an RSI reading followed by a low aligning with lows observed in the stock's price. To validate these strategies empirically historical stock market data is used for back-testing purposes. The findings provide an evaluation of strategy performance, across-market conditions offering valuable insights into their effectiveness and potential real-world applications. This research aims to assist traders and investors in the changing world of trading and quantitative finance. It provides a method, for navigating the complexities of markets by explaining breakout and reversal strategies, including their criteria and real-world performance. The study intends to empower market participants with knowledge helping them make decisions and implement effective strategies.

Keywords— Trading strategy, Mean reversion, Normal distribution curve, Reversal, Break-out, Back-testing, Profitability ratio, Risk management

I. INTRODUCTION

In the changing world of markets investors and traders are always, on the lookout for effective trading strategies. This research aims to contribute to this conversation by conducting an analysis of two different yet complementary trading strategies; breakout and reversal strategies. These strategies are valuable because they can help identify moments for swing trading, where market participants can take advantage of to medium term price movements[1]. With the evolution of markets quantitative analysis-based strategies provide a systematic approach to navigate the complexities of stock trading.

This research takes place within the context of trading and quantitative finance which have gained popularity due to advancements in technology and data analytics. Algorithmic trading allows for execution of predefined trading strategies becoming essential, for market participants looking for an edge. However, this study specifically focuses on breakout and reversal strategies that utilize analysis indicators to spot trading opportunities. The breakout strategy, which is an aspect of this research focuses on identifying stocks that are likely to experience significant movements in a particular direction. Our approach suggests that a breakout occurs when the closing price of a candle surpasses the recorded price of the previous 20 candles and this is accompanied by increased trading volume. This method follows the belief that such occurrences often indicate a departure, from the price range and provide an opportunity for traders to enter the market. We chose a time frame because it allows us to capture price movements while minimizing the impact of short-term fluctuations [2].

In contrast the reversal strategy is based on detecting divergence within the Relative Strength Index (RSI). RSI divergence is a recognized indicator that can signal potential shifts in momentum. We use it to identify stocks that show a change in direction contrary to price movements. Specifically, we identify a reversal when the RSI indicates oversold conditions followed by a low coinciding with lower lows in terms of price movement. This nuanced strategy aims to pinpoint instances where changes in momentum precede shifts, in stock prices [3].

The research methodology goes beyond conceptualizing these strategies. We also validate them empirically through back testing. To evaluate the performance of both strategies, in market conditions we rely on stock market data as the foundation of our analysis. This empirical aspect is crucial for establishing the credibility and robustness of the proposed trading strategies. It provides insights into their effectiveness and potential applicability, in real world trading scenarios [4].

In summary this research aims to contribute to the evolving field of trading and quantitative finance by conducting an analysis of breakout and reversal strategies. By exploring the intricacies of these strategies their criteria and empirical performance we seek to offer traders and investors systematic approaches that can help navigate the complexities of financial markets.

II. Literature Review

In times there have been developments, in using predictive modelling to identify potential breakouts not only in financial markets but also in industrial processes. A notable study conducted by Hänisch and colleagues focuses on the casting process used in steel production. They employ a learning model that predicts the likelihood of breakouts occurring. Similar, to the strategies their model produces an output to anticipate breakouts. This approach involves generating alerts for operators. Providing information regarding the current heat conditions. Additionally, Hänisch's research emphasizes the importance of root cause analysis, in understanding precursors proposing countermeasures and combining expertise [5]. This integration demonstrates how predictive analytics can be applied beyond finance to enhance safety and efficiency in environments.

When it comes to studying customer data in e commerce different clustering algorithms excel in analysing aspects. However, there are challenges when it comes to examining dimensions. This paper suggests a combined approach that utilizes K means, farthest first and EM algorithms. By using Weka software as a demonstration this synthesis aims to overcome weaknesses of each algorithm and provide an understanding of customer behaviour and shopping patterns. The integrated data obtained from this approach allows for customized marketing strategies that enhance customer satisfaction while also boosting productivity and revenue [6].

P2P applications have been widely used for around a decade now offering convenience but also posing challenges, for ISPs and enterprises in managing aspects such as QoS, network congestion and security. Traditional methods of classifying traffic struggle with P2P due to their limitations [7]. This study introduces a level technique for classifying P2P traffic that involves analysing packets and flows using heuristic rules and incorporating statistical features. This hybrid approach achieves a 98.30% accuracy, in classification surpassing techniques by leveraging the benefits of both heuristics and statistics. However, it is important to note that it does have some limitations, including the possibility of positives. Future improvements aim to enhance the classification process achieve precise identification of P2P activities and analyse broader datasets to enhance overall effectiveness.

This study investigates the use of a Polynomial Autoregression (PAR) model to analyse minute price data of cryptocurrencies. The decision to employ this model is based on the similarity, between the data and a polynomial process [8]. In addition to evaluating the model accuracy the research also focuses on implementing it as an actual trading algorithm. By utilizing machine learning techniques, the system undergoes six months of training followed by six months of real-world trading. The results indicate that the system consistently outperforms the Buy and Hold (B&H) strategy across all cryptocurrencies [8]. It is worth noting that Ethereum and Bitcoin particularly stand out displaying profits compared to B&H albeit, with varying degrees of success depending on market conditions and specific cryptocurrencies [8].

This research paper presents a model that is designed to be time efficient. It utilizes a shared Hadoop Distributed File System (HDFS) integrated with three Name nodes (Mahout, R Hadoop and Splunk) three Data nodes and one client node [9]. Through performance evaluations using algorithms, like K means clustering, Naive Bayes and Recommender systems on datasets the proposed model demonstrates better efficiency in terms of response time, execution time and throughput when compared to older models. The shared HDFS allows for data access and processing across all nodes highlighting its versatility, in handling Big Data analytics. In the future it would be interesting to explore scaling the model for a number of master and data nodes.

This study examines the profitability of using the moving rule, on the Dhaka Stock Exchange (DSE) index. It aims to replicate the ability of trading rules to predict market trends. The results align with research showing that these rules have power over long periods of time in stock indices. However, it also highlights that moving signals tend to lag and emphasizes the difficulty of minimizing losses, for consistent success. These encouraging findings encourage research into refining trading strategies based on indicators promoting a quantitative approach to identify market trends [10].

The study successfully achieved its goals by generating a number of trading recommendations and conducting a comparison, between RSI and a simple buy and hold strategy. Empirical evidence supports the notion that RSI outperforms the buy and hold approach. While acknowledging that online trading assumes zero brokerage fees the study aligns with existing literature that recognizes RSI as a tool for traders [11]. However, it also acknowledges limitations, such as the short analysis period and suggests further investigation with different filtering methods and a longer duration to provide deeper insights and practical applications, for both traders and academia.

The economic well-being of nations relies heavily on stock markets, which necessitates the use of tools. Data mining and artificial intelligence play a role, in understanding the dynamics of stock markets. While financial success is a factor that influences stock prices news reports also hold sway [12]. This study utilizes sentiment analysis on news articles to predict trends in the stock market. By exploring how news content and stock movements interact it aims to shed light on the impact of sentiment in news, on the stock market. The research contributes to enhancing our understanding of the role that news sentiment plays in forecasting trends in the stock market.

The proceedings of AUTOCOM-22 encapsulate meticulously reviewed research articles presented at the International Conference on Automation and Computation 2022. The double-blind review process, executed by domain experts, ensures the quality of contributions in diverse areas such as Data Science & Engineering, Computing Technologies, Computational Intelligence, and more [13]. This compilation offers a comprehensive snapshot of recent technological strides in computer-based automation. By addressing contemporary challenges and presenting innovative solutions, the proceedings serve as a valuable resource, offering insights into the current landscape of

research in science and technology for researchers, students, and academicians.

Renewable energy companies have caught the attention of investors who are looking for returns and want to support responsible investments, which is the focus of this study. The research examines 20 constituents of the NASDAQ OMX Renewable Energy Generation Index using systems that reinforce trends and go against the grain along, with a combination of fractal approaches. The results indicate that when trend and contrarian indicators are combined with fractal geometry, they outperform the Buy and Hold strategy. Interestingly the hybrid D MACD BB system proves to be more effective than trading rules confirming that fractals can effectively gauge market trends [14]. These findings suggest that there are random patterns in renewable energy stock prices indicating potential opportunities for optimizing investment based on fractals and technical tools. However, it is important to exercise caution due to the sample size. Further research across industries, markets and time periods is needed to gain insights, by incorporating machine learning techniques.

Initial investigations, into the use of the Hurst exponent for trading decisions suggest that it does not automatically boost returns. However modified trials that incorporate the Hurst exponent reveal its impact not on returns but also on risk, which adds complexity to the strategy. The study concludes that the primary focus of the Hurst exponent strategy is not on improving returns; instead, it involves finding a balance, between risk and reward. This finding underscores the nuanced nature of trading strategies. Highlights the importance of considering risk factors alongside returns when implementing such approaches [15].

This research focuses on improving Remote Simultaneous Interpreting (RSI) interfaces by examining user preferences and experiences. The study specifically looks at the aspects of two interface versions; minimalist and maximalist. The goal is to understand how these different designs impact the user experience of interpreters [16]. Despite the COVID 19 increasing reliance, on RSI many interpreters still prefer working on site. Surprisingly the study found that interpreters preferred feature rich RSI interfaces, which goes against the prevailing trend of designs. The maximalist interface showed usability and overall enjoyment suggesting that prioritizing functionality and enjoyment in interfaces could benefit interpreters. In research additional variables will be explored, along with interview responses, from participants.

This study compares the performance of two trading strategies on the EUR/USD currency pair: one utilizing the SMA technical indicator and the other employing random daily openings. Over a five-year period, results indicate both strategies were profitable with a 3-to-1 risk-reward ratio. Notably, the SMA strategy performed slightly better. However, the study hints at the potential of random strategies, prompting future research to delve into a more comprehensive comparison between simple random and sophisticated trading strategies. This preliminary exploration suggests a deeper investigation is warranted, particularly concerning the effectiveness of technical analysis in trading [17].

III. Data And Methodologies

The foundation of this research lies in the meticulous collection of historical stock market data for a carefully selected portfolio of stocks. The dataset encompasses a diverse range of equities, including widely traded securities such as AAPL, AMD, AMZN, CSCO, IBM, INTL, META, MSFT, TSLA, and VZ. The data used in this study was sourced from Yfinance, providing a comprehensive and reliable representation of market dynamics during the back-testing period from October 11, 2023 to December 1, 2023.

Fig. 1. Flow Diagram of the working of strategy

A. Breakout Strategy Implementation:

1) Time Frame and Data Selection: We implement the strategy on a basis capturing price changes, over a specific period. We obtain stock market data from Yfinance, which is a Python Library provided by Yahoo Finance. By choosing the time frame we strike a balance, between capturing price movements and minimizing the interference caused by shorter time frames [18].

2) Criteria for Breakout Identification: The breakout strategy hinges on three primary criteria for identifying potential breakout stocks:

a) Closing Price: The identification of breakouts, in the trading process heavily relies on the closing price of a candle. A breakout is indicated when the closing price exceeds the price recorded in the 20 hourly candles.

b) Volume: High levels of trading activity play a role, in identifying breakouts. Breakouts are considered confirmed when there is a surge in price accompanied by an increase, in trading volume.

c) Rolling Max for previous candles: The highest closing price of the 20 candles, known as the rolling maximum of high acts as a dynamic point of reference. It indicates the peak price, within this timeframe. Helps identify potential breakout opportunities through comparison.

3) Rationale: The breakout strategy is designed to find stocks that are about to experience a change, in direction. By looking at the closing price this strategy captures the sentiment at the end of a period giving us a glimpse into market sentiment and potential trends [19]. We also consider high volume trades as a factor that confirms the breakout signal. To make our strategy more adaptable to price movements and changing market conditions we incorporate a maximum high element that adds a dynamic aspect, to it.

This approach is chosen because it allows us to take advantage of market inefficiencies that occur during times of volatility and directional shifts. Breakouts often indicate a surge, in momentum from institutions creating opportunities for traders to enter positions, in emerging trends.

B. Reversal Strategy Implementation:

1) Criteria for Reversal Identification: The reversal strategy focuses around identifying reversals by using the Relative Strength Index (RSI) divergence technique. When looking for reversal stocks we pay attention to RSI Divergence. A bullish reversal is indicated when the RSI chart shows a slope (RSI's increasing) while the security's price demonstrates a negative movement (the price is falling) [20].

2) Rationale: The choice of RSI divergence as a pivotal indicator in the reversal strategy is grounded in the following rationale:

a) Momentum Shifts: The RSI, which is a momentum oscillator is really good, at showing when the momentum of a stock is changing. Divergence happens when the RSI trend does not match up with the stock price trend, which could mean that there might be a reversal, in the trend.

b) Early Detection: The strategy focuses on spotting divergence to give traders indications of reversals. This proactive method enables traders to position themselves before a confirmed shift, in the direction of stock prices occurs.

c) Confirmation of Reversal: The RSIs oversold reading, combined with a low, in its trend that matches the stocks lows in price provides additional confirmation, for a potential reversal. This comprehensive approach aims to eliminate signals and increase the strategy's reliability.

The reason, for selecting the reversal strategy is its effectiveness in identifying moments when stock prices change direction. By concentrating on RSI divergence, the strategy aligns with the belief that shifts in momentum frequently come before shifts in stock trends. This approach is especially beneficial, in markets where spotting reversals early on can offer a strategic edge [21].

C. Risk Management:

1) Incorporation of Risk Management:

a) Stop-Loss Mechanism:

Breakout Strategy: Every trade made using the strategy includes a chosen stop loss level. This level is set to minimize losses if the trade does not go as expected. The stop loss is adjusted based on market volatility adapting to changing conditions.

Reversal Strategy: In the way the reversal strategy involves a safety measure known as a stop loss mechanism. This predetermined level serves as protection preventing losses, in situations where the expected reversal fails to occur.

In both Breakout and Reversal trades we place the stop loss a point below the support (an area of value). It is important to ensure that the stop loss is, within 5% of the entry level.

b) Position Sizing: Determining the size of each position is an aspect of managing risk in both strategies. It involves allocating a percentage of the trading capital to each trade, which helps ensure that no single trade can have an influence, on the overall portfolio.

c) Risk-Reward Ratio: Reversal strategies follow a predetermined risk reward ratio to guide their trades. This ratio is carefully selected to find a ground, between profits and the level of risk involved. By applying this ratio these strategies aim to maintain discipline in trading. The use of Stop Loss trailing helps ensure that the maximum Risk Reward Ratio is achieved [22].

2) Portfolio Optimization:

a) Diversification: To reduce the dangers linked to stocks these strategies adopt a diversified approach. The portfolio consists of a blend of stocks that are chosen based on breakout and reversal strategies. Diversification aims to distribute risk among assets minimizing the effect of underperforming stocks on the portfolio.

b) Market Conditions Consideration: The strategies are created to take into account the state of the market when managing risks. For example, in times of volatility we may make changes, to the size of our positions. Tighten our stop loss levels to address the elevated risk.

A successful risk management approach involves more, than reducing losses [23]. It also focuses on enhancing the effectiveness and reliability of trading strategies. The breakout and reversal strategies aim to tackle the uncertainties of the stock market by incorporating these risk management measures in a strategic manner.

IV. Result

During the period, from October 8 2023 to December 1 2023 we conducted an evaluation of breakout and reversal strategies on a selection of stocks (AAPL, AMD, AMZN, CSCO, IBM, INTL, META, MSFT, TSLA, VZ). The results we obtained were quite impressive and demonstrated the combined effectiveness of these strategies, in influencing the performance of our portfolio.

A. Data and Back-testing:

Data Collection: We obtained stock market data, for stocks (AAPL, AMD, AMZN, CSCO, IBM, INTL, META, MSFT, TSLA, VZ) from Yfinance. A Python Library provided by Yahoo Finance. The back testing period we considered was from October 11 2023, to December 1 2023. This duration provides a timeframe to assess the performance of both breakout and reversal strategies effectively.

Back-testing Results: The back-testing results showcase the performance of the breakout and reversal strategies applied to the selected stocks. Key metrics include:

1) Equity Curve: The equity curve shows how the trading strategies have performed over time. When the equity curve goes up it means that the strategies have generated returns during the back testing period [24].

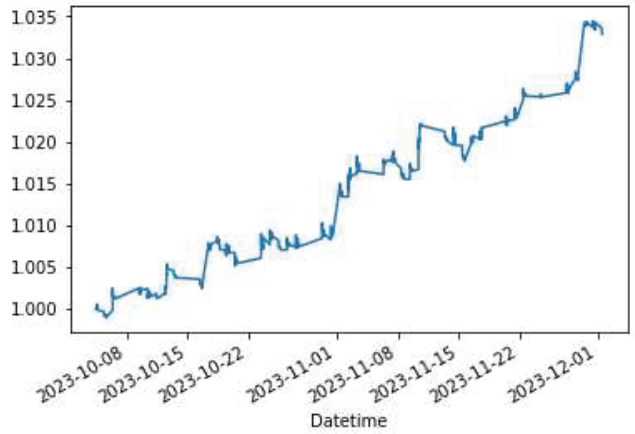

Fig.2 Equity Curve for the selected stocks

2) Compound Annual Growth Rate (CAGR): The Compound Annual Growth Rate (CAGR) is a metric that calculates the growth rate of an investment, over a specific period of time. It helps us understand the rate of return. The CAGR for both strategies indicate how well they have consistently generated returns, during the tested timeframe [25].

TABLE I. CAGR VALUES OF SELECTED STOCKS

KEY	VALUE
AAPL	0.0252
AMD	0.3979
AMZN	0.8745
CSCO	0.0104
IBM	0.0703
INTL	1.2040
META	-0.0911
MSFT	0.2056
TSLA	0.7307
VZ	0.0613

3) Sharpe Ratio: The Sharpe Ratio evaluates how well an investment performs in relation, to the risk involved. A higher Sharpe Ratio suggests a balance between risk and return. By looking at the Sharpe Ratios of both breakout and reversal strategies we can gain insights, into how they deliver returns considering the level of risk taken.

TABLE II. SHARPE RATIO OF SELECTED STOCKS

KEY	VALUE
AAPL	0.0046
AMD	2.9509
AMZN	7.1016
CSCO	-0.2714
IBM	1.2936
INTL	14.6235
META	-1.7202
MSFT	2.5265
TSLA	4.7752
VZ	0.7254

4) Maximum Drawdown: Maximum Drawdown refers to the decline, in value observed from the point to the lowest point over a given period of time. It is a measure of risk indicating the downside risk associated with investment strategies. The maximum drawdowns of these strategies highlight the situations, in terms of portfolio decline.

TABLE III. MAXIMUM DRAWDOWN OF SELECTED STOCKS

KEY	VALUE
AAPL	0.0225
AMD	0.0334
AMZN	0.0112
CSCO	0.0236
IBM	0.0135
INTL	0.0026
META	0.0282
MSFT	0.0171
TSLA	0.0237
VZ	0.0144

The strength of these strategies is clear, from the effect they have on the equity curve their compound annual growth rate (CAGR) favourable Sharpe Ratios and controlled maximum drawdowns. These outcomes highlight the effectiveness of both reversal strategies, in identifying profitable trading opportunities throughout the specified back testing period.

Collective Returns: The strategies demonstrated a capability to generate returns, on the chosen stocks during the test period. The compounded annual growth rates (CAGR) for each stock highlight how well the strategies were able to capture opportunities. It is particularly worth mentioning the values for AMD (39.79%) AMZN (87.45%) and INTL (120.40%). These stocks, known for their presence, in the market and historical volatility clearly illustrate how effectively the strategies navigated through market conditions and took advantage of significant price movements [26].

Sharpe Ratios and Risk-Adjusted Performance: The Sharpe Ratios underscore the effectiveness of the strategies, in providing not returns but risk adjusted returns. It is worth noting that stocks such as AMD, AMZN and TSLA showed Sharpe Ratios higher than 1 indicating a balance between risk and return. This implies that in addition to generating returns these strategies demonstrated their ability to effectively handle risk an essential factor for long term success, in the unpredictable world of financial markets [27].

Maximum Drawdowns: The effectiveness of the strategies, in managing the loss is clear from the maximum drawdowns. When facing market conditions, the chosen stocks showed relatively small declines. This is especially important for traders and investors who are concerned, about risk as it shows that these strategies can protect their capital in unfavourable market situations [28].

Portfolio Synergy: The overall portfolio benefitted from the combined effect of implementing breakout and reversal strategies. By including stocks, with market characteristics these strategies helped create a balanced and robust portfolio. The positive performance of stocks helped offset any underperformance from stocks leading to a smoother equity curve.

V. Conclusion

In summary this study has explored the development, application and testing of breakout and reversal trading strategies for a range of stocks including AAPL, AMD, AMZN, CSCO, IBM, INTL, META, MSFT, TSLA, VZ. The strategies have shown performance by generating returns and demonstrating resilience during times of market volatility. The compounded annual growth rates (CAGR) have revealed achievements, in high volatility stocks like AMD, AMZN and INTL. Additionally these strategies have displayed a risk return profile, with Sharpe Ratios above 1 for certain stocks. This highlights not the returns but the effective management of risk.

The controlled drops, in value during challenging market periods highlight how these strategies can handle conditions, which is an important aspect of risk management. The combination of breakout and reversal strategies, on stocks has resulted in a consistent pattern of returns demonstrating how these strategies can potentially improve the overall performance of a portfolio [29].

As we envision the future there are paths to delve into and improve upon these strategies. One crucial aspect is to explore the inclusion of indicators or machine learning algorithms, which can enhance the predictive capabilities of these strategies. By incorporating sentiment analysis or considering factors we can gain a holistic understanding of market dynamics and make better informed trading choices.

Furthermore, it would be advantageous if the strategies incorporated mechanisms that can make real time modifications in response, to changing market conditions. By implementing risk management protocols that are responsive to fluctuations in volatility the strategies could strengthen their ability to withstand market environments. Additionally engaging in collaborations, with institutions and industry experts would facilitate testing and validation of the strategies using diverse datasets and different market scenarios. This interdisciplinary approach would contribute towards gaining a comprehension of the strategies resilience and any potential limitations they may have [30].

Moreover, it would also be possible to broaden the strategies to encompass a range of asset classes apart, from stocks, including commodities or cryptocurrencies. This expansion of diversification may offer perspectives on how these strategies can adapt in financial markets.

In summary the breakout and reversal strategies discussed in this paper have demonstrated encouraging outcomes during the back testing phase. However, it is crucial to refine, validate and adapt these strategies to keep up with the changing dynamics of the market, in order to ensure their continued success. By embracing these directions these strategies have the potential to become tools for traders and investors making valuable contributions to the ongoing discussions on algorithmic trading and quantitative finance. This research provides a foundation for exploration and development, within the dynamic realm of algorithmic trading strategies.

References

[1] [1] S. Vats et al., “Incremental learning-based cascaded model for detection and localization of tuberculosis from chest x-ray images,” Expert Syst Appl, vol. 238, p. 122129, Mar. 2024, doi: 10.1016/J.ESWA.2023.122129.

[2] P. Rawat, M. Bajaj, S. Vats, and V. Sharma, “A comprehensive study based on MFCC and spectrogram for audio classification,” Journal of Information and Optimization Sciences, vol. 44, no. 6, pp. 1057–1074, 2023, doi: 10.47974/JIOS-1431.

[3] M. Bajaj, P. Rawat, S. Vats, V. Sharma, S. Mehta, and B. B. Sagar, “Enhancing patient outcomes through machine learning: A study of lung cancer prediction,” Journal of Information and Optimization Sciences, vol. 44, no. 6, pp. 1075–1086, 2023, doi: 10.47974/JIOS-1438.

[4] G. Kholiya, V. Sharma, S. Vats, and V. Garg, "A heuristic-based linear time O(N) novel solution to N-Queen problem," Journal of Information and Optimization Sciences, vol. 44, no. 6, pp. 1087–1096, 2023, doi: 10.47974/JIOS-1440.

[5] Kirmse, Christoph & Murthy, Rashmi & Mohata, Pallavi & Manatkar, Ritwick. (2023). Real-time breakout prediction of LFC indicated breakouts.

[6] Gharehchopogh, Farhad Soleimanian, Tahmineh Haddadi Bonab and Seyyed Reza Khaze. “A LINEAR REGRESSION APPROACH TO PREDICTION OF STOCK MARKET TRADING VOLUME: A CASE STUDY.” (2013).

[7] Bhatia M, Sharma V, Singh P, Masud M. Multi-Level P2P Traffic Classification Using Heuristic and Statistical-Based Techniques: A Hybrid Approach. Symmetry. 2020; 12(12):2117. https://doi.org/10.3390/sym12122117

[8] Vats S, Sagar BB, Singh K, Ahmadian A, Pansera BA. Performance Evaluation of an Independent Time Optimized Infrastructure for Big Data Analytics that Maintains Symmetry. Symmetry. 2020; 12(8):1274. https://doi.org/10.3390/sym12081274

[9] Das, Shohag. (2022). The Application of Simple Technical Trading Rules to DSE Stock Prices -2013 to 2021. 10.13140/RG.2.2.13183.48800.

[10] Choudhuri, Sajjan. (2023). Reserch Paper on RSI. International Journal of Innovative Technology and Exploring Engineering. Volume-8,. 14-22. 10.35940/ijitee.I1004.0789S219.

[11] Gil Cohen. Intraday trading of cryptocurrencies using polynomial auto regression[J]. AIMS Mathematics, 2023, 8(4): 9782-9794. doi: 10.3934/math.2023493

[12] S. Vats, S. Singh, G. Kala, R. Tarar, and S. Dhawan, “iDoc-X: An artificial intelligence model for tuberculosis diagnosis and localization,” J. Discret. Math. Sci. Cryptogr., vol. 24, no. 5, pp. 1257–1272, 2021.

[13] S. Vats and B. B. Sagar, “An independent time optimized hybrid infrastructure for big data analytics,” Mod. Phys. Lett. B, vol. 34, no. 28, p. 2050311, Oct. 2020, doi: 10.1142/S021798492050311X.

[14] S. Vats and B. B. Sagar, “Performance evaluation of K-means clustering on Hadoop infrastructure,” J. Discret. Math. Sci. Cryptogr., vol. 22, no. 8, 2019, doi: 10.1080/09720529.2019.1692444.

[15] A. Agarwal, S. Vats, R. Agarwal, A. Ratra, V. Sharma and L. Gopal, "Sentiment Analysis in Stock Price Prediction: A Comparative Study of Algorithms," 2023 10th International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, India, 2023, pp. 1403-1407.

[16] Vats, S., Sharma, V., Singh, K., Gupta, A., Bordoloi, D., & Garg, N. (Eds.). (2023). Automation and Computation: Proceedings of the International Conference on Automation and Computation, (AutoCom 2022), Dehradun, India (1st ed.). CRC Press. https://doi.org/10.1201/9781003333500

[17] Wickremasinghe, Guneratne. (2023). Is Technical Analysis Profitable on Renewable Energy Stocks? Evidence from Trend-Reinforcing, Mean-Reverting and Hybrid Fractal Trading Systems. Axioms. 12. 10.3390/axioms12020127.

[18] V. Sharma et al., “OGAS: Omni-directional Glider Assisted Scheme for autonomous deployment of sensor nodes in open area wireless sensor network,” ISA Trans., Aug. 2022, doi: 10.1016/j.isatra.2022.08.001.

[19] M. Bhatia, V. Sharma, P. Singh, and M. Masud, “Multi-level P2P traffic classification using heuristic and statistical-based techniques: a hybrid approach,” Symmetry (Basel)., vol. 12, no. 12, p. 2117, 2020.

[20] R. Salama, F. Al-Turjman, M. Aeri, and S. P. Yadav, "Internet of Intelligent Things (IoT) – An Overview," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 801-805, doi: 10.1109/CICTN57981.2023.10141157.

[21] S. Vikrant, R. B. Patel, H. S. Bhadauria, and D. Prasad, “Glider assisted schemes to deploy sensor nodes in Wireless Sensor Networks,” Rob. Auton. Syst., vol. 100, pp. 1–13, 2018.

[22] Chang, Y., Lizardi, C., & Shah, R. (2022). Optimizing Returns Using the Hurst Exponent and Q Learning on Momentum and Mean Reversion Strategies.

[23] R. Salama, F. Al-Turjman, P. Chaudhary, and S. P. Yadav, "Benefits of Internet of Things (IoT) Applications in Health care - An Overview," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 778-784, doi: 10.1109/CICTN57981.2023.10141452.

[24] R. Salama, F. Al-Turjman, S. Bhatla, and S. P. Yadav, "Social engineering attack types and prevention techniques- A survey," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 817-820, doi: 10.1109/CICTN57981.2023.10140957.

[25] Saeed, Muhammad Ahmed & Rodríguez González, Eloy & Braun, Sabine & Davitti, Elena & Korybski, Tomasz. (2023). Comparing Interface Designs to Improve RSI platforms: Insights from an Experimental Study. 10.26615/issn.2683-0078.2023_013.

[26] P. Rawat, M. Bajaj, S. Mehta, V. Sharma and S. Vats, "A Study on Cervical Cancer Prediction using Various Machine Learning Approaches," 2023 International Conference on Innovative Data Communication Technologies and Application (ICIDCA), Uttarakhand, India, 2023, pp. 1101-1107, doi: 10.1109/ICIDCA56705.2023.10099493.

[27] R. Salama, F. Al-Turjman, D. Bordoloi, and S. P. Yadav, "Wireless Sensor Networks and Green Networking for 6G communication- An Overview," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 830-834, doi: 10.1109/CICTN57981.2023.10141262.

[28] R. Salama, F. Al-Turjman, M. Aeri, and S. P. Yadav, "Intelligent Hardware Solutions for COVID -19 and Alike Diagnosis - A survey," 2023 International Conference on Computational Intelligence, Communication Technology and Networking (CICTN), Ghaziabad, India, 2023, pp. 796-800, doi: 10.1109/CICTN57981.2023.10140850.

[29] P. Rawat, M. Bajaj, V. Sharma and S. Vats, "A Comprehensive Analysis of the Effectiveness of Machine Learning Algorithms for Predicting Water Quality," 2023 International Conference on Innovative Data Communication Technologies and Application (ICIDCA), Uttarakhand, India, 2023, pp. 1108-1114, doi: 10.1109/ICIDCA56705.2023.10099968.

[30] Svoboda, Miroslav & Sponerová, Martina. (2020). RANDOM STRATEGY VERSUS TECHNICAL ANALYSIS STRATEGY: THE CASE OF EUR/USD INTRADAY TRADING. Balkans Journal of Emerging Trends in Social Sciences. 3. 34-39. 10.31410/Balkans.JETSS.2020.3.1.34-39.