

Stock Market Prediction using Darvas Box Technique

Chandrashekhar H. Patil¹, Mandar Parale², Ninad S. Zanje³, Karan Nadkarni⁴ and S. M. Mali⁵
^{1, 3-5}Dr. Vishwanath Karad MIT World Peace University / Department of Computer Science and Application, Pune, India
Email: chpatil.mca@gmail.com, ninadzanje@rediffmail.com, karanvnadkarni@gmail.com, shankar.mali@mitwpu.edu.in
²MAEER'S MIT Arts, Commerce and Science College, Alandi(D), Pune, Maharashtra, India 412105
Email: parailemandar@gmail.com

Abstract—The reason behind this paper is to showcase an attempt to create an algorithm that will implement the Darvas Box strategy and automatically identify profitable stocks. In addition, it will also recommend a stop loss order to the user so that he/she procures minimum loss. Our datasets consist of 3 month daily company-wise historical data for companies featured on the NSE 52 week high list. Our datasets have been gathered with a particular focus on the following features: Last Traded Price (LTP) and the volume of the stocks traded. The algorithm is particularly targeted towards short to medium term delivery trading. The algorithm works best when the analysis is done once the market closes. This is purely based on technical analysis of the stocks. To counter the unforeseen changes due to uncontrollable circumstances there is a stop loss applied to each stock that follows the pattern so as to minimize the losses occurred during the trades.

Index Terms— Algorithm, Darvas Box strategy, Stock prediction and Stop loss.

I. INTRODUCTION

Contemporary stock market prediction techniques rely on analysing data in huge volumes and also are generally made for intra-day trading. These techniques involve fundamental analysis of particular stocks. Fundamental analysis includes the analysis done on data obtained from a company's balance sheets, budgets, news, tax returns and other technical data. One has to have thorough knowledge of accounting and finance to draw a comprehensive conclusion of a particular company. Also the internal news regarding that company affects its performance which in turn reflects the direction of its stock. This data is highly confidential and mostly available only to people within the inner circles of the trading community. This debars the common retail investor having less capital and knowledge to effectively siphon his money for his profit. The common retail investor relies on tips that originate through word of mouth which are in turn a result of public sentiment towards a particular company. Human emotions which result in this public sentiment are very complex in nature to predict. Also the second thing that affects the stock price are the current events that take place in the society such as wars, natural disasters, political events leading to the change in the leadership of a nation etc. Such events are usually not in the hands of the common person who bids his hard earned money in the stock market. This instils fear amongst the mind of the common investor and therefore he shies away from investing in the stock market. A key to successful investing is also knowing the fundamentals of a company. However, for knowing those fundamentals one must be accustomed with the vast field of accounting and finance. A person may not possess such specialized knowledge of the same. This also prevents the common investor from investing his hard earned money.

II. RELATED WORK

[1] proposed a machine learning algorithm to predict prices for precious metals. The algorithm mainly makes use of three methods for predicting prices: Linear Regression, Darvas Box strategy and Bollinger Bands. The Linear Regression determines the general trend where every candlestick represents the high/low of the metal's price. The Darvas Box strategy is used to monitor the metal's price within a specific box model and its breakout from the box in a specific time period. The Bollinger Bands strategy is used to place buy and sell orders based on price movement. [2] created an algorithm that utilizes Darvas Box strategy and Linear Regression techniques to facilitate traders in forecasting bitcoin price trends. The algorithm further makes use of Particle Swarm Optimization to find the optimal combination of forecast setups. The results obtained via his algorithm proved that his approach was very effective for analysing and predicting bitcoin price trends along with procuring hefty profits. [3] developed a portfolio selection strategy based on the Darvas Box strategy. Further, this strategy employs machine learning to better the results. [4] proposed a strategy to suggest stop losses. This strategy can be implemented in various stock price prediction models. [5] put forth a machine learning model that predicts stop losses or takes profit pips. The machine learning model targets the gold trading market. The model has been developed using SVM, Random Forest and Neural Networks. [6] examines the most sophisticated systems created to foresee and trade financial assets. The primary value of the paper is in its coverage of the key approaches incorporated into trading systems using algorithms. Alongside this it outlines each methodology's advantages and disadvantages. [7] suggested a labelling strategy that adjusts for stop-loss in order to minimize the disparity between decision-making and prediction. [8] have employed Long Short-Term Memory Neural Networks (LSTM) to analyse changes in stock prices. In order to lower investor risks, a stop-loss method based on double thresholds is introduced, allowing investors to sell inside a predetermined window of time when the stock price drops to a specific range. [9] objectivizes using standard deviation and sharp ratios to analyse historical data in order to properly estimate stop-loss and take-profit levels. [10] presents a framework for an option sell-side technique that estimates the win-rate of an option by its premium, time to maturity, and volatility based on a statistical technique and Random Forest algorithm. [11] is the first to use a fractional Brownian motion-based market model to examine stop-loss strategies that take into account asset values' long-range dependence. Theory analysis and simulation studies are used to analyse the efficacy of stop-loss techniques and the determining criteria. [12] compared the trading performance of buy-and-hold and classic stop-loss techniques using the trailing stop-loss (SL2) and stop-loss (SL1) approaches. The study's findings can assist investors in selecting from a variety of tactics that will increase their profits on the Tehran Stock Exchange. [13] aims to investigate if stop-loss methods perform better than buy-and-hold strategies by comparing the two stock market tactics. Cumulative and mean returns are the evaluation parameters employed to find out if stop-loss tactics can create superior outcomes. The study suggests applying stop-loss tactics to a stock portfolio to reduce loss, particularly in times of market turbulence. [14] concentrates on short-term trading at minuscule frequencies, which entails analysing massive volumes of data that fluctuate quickly over extremely brief time intervals. This approach makes use of long short-term memory networks to catch time related dependencies in pricing sequences and convolutional layers to catch spatial information. The advised method does exceptionally well in a range of market situations and is particularly fruitful for down trending trades. [15] uses a combination of stock box theory with support vector machine algorithm to offer an intelligent trading system on the basis of oscillation box prediction. The box theory states that a successful stock buy or sell usually takes place when the price successfully exits the first oscillation box and enters a new one. The experiment evaluates the system on three distinct stock movement trends: bull, bear, and fluctuating markets.

[16] experimentally investigates the usefulness of trailing stop-loss (TSL) methods to produce additional profits for different investors. Furthermore, regardless of threshold level, the greater bulk of TSL trading techniques continue to show positive additional returns even after accounting for transaction charges and organized hazards. [17] looks at how stop loss tactics affect the risk and return of specific common equities. The findings suggest that, when security returns are expanded beyond historical realizations to potential future trajectories, these techniques neither decrease nor raise investor's loss in relation to a buy-and-hold strategy. Nonetheless, a special stop loss mechanism aids in lowering investment risk for investors.

[18] is the foremost authority on the Darvas Box strategy, its conception, the underlying theory and the market analysis and trading techniques carried out in conjunction with this strategy. [19] presents and evaluates a unique approach to automated stock trading that combines the closest neighbour classification with technical analysis. The primary goal of this research is to determine if an intelligent prediction system based solely on the historical closing prices and volumes of daily stock transactions can be used in practice. In order to do this, they provide a method that combines a closest neighbour classifier with many widely used technical analysis tools, like the RSI

filter, stop loss, and stop gain. For the majority of the firms, the suggested approach was demonstrated to provide significantly larger profits than buy-and-hold, with little purchase operations created and, as a result, lowering the risk of market exposure. [20] utilizes the trading histories of different investors in the UK stock market from 2006 to 2009 to demonstrate that using stop losses in investing choices is a useful strategy for mitigating the disposition effect. Additionally, it is demonstrated that stop loss users have fewer expertise than other investors and are more hesitant to realize losses when they don't utilize stop losses. [21] aims to simplify stock market predictions for traders by employing deep learning models such as recurrent neural networks and long short-term memory. It specifically focuses on forecasting stock values, while disregarding the potential influence of political tenures and financial tensions on the market. The authors utilize a combination of price prediction and sentiment analysis, incorporating past data, news analysis, and Twitter API data. This approach enables them to forecast stock prices and anticipate business movements. The study highlights the significance of using libraries such as Pandas, Numpy, and Matplotlib for data processing, mathematical problem-solving, and data visualization when creating predictive models.

III. PROPOSED METHOD

A. Data Gathering

In this research, we needed to gather vast amounts of historical data related to various stocks belonging to numerous companies belonging to different sectors and industries. To collect this data manually is a very cumbersome process. So for this we designed a web scraping module. This module contains the code to efficiently scrape data from the 'Moneycontrol' website which contains the data for the stock market like the last traded price, the current price, volume of the stock being traded, opening price, closing price etc. We first scraped the data depicting the companies that were on the NSE 52 week high list from the 'Moneycontrol' website. This dataset named the '52_Week_High.csv' included the company name, current day's price high, current day's price low, the change in price and also the percent change. Based on this dataset, we scraped the 3 month daily historical data for every company listed on the 52 week high list. To further optimize this process, we automated the entire process using Selenium. In this way, we created individual datasets for every company listed on the 52 week high list. In these datasets, every dataset contains two features namely the date and the last traded price for that day. Using these two features, we intended to conduct our technical analysis.

B. Data Preprocessing

Once we have the data sets we carefully select the ones which are being traded in high volume. Then we search for a particular pattern in the movement of the stock's price from the last 3 months. We then see whether the price is being consolidated within a box i.e. whether the price is stagnating between a fixed price. We assume this stagnation range as a hypothetical box. The box is for our reference. After that we check whether a particular stock is breaking out of the box i.e. attaining a price which is not the range it had consolidated earlier. The change can be either positive or negative which means that the change can be an increase in the price or a decrease in the price.

C. Algorithm

Now we have to pick out the stocks that show a positive change as it increases the price and in turn returns a profit to us. The stock is then classified as 'to be picked'. Next we have to calculate its stop loss which is about 10% of the buying price. The stop loss is the price we have to sell the stock to avail the maximum profit and the minimum loss. If the stock breakouts from the lower boundary of the box we have to remove it from our observation list. The stop loss we decide once the stock shows a positive breakout of the box has to be dynamic. This will allow the stop loss to change with respect to the last traded stock price. As the current stock price increases the stop loss also increases but it does not decrease with it. This allows us to either achieve a miniscule loss or not at all in many cases, i.e. sometimes even in a worst case scenario we will be left with some profit.

IV. RESULTS

Stock market prediction using Darvas Box technique is a short to mid term trading technique used to trade stocks in the stock market. As this technique is purely based on technical analysis checking for stocks consolidating between a fixed price range and then breaking out of it. Such stocks when paired up with a stop loss value depending upon our risk appetite can help us reap huge profits.

Following are the results we obtained upon the execution of our algorithm -

A. ABB India

```
C:\Users\Dell\Desktop\My Projects\Sem 3 Project\new_Darvas_Logic.py"
Breakout at 33.45000000000073
```

Figure 1. Algorithm implementation for ABB India

Company	Date	Close	Volume
ABB India	26-03-2024	5931.9	6532
ABB India	22-03-2024	5965.35	22855
ABB India	21-03-2024	5865.35	5362
ABB India	20-03-2024	5730.7	8134
ABB India	19-03-2024	5629.85	4929

Figure 2. Historical data chart for ABB India

As per Fig. 1 and Fig. 2, ABB India has shown a growth of 100 units which is more than our upper bound value. After stagnating between our upper and lower bound values, it has broken out of the box on 22/03/24 with a good volume of stocks traded. The algorithm thus terms this stock as profitable.

B. CG Power

```
C:\Users\Dell\Desktop\My Projects\Sem 3 Project\new_Darvas_Logic.py"
stagnate
stagnate
SL omitted at -37.70000000000045
```

Figure 3. Algorithm implementation for CG Power.

Company	Date	Close	Volume
ABB India	26-03-2024	5931.9	6532
ABB India	22-03-2024	5965.35	22855
ABB India	21-03-2024	5865.35	5362
ABB India	20-03-2024	5730.7	8134
ABB India	19-03-2024	5629.85	4929

Figure 4. Historical data chart for CG Power

As per Fig. 3 And Fig. 4, after stagnating initially CG Power has shown a negative growth of -37.7 units which is breaking our lower bound value. To minimize our losses, we sell the stock immediately.

C. Bharat Highways

```
C:\Users\Dell\Desktop\My Projects\Sem 3 Project\new_Darvas_Logic.py"
stagnate
stagnate
stagnate
stagnate
stagnate
stagnate
stagnate
```

Figure 5. Algorithm implementation for Bharat Highways

Company Name	Date	Close	Volume
Bharat Highways	26-03-2024	110.83	62448
Bharat Highways	22-03-2024	109.47	48520
Bharat Highways	21-03-2024	108.11	34650
Bharat Highways	20-03-2024	106.12	44055
Bharat Highways	19-03-2024	106.39	49630
Bharat Highways	18-03-2024	104.92	65497
Bharat Highways	15-03-2024	103.4	69431
Bharat Highways	14-03-2024	103.35	119120
Bharat Highways	13-03-2024	103.31	262326

Figure 6. Historical data chart for Bharat Highways

As per Fig. 5 And Fig. 6, the following stock has been stagnating in the box for the whole time. Therefore it isn't breaking out of the box i.e crossing our upper bound value nor it is crossing our stop loss limit i.e going under our lower bound value. Hence such stocks are to be kept under observation.

V. CONCLUSION

Nicolas Darvas created the time-tested Darvas Box theory, a trading method that uses volume and highs as important indications to identify companies. It draws "boxes" by utilizing the correlation between volume and price changes to pinpoint strategic entry and exit points in any given market. We have utilized this strategy to devise a trading and stock selection method which majorly relies on technical analysis that will benefit the common retail investor.

REFERENCES

- [1] G. Cohen, "Algorithmic Strategies for Precious Metals Price Forecasting", *Mathematics* 10, no. 7:1134, 1 April 2022
- [2] G. Cohen, "Forecasting Bitcoin trends using Algorithmic Learning Systems", *Entropy* 22, no. 8: 838., 30 July 2020
- [3] Han En Chou, "Online Portfolio Selection", ScholarBank@NUS Repository., 2016
- [4] Yoontae Hwang, Junpyo Park, Yongjae Lee, Dong-Young Lim, "Stop-loss adjusted labels for machine learning-based trading of risky assets", *Finance Research Letters*, Volume 58, Part A, 104285, ISSN 1544-6123, 27 July 2023
- [5] Tamer Shawky, "Gold Exchange Traded Funds (ETFs), Take Profit / Stop Loss Prediction using Machine Learning", *Journal of Business and Management Studies*. 5. 06-17. 10.32996/jbms.2023.5.4.2., 30 June 2023
- [6] Gil Cohen, "Algorithmic Trading and Financial Forecasting Using Advanced Artificial Intelligence Methodologies", *Mathematics* 10. 3302. 10.3390/math10183302., 12 September 2022
- [7] Yoontae Hwang, Junpyo Park, Yongjae Lee, Dong-Young Lim, "Predicting Price Movement with Stop-Loss Adjusted Labels", <http://dx.doi.org/10.2139/ssrn.4478403>, January 2023
- [8] Jimmy Ming-Tai Wu, Shaowei Ma, Ke Wang, Huizhen Ya, Qinghua Zhang, "Stock Trading Decision Method Based on Stop Loss Double Threshold", 8th International Conference on Computer and Communication Systems (ICCCS), Guangzhou, China, 2023, pp. 869-874, doi: 10.1109/ICCCS57501.2023.10151355., April 2023
- [9] Mahmut Sami Sivri, Ahmet Berkay Gultekin, Alp Ustundag, Omer Faruk Beyca, et al., "An Intelligent System for Determination of Stop – Loss and Take – Profit Limits: A Dynamic Decision Learning Approach", *Intelligent and Fuzzy Systems*. INFUS 2023. Lecture Notes in Networks and Systems, vol 759. Springer, Cham., 17 August 2023
- [10] Chi-Fang Chao, Yu-Chen Wang, Mu-En Wu, "A Quantitative Model for Option Sell-Side Trading with Stop-Loss Mechanism by Using Random Forest", 10.21203/rs.3.rs-769898/v1., 6 August 2021
- [11] Yun Xiang, Shijie Deng, "Optimal stop-loss rules in markets with long-range dependence", *Quantitative Finance*, 24(2), 253–263., 6 February 2024
- [12] Mohammad Amin Teimoori-Boghsani, Abdolmajid Abdolbaghi Ataabadi, Majid Ameri, "Effectiveness of Stop-Loss Trading Strategy VS Buy-And-Hold Strategy" *Iranian Journal of Accounting, Auditing and Finance*, 7(2), pp. 39-60., 30 April 2023
- [13] Muriuki, Diana M, "A Comparative Analysis of Stop-loss and Buy-and-hold Strategies at the Nairobi Securities Exchange", University of Nairobi, 2015
- [14] Iromie K. Samarasekara, Oshan K. Mendis, Sapumal Ahangama, Ajantha S. Atukorale, "Dynamic Stop-Loss Approach for Short Term Trades using Deep Learning", *IEEE International Conference on Big Data (Big Data)*, Osaka, Japan, 2022 pp. 3537-3546, December 2022
- [15] Qinghua Wen, Zehong Yang, Yixu Song, Peifa Jia, "Automatic stock decision support system based on box theory and SVM algorithm", *Expert Systems with Applications*, Volume 37, Issue 2, Pages 1015-1022, ISSN 0957-4174, March 1 2010
- [16] Steven Dolvin, Bryan Foltice, "Exploring the Effectiveness of Trailing Stop-Loss Strategies for Individual Investors", *The Journal of Beta Investment Strategies*. 14. jbis.2023.1.025. 10.3905/jbis.2023.1.025., January 2023
- [17] Adam Y.C. Lei, Huihua Li, "The Value of Stop Loss Strategies", *Financial Services Review*, Vol. 18, No. 1, pp. 23-51, January 2009
- [18] Nicholas Darvas, "How I made \$2,000,000 in the stock market"
- [19] Lamartine Almeida Teixeira, Adriano Lorena Inácio de Oliveira, "A method for automatic stock trading combining technical analysis and nearest neighbor classification", *Expert Systems with Applications*, Volume 37, Issue 10, Pages 6885-6890, ISSN 0957-4174, 13 April 2010
- [20] Daniel W. Richards, Janette Rutterford, Devendra Kodwani & Mark Fenton-O'Creevy, "Stock market investors' use of stop losses and the disposition effect", *The European Journal of Finance*. 23. 130 - 152. 10.1080/1351847X.2015.1048375., February 2017
- [21] Bhoite, Sachin & Ansari, Gufran & Patil, Chandrashekhar & Thatte, Surabhi & Magar, Vikas & Gandhi, Krishna. (2022), "Stock Market Prediction Using Recurrent Neural Network and Long Short-TermMemory", 10.1007/978-981-19-5331-6_65.