ZeltaLabs Crypto Trading Challenge

Team-59

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***Abstract*—The project aimed to create and test algorithmic trading strategies for the BTC/USDT market and involved using historical data from 2018 to 2022 to surpass benchmarks and manage risks by putting up the best possible strategy. The deliverables included the algorithm's source code with documentation, detailed testing results with performance metrics, and a risk management plan tailored to the BTC/USDT market, submitted through GitLab.**

I. Introduction

Algorithmic trading is the use of computer algorithms and mathematical models to carry out trades in the financial markets, relying on expertise in finance, data analysis, statistics, and programming.

The problem statement involved creating trading algorithms for the BTC/USDT crypto market with the objective of exceeding benchmark performance. It included tasks like data acquisition and preprocessing, designing strategies with statistical models, conducting extensive testing, and developing a comprehensive risk management plan.

II. Possible Approaches

A. Indicator Based Approach

In our Algotrading strategy, we leveraged a variety of technical indicators to diversify the strategy and covering both momentum and trend aspects of market analysis. The RSI helps in identifying potential reversal points, the MACD assists in understanding the overall trend direction, the Supertrend indicator aids in confirming the prevailing trend, and the EMA provides sensitivity to trend changes.

We also have the sentiment analysis tools/indicators in our model. So we need to add some sentiment analysis tools such as Fear & Greed Index which attempts to quantify and measure the emotions of market participants, also tools like sentiment and LunarCrush can be used to get idea of the social sentiments along with all the important events such as halving, FOMC meetings, Fed meetings, etc. This comprehensive approach aided in making informed decisions on when to enter and exit the market.

B. Random Forests Approach

Using this trading strategy is like having a bunch of specialized tools, each designed to understand a specific type of market signal. We train each tool to be really good at interpreting its particular signal. Then, we bring all these tools together into one big toolbox (the Random Forest) which smartly figures out whose advice is most important and helps us make the best trading decision. It's not just about looking at usual market signals, but also about taking into account big news and economic trends. This method gives us a clear and simple suggestion whether to buy, sell, or hold, making our trading decisions more effective and well-informed.

C. LSTM Approach

In algorithmic trading, Long Short-Term Memory (LSTM) networks are used to analyze historical price data and capture complex patterns over time. LSTMs are effective for learning and predicting trends in financial markets, making them a popular choice for forecasting stock prices or optimizing trading strategies based on historical data.

D. Reinforcement Learning Approach

In this approach, Reinforcement Learning is used for BTC trading. It integrates key technical indicators like Moving Average, Bollinger Bands, Parabolic SAR, MACD, and RSI, which provide insights into market trends and potential buy or sell points. These indicators help the system make more accurate and profitable trading decisions by adapting to various market conditions using technical analysis and historical data. This approach aims to enhance the system's responsiveness and effectiveness in the dynamic crypto market.

III. Proposed Solution

We started with focusing on different types of indicators, i.e volume, trend, momentum, etc. We shortlisted the indicators based on the time-frame we were working upon. Then we started generating the signals from combination of those indicators. We manipulated their input parameters to generate the best results. Then we altered using indicators and dropping out few of them to focus more on returns generated by the bot. Initially we were focusing solely on taking long positions. Following a period of back testing, we obtained the following results (Fig. 1).

One of our trades experienced a prolonged run, lasting a substantial eight months. This scenario presents both potential benefits and drawbacks from a trading perspective:

Advantage: It successfully capitalizing on the bull market, capturing almost the entirety of the bullish trend.

Disadvantage: This strategy resulted in overexposure of our capital for an extended duration (245 days), making it highly susceptible to market volatility.

Recommendations: It would be advisable to minimize drawdowns. While the current analytical approach is commendable, there is significant room for improvement in reducing drawdowns and protecting capital. We must strive for a more

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Fig. 1. Considering Long Run only

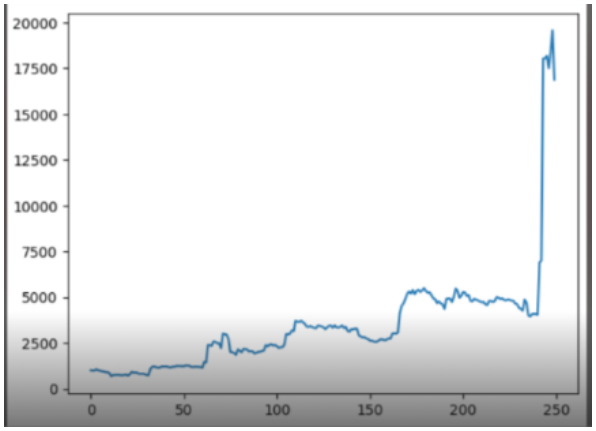

Fig. 3. Considering both Long and Short (Opening short just after closing long) - Portfolio

balanced approach, optimizing the trade holding period while effectively capturing market trends.

Subsequently, we opted for a long-short strategy. In this approach, we initiate a short position immediately after closing a long position, and vice versa. This strategy was subjected to backtesting, yielding the following results (Fig. 2 and Fig. 3).

Fig. 2. Considering both Long and Short (Opening short just after closing long) - Result

Our approach involved a thorough analysis of a long-short strategy, using two distinct methods for investment calculation: a static approach (allocating $1000 in every trade) and a compounding approach (adjusting net profit and loss). Here's a refined interpretation of our findings and strategy adjustments:

1) Holding Time Adjustment: The maximum holding time for a trade was capped at 245 days, exposing capital significantly to the volatility of the crypto market. While reducing this duration is advisable, an average holding time of 5 days is still reasonable.

2) Improving Win Rate and Profitability: Despite a win rate of just 46%, the strategy was profitable, surpassing benchmark returns. This success is attributed to a favorable risk-reward ratio, nearly 1:3 for average winning versus losing trades. Enhancing this ratio could further boost profitability.

3) Addressing Maximum Drawdown: The strategy's maximum drawdown stands at 37%, highlighting a crucial area for optimization to reduce potential losses.

4) Reducing Maximum Dip: The maximum adverse price movement in a trade was 30%, with an average dip of 2.9%. Efforts should be made to minimize these dips to protect against significant adverse price movements.

5) Benchmark Comparison and Compounding Success: While the static approach successfully beat the benchmark returns, the compounding approach showed remarkable results, with an approximate 16-fold increase in value.

Finally, we modified the strategy to minimize crypto holding time, aiming for a swift profit-taking at 1% and re-entering long positions if the signal remained unchanged. This adjustment was intended to leverage compounding benefits and improve the win ratio.

However, upon backtesting this modified strategy, we encountered the results as shown in Fig. 4, suggesting further areas for refinement.

Upon reviewing the results of our modified long-short strategy, we observed an unexpected outcome. While the win ratio improved, the overall account balance significantly declined, primarily due to substantial trading fees.

Key Observations:

1) High Trading Fees Impact: Each trade incurred a fee of 1.5% of the current account balance. Attempting to book profits for every 1% rise led to a net loss, as the fees outweighed the small profit margins.

2) Strategic Adjustment for Account Balance and Stop Loss: To counteract this issue, we revised our approach. We decided to book profits only when the account balance increased by 10%. Additionally, we implemented a stop loss at 5% to mitigate potential losses.

This revised strategy, focused on balancing the frequency of trades with the impact of fees and using a more cautious

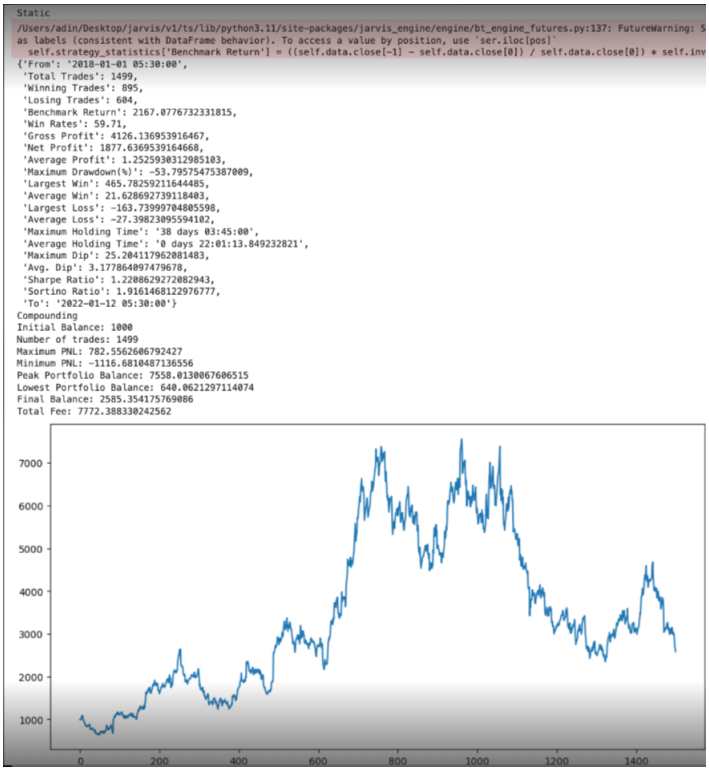

Fig. 4. Long-Short Strategy with 1% Take profit on long.

approach to profit booking and loss prevention, was our initial strategy.

Improvement Consideration: Further refinement could involve a more nuanced understanding of the fee structure and its impact on different trading scenarios, potentially leading to a more optimized strategy that balances risk, reward, and operational costs.

Then we went on to the best strategy we developed till now and started focusing on reducing lossy trades to unexpected market condition, i.e by adding the sentiment data. We found some APIs from coinGecko and other platforms, to add sentiment data over the strategy we prepared till now. We added the fear and greed over our bot. Fear and greed index has a good effect on bitcoins price, as we know that the Bitcoin dominance in the crypto market is very high around that time i.e over 50-60% of the crypto market was dominated by bitcoin. So, Fear and greed index of market will has a similar effect on price of bitcoin.

We added the sentiment data over our bot and back-tested it for the data provided, but the results weren't we expected. Instead of improving the win percentage, it reduced total number of trades and reduced the win rate. Also the total portfolio value reduced. So, after trying few more apis of different types of data we discontinued adding the sentiment data layer over our bot.

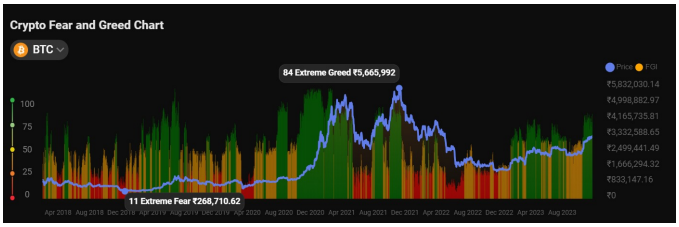

Fig. 5. Fear and Greed Index relation with BTC price

IV. Conclusions

We prepared a AlgoTrading Bot for 15 min timeframe over Bitcoin (BTC), that has generated a returns of over 16x the starting portfolio, i.e over 1600% of growth. We have only used the Technical indicators to predict the signals and their is scope of growth by adding proper sentiment over it. More over implementing a statistical model to maximize the returns can also improve the final result.

V. References

1) CoinGecko API documentation
2) Relative Strength Index (RSI)
3) Exponential Moving Average (EMA)
4) SuperTrend Indicator