QuantWeb
Assignment 4

May 29, 2024

Instructions

- Submission deadline is 1st May EOD.
- For the problem use the ticker symbol:
  'BTC-USD'. Start date: '2018-01-01'(1st Jan 2018), end date: '2022-01-12'(12th Jan 2018)
- The submission would be on GitHub classroom as stated in the meet. Submit separate .ipynb files for the problems you have attempted and most importantly **RUN ALL THE CELLS BEFORE SUBMITTING**
- Attach a document along with the submissions to explain the strategy and the risk management measure.
- In case of any query please feel free to contact the mentors.

Question 1:

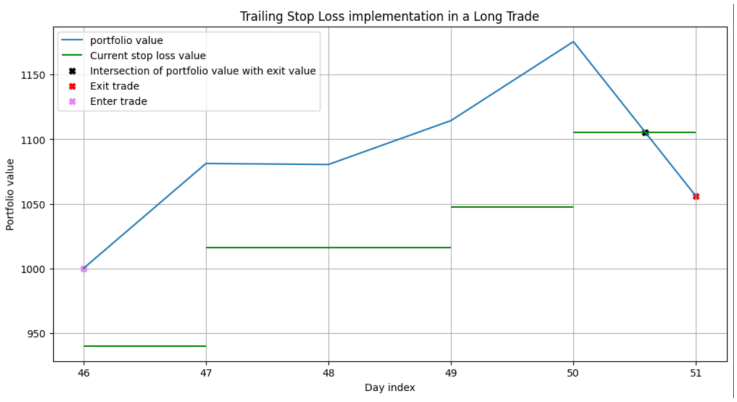
The problem statement remains the same as discussed in the meet. Implement a trading strategy for the bitcoin market. Try to draft a proper trading strategy. We are now dealing with the crypto market, so be careful and try to include the positives of as many strategies as possible and merge them in a single strategy.

Utilize the code provided on discord for testing the strategy. After attempting a strategy do update the sheet to let other's know of the strategies you have followed. Other's might implement the strategy in a better way or incorporate better risk management methods to improve the results.
The below are the risk management measures that you can incorporate in your strategies to improve the results.

RISK MANAGEMENT

- **Trailing Stop Loss Strategy(For Long Trades)**

  A stop-loss is a pre-set order to sell a security when it reaches a specified price, minimizing potential losses for an investor or trader. A trailing stop loss is a dynamic risk management strategy where the stop loss level adjusts automatically based on the asset's price movement, helping to lock in profits or limit losses. The trade is closed when the market price decreases by more than a defined percent from the current high.



  The above is an example of how the trailing stop loss is being implemented. The green line indicates the current stop-loss value. The trade started on day index 46, with the initial stop loss as 0.94 times the entry price as the stop loss percent has been set to 6 percent. The current maxima is the price on day index 46. Then as the price rises above the current maxima on day index 47 the current maxima is updated to portfolio value on day index 47 and the stop loss level is also raised. This process decreases our maximum loss in the trade. Now as the price drops slightly on day index 48, the stop loss is kept constant. The price rise continues on days 49 and 50 and hence the stop loss rises. It is on day 51 that the price level falls steadily but thanks to the trailing stop loss we were able to extract a substantial profit.

- **Dyanamic Exit condition for Short Trades**

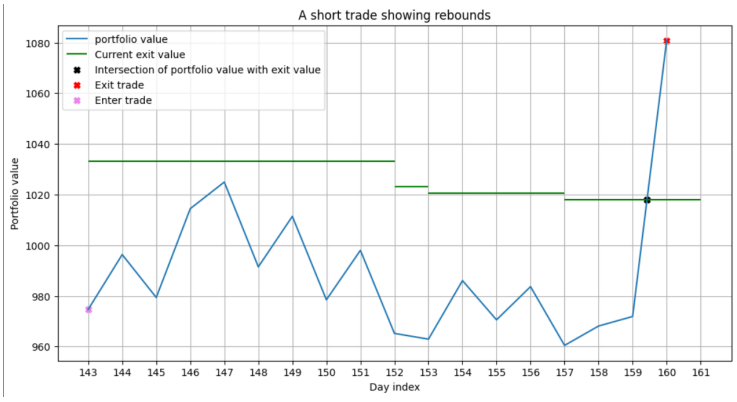
  We initially used a trailing stop loss for both long and short trades. However, we encountered challenges with short trades, where the portfolio value often decreased rapidly, triggering the stop loss too soon and reducing returns.

  To address this, we developed a dynamic exit condition for short trades. Here's how it works: Imagine the initial portfolio value is x dollars. We set an exit condition at x*(1+0.06), or the 1.06x level. If the portfolio

value decreases, the exit condition adjusts proportionally. For instance, if the portfolio value becomes 0.5x dollars, the exit condition would be set at 0.5x*(1.06), or 0.53x.

This dynamic exit condition proved advantageous by capturing rebounds in short trades, minimizing losses, and even generating profits. The goal was to avoid prolonged holding times and significant dips in portfolio value, common challenges in short trades.

A question arises: If short trades often result in a decrease in portfolio value, why not focus on a long-only strategy? The answer lies in the effectiveness of our dynamic exit condition, which allowed us to extract profits and minimize losses significantly. This approach also reduced the holding period compared to a long-only strategy, where extended dips and holding times are more prevalent. Consequently, we opted to implement this dynamic exit condition for its ability to enhance the performance of short trades.



Consider Trade Number 6 in our strategy(above is the graph), illustrating the effectiveness of our dynamic exit condition. If a standard trailing stop loss were applied, the outcome would likely have been a modest profit or even a loss. Unlike traditional approaches, our dynamic exit condition showcases its power by adapting to market conditions.

As the portfolio value rises, the exit condition remains constant. However, if the portfolio value falls below the minimum achieved so far, the exit condition is promptly updated (depicted by the green lines in the graph below). In this specific case, a substantial rebound led to a profitable outcome, yielding a return of 10.89 percent. This result contrasts with what might have occurred with a conventional stop loss, potentially

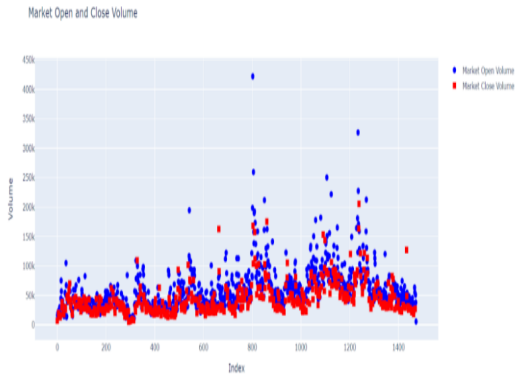
turning a winning trade into a losing one.

Therefore, this risk management measure significantly contributed to optimizing and enhancing the robustness of our strategy.

- **Market Volatility based stop loss**

  Recognizing the influence of external factors on the volatility of the BTC-USDT market, we have incorporated a dynamic adjustment to our exit condition as well as the trailing stop loss strategy. Extensive research has revealed a noteworthy correlation between heightened volatility in the BTC-USDT market and the days when global stock markets were open. In response to this insight, we have implemented a strategic modification to our trailing stop loss and the exit condition mechanism to better accommodate the increased market fluctuations during these periods.

  To capture the nuanced relationship between BTC-USDT market volatility and stock market activity, we introduced a multiplier within our framework. This multiplier serves as a dynamic factor that scales the trailing stop loss and exit condition percentage based on the prevailing volatility. Specifically, on days when stock exchanges worldwide are open, the multiplier is activated to proportionally increase the trailing stop loss and exit condition percentage.



This adaptive approach allows our strategy to respond effectively to the dynamic market conditions associated with global stock market operations. By aligning our trailing stop loss and exit condition with the observed fluctuations during these periods, we aim to enhance risk management and optimize the balance between profit-taking and loss limitation. This nuanced adjustment reflects our commitment to staying ahead of

market dynamics and underscores the importance of a flexible and data-driven approach in navigating the complexities of the BTC-USDT market.

- **Average True Range(ATR) Based Stop Loss**
  - *TrueRange*
    The true range of BTCUSDT for the day is the greatest of the following: current high less the current low; the absolute value of the current high less the previous close; and the absolute value of the current low less the previous close.
  - *AverageTrueRange*
    The Average True Range is a moving average of the true ranges.

  When volatility increases, the ATR value rises, and the stop-loss widens to accommodate larger price swings. Conversely, during periods of lower volatility, the stop-loss tightens. ATR is designed to measure market volatility. Using ATR allows us to set levels that are proportional to the current volatility, helping to account for the varying ranges of price movement.

  - **For Long Trades**
    Stop Loss price = closing price of bitcoin on the day of entry into trade- multiplier * present ATR value
  - **For Short Trades**
    Stop Loss price = closing price of bitcoin on the day of entry into trade + multiplier * present ATR value