

# Adaptive Grid Trading Bot using RL

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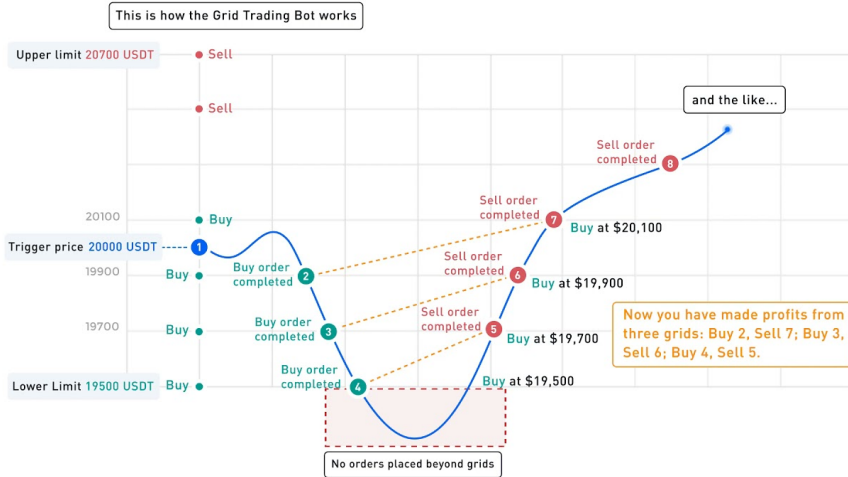
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A grid bot is a type of trading bot that operates within a predetermined price range or grid on a trading chart. It works by placing buy and sell orders at specific intervals above and below the current market price. As the market fluctuates, these orders are executed automatically, allowing the bot to capitalize on price movements within the established grid. Grid bots aim to profit from market volatility by systematically buying low and selling high, leveraging the price movements within the defined grid to execute trades.

# Graphically Explained



## Pros:

- ▶ Automation: Grid bots operate automatically, eliminating the need for constant manual monitoring and execution of trades
- ▶ **Profit in Sideways Markets:** Grid bots can generate profits when the market is moving sideways, as they capitalize on price oscillations within the set grid.
- ▶ No Emotions: eliminating emotional decision-making.

## Cons:

- ▶ Limited in Trending Markets: Grid bots may struggle in strongly trending markets where prices move in **one direction**, as they are designed to operate within a specific price range.
- ▶ Configurations Complexity: Setting up a grid bot requires careful consideration of parameters like **grid size**, distance between orders, and risk management.

The Sharpe Ratio is a risk-adjusted measure that assesses the performance of an investment or trading strategy, taking into account its volatility or risk.

## Sharp Ratio

$$\text{Sharpe Ratio} = \frac{E[R_p - R_f]}{\sigma_p} = \frac{E[R_p - R_f]}{\sqrt{\text{Var}[R_p - R_f]}}$$

- ▶ -  $E(R_p)$  is the expected (average) return of the portfolio or strategy.
- ▶ -  $R_f$  is the risk-free rate of return.
- ▶ -  $\sigma_p$  is the standard deviation of the portfolio's excess return.

A higher Sharpe Ratio indicates a better risk-adjusted performance, as it reflects a higher return for the same level of risk or a lower level of risk for the same return..

PNL is a straightforward measure of the overall profit or loss generated by a trading strategy. It is calculated as:

PnL

$$PnL = \text{Final Portfolio Value} - \text{Initial Portfolio Value}$$

While PNL provides a clear indication of the net financial outcome, it has limitations as a standalone metric. PNL doesn't consider the level of risk taken to achieve the profit or loss, making it less informative about the efficiency of a strategy.

We tried 3 types of grids





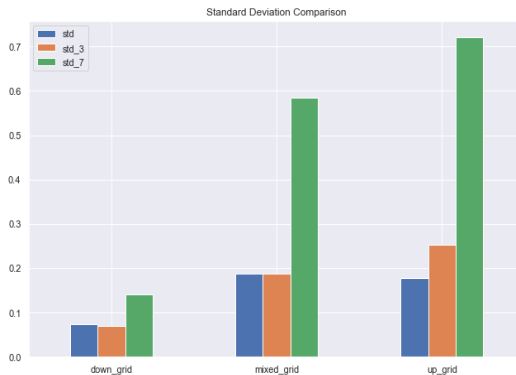
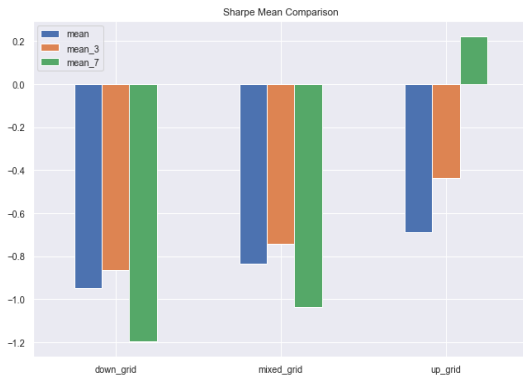
# Down grid



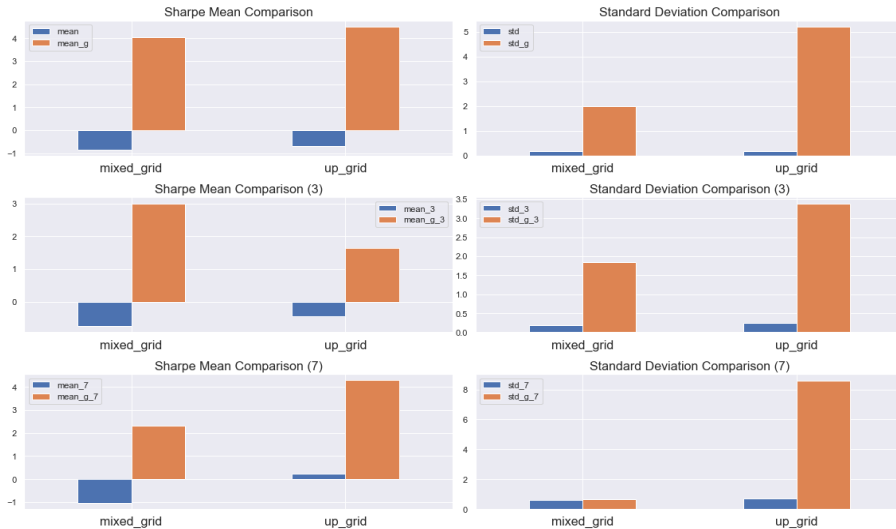
# Mixed grid



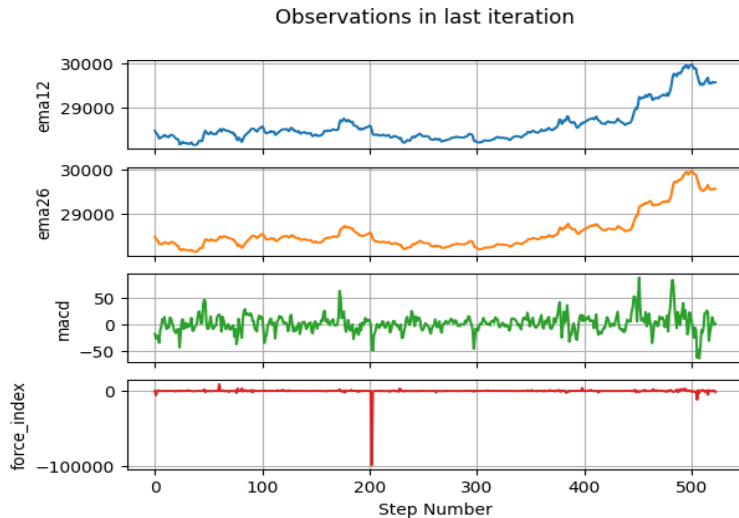
# Sharp on Regular Bot



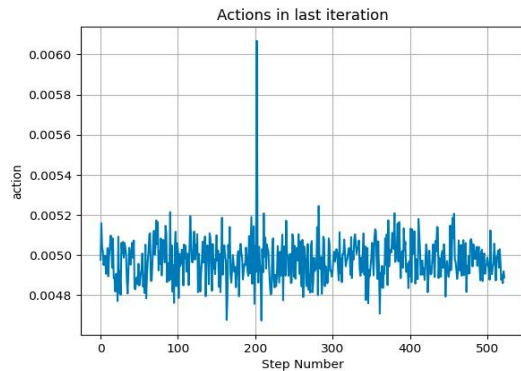
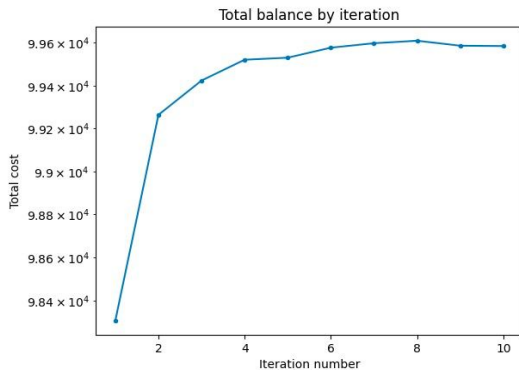
# Sharp on Regular Bot on good days



- ▶ Our idea - to recalculate the grid lower and upper bound.
- ▶ We use MACD, Force index, EMA12-EMA26 as our observations.
- ▶ Action - change the upper and lower bound of grid



# Our Solution



Balance in the end around 93871





- ▶ We found out the limitations of regular Grid Bot
- ▶ Wrote an adaptive Grid Bot using RL
- ▶ Compared both bots

- ▶ Mark Nuzhnov - Grid Bot, RL
- ▶ Vasiliy Viskov - RL, Grid Bot
- ▶ Nikolay Ivanov - Grid Bot, Presentation

Thank you for attention!  
Questions? Link to Github