Enhancing Double Deep Q-Learning for Single Asset Trading with Dueling Algorithm

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Problem statement

Reinforcement learning has recently generated a lot of interest in the area of financial trading due to its ability to select the optimum course of action based on the market environment. The Double Deep Q-Learning (DDQN), an improved Deep Q-Learning method, has proven to be effective for managing complex situations and minimizing the overestimation bias of traditional Q-Learning. By combining cutting-edge features and approaches, the aim of this work is to enhance the performance of the DDQN algorithm for trading a single asset by combining the Dueling algorithm with DDQN.

Literature survey

The work by Zejnullahu et al. presents a Double Deep Q-Network algorithm for trading single assets in finance. The authors conduct experiments to compare the performance of different models with varying input features, giving the result that with a specific episode length, each model is capable of outperforming the market in-sample[1]. Studies have shown that dueling architecture can improve performance in other applications of deep reinforcement learning algorithms[2] via improving the representation of Q-values. Thus it implies that by adding this multi-stream feature into the DDQN could provide a better performance on financial trading.

Datasets

E-mini S&P 500 continuous futures contract, data from other assets such as gold, oil, and bonds. Historical data could be acquired from public financial data sources such as Yahoo Finance[3]

Models

In the work by Zejnullahu et al, it shows that simpler models perform better than those with higher input features. Thus we will keep with simpler input data models, reproduce the DDQN algorithm and further modify it with addition of the Dueling algorithm.

Expected outcomes and significance

This study intends to show that the addition of the Dueling algorithm to the DDQN could improve trading performance under various market conditions. Researchers and financial professionals looking to use reinforcement learning techniques in trading and other financial applications can benefit from the insights acquired from this project.

References

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