Northwestern University

Term Project Checkpoint A

MSDS451: Financial Machine Learning

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Introduction

The research conducted here is a result of my personal interest in NVIDIA, both as a company shaping the future of artificial intelligence and as a potential employer. NVIDIA is widely regarded for offering stock compensation during the hiring process, which has motivated me to better understand the behavior and long-term value of its equity.

This project explores the feasibility of launching an actively managed exchange-traded fund (ETF) focused on NVIDIA and its surrounding technology ecosystem. The ETF will apply a data science–driven approach to security selection and timing decisions.

Potential users of this research include individual investors interested in AI growth stocks, and technologists looking to integrate machine learning into finance. The final knowledge base may inform the development of automated investment strategies built around reinforcement learning agents.

Literature Review

Several researchers and firms have explored the intersection of machine learning and financial portfolio management. One study conducted by Yue Deng demonstrated how deep reinforcement learning (DRL) can be applied to asset trading by modeling financial environments. Another integral study contributing to this field was managed by Xiao-Yang Liu. Liu used the FinRL framework and provided open-source environments for building, training, and evaluating RL-based trading agents. There are many other researchers in this

field like Théate and Ernst, Yu & Zhang, and Awad who have contributed greatly to incorporating machine learning with actively managed ETFs. Overall, these studies establish a growing body of research around using reinforcement learning in financial markets, particularly for trading high-volatility, high-growth equities such as NVIDIA.

Methods

This research is theoretical and focused on the design phase of an ETF, rather than implementation. The planned methodology involves an extensive review of academic and industry literature related to:

- Reinforcement learning and algorithmic trading
- Actively managed ETFs
- Security selection strategies
- Quantitative risk management

The envisioned ETF would use rule-based decision logic powered by reinforcement learning agents to determine buy and sell timing for NVIDIA and related stocks. This would require identifying past returns, volatility, sentiment scores, and risk to guide trading decisions with a financial environment structure.

Results

As this research is still in the exploratory phase, no numerical results or tests have been produced. However, a review of the literature has yielded several important insights:

- Reinforcement learning has become an increasingly popular tool for financial decision-making, although most applications are still experimental or limited to academic environments.
- NVIDIA is well-suited for this type of analysis due to its strong volatility, frequent news cycles, and central role in AI and chip sectors, all which are factors that may provide exploitable signals.
- Many existing ETFs still rely on passive or semi-active strategies; the combination of DRL and an actively managed ETF structure remains relatively underexplored, representing a potential niche opportunity.
- Sentiment analysis, time-series modeling, and risk control mechanisms are crucial components for building a viable reinforcement learning trading system.

Conclusions

This project seeks to understand the technical and strategic considerations involved in launching an actively managed ETF. While the idea is rooted in financial innovation, it is also personal: gaining deeper insight into NVIDIA's stock dynamics aligns with my professional aspirations and interest in finance market. The literature review confirms the growing academic and industry interest in using reinforcement learning to manage portfolios. However, I have many questions regarding model stability, regulatory compliance, and real-world performance. Other than this, I have no significant concerns about the project. I look forward to learning how to deploy machine learning models to manage a portfolio.

References

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