Risk-sensitive Distributional Reinforcement Learning for Algorithmic Trading

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Todo list

1 Domain Background

Paper	**Summary**	**Drawbacks w.r.t ours**
RSQ (Shen et al., 2014b,a)	Utility function over TD error, convergence and optimality guarantees	Tabular Q; Trading on limit order market
Ensemble actor-critic (Yang et al., 2020)	Ensemble trained by returns but the winner is selected by Sharp ration	Add-hoc risk strategies
Exponential Bellman Equation (Fei et al.)	Theoretical guarantees; An instantiation of distributional RL through the MGF of rewards	theoretical paper, no application

2 Problem/Solution Statement

3 Dataset & Input & Metric

1. Environment/Experiments.
   - portfolio allocation problem
2. Benchmark model & results, which contextualises existing methods/knowledge in the domain.

- SOTA: How are the existing work related to our methods?
- Experiments contrasting risk-neutral with risk-sensitive RL methods

Metric: objectively compare the solution model with the benchmark model.

3. - Returns vs. Risk
   - Sharp ration, CVaR, etc.
   - Theoretical guarantees and insights on convergence and optimatliy

4 Theoretical workflow

4.1 End-to-end formalization

5 Network Architecture

- MLP

References

Fei, Y.; Yang, Z.; Chen, Y., and Wang, Z. Exponential Bellman Equation and Improved Regret Bounds for Risk-Sensitive Reinforcement Learning. page 24.

Shen, Y.; Huang, R.; Yan, C., and Obermayer, K. Risk-averse Reinforcement Learning for Algorithmic Trading. pages 391–398. IEEE, 2014a.

Shen, Y.; Tobia, M. J.; Sommer, T., and Obermayer, K. Risk-sensitive Reinforcement Learning. *Neural Computation*, 26(7):1298–1328, July 2014b.

Yang, H.; Liu, X.-Y.; Zhong, S., and Walid, A. Deep Reinforcement Learning for Automated Stock Trading: An Ensemble Strategy. *SSRN Electronic Journal*, 2020.