Deep Learning

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My personal notes on *An application of deep reinforcement learning to algorithmic trading.*

I. REINFORCEMENT LEARNING

Some definitions and symbols

1. S: Set of environment and agent state.
2. A: Set of actions which are available for agent to use.
3. s_t: RL environment internal state
4. o_t: Observation
5. a_t: Trading action
6. i_t: Information
7. $\pi(a_t|i_t)$: Trading policy (Rule)
8. r_t: Network's reward.
9. ν_t^c: Total amount of cash in portfolio.
10. ν_t^s: Corresponding value of the share.
11. n_t: Total number of shares, lots.

Reinforcement learning techniques are concerned with the design of π maximizing an optimality criterion, which directly depends on the immediate rewards r_t observed over a certain time horizon.

A. Trading Environment

The trading environment of the DQL is implemented in *OpenAI Gym* framework. The elements of the trading environment are as follows:

$$\mathcal{E}_{TE} = \{\text{Close, Low, High, Volume, Position,} \quad (1)$$
$$\text{Action, Holdings, Cash, Money, Returns}\} \quad (2)$$

II. ADDITIONAL NOTES AND QUESTIONS

1. Representing the transition from one candle to the next one as a Markov process.
2. Considering the correlation between candles as a spin system (as in the case of Witten's "An introduction to quantum information theory")

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