ETF ; SPY Option Chains

From 2010 to 2021 { 3,000 obs / day
70,000 - 80,000 obs/ month

Q1 : How to get the correct options' prices? (underlying asset price)

① Train NN on historical data { S, T, K, other (interest rate, volume, etc) ⇒ vol ⇒ price

② single agent (Deep Q-learning)

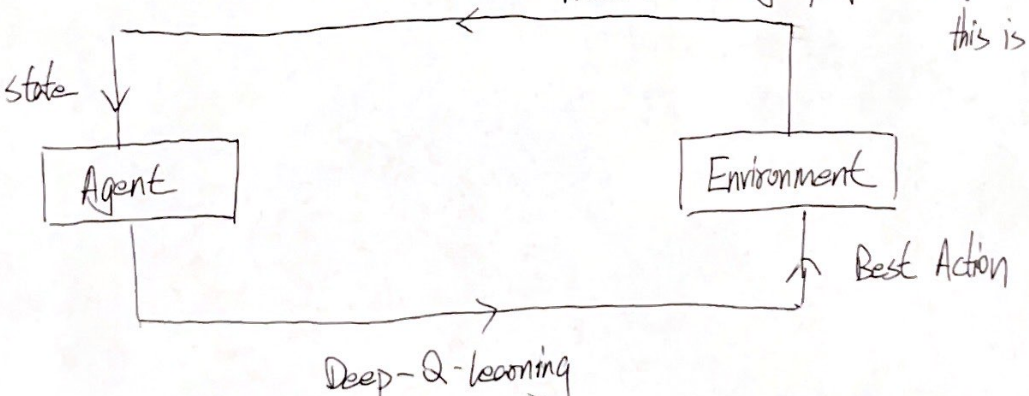
as comparison : { perform random actions ← do this first
use trained NN as signal

Model : Options trading environment (OpenAI Gym)

State : Option chains, predicted options' prices from trained NN

Actions : Buy, sell, and hold

Reward : Average profit (If the discount factor = 1, this is maximizing profit)



Q2 : Actions space is large. How to evaluate the contracts?

③ Train the agent

For epoch in number-of-epochs :   # add small noises to the underlying asset

set Env, starting balance

~~pe~~ prediction NN predicts Quality values. $q(s,a)$

Choose best action

save state, action, reward, newstate, I(done) to memory

Target NN predicts $\max_a Q(s_{t+1}, a)$

$y = R_t + \lambda \cdot \max_a Q(s_{t+1}, a)$

Train the prediction NN .fit(state, y)

Every C days, copy the Ws in the prediction NN to the Target NN)

④ Results ~~any~~ analysis

mean, variance of the profits