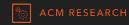
Build Night 4

Follow-the-Winner Strategies II



Team Meeting Agenda

- Discuss homework + potential future direction (15min)
- Go over remaining Follow-the-Winner strategies (25min)
- Discuss constrained optimization libraries (5min)
- GitHub basics and norms (10min)
- Data parsing/wrangling + strategy implementation practice (20 min)



Project Schedule

- 1. Welcome & Problem Definition
- 2. Power Outage Python and Reading Review
- 3. Baseline + Follow-the-Winner Strategies I
- 4. Follow-the-Winner Strategies II
- Follow-the-Loser Strategies I
- 6. Follow-the-Loser Strategies II
- 7. Pattern-Matching Strategies I
- 8. Pattern-Matching Strategies II
- 9. Backtesting, Experimentation, and Comparison
- 10. Poster Work & Presentation Practice

(you are here!)

Project Schedule: Potential Compression?

- 1. Welcome & Problem Definition
- 2. Power Outage Python and Reading Review
- 3. Baseline + Follow-the-Winner Strategies I
- 4. Follow-the-Winner Strategies II
- 5. Follow-the-Loser Strategies
- 6. Pattern-Matching Strategies
- 7. Framework I
- 8. Framework II
- 9. Backtesting, Experimentation, and Comparison
- 10. Poster Work & Presentation Practice

(you are here!)

Homework Discussion



Follow-the-Winner: Part 2



Follow-the-Leader

Tracks the BCRP strategy until some time t and uses it as the basis for an optimization problem

$$\mathbf{b}_{t+1} = \mathbf{b}_t^* = rgmax_{\mathbf{b} \in \Delta_m} \sum_{j=1}^t \log \left(\mathbf{b} \cdot \mathbf{x}_j
ight).$$

 This uses historical data up till the current time period and uses that as the basis for future predictions

Follow-the-Leader

• The way this is used for future predictions varies. An approach that combines uniform portfolios with this:

$$\mathbf{b}_{t+1} = \frac{t}{t+1}\mathbf{b}_t^* + \frac{1}{t+1}\frac{1}{m}\mathbf{1}.$$

 This strategy utilizes a trade-off parameter to balance the adjustment between the previous trading period and the current one:

$$\mathbf{b}_{t+1} = (1 - \gamma) \, \mathbf{b}_t^* + \gamma \, \mathbf{b}_t,$$

Follow-the-Leader

• This strategy compares to a fixed window W in the past:

$$\mathbf{b}_{t+1} = rg \max_{\mathbf{b} \in \Delta_m} \sum_{j=t-W+1}^t \log(\mathbf{b} \cdot \mathbf{x}_j),$$

Follow the Regularized Leader

Works similar to Follow the Leader but adds a regularization function R(b)

$$\mathbf{b}_{t+1} = rgmax_{\mathbf{b} \in \Delta_m} \sum_{ au=1}^t \log(\mathbf{b} \cdot \mathbf{x}_{ au}) - rac{eta}{2} R(\mathbf{b}),$$

Follow the Regularized Leader

• There may or may not be a closed form solution? Math is fun :))

$$\mathbf{b}_1 = \left(rac{1}{m}, \dots, rac{1}{m}
ight), \quad \mathbf{b}_{t+1} = \Pi_{\Delta_m}^{\mathbf{A}_t} ig(\delta \mathbf{A}_t^{-1} \mathbf{p}_tig),$$

with

$$\mathbf{A}_t = \sum_{ au=1}^t \left(rac{\mathbf{x}_ au \mathbf{x}_ au^ op}{\left(\mathbf{b}_ au \cdot \mathbf{x}_ au
ight)^2}
ight) + \mathbf{I}_m, \quad \mathbf{p}_t = \left(1 + rac{1}{eta}
ight) \sum_{ au=1}^t rac{\mathbf{x}_ au}{\mathbf{b}_ au \cdot \mathbf{x}_ au},$$

where β is the trade-off parameter, δ is a scale term, and $\Pi_{\Delta_m}^{\mathbf{A}_t}(\cdot)$ is an exact projection to the simplex domain.

Universal Portfolios

- Assign capital to a class of experts and pool their wealth, similar to a BAH strategy
- Based on my Internet research, this was a pretty influential strategy when it was published, but is based on an idealized market model
- More study is needed because I still don't know how to implement this! :)

$$\mathbf{b}_{t+1} = rac{\int_{\Delta_m} \mathbf{b} S_t(\mathbf{b}) d\mu(\mathbf{b})}{\int_{\Delta_m} S_t(\mathbf{b}) d\mu(\mathbf{b})}.$$

$$S_n(UP) = \int_{\Delta_m} S_n(\mathbf{b}) d\mu(\mathbf{b}).$$

Universal Portfolios

 For this type of strategy, I think reference implementations will help us understand what's going on better

$$\mathbf{b}_{t+1} = rac{\int_{\Delta_m} \mathbf{b} S_t(\mathbf{b}) d\mu(\mathbf{b})}{\int_{\Delta_m} S_t(\mathbf{b}) d\mu(\mathbf{b})}.$$

$$S_n(UP) = \int_{\Delta_m} S_n(\mathbf{b}) d\mu(\mathbf{b}).$$

Aggregating-Type Algorithms

- Find a set of base expert stocks that help track the others in a changing market and allocate among the experts
- "I like your funny words, magic man"

$$\mathbf{b}_{t+1} = rac{\int_{\Delta_m} \mathbf{b} \prod_{i=1}^{t-1} (\mathbf{b} \cdot \mathbf{x}_t)^{\eta} P_0(d\,\mathbf{b})}{\int_{\Delta_m} \prod_{i=1}^{t-1} (\mathbf{b} \cdot \mathbf{x}_t)^{\eta} P_0(d\,\mathbf{b})},$$

Constrained Optimization



Github Basics and Norms



The Basics

- Commits
- Branches
- PRs
- Issues

Data Wrangling & Strategy Implementation Practice

Homework



This Week

- On Github (will be modified soon)
- 2 weeks from now is Spring Break, so we'll have the meeting after (look for the invite soon!)