

# Math 420, Spring 2018

## Fourth Team Homework

due Tuesday, 3 April, 2018

In the following exercises consider the risky assets in groups (A), (B), and (C) of your final project.

**Exercise 1.** For each asset consider its daily return history  $\{(d, r(d))\}_{d=1}^D$  over the five year period 2013-2017. Use plots of these histories to explain when each of these assets is a good candidate to be mimiced by an IID model.

**Exercise 2.** Consider one-year histories of daily share price data for each asset over the years ending December 31 of 2013-2017. Use the unbiased estimators  $\hat{\mu}$ ,  $\hat{\xi}$ ,  $\hat{\gamma}$ , and  $\hat{\theta}$  given by

$$\begin{aligned}\hat{\mu} &= \frac{1}{D} \sum_{d=1}^D r(d), & \hat{\xi} &= \frac{1}{D-1} \sum_{d=1}^D (r(d) - \hat{\mu})^2, \\ \hat{\gamma} &= \frac{1}{D} \sum_{d=1}^D x(d), & \hat{\theta} &= \frac{1}{D-1} \sum_{d=1}^D (x(d) - \hat{\gamma})^2,\end{aligned}$$

to estimate  $\mu$ ,  $\xi$ ,  $\gamma$ , and  $\theta$  given the share price history  $\{s(d)\}_{d=0}^D$  with

$$r(d) = \left( \frac{s(d)}{s(d-1)} - 1 \right), \quad x(d) = \log \left( \frac{s(d)}{s(d-1)} \right).$$

How do  $\hat{\mu}$  and  $\hat{\gamma}$  compare as measures of reward over the years considered? How do  $\hat{\xi}$  and  $\hat{\theta}$  compare as measures of risk?