

# Math 420, Spring 2017

## Fifth Team Homework

due Tuesday, 18 April, 2017

In the following exercises consider the risky assets in groups (A) (B) and (C) of your final project. Consider one-year histories of daily share price data for each asset over the years ending December 31 of 2012-2016.

**Exercise 1.** The quadratic estimators of  $\gamma$  and  $\theta$ , the growth rate mean and variance, are given by

$$\hat{\gamma} = \hat{\mu} - \frac{1}{2}(\hat{\mu}^2 + \hat{\xi}), \quad \hat{\theta} = \hat{\xi}.$$

Use these to estimate  $\gamma$  and  $\theta$  for each asset and year. How do these  $\hat{\gamma}$  and  $\hat{\theta}$  compare with the unbiased estimators for  $\gamma$  and  $\theta$  that you obtained in Exercise 2 of the previous homework?

**Exercise 2.** Compute  $\hat{\mu}$  and  $\hat{\xi}$  for the Markowitz portfolios with value equally distributed among the assets in group (A), groups (A) and (B) combined, and groups (A), (B), and (C) combined.

- (a) Simulate each of these portfolios three times by drawing daily return rates from a normal distribution with mean  $\hat{\mu}$  and variance  $\hat{\xi}$ . How do the simulated portfolio return rates compare with the actual ones? How do the simulated portfolio return rates compare with the actual ones for the next year?
- (a) Simulate each of these portfolios three times by drawing daily growth rates from a normal distribution with mean  $\hat{\gamma}$  and variance  $\hat{\theta}$  given in Exercise 1 and converting then to return rates. How do the simulated portfolio return rates compare with the actual ones? How do the simulated portfolio return rates compare with the actual ones for the next year?