

# Math 420, Spring 2017

## Second Project: Graphical Validation of IID Models

presentation due Thursday, 4 May, 2017

report due Thursday, 11 May, 2017

This project explores how to use a graphical test to guide the choice of the risk aversion coefficient. Consider the following groups of assets.

- (A) This will be the Group A from the first project.
- (B) This will be the Group B from the first project of one of the team members. It will be filled in once the team is assigned.
- (C) This will be the Group C from the first project of one of the team members. It will be filled in once the team is assigned.

For each of the years ending December 31 of the years 2002-2016 use one-year histories of daily returns and uniform weights to calibrate  $\mathbf{m}$  and  $\mathbf{V}$ .

For each asset  $i$  consider the points  $\{(d, r_i(d))\}_{d=1}^D$  in  $\mathbb{R}^2$ . Recall that for an IID model this distribution should be uniform in  $d$ . Devise a measure of how nonuniform this distribution is in  $d$ . Order the assets from most uniform to least uniform according to this measure. Plot the points  $\{(d, r_i(d))\}_{d=1}^D$  for the most uniform and the least uniform asset.

For each pair of assets  $(i, j)$  with  $i \neq j$  consider the points  $\{(d, r_i(d), r_j(d))\}_{d=1}^D$  in  $\mathbb{R}^3$ . Recall that for an IID model this distribution should be uniform in  $d$ . Devise a measure of how nonuniform this distribution is in  $d$ . Plot these points for the most uniform and least uniform pair of assets.

Consider at least four measures of how each market history is consistent with an IID model based on what you did above. For example, you can average the measures you devised above, or take their maximum, or anything else that makes sense.

Repeat the last homework assignment with  $\chi = 0, .25, .5, .75, 1, 1.25, 1.5, 1.75$  and  $2$ . Determine which value of  $\chi$  yields the best performing portfolios in the subsequent year. Use scatter plots to seek correlations between these best  $\chi$  and the measures that you devised above. Identify the two measures that have the strongest correlation and find a linear function of those measures that best fits these  $\chi$ .