Math 420, Spring 2013
Second Project: Validity of the Objective Function

presentation due Monday, 29 April, 2013
report due Wednesday, 8 May, 2013

This project explores how to validate the objective function used in our optimization, and how it influences the choice of the risk aversion coefficient. Consider the following groups of assets.

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

(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.

For each of the years ending June 30 of the years 2007-2012 use one-year histories of daily return rates and uniform weights to calabrate $\mathbf{m}$ and $\mathbf{V}$.

Recall that the derivation of the estimators $\hat{\gamma}$ and $\hat{\theta}$ that were used to build our objective function had three potential sources of error:

(1) the estimators $\hat{\mu}$ and $\hat{\xi}$ upon which they are based,

(2) the approximations $\hat{K}'(0)$ and $\hat{K}''(0)$ used to estimate γ and θ from μ and ξ,

(3) the "large D" approximation

$$\left|\frac{\hat{\mu}}{D}\right| \ll 1\,, \qquad \left|\frac{\mathbf{f}^T\mathbf{V}\mathbf{f}}{D}\right| \ll 1\,,$$

applied to $\hat{K}'(0)$ and $\hat{K}''(0)$.

Devise measures of the quality of each of these approximations assuming that an IID model is valid. This can be done by using moments of the data beyond the mean can covariance, and by using standard numerical analysis estimates on the error of your approximations of $K'(0)$ and $K''(0)$. There should be at least six measures — at least two for each potential source of error listed above.

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