BUSI 525 Spring 2022
Problem Set 1

Giovanni Aiello

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Skill and Luck in Performance Evaluation

In practice, we do not observe which funds are skilled or unskilled. We have to estimate this using data on realized returns (or holdings). Let's simulate some data to understand this problem.

For each part below, simulate a panel of $N = 1000$ funds with a time-series of $T = 120$ months each. Assume a market model data-generating process with normally distributed excess market returns and residual where the mean market excess return's mean is 5% per year and its volatility is 20% per year. Assume residual volatility of 30% per year and that all funds have a beta of 1 . Monthly fund excess returns, r^e_{it}, are generated by:

$$r^e_{it} = \alpha_i + \beta_i r^e_{mkt,t} + \varepsilon_{it},$$

where $\mathrm{E}\left[r^e_{mkt,t}\right] = 5\%/12, \mathrm{sd}\left(r^e_{mkt,t}\right) = 0.2/\sqrt{12}$, and $\mathrm{sd}\left(\varepsilon_{it}\right) = 0.1/\sqrt{12}$. We will vary the distribution of skill (α) in the cross-section of funds in the parts below.

Part 1: No Skilled Funds

Run the simulation assuming each fund is truly unskilled, so $\alpha_i = 0$ for all i.

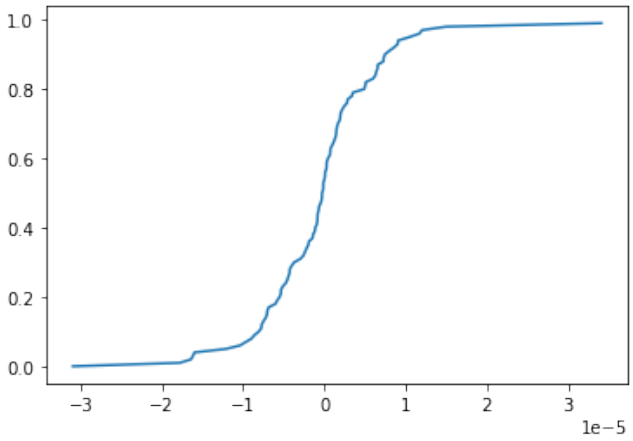

Figure 1: Average

Part 2: Some Skilled Funds

Now let's add some skill to the true underlying distribution. Suppose that a fraction of funds λ are truly skilled with alpha of 1%, 2.5% or 5% per year. What do the simulations and estimated statistics look like now? Consider λ values of $0.1, 0.25, 0.5$, and 0.75.

GitHub code repository.
https://github.com/GiovanniAiello/BUSI525

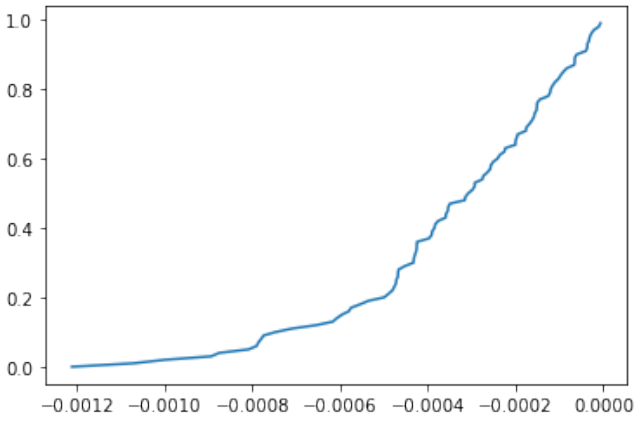

Figure 2: 5 pc

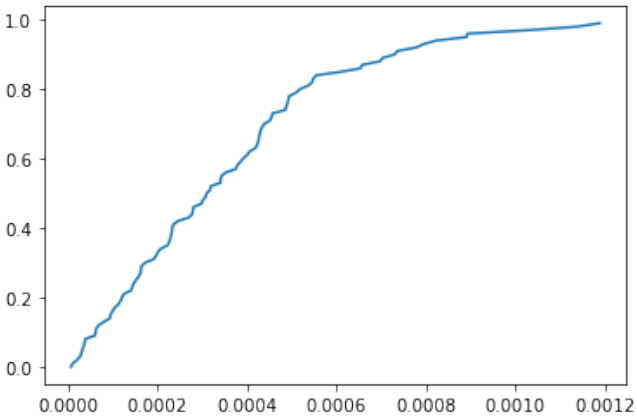

Figure 3: 95 pc

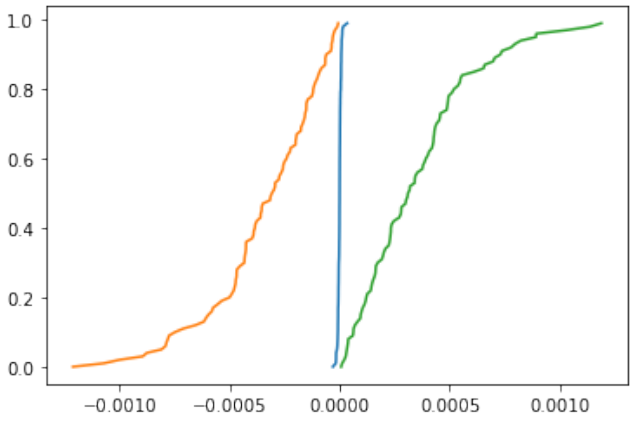

Figure 4: 5 pc, Avg, 95 pc

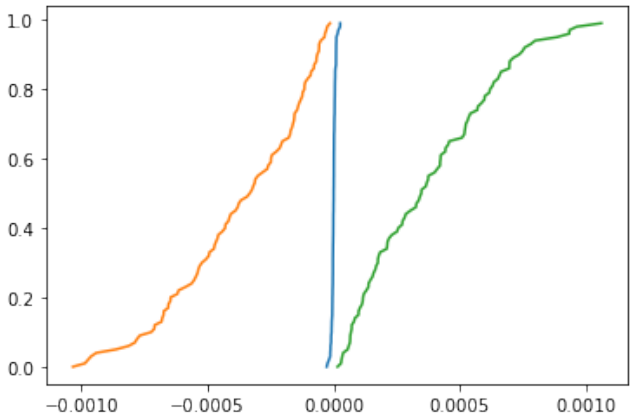

Figure 5: $\lambda = 0.1$, $\alpha = 1\%$

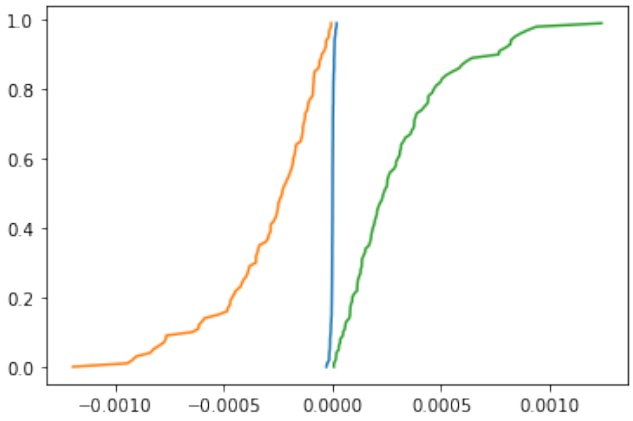

Figure 6: $\lambda = 0.1$, $\alpha = 2.5\%$

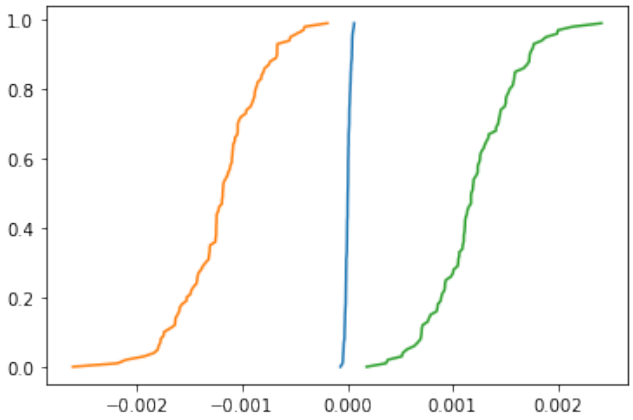

Figure 7: $\lambda = 0.1$, $\alpha = 5\%$

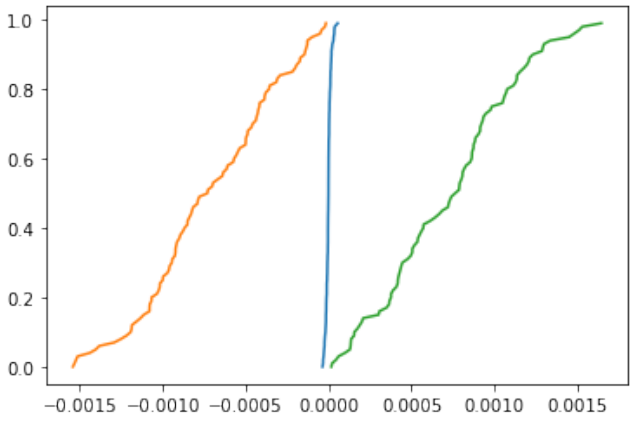

Figure 8: $\lambda = 0.25$, $\alpha = 1\%$

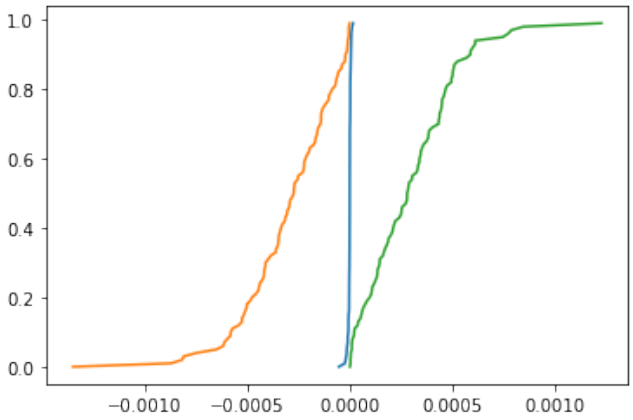

Figure 9: $\lambda = 0.25$, $\alpha = 2.5\%$

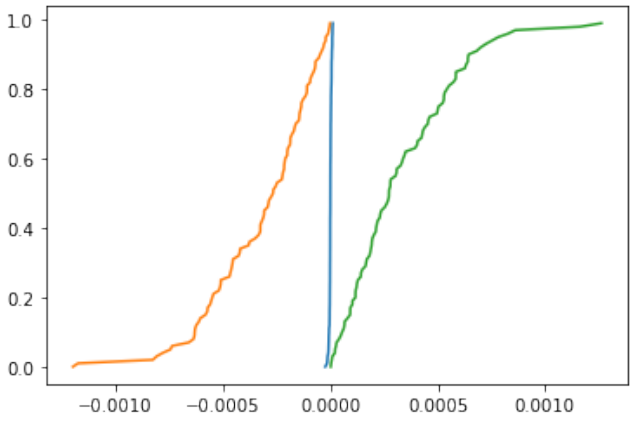

Figure 10: $\lambda = 0.25$, $\alpha = 5\%$

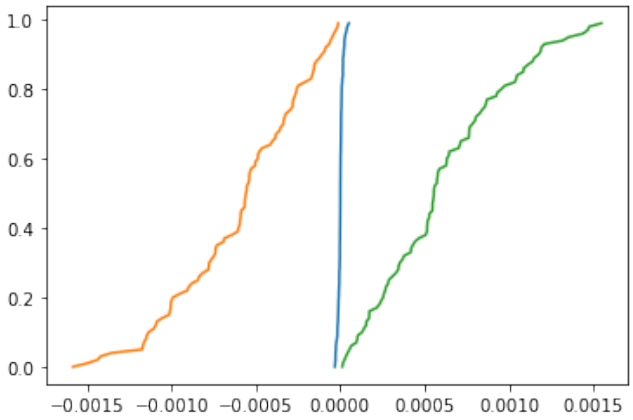

Figure 11: $\lambda = 0.5$, $\alpha = 1\%$

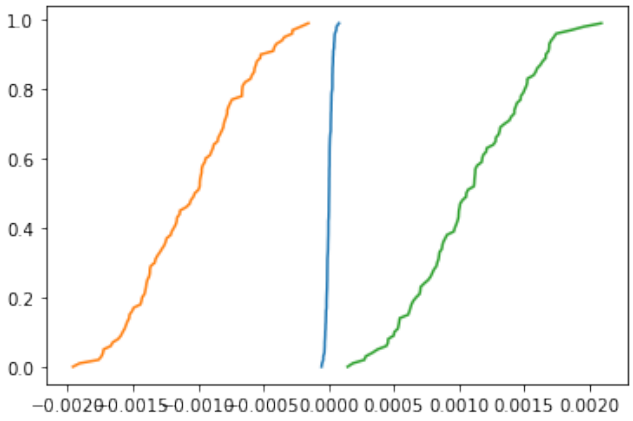

Figure 12: $\lambda = 0.5$, $\alpha = 2.5\%$

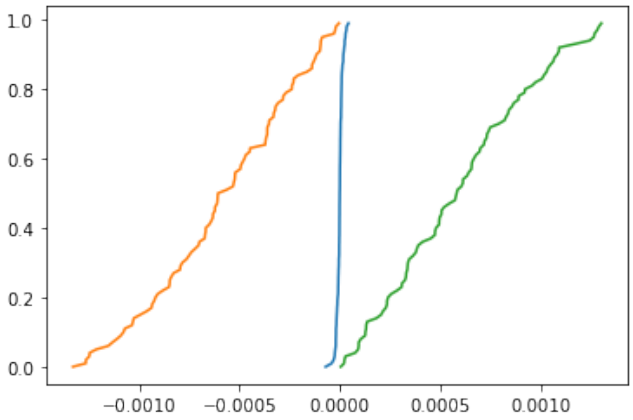

Figure 13: $\lambda = 0.5$, $\alpha = 5\%$

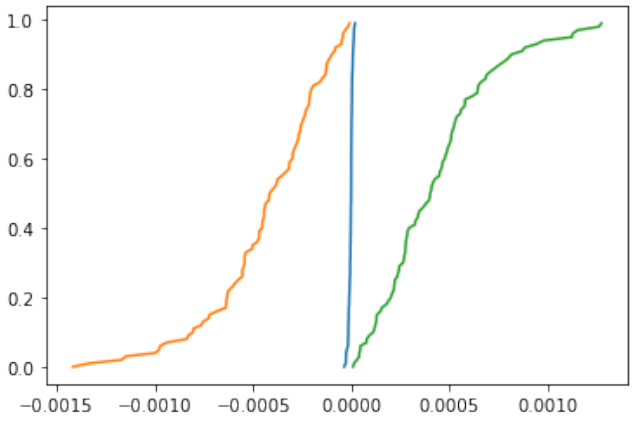

Figure 14: $\lambda = 0.75$, $\alpha = 1\%$

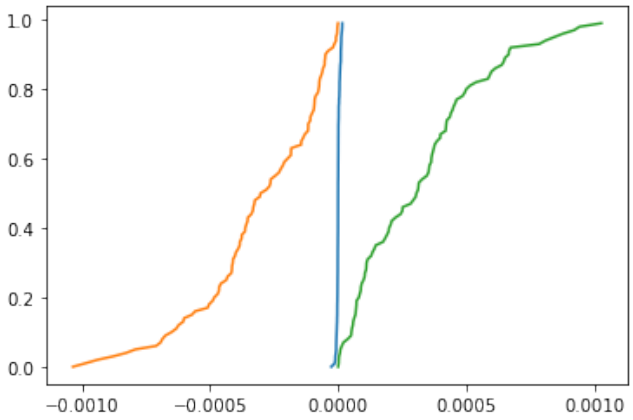

Figure 15: $\lambda = 0.75$, $\alpha = 2.5\%$

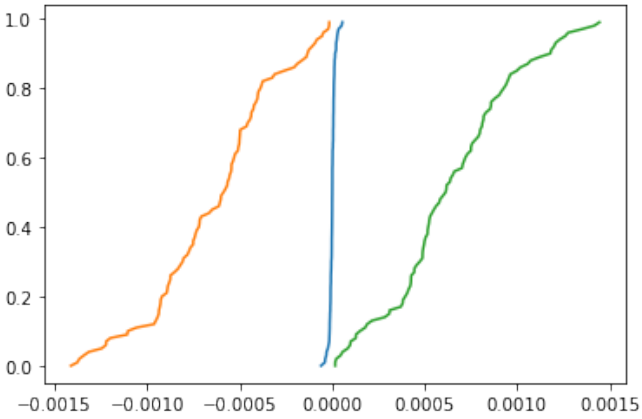

Figure 16: $\lambda = 0.75$, $\alpha = 5\%$