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MGMT 525 Problem Set #1

Github Site: https://github.com/azdrojew/MGMT525

Part 1—No Skilled Funds:

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

1. **For each fund, estimate its alpha and t-statistic. How many funds are skilled at the 5% significance level based on t-statistics?**

   I call funds skilled if they have statistically significant positive alphas. Under this definition, 22 funds, or 2.2% appear to be skilled.

2. **Plot the distributions of t-statistics and p-values for alpha.**

   See Figures 1 and 2 for the distributions of T-statistics and p-values, respectively.

3. **What does the distribution of p-values look like?**

   The distribution of p-values resembles a (roughly) uniform distribution between 0 and 1. This is similar to the figure depicted in Figure 1 of Wermers (2011).

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 2.5% 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.

1. **For each λ value, make a plot of the cross-sectional distribution of estimated α, their t-stats, and the p-values. How does the p-value distribution change with the fraction of truly skilled funds?**

   Figure 3 depicts the distribution of alphas, whereas Figure 4 depicts that of T-statistics and Figure 5 depicts that of p-values. Each figure includes a separate panel for each of the four values of lambda, to visually emphasize how the distributions change as lambda increases.

   Figure 3 and Figure 4 show that the distribution of estimated alphas and T-statistics shifts to the right as the fraction of truly skilled funds increases. The shape of the distribution seems roughly unchanged, but there is more probability mass on the right-hand side of zero.

Figure 5 shows that, as the fraction of truly skilled funds increases, a much greater frequency of p-values near zero is obtained. Between roughly .2 and .8, the distributions remain roughly uniform in appearance. However as lambda increases the density level over this part of the distribution decreases to accommodate the density accumulating around zero.

2. **How many of the truly skilled funds have insignificant alpha estimates? And how many of the truly unskilled funds are identified as skilled based on significantly positive alpha estimates? For each λ value, report the percentage of funds in each of the following classifications:**

		Estimated Skill	
		Y	**N**
True Skill	**Y**	True Positive	False Negative
	N	False Positive	True Negative

See the Tables (1-4) on page 6/7. Increasing lambda increases the percentage of truly skilled observations, but the ability to identify these funds is still rather weak. For example, in Table 4 with lambda=.75, only .08/.75=10.7% of the skilled funds are correctly labeled as such.

Part 1 - No Skilled Funds

Figure 1 : The figure below depicts the distribution of simulated T-statistics associated with alpha. Alpha is estimated with simulated returns which are generated such that true alpha is equal to zero for each of 1000 funds/returns.

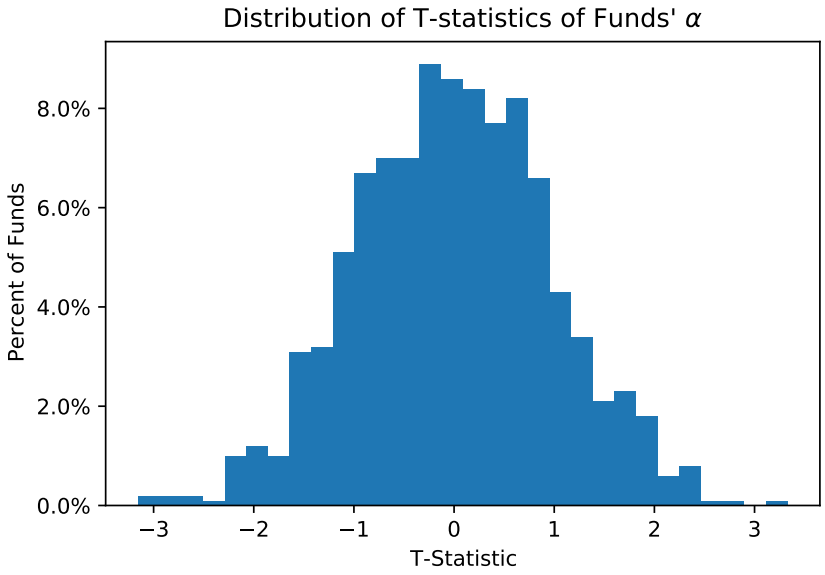
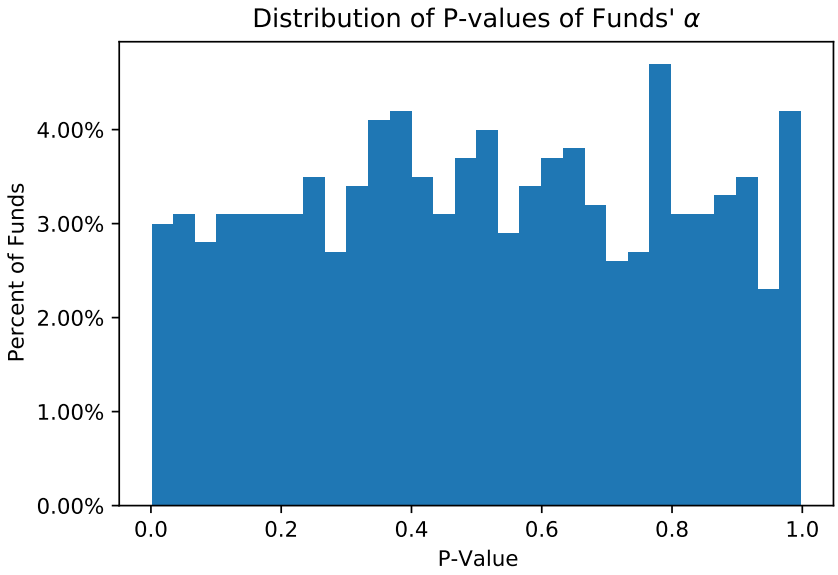


Figure 2 : The figure below depicts the distribution of simulated p-values associated with alpha. Alpha is estimated with simulated returns which are generated such that true alpha is equal to zero for each of 1000 funds/returns.



Part 2 - Some Skilled Funds

Figure 3 : The figure below depicts the distribution of simulated alpha estimates. Returns are simulated such that a fraction λ of the funds/returns are truly skilled ($\alpha = 5\%$ per annum).

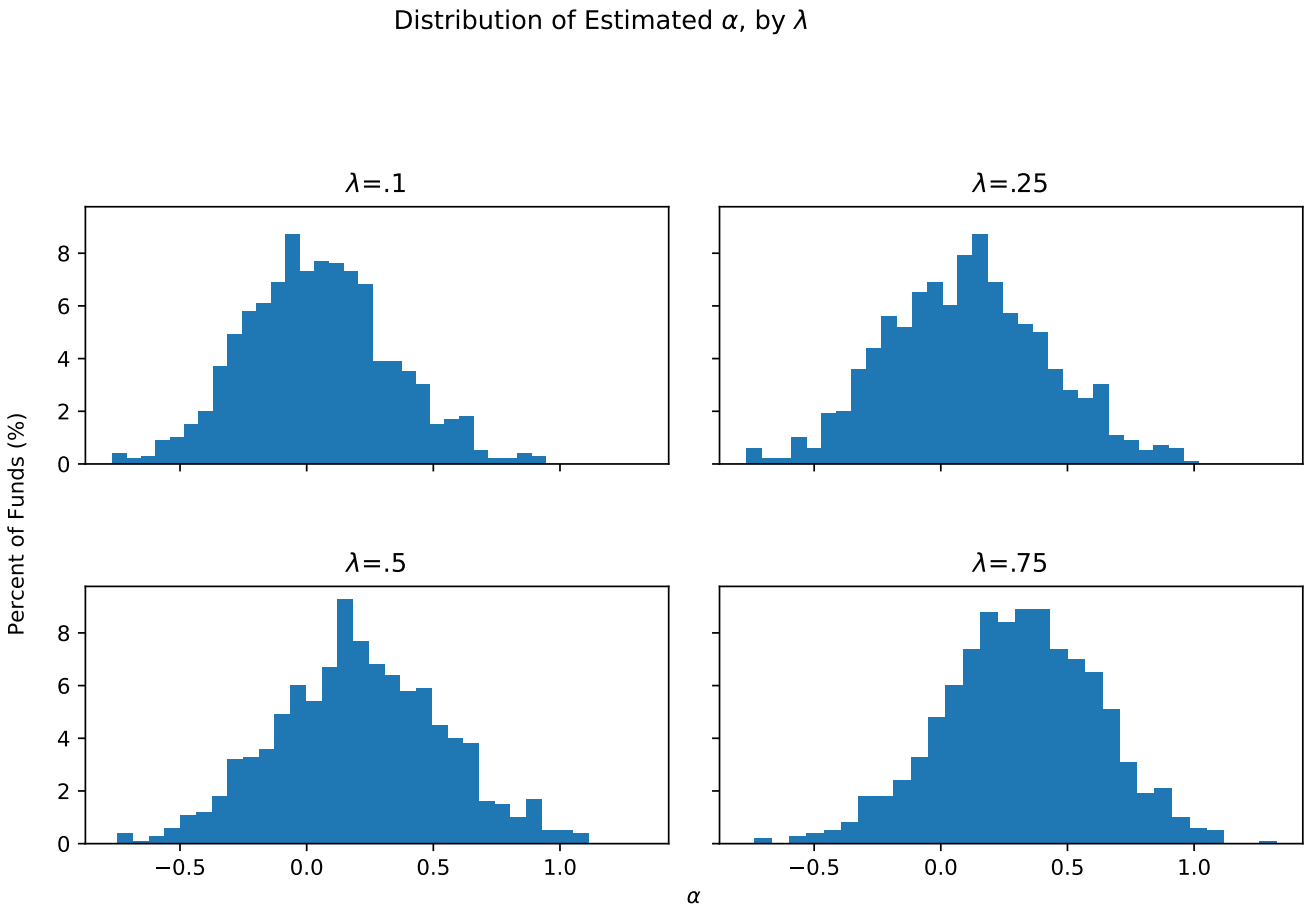


Figure 4 : The figure below depicts the distribution of simulated T-statistics associated with alpha. Returns are simulated such that a fraction λ of the funds/returns are truly skilled ($\alpha = 5\%$ per annum).

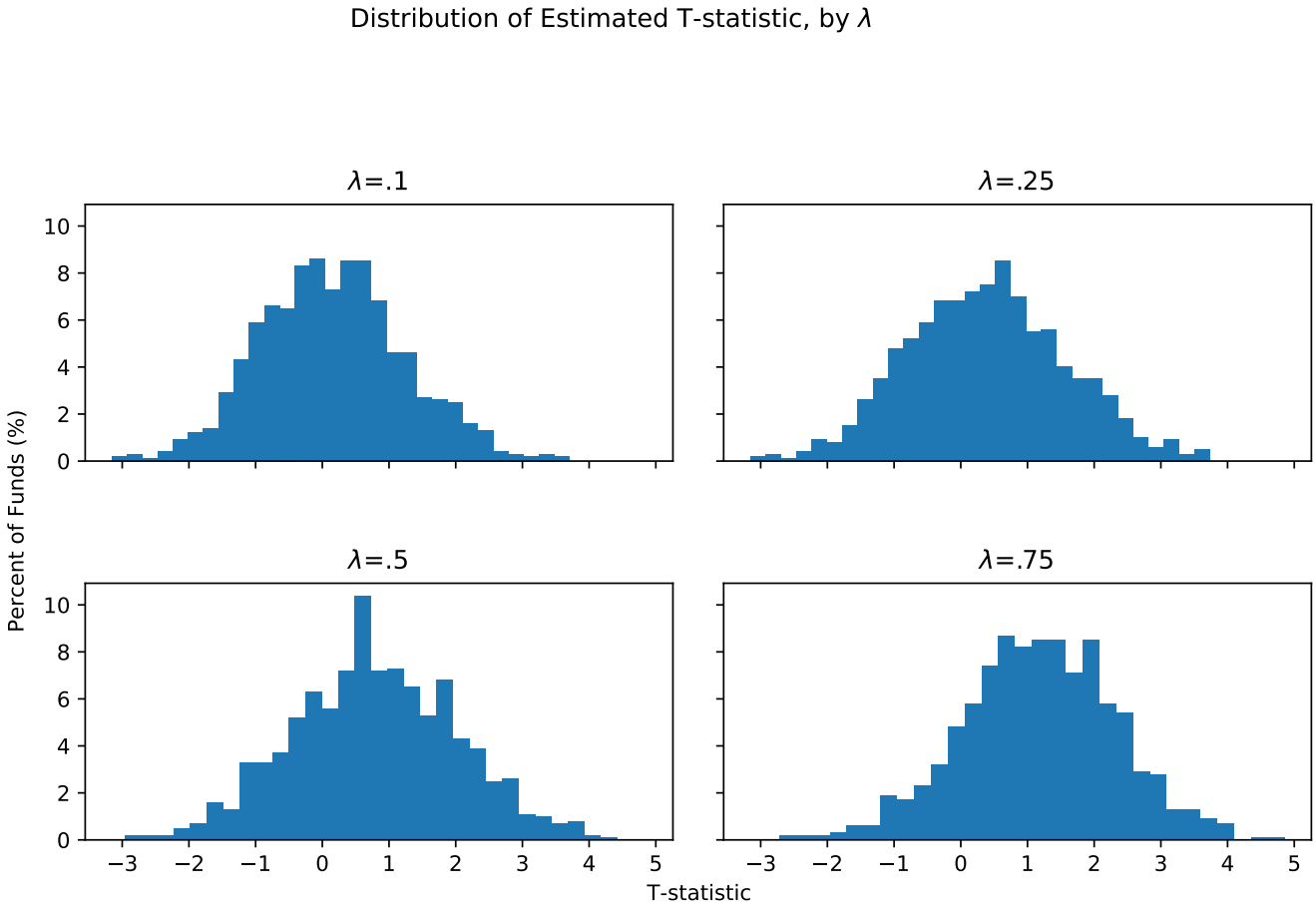
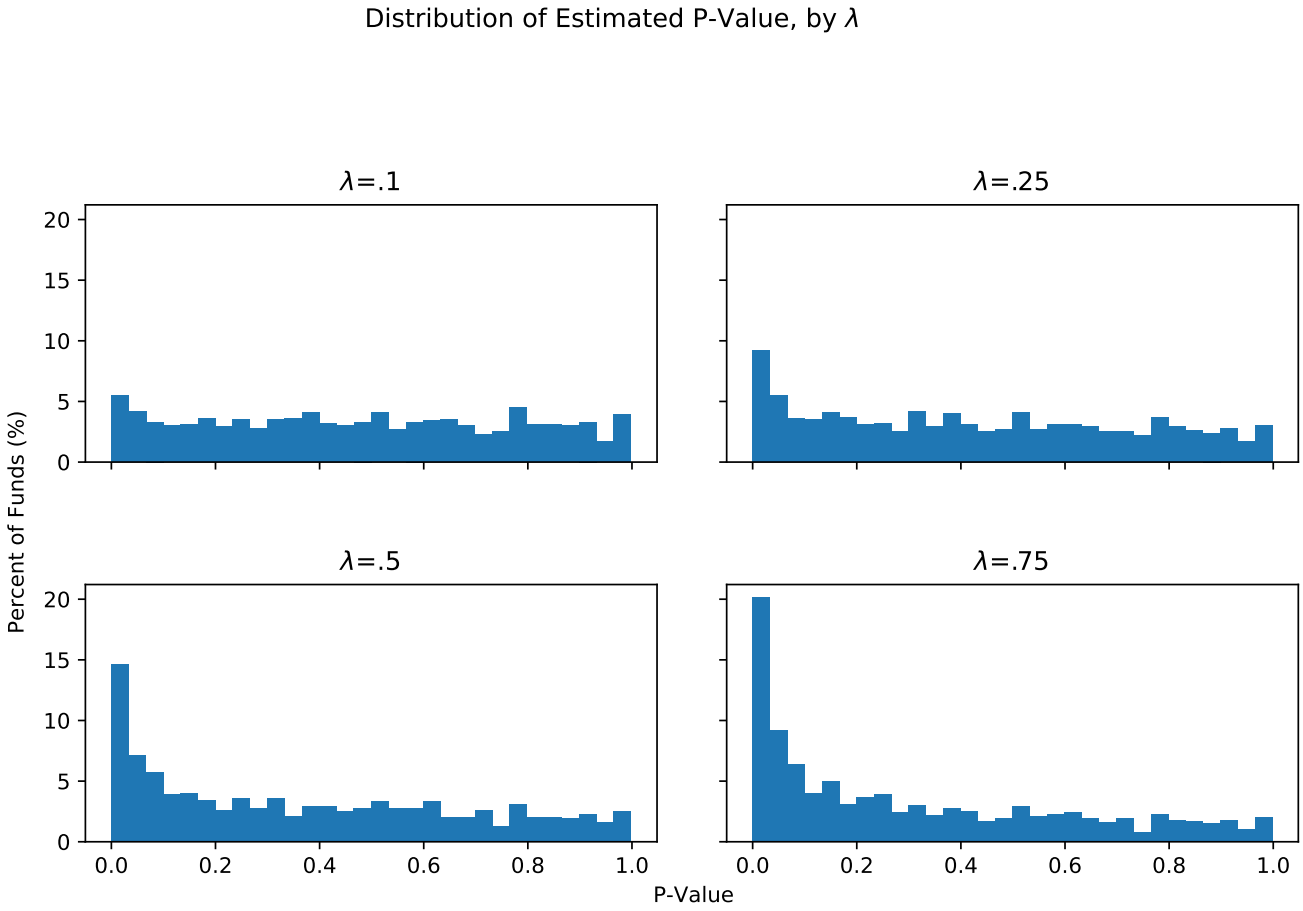


Figure 5 : The figure below depicts the distribution of simulated p-values associated with alpha. Returns are simulated such that a fraction λ of the funds/returns are truly skilled ($\alpha = 5\%$ per annum).



Tables 1-4 : The below tables display the perentage of funds falling into each true vs estimated skill category. Returns are simulated such that a fraction λ of the funds/returns are truly skilled ($\alpha = 5\%$ per annum). I am not sure why the tables are not appearing on the same page; I need to experiment with this more.

Table 1: Lambda=.1

		Estimated Skill	
		Y	N
True Skill	Y	0.9	9.1
	N	2.1	87.9

Table 2: Lambda=.25

		Estimated Skill	
		Y	N
True Skill	Y	2.2	22.8
	N	1.9	73.1

Table 3: Lambda=.5

		Estimated Skill	
		Y	N
True Skill	Y	5.6	44.4
	N	0.8	49.2

Table 4: Lambda=.75

		Estimated Skill	
		Y	N
True Skill	Y	8.0	67.0
	N	0.4	24.6