Problem Sheet 1

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2/8/2022

Code is posted at the following site: https://github.com/alexanderober/BUSI525/tree/main/PS1

Problem 1

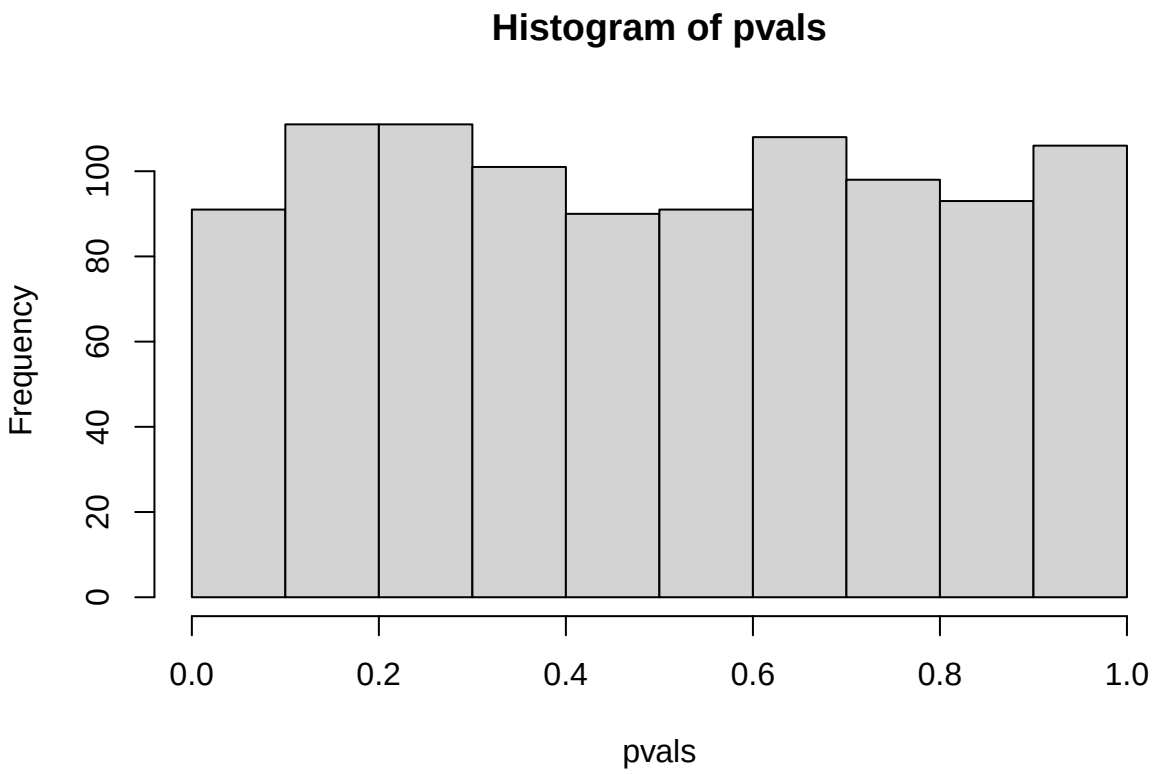
Note throughout I test at 5% confidence and as if the alternative is two-sided, since this is what the Wermers survey (pg. 149) suggests to do. I then assume skill is assumed if the t-stat is positive AND significant. In effect, this is a 2.5% one-sided test. Using one-sided 5% tests directly produces similar results.

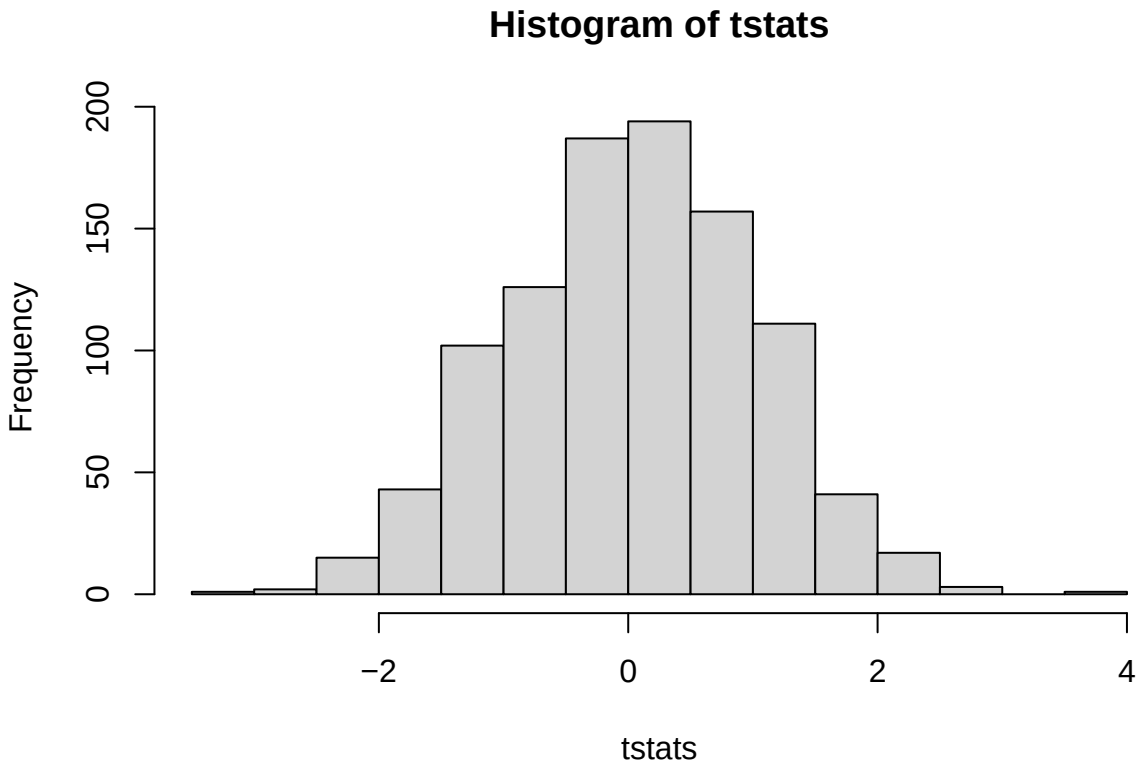
(a)

22 of the 1000 funds have significantly positive alphas. We'd expect about 2.5% = 5/2% of the statistics to be significant and positive, which is what we see.

(b)

Here are some plots:


Histogram of pvals
Frequency
0
20
40
60
80
100
0.0
0.2
0.4
0.6
0.8
1.0
pvals

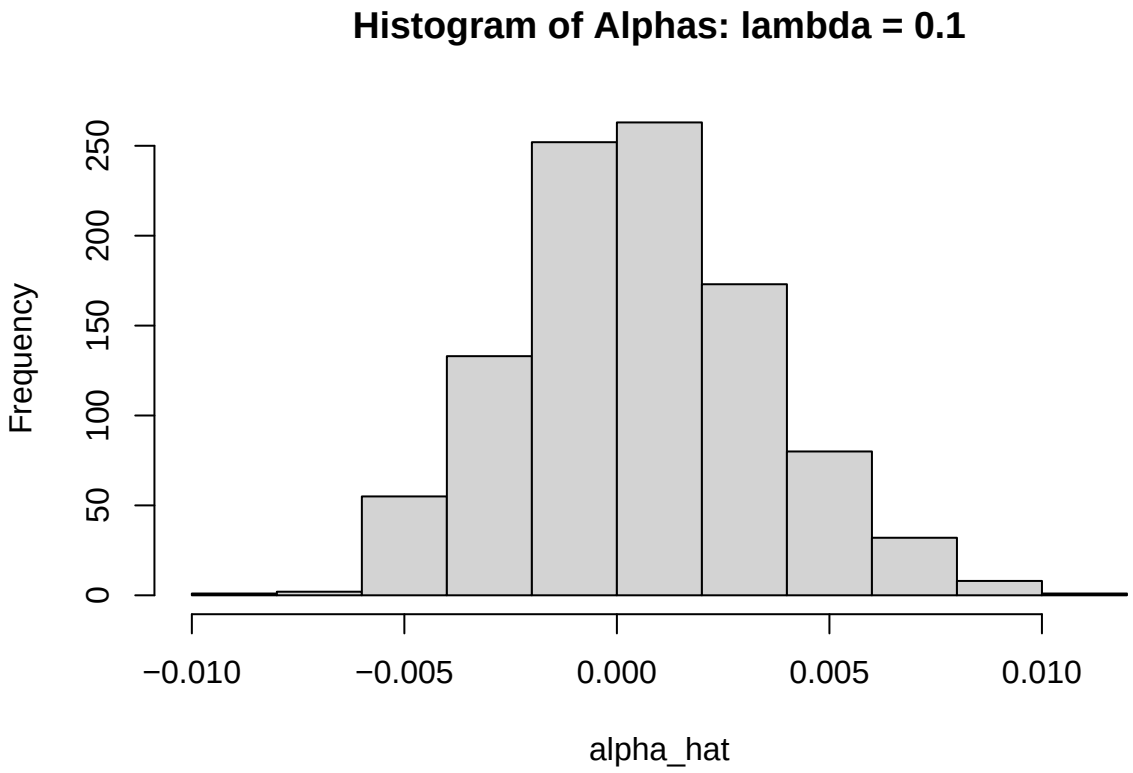


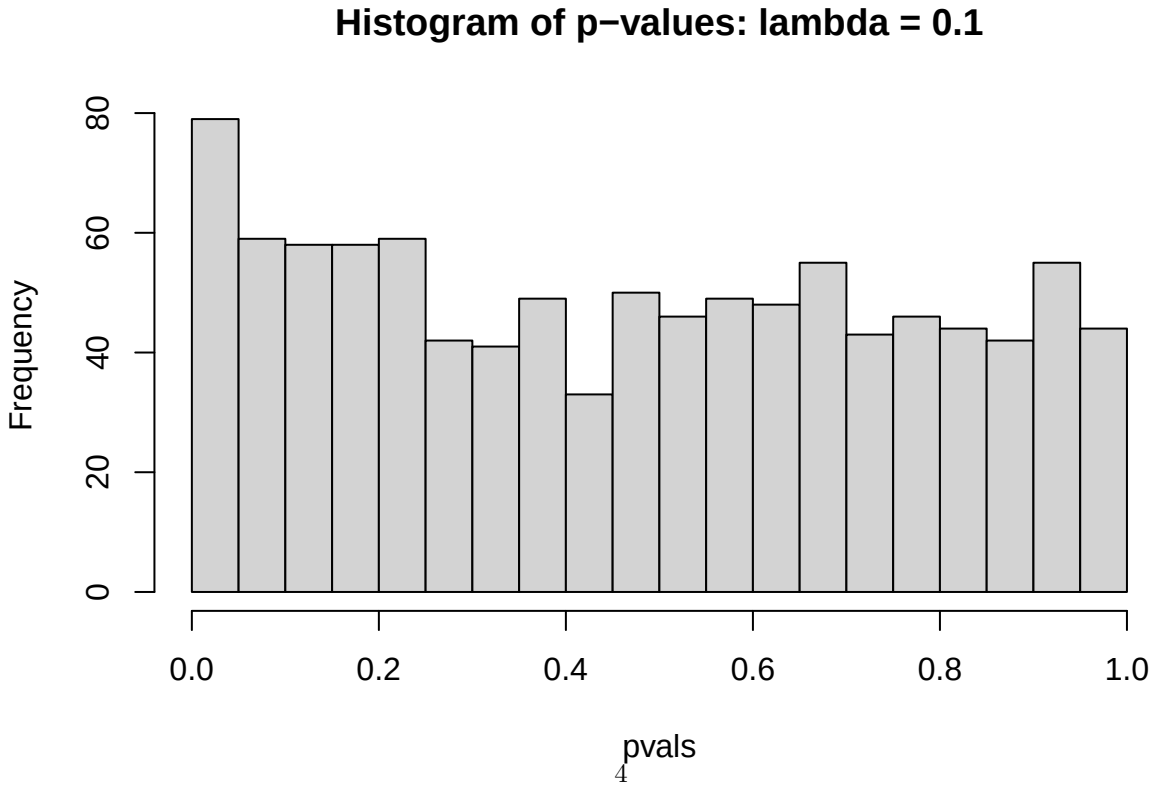
(c)

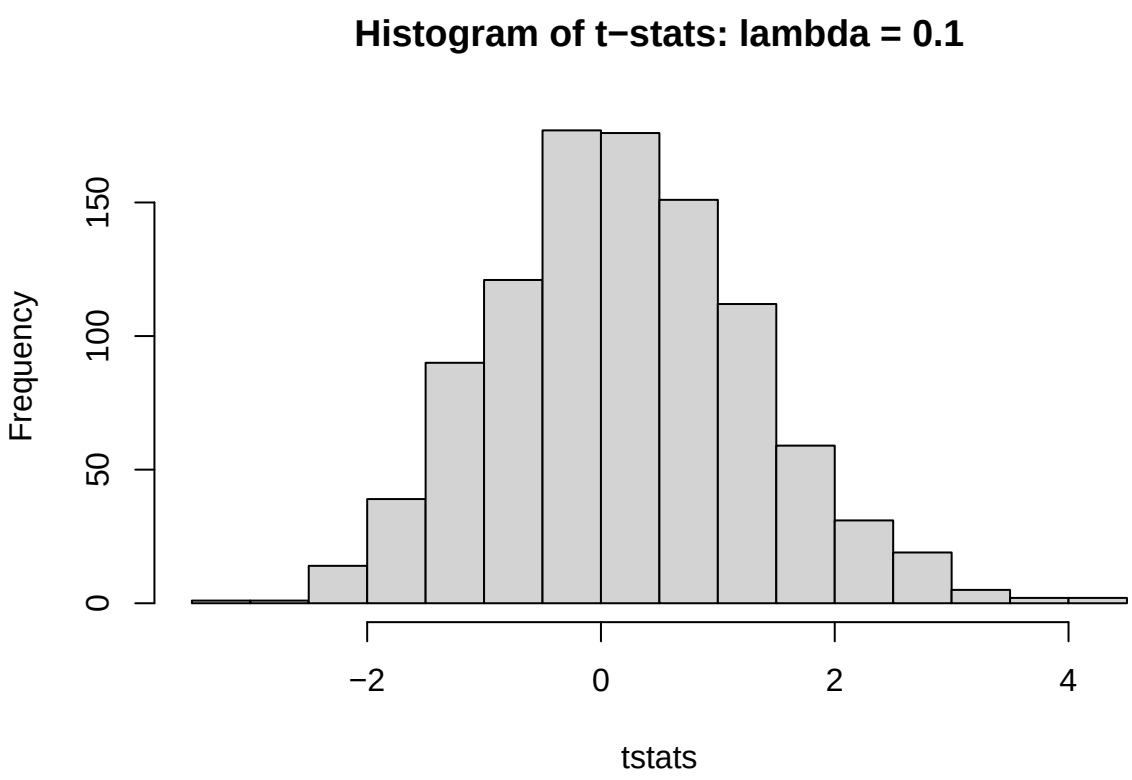
The distribution looks essentially uniform[0, 1]. This is not too surprising, as under the null the coefficients have a t distribution centered at 0, so p values are uniformly distributed. This is illustrated in one of the footnotes in the Wermers 2011 survey.

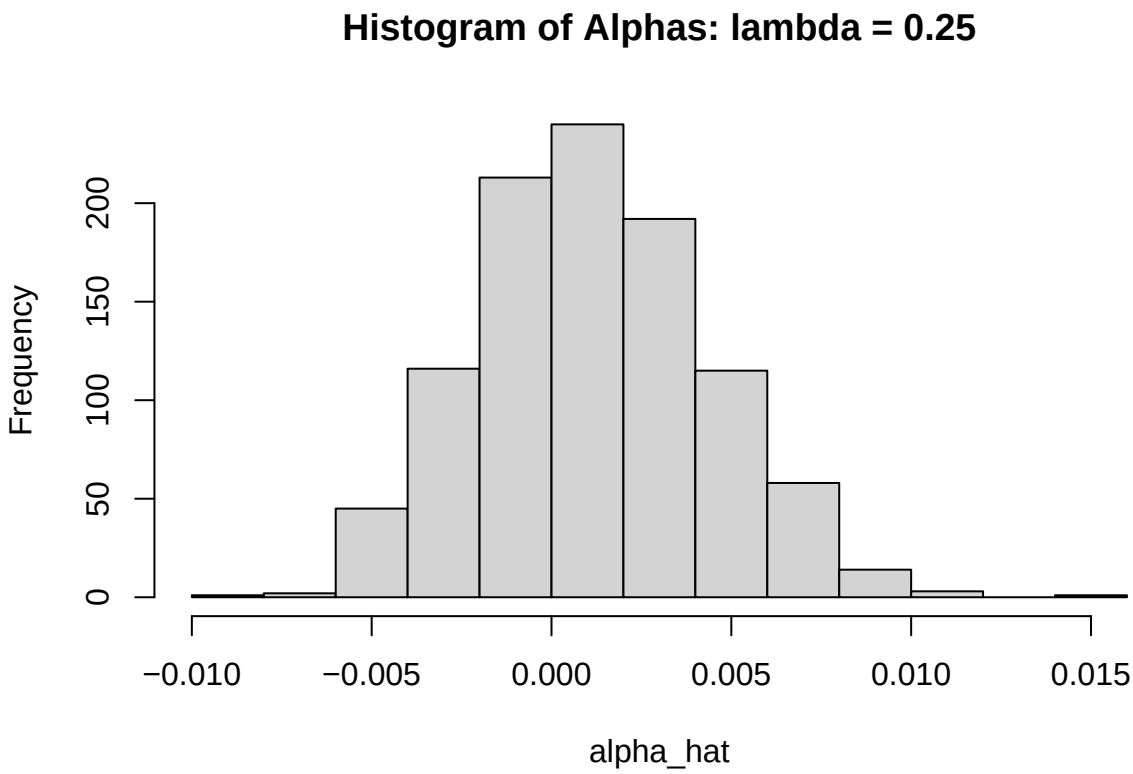
Problem 2

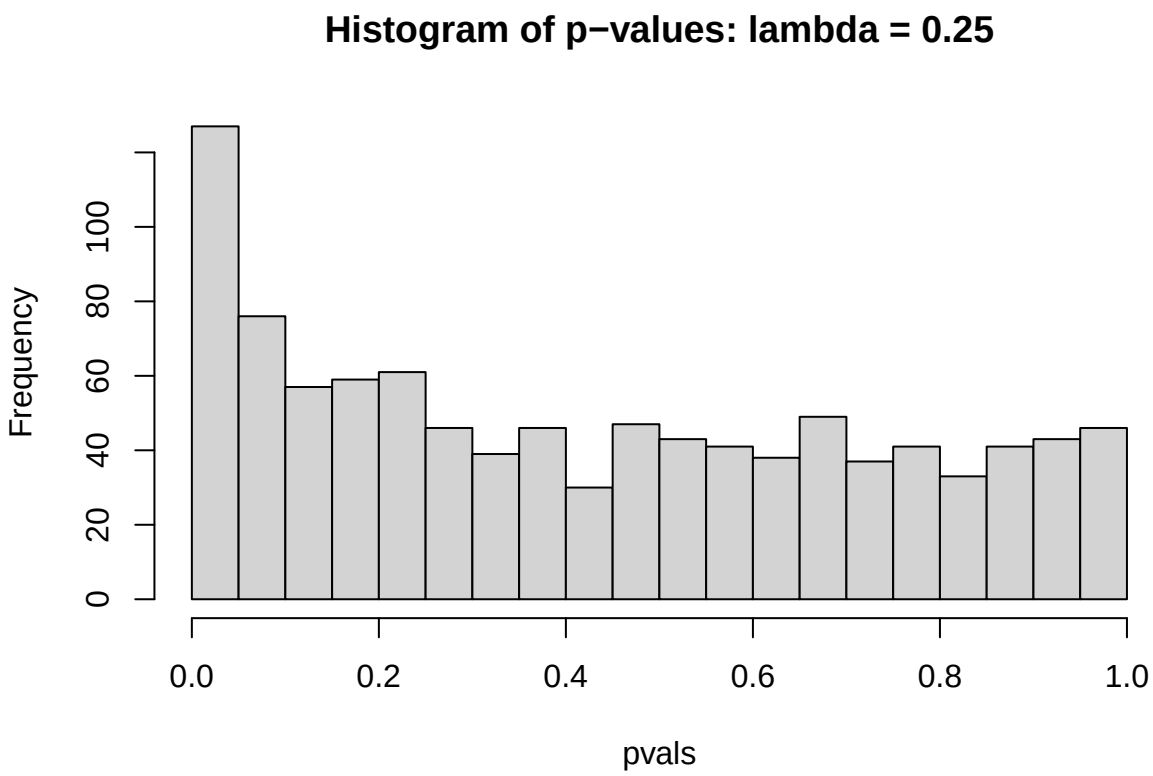
(a)

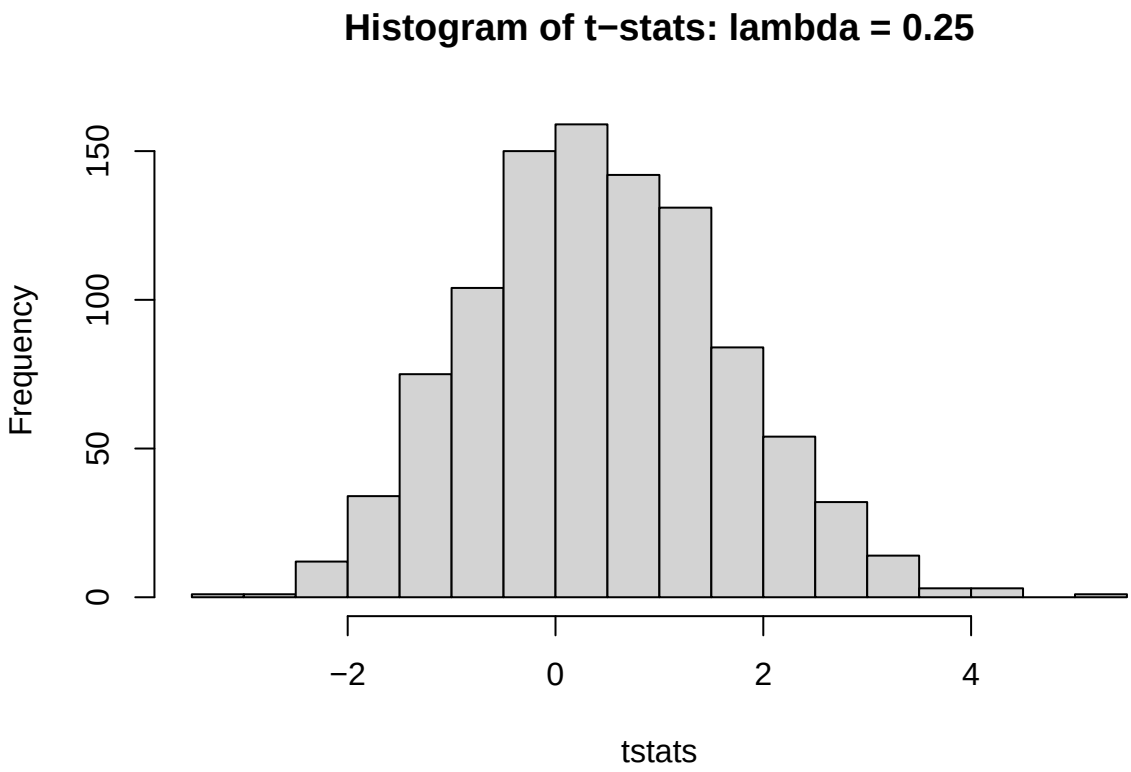

Histogram of Alphas: lambda = 0.1
Frequency
0
50
100
150
200
250
−0.010
−0.005
0.000
0.005
0.010
alpha_hat

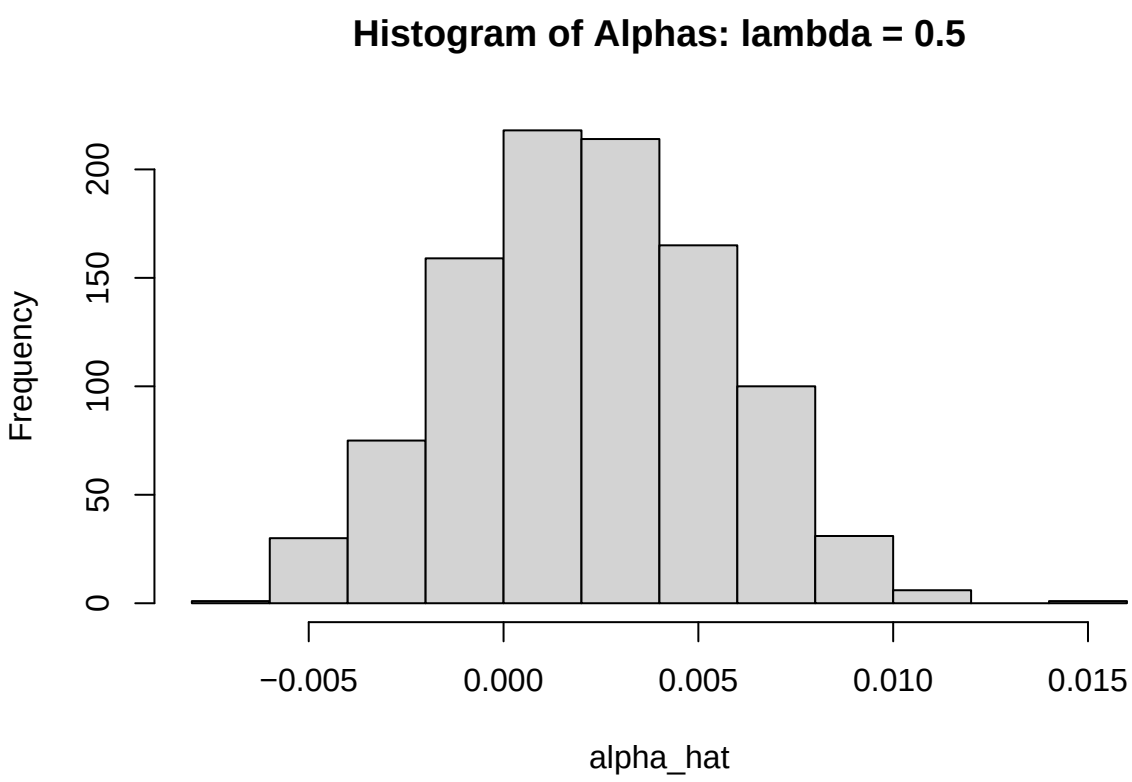

Histogram of p−values: lambda = 0.1
Frequency
0
20
40
60
80
0.0
0.2
0.4
0.6
0.8
1.0
pvals

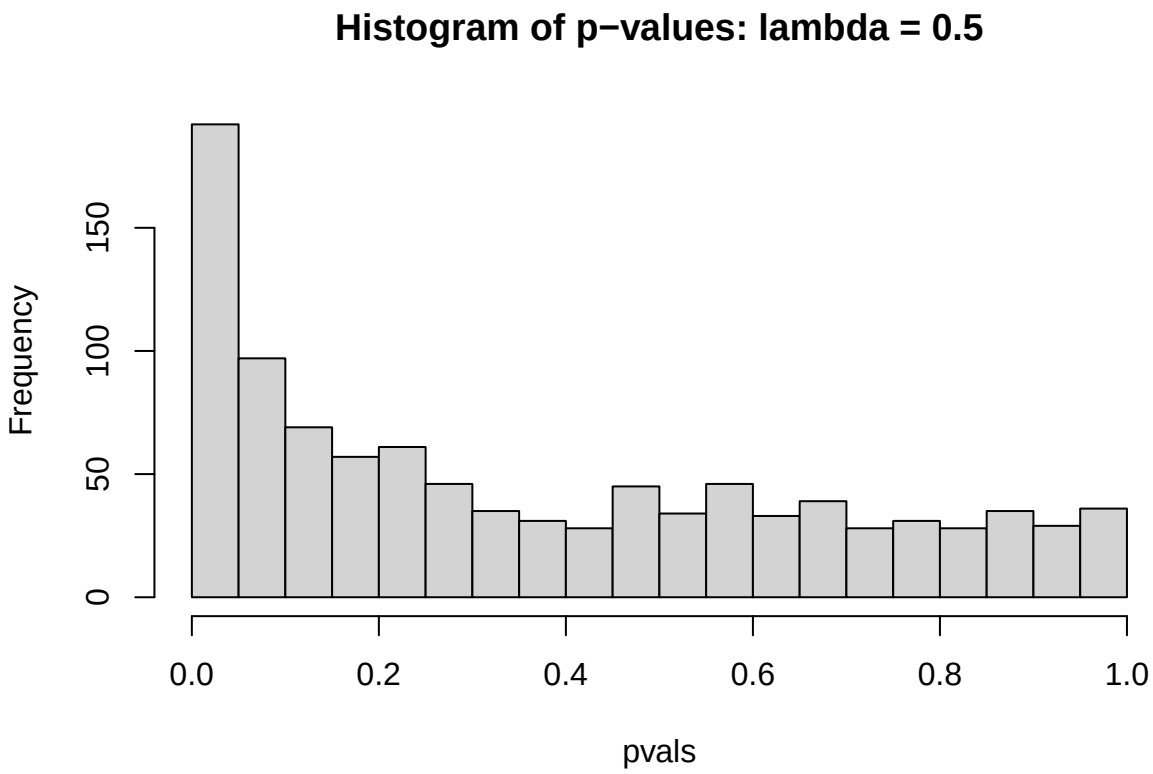

Histogram of t−stats: lambda = 0.1
Frequency
0
50
100
150
−2
0
2
4
tstats

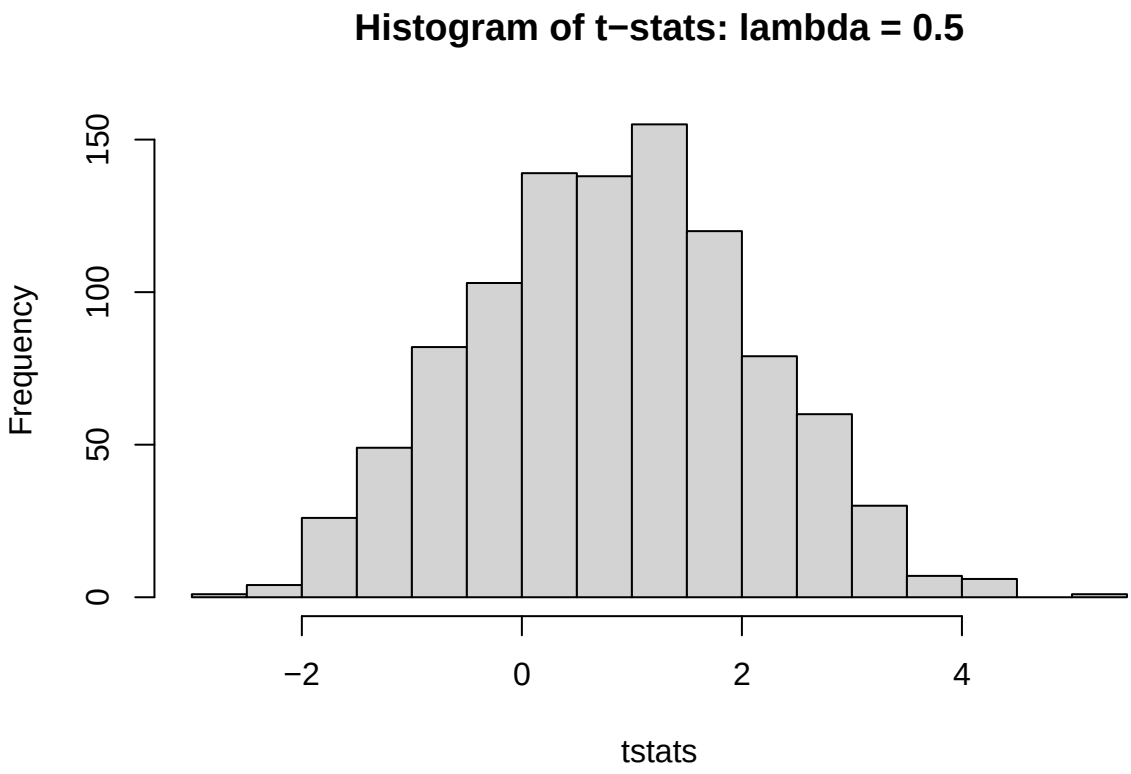

Histogram of Alphas: lambda = 0.25
Frequency
0
50
100
150
200
−0.010
−0.005
0.000
0.005
0.010
0.015
alpha_hat

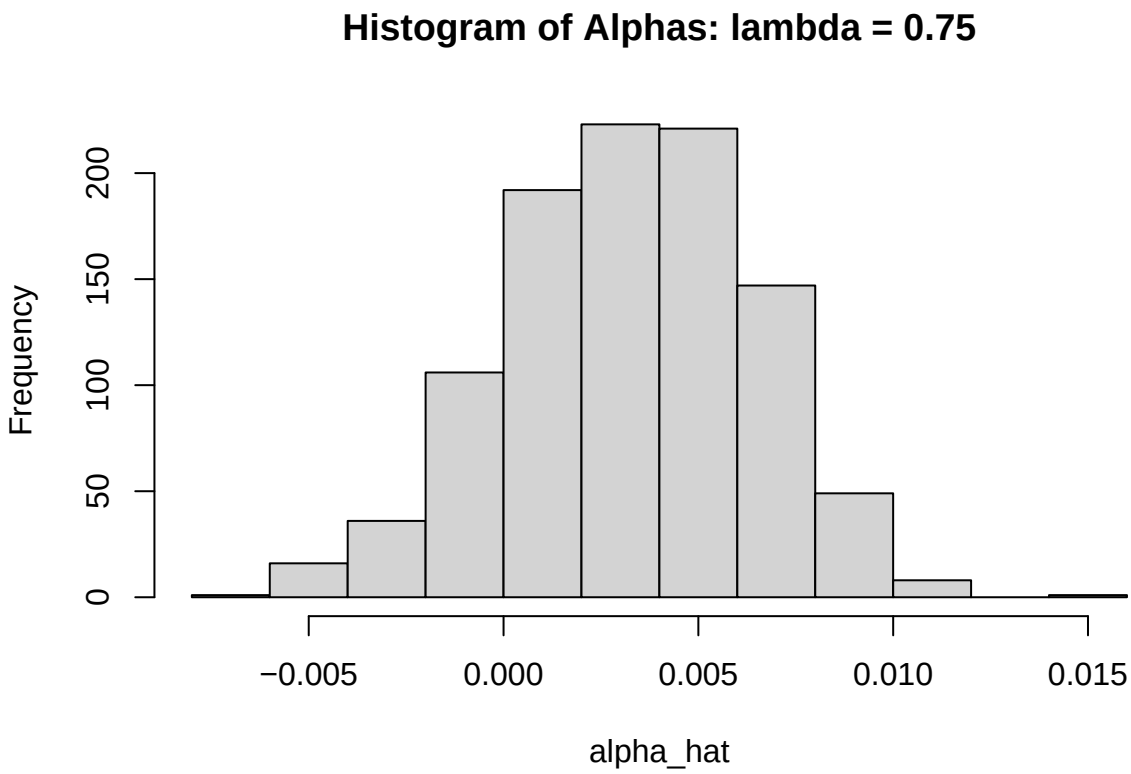

Histogram of p−values: lambda = 0.25
Frequency
0
20
40
60
80
100
0.0
0.2
0.4
0.6
0.8
1.0
pvals

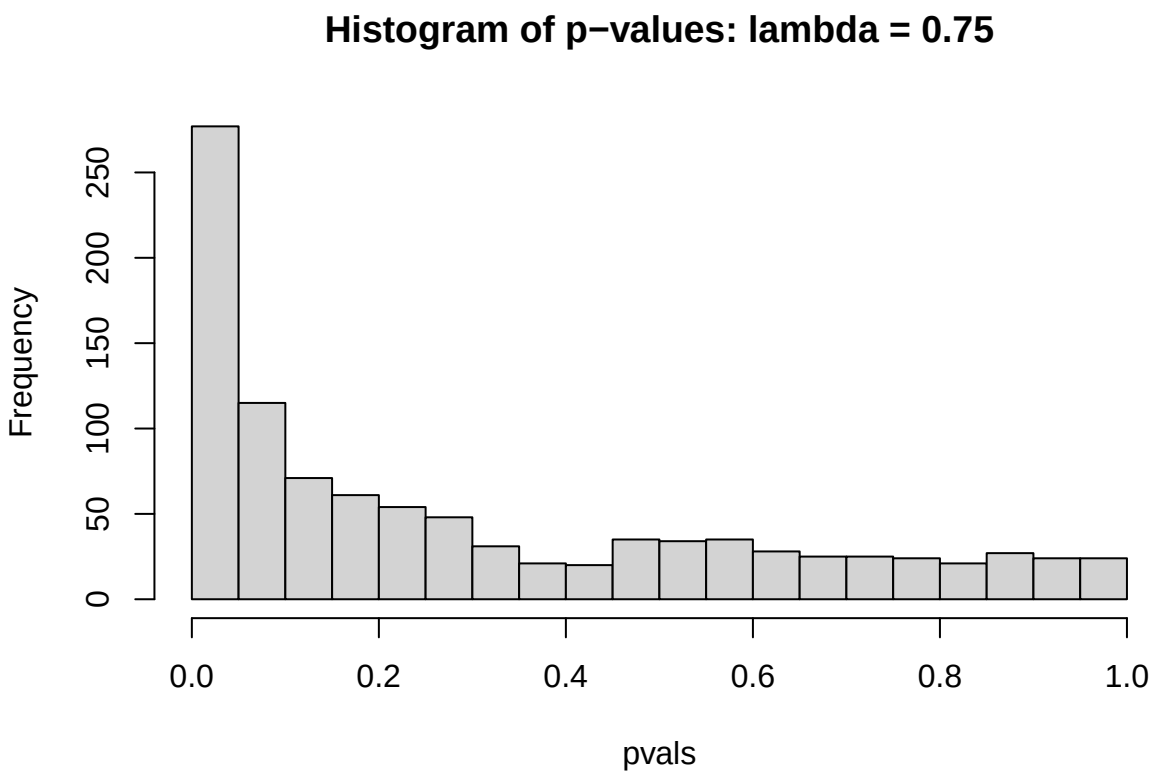

Histogram of t−stats: lambda = 0.25
Frequency
0
50
100
150
−2
0
2
4
tstats

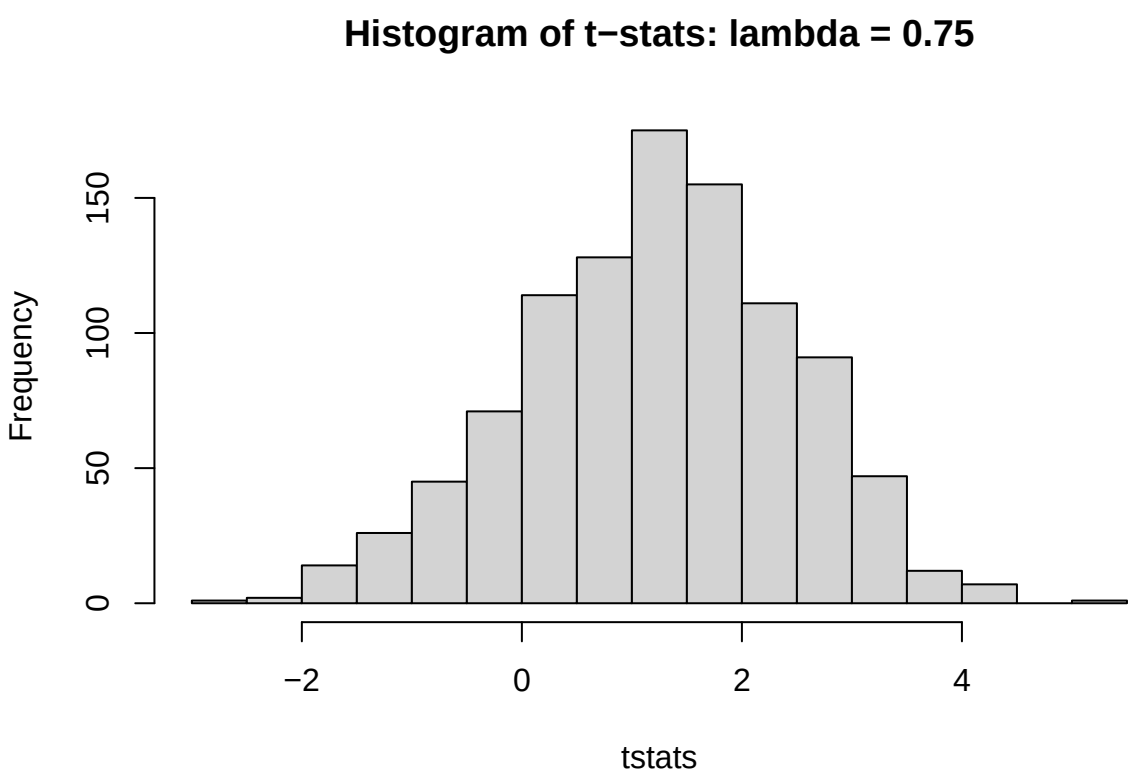

Histogram of Alphas: lambda = 0.5
Frequency
0
50
100
150
200
−0.005
0.000
0.005
0.010
0.015
alpha_hat


Histogram of p−values: lambda = 0.5
Frequency
0
50
100
150
0.0
0.2
0.4
0.6
0.8
1.0
pvals


Histogram of t−stats: lambda = 0.5
Frequency
0
50
100
150
−2
0
2
4
tstats


Histogram of Alphas: lambda = 0.75
Frequency
0
50
100
150
200
−0.005
0.000
0.005
0.010
0.015
alpha_hat


Histogram of p−values: lambda = 0.75
Frequency
0
50
100
150
200
250
0.0
0.2
0.4
0.6
0.8
1.0
pvals



The distributions of t-stats and p-values visibly shift to the right and left, respectively, as we increase lambda, which is what we'd expect as more of the funds are skilled. This shift in the p-values is particularly pronounced among significant (<5%) p-values.

(b)

Below I construct four tables containing proportions (out of N = 1000) of the corresponding samples.

The number of truly skilled funds with insignificant alpha estimates for $\lambda = 0.1, 0.25, 0.5, 0.75$ are 58, 154, 323, 479, respectively. Note, theoretically, these values might differ slightly from the corresponding number in the false negative cell below as the number of insignificant estimates doesn't include significant estimates with negative alphas. In the table, such estimates are identified as unskilled. These numbers account for roughly 60-70% of skilled funds.

The number of truly unskilled funds identified as skilled based on significantly positive alpha estimates is given in the false positive cell, and generally consists of around 2.5% of the unskilled funds. Note since the other half of the significant funds are identified as unskilled, this number is 2.5, not 5.

Lambda = 0.1:

Truth\Estimate	Positive	Negative	Total
True	0.042	0.058	0.1
False	0.019	0.881	0.9
Total	0.061	0.939	

Lambda = 0.25:

Truth\Estimate	Positive	Negative	Total
True	0.096	0.154	0.25
False	0.015	0.735	0.75
Total	0.111	0.889	

Lambda = 0.5:

Truth\Estimate	Positive	Negative	Total
True	0.177	0.323	0.5
False	0.009	0.491	0.5
Total	0.186	0.814	

Lambda = 0.75:

Truth\Estimate	Positive	Negative	Total
True	0.271	0.479	0.75
False	0.003	0.247	0.25
Total	0.274	0.726	