Dear all,

For the bonus assignment, you will need my attached .zip file. You would be insane to do this in Python or anything else, because I have all the codes in Matlab.

See the program stabletests.m. This is a batch file that calls my specific routines for testing the stable. You see:

%   Alhadi      test is availble for 250<=T<=10000  
%   tau\_{Nperm} test is availble for 500<=T<=10000  
%   Combined    test is availble for T=500 and T=1000.

So, you will do 4 tests. Alhadi, tau\_nperm, combined, and the LRT. For LRT, some work is required. You need to engage the bootstrap to determine the appropriate cutoff values for LRT so that your test has correct size. Only then can you do power comparisons. See Vuong.

For my codes, they are recent, but you still need to ensure they work. If there are any problems with them, such as with the most recent matlab, you need to fix them :-). You do the usual --- you generate some data set, and run the codes. If it delivers numbers and no errors, super. If not, you need to dig in and figure out what is wrong. Your task, not mine. Then send me your repaired codes.

From the above list of valid sample sizes, you will use T=250 and just Alhadi. Then, you do T=500 and T=1000, for all the tests, including LRT.

My speculation is that, as k, the number of Gaussian mixture components increases, the power of all test should drop. So, you do, say, k=1, 2, 3, 4, 5, 6, 7, 8, 9, 10. This part is easy, it is just a big FOR loop. As said in the first email, for the LRT, you need the MLE of the stable, which is easy because I sent you the density codes with vectorized numeric integration. For the MLE of mixed normal, this is all spelled out in my book, and I suggest you use the EM algorithm, with a small amount of quasi-Bayesian (Hamilton) prior. I think I have the codes right in my book.

I would have made this an example for book if I had thought of it. It would take me 15 minutes to set up the batch matlab codes, and then just let it run, get the correct LRT cutoffs, and then make beautiful power plots. These would demonstrate that a mixture of Gaussians can replicate the stable distribution to any degree of accuracy desired, provided k is high enough. And we would learn how large k has to be, for a given sample size. Useful!

I was thinking of a possible "bonus" exercise for those of you who desire some more points. I have not decided on how many points (maybe something like 50), and a rough idea of the assignment would be:

Test the stable Paretian assumption against the mixed normal. Do so using my test (I will send you Matlab codes), and via a LRT and use of Vuong, 1989, see here:

https://en.wikipedia.org/wiki/Vuong's\_closeness\_test

You would use a single normal distribution, k=1.

Then increase to k=2, i.e., a discrete mixture of two normals.

Then 3, etc., and make nice plots of k versus the power of the tests.

You would need my test -- I give you that, and the MLE of the stable, which I gave you, and the MLE of the mixed normal, for which you would use my quasi-bayes method, with a small amount of prior.

Hi Patrick,

Here is our draft for the Preliminary thesis report. As the draft have come together, we wanted to incorporate the “Low-Risk Anomaly?” (LRA) paper by Schneider, Wagner, and Zechner. This became a possibility as we gained access to OptionMetrics through the University of Zurich, but unfortunately the registration started today. We have therefore just been able to quickly address the data, but we have access and can download data. So, this should absolutely be doable during the Christmas break.

Secondly, since we want to incorporate the LRA paper should we only do the replication for the US sample, as we don’t have option data otherwise?

Thank you in advance for the feedback.

Best regards,

Sania and Christoffer