MFE 409: Financial Risk Management
Problem set 3

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due 4/22 before midnight

You should work with your assigned group but should write up your answer individually. Give the name of your group members in your writeup and submit it on CCLE before Monday April 22 before midnight.

1 Choosing a VaR technique

Download the excel file which contains the time series of gains for a strategy from 1/2/2014 to 12/19/2017.

1. For each day in 2015-2017, compute historical VaR and exponential weighted 1-day 99%-VaR (with $\lambda = 0.995$). Comment on the exceptions that happen with these two measures.
2. For each day in the sample, compute the 95% confidence intervals of the historical VaR and the exponential weighted VaR you obtained in Question 1, using both parametric (for the historical VaR) and bootstrap methods (for the two measures). For the parametric method, assume the gains are normally distributed.
3. For each day in the sample, compute the volatility of the portfolio in the previous month. Normalize gains with estimated volatility. Compare the distribution of the normalized gain with the original ones.
4. Develop an approach to measure VaR which takes advantage of your response to the previous question. Implement it and compare its exceptions with the previous approaches.
5. Combining your answers to the previous questions, write a proposal to the head of trading for measuring the risk of this trade in real time, justifying your choices.

2 Short questions

1. Prove that if 8 people are born in a three-year period, at least 3 of them are born within the same one-year period.

2. What is the ten-day 99% VaR of a portfolio with a five-day 98% VaR of $10 million?

3. What is the probability of having more than one exception in the same month? Use the answer this question to come up with a test of a VaR measure based on bunching.

4. Uber is going to IPO soon, how would you estimate the 1-year 99% VaR of investing $1m in the IPO? *Bonus question:* Provide a number.