MFE 237I: Financial Risk Management
Problem set 3

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due 4/24 before midnight

You should work with your assigned group but should write up your answer individually. Give the name of your group memebers in your writeup and email it to the TAs at shenje.hshieh.1@anderson.ucla.edu and yingcong.tang.1@anderson.ucla.edu before Monday April 24 at midnight.

1 Choosing a VaR technique

Download the excel file which contains the time series of gains for a strategy from 8/8/2006 to 9/25/2008.

1. For each day in 2007-2008, compute historical VaR and exponential weighted 1-day 99%-VaR. 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. Assess the normality of the gain distribution. Estimate a power law for the left tail of the distribution with MLE. Use this estimate to compute the VaR with 99 percentile and 99.9 percentile using the estimated power law model.

4. For each day in the sample, compute the volatility of the portfolio in the past month. Normalize gains with estimated volatility. Compare the distribution of the normalized gain with the original one and discuss which is closer to normal distribution.

5. Repeat Question 4 but assuming that somebody tells you in advance what the volatility will be in the next month.

6. Write a proposal to the head of trading for measuring the risk of this trade in real time, justifying your choices.

2   Interview questions

1. How many independent random variables uniformly distributed on $[0, 1]$ should you generate to ensure that there is at least one between 0.70 and 0.72 with probability 95%?

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

3. How would you compute π using Monte Carlo simulations? What is the standard deviation of this method?

4. What is the Gamma of an option? Why is it preferable to have small Gamma? Why is the Gamma of plain vanilla options positive?