

MFE 409: Financial Risk Management

Problem set 2

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due 4/15 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 15 at midnight.

1 VaR during the 2008 Financial Crisis

All major banks use Value-at-Risk as a measure of market risk. As part of their disclosure to investors, banks report how they measure and manage market risk, including how they use Value-at-Risk. They also report on how their Value-at-Risk models have performed. Each study group is assigned to a bank as follows and responsible for summarizing the VaR used by these banks during the 2008 financial crisis. Your group number can be found in the attached list.

Group	Bank
1/11	Goldman Sachs
2	UBS
3	JP Morgan Chase
4	Citigroup
5	Barclays Capital
6	Morgan Stanley
7	Deutsche Bank
8	Bank of America
9	BNP Paribas
10	Credit Suisse

1. Download their 2008 annual reports (10-K for US firms and 20-F or 6-K for foreign firms) from SEC's website (<https://www.sec.gov/edgar/searchedgar/companysearch.html>). Find the section where market risk is discussed and write a short essay summarizing the bank's practices concerning the following:

- Technique used to compute VaR
 - What data is used to compute VaR? Is more recent data weighted more heavily?
 - Time horizon
 - Confidence level
 - Number of VaR exceptions in 2008 (days where loss exceeded VaR)
 - Any changes to VaR methodology made as a result of the financial crisis?
2. Download the daily stock price for the corresponding bank over 2006-2008 from Yahoo finance.
 - (a) On each day of 2008, compute the 99% 1-day VaR for the stock return using the historical method with all past data in the sample.
 - (b) If you are at the end of 2008 and want to back-test this approach, what do you do and what do you conclude?
 - (c) Comment on the relation with what you found in the annual report.
 3. Add to your dataset the daily stock price for all 10 banks over the same period.
 - (a) Use the historical method to compute the VaR for a portfolio with \$1m in the odd-numbered banks (1, 3, ...), \$2m in the even-numbered banks.
 - (b) Compute the DVaR and CVaR for each bank.
 - (c) Comment on the results.
 - (d) If you had to make a recommendation on how to tilt this portfolio, what would it be based on the data you have?

2 Expected shortfall

1. Derive a formula for the expected shortfall if gains are normally distributed $\mathcal{N}(\mu, \sigma^2)$.
2. The expected shortfall can also be defined as the average of the VaR for all confidence level above c :

$$ES = \frac{1}{1-c} \int_{1-c}^1 VaR_{\alpha} d\alpha$$

Prove that this definition is equivalent to the one we have seen in class.
Hint: You can use integration by part and a change of variable.