MFE 409: Final Review

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This list of topics is here to give you a guideline of the main ideas we studied in class as you prepare for the final.

1. Broad ideas
   (a) Reasons to manage risk: Modigliani-Miller theorem, reasons for regulation
   (b) Reasons to take risk, risk regulations as a constraint
2. Value-at-Risk
   (a) Definition of VaR
   (b) Rationale for VaR: necessary capital measure, tail risk measure
   (c) Issue 1 with VaR: not capturing the structure of tail risk
   (d) Definition of Expected Shortfall, why it helps with issue 1
   (e) VaR and ES for normal distributions
   (f) Role of time for VaR
   (g) VaR for a portfolio: normal distribution and approximation
   (h) DVaR, CVaR, and decomposition of VaR
   (i) RAROC and its use for capital allocation
   (j) Issue 2 with VaR: not always capturing diversification
   (k) Coherent risk measures, why VaR is not one, why ES is one
3. Back-testing
   (a) Definition
   (b) Distribution of the number of exceptions
   (c) Bunching
4. Historical simulation approach to compute VaR
   (a) Definition and implementation in the simplest case, computing ES.
   (b) Stressed VaR: definition and properties

(c) Estimation of the accuracy of VaR: parametric and bootstrap

(d) Tradeoff for choosing how much data to use

(e) Exponentially weighted VaR

(f) Implication of extreme value theory for tail of distributions

(g) Estimating a generalized Pareto distribution and using it to compute VaR and ES

5. Model-building approach to compute VaR

   (a) Normal model for a portfolio

   (b) Imperfect hedging and VaR reduction

   (c) Volatility: definition, best estimate, MLE, and estimator used in practice

   (d) Weighting schemes for volatility estimations

   (e) Applications: ARCH, EWMA, and GARCH

   (f) MLE estimation of those models

   (g) Implied volatility: definition and construction

   (h) How to use options to infer future moments of the data, limitations

   (i) Tradeoffs for choosing between model-building and historical simulation

6. Risk for options

   (a) The difference between static hedging and dynamic hedging

   (b) Delta approach for computing VaR, why it goes wrong

   (c) Delta-Gamma approach for computing VaR

   (d) Cornish-Fisher expansion

   (e) Other Greeks and general risk management ideas

7. Regulation of Financial Institutions

   (a) Why we regulate risk-taking of banks and financial institutions

   (b) Capital ratio (Cooke ratio) definition and calculation under Basel I, the various tiers of capital

   (c) Derivative capital weight and the role of netting.

   (d) Market risk after the 1996 amendment: VaR. How it changed in Basel II.5

   (e) The three pillars of Basel II

   (f) The IRB approach to credit risk

   (g) Additional capital buffers in Basel III and their justification

   (h) Leverage ratio

(i) Measures of liquidity risk

(j) SIFIs, SIBs, ...

8. Credit Risk

   (a) Historical method: using firm caracteristics, ratings, ...

   (b) Link between default probabilities and hazard rates

   (c) Credit default swap: definition, CDS spread

   (d) Recovering risk neutral hazard rates from CDS spreads

   (e) Merton model: setup, distance to default

   (f) How to use equity values to recover asset value and volatility in the Merton model

   (g) Issues with the Merton model

9. Liquidity risk

   (a) Market liquidity definition

   (b) Determinants of market liquidity of a trade:time, size, market conditions

   (c) Bid-ask spread, transaction cost, trade-off for optimal execution

   (d) Funding liquidity definition

   (e) The LTCM experience: how liquidity problems create limits to arbitrage