

# MFE 409: Midterm 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 midterm.

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 these models
  - (g) *Implied volatility: definition and construction (not on midterm)*
  - (h) *How to use options to infer future moments of the data, limitations (not on midterm)*
  - (i) Tradeoffs for choosing between model-building and historical simulation