

**U6016: Cost-benefit analysis**  
School of International and Public Affairs, Columbia University  
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**Lecture outline**

IV. RISK ANALYSIS

**A. Risk analysis: an overview**

1. An example
2. Steps in risk analysis
  - a. quantifying risk
  - b. adjusting for risk

**B. Review of basic statistical concepts**

1. Random variables
  - a. domain
  - b. probability distribution
  - c. cumulative distribution
  - d. event
2. Moments and other summary statistics of a random variable
  - a. expectation
  - b. variance
  - c. mode
3. Relationship between random variables
  - a. independence
  - b. covariance
  - c. joint distribution
  - d. marginal distribution
  - e. conditional distribution

**C. Quantifying risk: a simple example**

1. Outcome trees
2. Calculating probabilities
3. Accounting for correlations
4. Cumulative distribution of the NPV

**D. Quantifying risk: simulation analysis**

1. Simulation analysis: basic concepts
  - a. sample size
  - b. replications
  - c. generating random outcomes
2. Simulating various statistics
3. Cumulative distribution of the NPV

**E. Adjusting for risk**

1. risk aversion and risk premia
2. risk discount factors

**F. Uncertainty, irreversibility and quasi-option values**