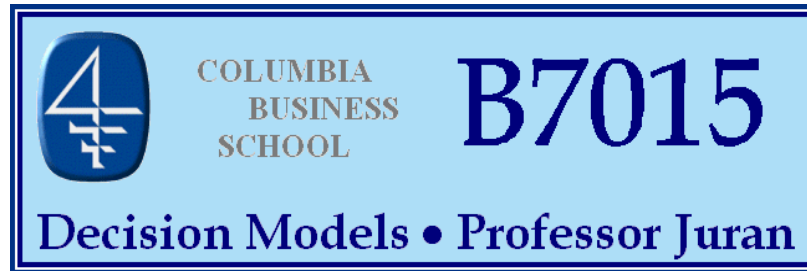


COLUMBIA UNIVERSITY
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Lecture 1

- Syllabus Overview
- Introduction to Decision Models
- Linear programming formulation
- Demonstration of the spreadsheet optimization method.
- EX - Bland Brewery Linear Programming Model (*Mixing/Blending problem, Maximize profits*)
- EX Bonus – Malcolm’s Glass Shop (*2 product Mix problem, a lot of Constraints, Maximize profits*)

Lecture 2

- EX - Extreme Downhill (*2 products mix, 4 Constraints, Maximize profits*)
- EX - Shelby Shelving Case (*2 products mix, 2 Constraints, a lot of Fixed and Variable costs, Maximize profits*)
- EX - Advertising Mix Problem (*3 decision variables, Matrix Constraints, Minimize spending*)
- EX - TransportCo **Distribution** Problem (*Network/Supply-Demand problem, Minimize shipping costs*)

Lecture 3

- Sensitivity Analysis
- Understanding the solver sensitivity report (EX - Shelby Shelving Case)
 - ▶ Shadow prices (slide #7)
 - ▶ Right hand side ranges
 - ▶ Objective coefficient ranges
- EX - Petromor bidding problem
- SolverTable Add In
- Economic interpretation of shadow prices

Lecture 4

- Multi-period Planning Models
- Cash-Flow-Matching LP
 - ▶ EX –Project – Bond funding (*Minimize cost; Solver Table to determine discount rates.*)
- Non-Linearity in Optimization: Multi-period revenue management problem

Lecture 5

- Multi-Period Revenue Management Problem
 - ▶ EX – Retailer - Restricted Number of Price Levels
- Integer Programming
 - ▶ EX - Plant-location (network problem)

Lecture 6

- Portfolio Optimization (Asset Allocation) - Part I
 - ▶ EX – Investment non-linear Equal Probabilities
- Portfolio Optimization - Part II
 - ▶ The Efficient Frontier and Correlation (slide #20)

- ▶ EX - With Historical Real Data

- CAPM
- Selling Short

Lecture 7

- Portfolio Optimization II (continued)
 - ▶ Adding a constraint on the number of securities in an optimal portfolio
- Introduction to Options
- GMS Stock Hedging
- Summary and Preparation for next class

Lecture 8

- Decentralized vs. Centralized Optimization
 - Context: Pollution Trading
 - Efficiency vs. Equity
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Lecture 9

- Simulation
 - ▶ Introduction to Crystal Ball
- Risk-management simulation example
 - ▶ Insuring against oil-price increases
 - ▶ Analysis of results

Lecture 10

- Using Simulation for Risk Management
 - ▶ Risk management at Merck
 - ▶ Should corporations hedge?
 - ▶ Simulating foreign exchange rates
 - ▶ Evaluating hedging effectiveness using simulation
- Sensitivity analysis using Decision Tables

Lecture 11

- Introduction to Value at Risk (VaR)
 - ▶ Computing VaR for a Single Bond
 - ▶ Computing VaR for a Bond Portfolio
 - ▶ Risk Management Systems
- Introduction to Retailer Simulation

Lecture 12

- Retailer simulation
- Course Wrap-up