

# MGT 40750 – Quantitative Decision Modeling Spring 2017

## Final Review

Professor Hong Guo

## Course Structure

### MGT 40750 – Quantitative Decision Modeling

#### Simulation

- Process simulation (SimQuick)
- Spreadsheet simulation (@Risk)

#### Optimization (Solver)

- Linear programming
- Network models
- Integer programming
- Nonlinear programming

## Key Topics – Before the Midterm

- Process Simulation
  - Waiting lines: bank, airport, call center, hospital
  - Inventory: grocery store
  - Manufacturing: production game
- Linear Programming
  - Advertising: Chery advertising
  - Blending: mixing drinks, orange blending
  - Production: reprocessing, change production levels
  - Investment: currency trading, investment portfolio

## Key Topics – After the Midterm

- Network Models
  - Shortest path problems: messaging through mobile network, travelling from New York to LA
  - Transportation problems: assigning auditors to projects
- Integer Programming
  - Integer / Binary variables
  - Basketball lineup
  - Crew scheduling: pick one schedule for each worker so that demand is covered and worker satisfaction is maximized.
  - Production scheduling with shifts
- Nonlinear Programming
  - Rating college football teams: squared errors is nonlinear.
  - Locating a fire station: Abs() function is nonlinear.

## Spreadsheet Simulation Using @Risk

- Investing for retirement
  - 3 models in class and 1 model in Assignment 4
  - Calculate probabilities of interest from the simulation results
- Roulette
  - Optimal target hitting strategy
  - Doubling strategy
- Reservation Management
  - Optimal max # of reservations to accept
  - Balance the tradeoff between ticket revenue and cost of bumping
- Hockey
  - Pulling the goalie in the last minute, the last 2 minutes, the last 3 minutes, or keeping the goalie in throughout the whole game

## Spreadsheet Simulation Using @Risk

- @Risk Functions
  - Probability distribution functions:
    - RiskNormal(mean, standard deviation)
    - RiskDiscrete(outcomes, probabilities)
    - RiskBinomial(# of trials, probability of success)
  - RiskOutput ("output cell name")
  - RiskSimTable(list of parameter values)
  - RiskMean(cell reference, Sim#)
- @Risk Setup
  - Iterations = \_\_\_\_ (the more the better, but may be time consuming)
  - Simulations = \_\_\_\_ (depend on how many parameter values)

## Useful Excel Functions

- Common Excel Functions: *If*, *Average*, *Sum*, *Min*, *Max*, *And*, *Abs*
- *SumProduct(array1, array2)*: Returns the sum of the products of corresponding ranges or arrays.
- *SumIf(range, criteria, sum\_range)*: Adds the cells specified by a given condition or criteria.
- *CountIf(range, criteria)*: Counts the number of cells within a range that meet the given condition.
- *VLookup(lookup\_value, table\_array, col\_index\_num, true/false)*: Look for a value in the leftmost column of a table, and then returns a value in the same row from a column you specify.

## Materials Covered

- Lectures
- Assignments 1-4
- Exercises for the Midterm Exam
- Exercises for the Final Exam
- SimQuick Textbook Chapters 1-4 (optional)
- Practical Management Science Textbook Chapters 4-7 and 10-11 (optional)

## Final Exam

- Wednesday (03/08), in class
- 75 mins, 125 total points, **cumulative (25% from before the midterm)**
- Cheat sheet (one page, two-sided)
- Access to computers
- Exam structure
  - 4 questions
  - Similar format as the assignments, the exercises, and the midterm
- **Bring your questions to office hours @ 356 Mendoza**
  - 3pm – 5pm on Tuesday (03/07)



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