# MGT 40750 – Quantitative Decision Modeling
# Fall 2016

## Midterm Review

Professor Hong Guo



## Outline – Examples in each topic

- 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

## Process Simulation

- Three common statistical distributions
  - Nor(m,s), Exp(m), Uni(a,b)
- Five Elements in SimQuick
  - Entrances, Exits, Work Stations, Buffers, Decision Points
- Process flow map
  - Type of SimQuick element
  - Unique name



## Performance Measures

Understanding SimQuick results:

- Service level
  - Service level at Entrance = Objects entering process / (Objects entering process + Objects unable to enter)
  - Service level at Exit = Objects leaving process / (Objects leaving process + Object departures missed)
- Cycle time at Buffer
- Throughput of a process
- Cycle time of a process
  - Processing time at Work Station
  - Cycle time at Buffer
  - Cycle time of internal buffer at Work Station
- Utilization at Work Station

## Sensitivity Analysis in Process Simulation

- Sensitivity analysis: the impact of changing parameters on performance measures
  - Time between patient arrivals in the hospital example
  - Variability of processing time in the production game
  - Inventory levels in the production game
  - Storage size in the grocery store example
  - …
- Use ScenVar(·) to conduct sensitivity analysis



## Linear Programming

- Key concepts
  - Objective
  - Decision variables
  - Constraints
- Steps of solving a LP problem
  - 1. Determine the decision variables (Solver will find the values of decision variables → No formula needed)
  - 2. Set up the Excel worksheet (Specify all the necessary formulas for the objective and all constraints)
  - 3. Set up Solver (objective, decision variables, constraints, non-negativity, the Simplex LP method)

## Understand Solver Results

- What's the recommended decision?
  - Values of the decision variables
- How would the objective change if we change the constraints?
  - Add an extra constraint?
  - Relax a constraint?
- How would the decision change if we change the constraints?
  - Add the integer constraint?



## Sensitivity Analysis in Linear Programming

- Sensitivity analysis: the impact of changing parameters on the objective value
  - Required number of exposures in the advertising example
  - Level of the available raw materials in the mixing drinks example
  - …

## Materials Covered

- Lectures
- Assignments 1-2
- Exercises for the Midterm Exam
- SimQuick Textbook Chapters 1-4 (optional)
- Practical Management Science Textbook Chapters 4 (optional)



## Useful Excel Functions

- SUMPRODUCT(Array1, Array2): Returns the sum of the products of corresponding ranges or arrays.
- TRANSPOSE(Array): Converts a vertical range of cells to a horizontal range, or vice versa.

## Useful Reference

- SimQuick Textbook Appendix 5: SimQuick Reference Manual



## Midterm Exam

- Wednesday (09/14), in class
- 75 mins, 100 total points
- Cheat sheet (one page, one-sided)
- Access to computers
- Exam structure
  - 3 questions
  - Similar format as the assignments and exercises

- Bring your questions to office hours @ 356 Mendoza
  - 3:30pm – 4:30pm on Monday (09/12)
  - 3pm – 5pm on Tuesday (09/13)