IOM 547: Designing Spreadsheet-Based Business Models[1]
Fall 2013

University of Southern California – Marshall School of Business

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Textbook

Management Science: The Art of Modeling with Spreadsheets (3rd ed.), by Stephen G. Powell and Kenneth R. Baker (John Wiley & Sons).

Course Objective

Spreadsheets are convenient and widely available platforms for organizing information and performing "what if" analyses. Excel therefore, has become an indispensable tool for business analysis. This course will focus on structuring, analyzing and solving managerial decision problems on Excel spreadsheets.

This course is not about becoming an Excel expert, but about modeling through Excel. Its goal is to train you to become an effective modeler who can build sound models to solve business problems.

We will study four broad classes of managerial problems:

1. **Data Analysis**: How to summarize available data into useful information. The cost of collecting data has declined fairly dramatically and most firms now have a fair amount of data. The first few, perhaps the most useful, steps in understanding and structuring a business decision is to find out what data is available and organizing it to support decision making.

2. **Resource Allocation**: How to optimally allocate a limited pool of resources among available opportunities. This is the most common managerial problem, occurring in every functional area. Examples in finance include constructing an optimal risk-return portfolio, and capital budgeting. Examples in marketing include media planning, and sales force territory planning. In operations management resource allocation problems arise in capacity, logistics and operations planning.

3. **Decision Analysis/ Contingent Decisions**: How to synthesize a sequence of decisions involving uncertainty. An intuitive approach to handling uncertainty is to explore the possibility of deferring a decision until some uncertainty is resolved, especially when the stakes are high. If we can we should make sequence of decisions instead of one big decision. Business examples where such decision techniques are used include dynamic portfolio management, new product development, and capacity expansion planning.

4. **Risk Analysis**: How to incorporate uncertainty in problem parameters. Almost always managerial decisions are based on anticipated states of the business environment. Clearly as the decision horizon becomes longer there is an increase in uncertainty. Managers have to carefully consider different potential scenarios while making decisions. In this part of the course we will learn how to explicitly incorporate uncertainty into business models.

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[1] August 26, 2013. Any update will be posted in Blackboard.

Excel Skills and Software

Previous knowledge of Excel is not required. Knowing how to enter formulae involving relative and absolute cell addresses, and how to graph using chart wizard is sufficient. We will learn to use a set of Excel add-on tools to find optimal resource allocations, analyze contingent decisions, and simulate the effects of uncertainty.

Grading

Homework assignments	20%
Midterm Exam	25%
Final Exam (cumulative)	35%
Class Participation	10%
Problem of the Day	10%

There will be absolutely no other assignments.
Exams are in-class and closed book/notes. There are no make up exams.
Homework assignments are accepted only via Blackboard. The instructor will not accept homework assignments in class. Late homework will not be graded.

Practices and Assignments

Throughout the semester, there will be practice problem sets and (group) homework assignments. Please form groups of **3 or less** students. All the members in a group will receive the same score. You can form different groups for different assignments.

Blackboard

We will use Blackboard as our "information center". Handouts, assignments, solutions, syllabus updates, supplementary reading materials, for instance, will all be posted there.

Laptops

You are expected to bring a laptop to each class, unless otherwise instructed. But we will not use it throughout each class. Please close your laptop until you are asked to use it.

Notice on Academic Integrity

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student's work as unacceptable and assign a failing mark on the paper.

For Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the office as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Time Table (Tentative)

The major part of the course consists of optimization (resource allocation) and simulation (risk analysis). The remaining part of the course covers data analysis and decision tree analysis.

Date	Topic

Aug. 27	**Course Introduction**
	    Objective, outline, textbook, expectations;
	Introduction to Modeling
	    Definition of modeling, types of models, examples, a simple profit model, card game observation and analysis, modeling steps

Aug. 29	**Excel Basics (Chapters 3 and 4)** Cell referencing; range names; functions (for example, vlookup); auditing tools, menu items, etc.
Sep. 3	**Data Analysis (Chapter 7)** Visualization, database/list, searching and editing, sorting, filtering, tabulating (pivot table), importing data from files and the Internet, data table
Sep. 5	**Optimization – Introduction (Chapter 11)** Model components, success stories, advertising mix problem (math formulation, spreadsheet layout and solver setup), Excel solver setup, model layout **HW0 is due Sep. 5.**
Sep. 10 Sep. 12	**Optimization – Linear Programming (Chapter 11)** Linear functions, linear vs. nonlinear programming, types of LP problems, Veerman furniture (allocation) problem, Dahlby outfitters (covering) problem, Diaz coffee company (blending) problem
Sep. 17 Sep. 19 Sep. 24	**Optimization – Network Models (Chapter 12)** Network components and diagram, transportation problem, assignment problem, standard form, oil pipeline problem, inventory problem, tuition planning problem **HW1 is due Sep. 19.**
Sep. 26 Oct. 1 Oct. 3	**Optimization – Integer Programming (Chapter 13)** Solver behavior, types of IP models, solver setup, relationship between IP and LP (machine tool problem), staff scheduling problem, project selection problem, binary variables for logical relationships, baseball problem, set covering problem, fixed cost problem, machine assignment problem, quantity discount problem, eight-queen problem **HW2 is due Oct. 1.**
Oct. 8 Oct. 10	**Optimization – Nonlinear Programming (Chapter 10)** Challenge posted by nonlinear programming models, solver setup and tips, facility location problem, revenue maximization problem, curve fitting problem, portfolio optimization model **HW3 is due Oct. 10.**
Oct. 15	**Midterm Review**

Oct. 17	**Midterm Exam (in class)**
Oct. 22 Oct. 24 Oct. 29	**Decision Tree Analysis (Chapter 14)** Basics, decision tree diagram, drug development problem, rollback procedure, Treeplan add-in, new-product introduction problem, sensitivity analysis, DriveTek contract problem
Oct. 31	**Simulation – Introduction (Chapter 15)** Motivation example, what/why/how, random number and RAND() function, common probability distributions (binomial, normal, uniform, triangular, …), histogram, a profit-calculation problem, Crystal Ball basics, general steps in simulation **HW4 is due Oct. 31.**
Nov. 5 Nov. 7	**Simulation – Finance Examples** Butson store problem (illustrating steps of simulation using Crystal Ball), Netscape valuation problem, option pricing problem; Crystal Ball tips: tornado chart, correlation among inputs, and CB functions
Nov. 12 Nov. 14	**Simulation – Marketing Examples** New product introduction problem (the Bass diffusion model), customer retention problem; Crystal Ball tip: build an open-end CB model
Nov. 19 Nov. 21	**Simulation – Operations Examples** Hastings sportswear problem (newsvendor problem), contract bidding problem, order due-date problem; Crystal Ball tip: grid search and replication
Nov. 26 Dec. 3	**Simulation – Game Examples** The Craps game, basketball tournament model, etc.
Dec. 5	**Conclusions** **HW5 is due Dec. 5.**
Dec. 12 .	**Final Exam (in class) 2:00-4:00pm** **No early finals are allowed by University Policy.**

19	**No Class (Spring Recess)**
26	**Decision Tree Analysis (Chapter 14)** Basics, decision tree diagram, drug development problem, rollback procedure, Decision Tree software, new-product introduction problem, sensitivity analysis, DriveTek contract problem
Apr. 2	**Decision Tree Analysis Cont'd**
9	**Simulation – Introduction (Chapter 15)** Motivation example, what/why/how, random number and RAND() function, common probability distributions (binomial, normal, uniform, triangular, …), histogram, a profit-calculation problem, simulation basics, general steps in simulation **Due: HW4**
16	**Simulation – Finance Examples** Butson store problem (illustrating steps of simulation using software), Netscape valuation problem, option pricing problem; Simulation tips: tornado chart, correlation among inputs, and simulation functions

23	**Simulation – Marketing Examples**
	   New product introduction problem (the Bass diffusion model), customer retention problem; Simulation tip: build an open-end simulation model
	Simulation – Operations Examples
	   Hastings sportswear problem (newsvendor problem), contract bidding problem, order due-date problem; Simulation tip: grid search and replication

30	**Simulation – Game Examples** The Craps game, basketball tournament model. **Due: HW5**
May 14.	**Final Exam (in class)** **7:00-9:00pm**