

MBA Elective Course: Advanced Decision Models

Module Leader and Lecturer

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Time and Place

May 03rd, 2010, Monday, 02–06pm, Lecture Theatre 3

May 04th, 2010, Tuesday, 02–06pm, Lecture Theatre 3

May 05th, 2010, Wednesday, 02–06pm, Lecture Theatre 3

May 06th, 2010, Thursday, 02–06pm, Lecture Theatre 3

May 10th, 2010, Monday, 02–06pm, Lecture Theatre 3

May 11th, 2010, Tuesday, 02–06pm, Lecture Theatre 3

Course Website

The web page for the course can be found on the Lancaster MBA bulletin board.

Course Description

This course provides an introduction to computer-based models for decision-making. The emphasis is on models that are widely used in diverse industries and functional areas, including finance, accounting, operations, and marketing. Applications will include advertising planning, revenue management, asset-liability management, environmental policy modeling, portfolio optimization, and corporate risk management, among others.

The aim of the course is to help students become intelligent consumers of these methods. To this end, the course will cover the basic elements of modeling – how to formulate a model and how to use and interpret the information a model produces. The course will attempt to instill a critical viewpoint towards decision models, recognizing that they are powerful but limited tools.

The applicability and usage of computer-based models have increased dramatically in recent years, due to the extraordinary improvements in computer, information and communication technologies, including not just hardware but also model-solution techniques and user interfaces. Twenty years ago working with a model meant using an expensive mainframe computer, learning a complex programming language, and struggling to compile data by hand; the entire process was clearly marked ‘experts only.’ The rise of personal computers, friendly interfaces (such as spreadsheets), and

large databases has made modeling far more accessible to managers. Information has come to be recognized as a critical resource, and models play a key role in deploying this resource, in organizing and structuring information so that it can be used productively.

Another important aspect of this course is to encourage a more disciplined thinking process in the way you approach management situations. As a result of this course you will become more confident in understanding and using models, both in other courses and on the job. More specifically, the course will:

- ❑ Show you how to use Excel spreadsheets effectively for business analysis. You will learn a comprehensive set of spreadsheet skills and tools, including how to design, build, test, and use a spreadsheet.
- ❑ Introduce you to the basic principles and techniques of applied mathematical modeling for managerial decision-making. You will learn to use some of the more important analytic methods, to recognize their assumptions and limitations, and to employ them in decision-making. These methods will be applied to problems arising in a variety of functional areas of business, including economics, accounting, marketing, operations, and capital markets.
- ❑ Sharpen your ability to structure problems and to perform logical analyses. You will practice translating descriptions of business situations into formal models, and you will investigate those models in an organized fashion.
- ❑ Expose you to settings in which models can be used effectively. You will apply modeling concepts in practical situations. You will learn to extract insight from models, and to use those insights to communicate, persuade and motivate change

With regard to mathematical techniques, this course will introduce you to two key methods used in management science:

- ❑ **Linear Programming**
This mathematical technique is useful for a wide range of problems, enabling optimal use of resources and providing vital information for planning. The course provides an overview of the major types of linear programs, starting with a review of allocation, blending and covering models, proceeding to specially structured networks, and finally proceeding to general network formulations. We look at nonlinear programming very briefly. Then we cover the formulation and solution of integer programs, focusing on the use of binary variables and emphasizing applications in distribution, marketing and logistics.

Simulation

This technique can be used to provide a way to experiment in complex situations to analyze and compare alternative decisions and to give insight and understanding. We will cover the basics of Monte Carlo simulation modeling using spreadsheets: deterministic modeling and sensitivity analysis, identifying random variables, selecting probability distributions, structuring simulations, and analyzing outputs. We will cover a range of applications from finance (e.g., valuation, cash management, real options), marketing (e.g., market share with advertising and promotions), operations (e.g., capacity planning, inventory management), and economics (e.g., competitive bidding).

Learning Outcomes

The primary objective of this course is to enable the student to develop facility in generating insights via modeling in a wide range of realistic situations. The skills developed in this course include the ability to recognize the key problems in a situation, the skill to develop a structure for analyzing the problem, the ability to carry out a cogent analysis, and the mental flexibility to present the analysis and insights to interested parties in a convincing, non-technical manner. The course is designed to be useful for any student, regardless of career plans. The techniques developed here are vital to anyone helping today's organizations to navigate a course through uncertain and uncharted territory, and they are particularly useful for students seeking a career in Consulting. By the end of the course students should be able to:

- Structure real life problems, build and analyze a model;
- Apply the discussed techniques to solve basic problems;
- Identify opportunities for benefiting from use of the techniques;
- Understand when and how the techniques can be applied in business;
- Understand their main benefits and limitations.

Course Assessment

The course is assessed by an individual take-home case or problem set at the end of the class.

Honor Principle

Each student is expected to work independently of other class members and other students on the cases. Students are encouraged to seek outside assistance for

gathering *facts* relevant to the cases, but not to use assistance in the process of modeling and analysis. The instructor will be available to work with students on the modeling and analysis aspects of the cases. Students are *encouraged* to discuss their work with the instructor.

Reading and Lecture Notes

The class is self-contained, all lecture notes and cases will be posted on the course website or distributed in class. It will be updated as the course progresses.

Additional optional Reading

- Stephen G. Powell and Kenneth R. Baker: *The Art of Modeling with Spreadsheets*, John Wiley & Sons, 2004. The library has some copies on reserve.
- Wayne L. Winston and S. Christian Albright: *Practical Management Science: Spreadsheet Modeling and Applications (2nd Edition)*, South-Western College Publications, 2004. The library has some copies on reserve.

Computer Software

We will use spreadsheets fairly extensively throughout the course. In particular, we will utilize the Excel spreadsheet package for Windows. This package has extensive optimization capabilities built in. In the beginning of the course you should make sure that you have the following pieces of software installed on your computer:

- Solver*: Solver is an Excel add-in that allows you to solve different types of optimization problems and is part of the standard Excel installation.
- Crystal Ball*: a professional add-in for Excel created by Decisioneering and now owned by Oracle, Inc. that makes it much easier to run simulations in a spreadsheet. The School will license this package for all students that register for this course and you will receive installation instructions prior to commencement of the first session.

The MBA office and Computer services will work with you to install this software on your laptops. To check whether or not you have these add-ins already, choose the Tools/Add-ins menu option in Excel. In the box that appears, you should have a line for each add-in, and the corresponding boxes should be checked. If you do not have a line for an add-in, please go to Computer services to have it installed. **You do not need to install the software from the CD that comes with the P&B book.**

Disclaimers

This is a new course in the Lancaster MBA Program, hence the following schedule is tentative and I will make adjustments to the topics covered along the course. Your feedback in this process is valuable, and motivates continuous course improvement. Please do not hesitate to let me know, throughout the course, how I can improve the course and the learning experience it provides!

Course Schedule

Session #	Topic
1	Introduction to Decision Models
2	Modeling Examples: Cash-Flow Management, Advertising Spending
3	Graphical and Sensitivity Analysis
4	Non-Linear Models: Revenue Management in Retail
5	Integer Models: Plant Location
6	Decentralized Optimization: Pollution Reduction
7	Introduction to Decision Making under Uncertainty
8	Simulation Examples: Pricing Asian Option, Flu Vaccine Supply
9	Managing FX Risk: Comparing Alternatives in Simulation. Intro to VaR
10	Portfolio Optimization and Hedging
11	Case: <i>SS America</i>
12	Course Wrap-Up