



B8816 – Quantitative Pricing & Revenue Analytics (Lab Course) – Fall (B) 2016

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and

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Time: M 4:00pm – 7:15pm Warren 207
Office Hours: Monday 2-3:30pm or by appointment

Course Description:

Quantitative pricing and revenue analytics collectively refers to the set of practices and tools that firms in various industries use to quantitatively model consumer preferences, segment their market, and tactically optimize (often in micro targeted or personalized manner) their product assortment, pricing, and promotion strategies.

The origins of this field, often referred to as revenue management as it is also called, are in the airline industry during the late 80s. The prototypical question is how a firm should set and update pricing and product availability decisions across its various selling channels in order to maximize its profitability. In the airline industry, as most of us know, tickets for the same flight may be sold at many different fares, the availability of which is changing as a function of purchase restrictions, the forecasted future demand, and the number of unsold seats. The adoption of such systems has transformed the transportation and hospitality industries, and is increasingly important in retail, telecommunications, entertainment, financial services, health care, manufacturing, as well as on-line advertising, online retailing, and online markets. In parallel, pricing and revenue optimization has become a rapidly expanding practice in consulting services, and a growing area of software and IT development.

This “lab course” will be a hands-on dive into the above tools in the context of 2 or 3 datasets. There will be a few lectures to set the stage; a brief review of simple programming tools in R (a bit more info follows below); a set of supporting online short lectures on some of the supporting material that we will be using in class; and a set of hands-on sessions where student teams / TAs / Professors will jointly work on 2 or 3 applied cases and datasets. One is from an online retailer; another (probably) from financial services; and a third from a company offering self-storage services.

The ultimate goal is for students to learn to identify and exploit opportunities for revenue optimization in different business contexts. As the ensuing outline reveals, most of the topics covered in the course are either directly or indirectly related to customer segmentation, demand modeling, and tactical price optimization.

Textbook

One recommended book for the course is by Robert Phillips titled “Pricing and Revenue Optimization.”

Prerequisites / Connections to the Core

I will assume that students are familiar with the content covered in the managerial statistics, business analytics, managerial economics and marketing core courses. In more detail, the course assumes knowledge in the following areas:

- Managerial statistics: basic understanding of probability; probability distributions; expected value calculations; knowledge of regression and how to run a regression in excel
- Business Analytics: some knowledge of spreadsheet modeling; linear & nonlinear optimization; how to formulate these problems in excel; how to use solver to get a solution; how to interpret the solution; how to interpret the shadow price variables (we will use this type of knowledge quite a bit). We will also use logistic regression as well as the tool used in the BA course (I will make it available anew).
- Marketing / Economics: basic understanding of demand functions; what they mean; some examples; some basic understanding of consumer choice.

In addition to the above, it is important to note that the course will emphasize quantitative analysis and tools, will involve a significant amount of quantitative data analysis, and some degree of programming in R (or Excel). This will primarily be done in teams, much of it in class, and with the help of the TAs and the 2 professors. Sample code will be shared for various parts of these analyses.

Course deliverables

Apart from class participation (30% of the total grade), the other course deliverables consist of a set of in-class (homework) assignments (40%) and a take-home final exam (30%).

- Class participation: I will routinely ask that you review some material, or watch some short recorded lecture, and come to class ready to discuss, but more importantly, use some of these concepts.
- As mentioned earlier, most of the course will be organized around a few hands-on analyses that will be done in groups (of up to 6 students). A significant part of the work will be done in class, but some will be done off line. The in class sessions will be planning, brainstorming sessions, where the TAs and professors will be involved in working through the issues.
- There is a take-home final that will touch upon multiple –but perhaps not all—topics of the course. The take-home final is an individual assignment that should not be discussed with your classmates.

Summary of the course:

**** (this course is new in the proposed format and some things are still in flux as we work out the hands on lab exercises during the summer)**

Intro to revenue management (1/2 session)

Intro to R (1/2 session)

Quantitative models of consumer demand & segmentation (2 sessions): a) fitting demand models via regression; b) discrete choice models and the multinomial logit model; c) maximum likelihood estimation and logistic regression to fit the MNL based on choice data. Segmentation.

- Online retailer dataset
- Financial services dataset

Demand forecasting (1 session): a) seasonality; b) uncensoring

- Self-storage data

Price optimization (3/2 sessions): formulation of pricing problems as constrained optimization problems; b) applications to keyword bidding; retail markdown pricing; event pricing; c) strategic consumer behavior; d) personalized pricing.

- Online retailer dataset
- Financial services dataset

Implementation of revenue management solutions & performance evaluation (1/2 session)

- Bloomingdale's dataset