

40108 Revenue Management

J.R. Birge, Spring 2013

Course Content

This course will focus on the identification, formulation, solution, and implementation of systems for pricing and revenue optimization. The course will develop fundamental understanding of the use of pricing and capacity concepts combined with optimization tools to achieve revenue improvement within the practical context of limited resources and information. Case examples from a variety of industries including airlines, hotels, car rental agencies, internet/media advertising, entertainment, retailing, energy, commodities, freight, and manufacturing will be used to develop skills in designing and implementing solutions in different environments.

Students will learn how to recognize opportunities for revenue enhancement; how to differentiate among types of opportunities; how to segment markets while incorporating constrained capacity, opportunity costs, customer and competitor response, demand and supply uncertainty, and information infrastructure; how to formulate and solve for revenue management decisions using constrained optimization; and how to define overall implementation requirements.

Textbook (optional): R. Phillips, *Pricing and Revenue Optimization*, Stanford Business Books, 2005. The book is optional. It can be a useful reference, but it has a quantitative emphasis with notation that can be confusing.

A helpful reference on pricing in general is T. T. Nagle and J. E. Hogan, *The Strategy and Tactics of Pricing: A Guide to Growing More Profitably*. Pearson Prentice Hall, Upper Saddle River, NJ, USA, fourth edition, 2006. Other readings are listed below and are linked on the Chalk site for the course. Cases requiring copyright clearance are provided in the course pack.

Prerequisites: Business 33001 and 41000. (The concepts assumed in the class are properties of distributions, estimation, linear regression, and pricing optimization for a monopolistic firm. The class also uses Excel tools including the Solver for determining optimal values.)

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Office hours: Thursdays 12-3PM in Hyde Park and Saturday before class (12-1:30) at Gleacher.

Grading:

Homework/case write-ups: 10%; Online reading/concept-check quizzes: 10%;
Class/Group Contribution: 10%, Midterm: 25%, Final: 45%.
(Provisional grades for graduating students will be available.)

Honor code: Students are expected to follow the GSB Honor Code, the GSB Standards of Scholarship, and to sign the GSB Honor Code pledge: “I pledge my honor that I have not violated the Honor Code during this examination,” on every examination.

Homework assignments, group work, and class contribution:

You are encouraged to work in groups on all homework and case assessments. You are to hand in two case write-ups (Skyjet and Fjord Motor) and prepare the others for class discussion. Please let me know your group members by Week 2. I will ask you to evaluate the contributions of other group members at the end of the course. I will consider those evaluations as well as the quality of your participation during class.

Online quizzes: Short “concept-check” quizzes will be posted on the Chalk site for each week’s reading and practice problems.

Exams: The midterm is scheduled for Week 6. The final is scheduled for Week 11. (Note: early or remotely-proctored finals can be scheduled for those with early internship starting dates if notice is given before Week 6.) Both exams will be open book and will require the use of a laptop to build and solve models in Excel to upload to the Chalk server.

Course Outline (subject to change):

Week 1: Introduction: pricing and revenue optimization

Read: Yahoo! Pricing Search Engine Advertising and *be prepared to discuss the questions at the end of the case* and on the First Class Assignment page in the course pack (and on Chalk). Also, complete the Excel tutorial to refresh your memory of the Solver. (Optional: Chapters 1 and 2 in PRO.)

Learning objectives:

- Understanding of and facility with basic cost-plus, market-based, and value-based pricing policies.
- Refreshed ability to interpret consumer’s willingness-to-pay through a price-response function and demand elasticity and to differentiate between fixed and marginal costs.
- Ability to solve for a revenue-maximizing price in a simple model without a capacity constraint and to build a spreadsheet model of a pricing decision to maximize revenue subject to capacity constraints.

- Understanding of the value of and mechanisms for customer segmentation in internet advertising.

Week 2: Product differentiation and market segmentation

Read: Case: *What price Vertigo?*; Articles: A. Cortese, “[Trends: Twists on online data](#),” *CIO Insight*, March 1, 2002; A. Finder, “[Aid lets smaller colleges ask, why pay for Ivy League retail?](#)” *New York Times*, January 1, 2006; P. Coy, “[The secrets to Google’s success](#),” *Business Week*, March 6, 2006; H.R. Varian, “[The dynamic of pricing tickets for Broadway shows](#),” *New York Times*, January 13, 2005. Additional sport scheduling material: Qcue in *Business Week*: http://www.businessweek.com/magazine/content/10_22/b4180039348750.htm; Qcue.com (Optional: PRO, Chapters 3-4.)

Prepare to discuss answers to the questions in *What price Vertigo?*

Learning objectives:

- Understanding of the objectives and mechanisms for pricing products and services with limited supply and the relationship between the run-out and profit-maximizing price
- Ability to design pricing models for differentiated products to exploit differences in customers’ willingness-to-pay and to protect against cannibalization and arbitrage
- Ability to interpret the output from a spreadsheet model to value limited resources
- Understanding of the range of differences in individual consumer’s valuations and of pricing segmentation strategies using versioning and bundling

Week 3: Customer segmentation strategies and the role of uncertainty

Read: Cases: *Cambridge Software Corporation (CSC)* and *Atlantic Computer. C. Shapiro* and H. R. Varian, “[Versioning: The smart way to sell information](#),” *Harvard Business Review*, November-December 1998, pp. 106-114.; Groupon links: Y. Koh, “[Groupon learns Japan ropes](#),” *WSJ* January 18, 2011; *WTTW*, February 16, 2011, “Losing money with Groupon” Search title on: <http://www.wttw.com/main.taf?p=42,8,80> (Optional: PRO, Chapters 5-6.)

Prepare: Atlantic Computer and CSC for in-class discussion; For Groupon discussion: what is their business model? How is revenue management relevant for them? What problems did these sellers have? What should a Groupon customer try to determine?

Learning objectives:

- Ability to assess pricing strategies based on versioning and bundling and to build and assess models for multiple products with known demand response
- Understanding of the effects of customer diversion across differentiated products
- Understanding of the mechanics of the booking-limit pricing policy for perishable products and time-sensitive consumers

- Appreciation of the role of uncertainty and the value of demand forecasting in designing booking-limit policies
- Ability to set booking limits using the newsvendor model for two-segment systems

Week 4: Demand estimation and capacity allocation

Read: *Skyjet* and *Michelle's* case description; S. Netessine and R. Shumsky, "[Introduction to the theory and practice of yield management](#)," *INFORMS Transactions on Education*, Volume 3, 2002, Number 1; case description. (Optional: PRO, Chapter 7.)

Prepare: discussion of the results from *Skyjet* and responses to the *Michelle's* restaurant (Groupon) questions.

Hand in: Summary of *Skyjet* case.

Learning objectives:

- Qualitative understanding of the effects of uncertainty in forecast distributions of demand
- Quantitative understanding of the relationships among capacity controls, prices, and the level of uncertainty about future demand
- Ability to set capacity controls for multiple customer segments using the expected marginal revenue concepts and to set levels for overbooking with potential no-show customers

Week 5: Overbooking capacity decisions and network revenue management

Read and play: Airline Yield Management game on Chalk. (Optional: PRO, Chapters 7-8.)

Prepare to discuss: Airline Yield Management game results (see detailed description on the Chalk site.)

Learning objectives:

- Understanding of the effects of overbooking, no-shows, and multiple segments on capacity allocations and expected revenues in practice
- Ability to set up spreadsheet models for network revenue management using the bid-price-control linear optimization model
- Understanding of the issues in network revenue management for different industries including transportation/freight, hospitality, real estate, bandwidth, and rental or leasing firms.

Week 6: Midterm (potential guest speaker)

Week 7: Network issues and retail pricing including markdown management

Read: *Transportation National Group* case; B. Vinod, "[Retail revenue management and merchandise optimization](#)," *J. Revenue and Pricing Management*, Volume 3:4, Jan. 2005, pp. 358-368; B. Tedeschi, "[Scientifically priced retail goods](#)," *NY Times*, Sept. 2, 2002; "[Before Christmas, Wal-Mart was stirring](#)" (*New York Times*, Jan 2005). (Optional: PRO, Chapters 9-10.)

Prepare to discuss: TNG case.

Learning objectives:

- Ability to use shadow-price information to set prices of new products in networks
- Understanding of issues in retail pricing and segmentation mechanisms
- Understanding of the limits to price-skimming and the potential for successful markdown policies
- Ability to construct single-markdown-point and multiple-markdown prices with linear optimization models for products without replenishment options

Week 8: Auctions and customized pricing (bidding) strategies

Read: Retailer game case, D. Joneja and M. Broadie, *The Retailer simulation*, Columbia Business School, 1994 (in Chalk); "[Live Nation, Groupon to launch discount ticket site](#)," *LA Times*, May 11, 2011; P.D. Klemperer, "[What really matters in auction design](#)," *Journal of Economic Perspectives*, Volume 16, 2002, pp. 169-189; R.P. McAfee and J. McMillan, "[Auctions and bidding](#)," *Journal of Economic Literature*, Volume 25, 1987, pp. 699-738; R.H. Thaler, "[Anomalies: The winner's curse](#)," *Journal of Economic Perspectives*, Volume 2, 1988, pp. 191-202; H. R. Varian, "[Economic science: Online users as laboratory rates](#)," *NY Times*, November 16, 2000. (If interested, you can also check the paper by P. Bajari and A. Hortaçsu, "[The winner's curse, reserve prices, and endogenous entry: empirical results from eBay auctions](#)," *RAND J. Economics*, Vol. 34, 2003, pp. 329—355.)

Prepare to discuss: the Retailer game.

Learning objectives:

- Understanding of alternatives to markdown pricing and issues for retailers
- Appreciation of the range of pricing alternatives from fixed/posted price to auction and negotiation

- Understanding of the basic auction mechanisms, their relative advantages for buyers and sellers, the concepts of revenue equivalence and the revelation principle, and the role of reserve prices
- Ability to construct spreadsheet models to determine optimal bids for a single auction or contracting event

Week 9: Practical auction design and pricing financial services

Read: ; Fjord Motor case (R. Phillips, *The Fjord Motor custom fleet pricing exercise*, Stanford Graduate School of Business, 2007, in Chalk) *Auction Vignettes* cases.; ; H.L. Maurstad, J. Riddergard, and C. Vrolijk, "[Insuring profits](#)," McKinsey Quarterly, 2001, Number 2, pp. 12-15; (Optional: PRO, Chapter 11.)

Prepare to discuss: Auction Vignettes questions.

Hand in: Summary of Fjord Motor case.

Learning objectives:

- Ability to design auctions for different settings depending on the levels of private and common valuations and bidder characteristics
- Understanding of the issues in pricing financial products such as loans and insurance
- Appreciation of the role of cost risk in financial services and the role of economic capital as a resource for allocation
- Ability to represent financial risk allocation in a spreadsheet model for optimal prices of financial products

Week 10: Customer loyalty, acceptance, and legal issues.

Read: *Harrah's* and *Schwab* cases; Loveman, *Diamonds in the Data Mine*, Loveman, HBR 2003; P. Krugman, "[What price fairness?](#)" NY Times, October 4, 2000: A. Odlyzko, "[Privacy, economics and price discrimination on the Internet](#)," *ICEC2003: Fifth International Conference on Electronic Commerce*, N. Sadeh, ed., ACM, 2003, pp. 355-366; N. Secomandi, K. Abbott, T. Atan, and E. A. Boyd, "[From revenue management concepts to software systems](#)," *Interfaces*, Volume 32, Number 2, 2002, pp. 1-11, March/April 2002. (Optional: PRO, Chapter 12.)

Prepare to discuss: Schwab case and answers to the questions in the Harrah's case.

Learning objectives:

- Understanding of the value and responsibilities of loyalty programs and of the options for pricing and learning
- Appreciation of the limits to price differentiation and of conditions warranting price and product consolidation
- Understanding of the legal and ethical issues associated with price discrimination

- Appreciation of the role of price presentation in customer acceptance
- Ability to recognize the implementation requirements for a multi-segment pricing