

OPRE 6377 **Demand and Revenue Management** Syllabus

Section OPRE 6377-001 Term Fall 2016

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Lecture hours 4:00-6:45 pm on Th JSOM 2.717

Office hours 4:00-6:00 pm on T JSOM 3.408

Teaching Assistant

- TBD.

Course Description

Conceptual: Management is about matching demand and supply. This course focuses on the demand without attempting to manage the supply. But it does take the amount, location, condition, or vintage of the supplies into account. Demand must be understood first to be managed. This understanding comes partly from statistical forecasting but more importantly from the identification of the demand drivers. These drivers are specific to industries but some are common and easily obtainable such as general macroeconomic indicators, demographic data, housing inventories, and temperatures. Unlike these demand drivers, prices can be managed over time, customer classes, locations. A good portion of the course is dedicated to determining good prices depending on inventory, capacity, input costs, and previous prices¹. In this process, both analytical arguments and methods are presented and their appropriateness in various practical contexts are discussed.

Practical: Revenue management (RM) first emerged in US airline industry after the deregulation in 1980s. It has successfully implemented by companies in air transportation, hospitality (hotels, cruises, theme parks, casinos), car rental, media, broadcasting, natural-gas storage and transmission, electricity generation and transmission, show business (concerts, theaters, sport events), universities. Most applications are recent and made possible by the advances in technology, information systems, and data mining. However, there are issues of legality and customer backlash for charging different prices for virtually the same product. The course will touch upon these issues as well.

Course Objectives

Students will

- be able to list and relate demand drivers to demands in specific industries,
- be able to derive and compute price-demand relationship, optimal prices and revenues,
- be aware of revenue management practices.

Course Pre-requisites and Related Courses

- Pre-requisites: OPRE 6302 and exposure to probability, or consent of the instructor. Knowledge (not expertise) of equation solving, derivatives and integrals of polynomials, and expectation. Familiarity with linear programming formulations. Read MBA math review 1-2 under the “Supplements” section of the course web site. Khan Academy <https://www.khanacademy.org/> has free online courses on probability and calculus.
- Math refresher: UTD has a math refresher course that can help you remember what you learnt in a calculus course. The math refresher should always be available online; to test whether you need this course, see <https://jindal.utdallas.edu/application/math-refresher-course/>.

¹This dependence distinguishes this course from a standard marketing course.

- Related courses by Prof. Metin Çakanyıldırım:
 - OPRE 6302: *Operations Management* in Falls / Springs.
 - OPRE 6366: *Global Supply Chain Management* in-class in Falls and online in Springs.
 - OPRE 6389: *Managing Energy: Risk, Investment, Technology* in Springs.
 - OPRE 7310: *Probability and Stochastic Processes* in Falls.
 - OPRE 7372: *Advanced Topics in Supply Networks* in Falls.

Required Textbooks and Materials

- Textbook: Pricing and Revenue Optimization. By Robert L. Phillips. First edition published by Stanford University Press, 2005. ISBN 0-8047-4698-2.
- Linear/Integer Programming Notes: Students are expected to know how to formulate a linear/integer program. This subject is discussed in OPRE 6302. To refresh that discussion and see more formulation examples, students are advised to study the “Formulation”, “Transportation” (pp. 1-4) and “Location” course notes under the “Supplements” section of the course web site.

Suggested Course Material

- Supplementary articles in journals accessible by UTD community. OR (Operations Research), MS (Management Science), TS (Transportation Science), MSOM (Manufacturing and Service Operations Management) and others.
 - *A Taxonomy and Research Overview of Perishable-Asset Revenue Management: Overbooking, Yield Management and Pricing* by L. Weatherford and S. Bodily, OR, vol.40, 1992.
 - *Revenue Management: Research Overview and Prospects* by J. McGill and G. van Ryzin, TS, vol.33, 1999.
 - *An Overview of Pricing Models for Revenue Management* by G. Bitran and R. Caldentey, MSOM, vol.5, 2003.
 - *Dynamic Pricing in the Presence of Inventory Considerations: Research Overview, Current Practices, and Future Directions* by W. Elmaghraby and P. Keskinocak. MS, vol.49, 2003.
 - *Revenue Management and E-commerce* by A. Boyd and I. Bilegan, MS, vol.49, 2003.
- Supplementary books:
 - *Segmentation, Revenue Management and Pricing Analytics* by Tudor Bodea and Mark Ferguson. First edition by Routledge, 2014. ISBN 0-415-89832-3.
 - *Data Analysis for Managers* by Christian Albright, Wayne Winston and Christopher J. Zappe. Second edition by Duxbury, 2004. ISBN 0-534-39721-2. Forecasting in Part 4 is useful. But there are many similar books with titles such as Managerial Statistics, Spreadsheet Modelling, Quantitative Analysis.
 - *The Theory and Practice of Revenue Management* by Kalyan T. Talluri and Garrett J. van Ryzin. First edition published by Kluwer Academic Publishers, 2004. ISBN 1-4020-7701-7. The book is a mixture of theory and practice. The theory is closer to the PhD level than MBA/Master level. The practice (in chapters 1, 10-11) is fun to read.
 - *Yield Management: Strategies for the Service Industries* by A. Ingold, I. Yeoman and U. McMohan.
 - *Revenue Management and Pricing: Case Studies and Applications* by I. Yeoman and U. McMohan-Beattie.
 - *Revenue Management Hard Core Tactics for Market Domination* by R. G. Cross.
 - *Future of Pricing: How Airline Ticket Pricing Has Inspired A Revolution* by A. Body.

Assignments & Grading Policy

- Classes start on Aug 25. Students are advised to attend the classes.
- Grading
 - 5% for Class attendance and contribution to discussion. Please bring your nametags to the class.
 - 20% * Homeworks: There will be 4-5 homeworks. You may discuss homework problems with others, but you must write up by yourself with the full understanding of what you write. Students handing in identical assignments will be violating university regulations and will not receive credit! Late homeworks are not allowed unless you negotiate with the TA at least one day in advance. Your minimum homework grade will be dropped from consideration.
 - 27% * Quiz 1. October 06.
 - 28% * Quiz 2. November 17.
 - 20% * Project report (12%) due to November 28. Presentation (8%) on December 1.
- During the quizzes, any book/note/printed material can be used but no device with cellular (mobile, wireless) communication capability is allowed even if the device or the wireless capability is turned off.
- Overall grades will be curved by considering the current class average.
- Students who score less than 50% of the first quiz grade must schedule an appointment with the instructor to discuss the possible ways to improve their performance.
- In this course, you will be given +/- minus grades. For example, you may get an A- or B+ grade. Students earn a grade in this course by mastering the course material. Students are not graded based on any type of need, amount of effort, family, personal circumstances, or their previous record in other courses.

UTD Resources

- UTD has two centers relevant to this course. The centers perform interdisciplinary research and develop cooperation in risk management, supply chain management and decision-making by exchanging knowledge and experience among academia, industry, and public agencies. For more info:
 - Center for Intelligent Supply Networks (C4ISN) <http://som.utdallas.edu/centers/c4isn/>.
 - International Center for Decision and Risk Analysis (ICDRiA) <http://som.utdallas.edu/centers/icdria>.
- E-Access to Journals via UTD Library: Library electronically subscribes to many journals such as Harvard Business Review, Management Science, which are of interest. To access such a journal go to the UTD Library web page. Click on "E-Journals". You will see an alphabetical list of journals. Click on "H" for "H"arvard Business Review. You will see that HBR is listed 15-20 from the top among the journals starting with letter "H". Click on HBR link, you will be transferred to EBSCO web site which keeps the journal. To access Interfaces journal, click on "I" for "I"nterfaces, and continue as before. To access from a non-UTD computer, you need UTD ID and password. Please respect the copyright laws.
- Career Center: The SOM Career Center (<http://som.utdallas.edu/somResources/somCareerCenter>) provides the following services: Career Counseling, Resume Assistance, Interview Assistance, Job Search Assistance, Career Resource Library, Web Resume Database, On Campus Recruiting, Active Internship Program.

Web Pages/Groups

The course web page can be reached via www.utdallas.edu/~metin/teaching.html with the password
SCM-MS degree unofficial web page is www.utdallas.edu/~metin/SCM/scm-ms.html. UTDSCM Google Group web page is <http://groups.google.com/group/utdscm>. UTD SCM community communicates via a facebook personality named Utd Scm – become its friend to join the community.

Informs Revenue Management and Pricing Section <http://revenue-mgt.section.informs.org>.

Professional Pricing Society www.pricingsociety.com.

Airline Group of the International Federation of Operational Research Societies (AGIFORS) www.agifors.org.

Regional demand and other data www.dallasfed.org/data/index.html.

Revenue Management Solution Developers

This is an incomplete list. Solution development/software industry is very dynamic. I can add more companies to this list, if you tell me about them.

Sabre Inc. www.sabre.com. JDA Software Group www.jda.com. PROS Revenue Management www.prospricing.com. Veritec Solutions www.veritecsolutions.com. KSS revenue management solutions www.kssg.com. Rubicon group www.therubicongroup.com. Zilliant www.zilliant.com. RTS www.rtscorp.com. Micros www.micros.com.

Academic Integrity

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations of the Board of Regents of the University of Texas System, Part 1, Chapter VI, Section 3, and in Title V, Rules on Student Services and Activities of the Course Syllabus Page 8, University's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SSB 4.400, 972.883.6391). A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

The faculty and administration of the School of Management expect from our students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work. We want to establish a reputation for the honorable behavior of our graduates, which extends throughout their careers. Both your individual reputation and the school's reputation matter to your success. The Judicial Affairs website lists examples of academic dishonesty: <http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-Basicexamples.html>.

Plagiarism on written assignments, especially from the web, from portions of papers for other classes, and from any other source is unacceptable. On written assignments, this course can use the resources of <https://turnitin.com>, which searches the web for plagiarized content and is over 90% effective.

During tests/quizzes, students in this section are not allowed to use any electronic devices, including iPads, iPhones, iPods, MP3 Players, earphones, radios, smart phones, cameras, multi-function timepieces or computers. When possible, students should sit in alternating seats, face forward at all times, and remove any clothing which might conceal eye movements, reflect images of another's work. Exam proctors will monitor any communication/signaling between students by talking, whispering, making sounds or by using your hands, feet, other body movements, the test paper itself or your writing implement.

Tentative Course Timeline

1. Week - Aug25. DEMAND MANAGEMENT

- (a) Ch2: Introduction to pricing and revenue optimization.

2. Week - Sep01.

- (a) Ch3. Demand functions and price optimization: Price-response function; Competition.
- (b) Who sets prices, Customer, Company or Collaboration? *When Customers Help Set Prices*. M. Bertini and O. Koenigsberg. Summer 2014. **MIT Sloan Management Review**, Vol.55, Iss.4: 57-64. <http://sloanreview.mit.edu/article/when-customers-help-set-prices>.
- (c) *Context study: Car rental*. *Evolutionary Change in Product Management: Experiences in the Car Rental Industry*. W.J. Carroll and R. C. Grimes. Sep-Oct 1995. **Interfaces**, Vol 25: 84-104. *Revenue Management Saves National Car Rental*. M.K. Geraghty and E. Johnson. Jan-Feb 1997. **Interfaces**, Vol.27: 107-127.

3. Week - Sep08.

- (a) Demand drivers. *Context study: Forecasting Sales in the HVAC (Heating, Ventilating, Air Conditioning) Industry*.
- (b) Price-response estimation.

4. Week - Sep15.

- (a) Ch4: Price differentiation: Volume discounts; Arbitrage and cannibalization; Consumer welfare.
- (b) *Context study: Price dependent substitution of food items*.

5. Week - Sep22.

- (a) Ch5: Constrained supply: Opportunity cost; Segmentation; Variable pricing.

6. Week - Sep29. REVENUE MANAGEMENT

- (a) Ch6: Revenue Management.

7. Week - Oct06. Quiz 1.

8. Week - Oct13.

- (a) Ch7: Capacity Allocation.

9. Week - Oct20.

- (a) Ch8: Network Management.

10. Week - Oct27.

- (a) Ch9: Overbooking.

11. Week - Nov03. OTHER PRICING CONTEXTS

- (a) Ch10: Markdown Pricing.

12. Week - Nov10.

- (a) Ch11: Customized Pricing: List prices vs. customized prices; Responses to competitor bids.

13. Week - Nov17. Quiz 2.

Week starting on Nov21 is Fall break and Thanksgiving holiday.

14. Week - Dec01: Project presentations.