

MIT Sloan School of Management
15.764 - The Theory of Operations Management:
Special Seminar on Dynamic Pricing

Spring 2003 - TTh 11:30-1, E51-149

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Course Description:

Recent advances in electronic commerce and information technology have resulted for firms in: (i) an opportunity to gather massive amounts of quantitative information about customer behavior; and (ii) a reduction by orders of magnitude of the cost to make price adjustments. As a result, much of the existing literature on dynamic pricing has gained considerable practical relevance, and this topic is becoming increasingly popular among researchers in several disciplines. This recent interest in dynamic pricing models is also very much present in industry, as exemplified by the ongoing "rocket science" revolution in retailing, and the emergence of several pricing software providers such as ProfitLogic, KhiMetrics, Manugistics, i2, SpotLight Solutions, DemandTec, etc...

This semester, the goal of the operations management seminar is precisely to provide doctoral students with a broad introduction to the research literature on dynamic pricing. Although some of the seminal Operations Management papers on this topic will indeed be discussed, the seminar will still be quite multi-disciplinary and cover a large range of perspectives and modeling approaches; for this reason it may also be of interest to doctoral students in Marketing, Operations Research, Information Technology and System Dynamics (among others). The set of papers I have selected will take the class through the following topics:

- Diffusion models;
- Pricing of short life cycle products and revenue management;
- Multiple product models;
- Adaptive pricing;
- Competitive models;
- Pricing to strategic customers;
- Pricing and inventory management; and
- Network and congestion pricing.

Overall, this seminar should be a valuable opportunity to both learn about the classical results on pricing and find out about the current research directions and opportunities. We will maintain throughout an informal (luncheon) setting, with the goal of stimulating an active learning environment through open discussions. Participating students will be individually responsible for presenting a couple of papers to the class, so it will also be an opportunity for them to get some detailed feedback on and improve their research presentation skills.

Schedule:

Most of the following papers are available to students taking the course from Sloanspace, in the class locker for 15.764 Theory of Operations Management (<http://sloanspace.mit.edu>).

Class 1: Tuesday, February 4 - Organizational Session In this first class we will go over the list of papers covered. It is recommended that you read at least the first of the two following survey papers:

- Elmaghraby, W., P. Keskinocak. 2002. "Dynamic Pricing: Research Overview, Current Practices and Future Directions," Working paper, Georgia Institute of Technology.
- Bitran, G. and R. Caldentey, "An Overview of Pricing Models for Revenue Management," Working Paper, MIT Sloan School of Management, 2002.

Diffusion Models:

Class 2: Thursday, February 6 - Shobhit Gupta

- Bass, F., "A New Product Growth Model for Consumer Durables," *Management Science*, 15 (1969), p. 215-227.

Class 3: Tuesday, February 11 - Clint Plummer (Amr Farahat)

- A.P. Jeuland and R.J. Dolan (1982), "An Aspect of New Product Planning: Dynamic Pricing," *TIMS Studies in Management Sciences* 18, 1-21.

Class 4: Thursday, February 13 - Guillaume Roels (Ping Xu)

- T.V. Krishnan, F.M. Bass, D.C. Jain (1999), Optimal Pricing Strategy for New Products, *Management Science*, Vol. 45, No. 12, 1650-1663.

Revenue Management - Pricing of Short Life-Cycle Products:

Class 5: Thursday, February 20 - Ekaterina Lesnaia (Chee-Chong Teo)

- Lazear, "Retail Pricing and Clearance Sales," *The American Economic Review*, 76 (1986), p. 14-32
- B.P. Pashigian and B. Bowen (1991), Why Are Products Sold on Sale? Explanations of Pricing Regularities, *The Quarterly Journal of Economics*, Vol. 106, No. 4, 1015-1038.

Class 6: Tuesday, February 25 - Pin Xu (Suri Gurumurthi)

- Gallego, G. and van Ryzin, G.J. (1994), "Optimal Dynamic Pricing of Inventories with Stochastic Demand Over Finite Horizons", *Management Science*, 40, 999-1020.

Class 7: Thursday, February 27 - Tieming Liu (Peng Sun)

- Bitran, G. and S. Mondschein, "Periodic Pricing of Seasonal Products in Retailing," *Management Science*, 43, p. 64-79 (1997).

Class 8: Tuesday, March 4 - Felipe Caro (Opher Baron)

- Bitran, G., R. Caldentey and S.V. Mondschein (1998), "Coordinating Clearance Markdown Sales of Seasonal Products in Retail Chains," *Operations Research*, Vol. 46, No. 5, 609-624.

Multiple Product Models and Bundle Pricing:

Class 9: Thursday, March 6 - Amr Farahat (Raphael Schorr)

- Gallego, G. and van Ryzin, G.J (1997), "A Multiproduct Dynamic Pricing Problem and Its Applications to Network Yield Management," *Operations Research* 45, 24-41.

Class 10: Tuesday, March 11 - Emmanuel Carrier (Sanne de Boer)

- Awad, P., G. Bitran, S. Mondschein (2000), "Pricing Policies for a Family of Substitute Perishable Products," Working paper, MIT Sloan School of Management.

Class 11: Thursday, March 13 - Peng Sun (Clint Plummer)

- Bakos, J.Y. and E. Brynjolfsson, "Bundling Information Goods: Pricing, Profits and Efficiency," *Management Science*, December 1999, Vol. 45, No. 12 pp. 1613-1630.

Adaptive Pricing:

Class 12: Tuesday, March 18 - Chee Chong Teo (Yann Le Tallec)

- Balvers and Cosimano, "Actively Learning About Demand and the Dynamics of Price Adjustment," *The Economic Journal*, 100 (1990), p. 882-898.

Class 13: Tuesday, April 1 - Sanne de Boer (Damian Beil)

- Aviv, Y. and A. Pazgal, "Pricing of Short Life-Cycle Products Through Active Learning," Olin School of Business, Washington University, 2002.

Pricing to Strategic Customers:

Class 14: Thursday, April 3 - Michelle Cheong (Emmanuel Carrier)

- Varian, H. R., "A Model of Sales," *American Economic Review*, 70 (1980), 651-659.

Class 15: Tuesday, April 8 - Raphael Schorr (Bill Drigert)

- N. Stokey (1979), "Intertemporal Price Discrimination," *Quarterly Journal of Economics*, Vol. 93, No. 3, pp. 355-371.

Class 16: Thursday, April 10 - Damian Beil (Hasan Harslan)

- Besanko, D., W. Wynston (1990), "Optimal Pricing Skimming by a Monopolist Facing Rational Consumers," *Management Science* 36, 555-567.

Competitive Pricing:

Class 17: Tuesday, April 15 - Hongmin Li (Hui Li)

- Eliashberg, J., A.P. Jeuland. 1986, "The Impact of Competitive Entry in a Developing Market Upon Dynamic Pricing Strategies," *Marketing Science*, 5, 20-36.

Class 18: Thursday, April 17 - Bill Drigert (Michelle Cheong)

- Kephart, J. O., J. E. Hanse and A. R. Greenwald, "Dynamic Pricing by Software Agents," *Computer Networks*, 32(6):731-752, 2000.

Class 19: Thursday, April 24 - Suri Gurusurthi (Chee Chong Teo)

- Van Mieghem, J. and M. Dada, "Price Versus Production Postponement: Capacity and Competition," *Management Science*, 45 (12), 1999.

Pricing and Inventory Management:

Class 20: Tuesday, April 29 - Ekaterina Lesnaia (Xin Chen)

- S. Smith and D. Achabal (1998), "Clearance Pricing and Inventory Policies for Retail Chains," *Management Science* Vol. 44, No. 3, 285-300.

Class 21: Thursday, May 1 - Opher Baron (Tieming Liu)

- A. Rajan, Rakesh and R. Steinberg (1992), "Dynamic Pricing and Ordering Decisions By a Monopolist," *Management Science*, Vol. 38, No. 2, pp. 240-262.

Class 22: Tuesday, May 6 - Xin Chen (Guillaume Roels)

- Federgruen, A. and A. Heching, "Combined Pricing and Inventory Control Under Uncertainty," *Operations Research*, 47 (3), 1999.
- Chen, X. and D. Simchi-Levi, "Coordinating Inventory Control and Pricing Strategies with Random Demand and Fixed Ordering Costs: The Finite Horizon Case," MIT Operations Research Center, April 2002.

Network and Congestion Pricing:

Class 23: Thursday, May 8 - Hasan Harslan (Hongmin Li)

- Mendelson, H. and Whang, S. (1990), "Optimal incentive-compatible priority pricing for the M/M/1 queue," *Operations Research*, 48(5), 870-883.

Class 24: Tuesday, May 13 - Hui Li (Ekaterina Lesnaia)

- Van Mieghem, J., "Price and Service Discrimination in Queueing Systems: Incentive Compatibility of Gcmu Scheduling", *Management Science*, 46 (9), 2000.

Class 25: Thursday, May 15 - Yann Le Tallec (Felipe Caro)

- Paschalidis, I. C. and J. N. Tsitsiklis, "Congestion-Dependent Pricing of Network Services", *IEEE/ACM Transactions on Networking*, Vol. 8 (2000), No. 2, pages 171-184.