

MANAGEMENT SCIENCE AND ENGINEERING

DEMAND AND SUPPLY ANALYTICS

Spring Semester 2017

Professor Daniel Guetta (Palantir Technologies)

How do airlines decide when to increase ticket prices? Should a hotel charge less per night for a long stay than a short one? Why do some software companies bundle very different products together? How should a fashion retailer decide when to start discounting clothes? Why do so many discounted rates end in “.99”? How should a company balance the risk of holding too much inventory on hand and the risk of turning away customers? Are retailers ever incentivized to lie to suppliers about how much they should be ordering? Should retailers with multiple locations hold most of their inventory in a central warehouse or at the individual locations?

These are only a small sample of the operational and pricing challenges all businesses regularly face. These challenges are often addressed individually and in isolation but, in reality, all of these decisions interact with each other. This class looks at the demand and supply management challenges faced by companies in various industries and provides an introduction to the tools that can be used to address these challenges. Specific topics covered include:

- Pricing and revenue management,
- Market segmentation,
- Customized pricing,
- Non-linear pricing,
- Markdown pricing,
- Auctions,
- Overbooking strategies,
- Consumer Choice Modeling,
- Inventory-service tradeoffs,
- Safety stock allocation,
- Information sharing and contract design,
- Supply chain coordination,

- Behavioral issues, fairness, trust and altruism.

Prerequisites	A basic understanding of both probabilistic and deterministic modeling.
Class Times	Thursdays 4:10pm – 6:55pm Room TBA
Schedule	The first class is Thursday, Jan 19 th , 2017: consistent with the Engineering School Schedule There will be no class on March 16 th , due to Spring Break
Course Texts	<ul style="list-style-type: none">• R.L. Phillips, <i>Pricing and Revenue Optimization</i>. Stanford University Press, 2005.• Özer, Ö. and Phillips, R. <i>Oxford Handbook of Pricing Engineering</i>. Oxford University Press, 2012. The following books may also be useful for reference purposes <ul style="list-style-type: none">• D. Simchi-Levi, P. Kaminsky, E. Simchi-Levi, <i>Designing and Managing the Supply Chain</i>, McGraw-Hill/Irwin, 3rd edition, 2008.• K. T. Talluri and G. J. van Ryzin, <i>The Theory and Practice of Revenue Management</i>, Springer, 2004.
Teacher	Professor Daniel Guetta guetta@cantab.net
Teacher Office Hours	TBA
Teaching Assistant	TBA
T.A. Office Hours	TBA

Homework There will be two homework assignments. You may work with other members on these assignments, but each student has to turn in an individual solution. Keep in mind that you will not be allowed to collaborate on the exam questions. **Homework is due at the beginning of class. There is no credit for late homework.**

Case Assignments For classes with case assignments, each student group will turn in a maximum 5 page write-up describing their solutions. Students must be prepared to summarize the case and suggest a solution in class.

Exams There will be one midterm exam and a final exam.

Modelling project Every group will work on a modelling project as part of the class. The purpose of the modelling project is *either* to apply the modelling concepts and methods learned in the class to an real-world decision making problem based on your own work or personal experience *or* to carry out a more in-depth study of one of the subjects studied in the course.

Grading I will calculate a grade for each student using two methods – the method that results in the *higher* percentage will be used to calculate your grade for the course:

- Method 1

Final exam	75%
Project	15%
Participation	10%

- Method 2

Final exam	40%
Mid-term exam	20%
Homeworks and cases	15%
Project	15%
Participation	10%

Each assignment will be individually standardized and curved before weighting.

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CLASS SCHEDULE (SUBJECT TO CHANGE)

Class	Date	Topics and Assignments
MODULE 1	1	<p style="text-align: center;">Topics</p> <ul style="list-style-type: none"> • Introduction • What is Demand and Supply Analytics? • Price Optimization <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapters 1, 2, and 3 <p>Assignments</p> <ul style="list-style-type: none"> • Homework 1
	2	<p style="text-align: center;">Topics</p> <ul style="list-style-type: none"> • Price Optimization, continued <p>Guest Speaker</p> <ul style="list-style-type: none"> • Robert Phillips, Director Marketplace Optimization Data Sciences at Uber <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapters 1, 2, and 3
	3	<p style="text-align: center;">Topics</p> <ul style="list-style-type: none"> • Dynamic Pricing <p>Class activities</p> <ul style="list-style-type: none"> • Revenue management game <p>Assignments due at start of class</p> <ul style="list-style-type: none"> • Homework 1

4	Thurs, Feb 9 th	<p>Topics</p> <ul style="list-style-type: none"> • Nonlinear pricing • Revenue management <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapters 5, 6, and 7 • Netessine and Shumsky: “Introduction to the Theory and Practice of Revenue Management” <p>Assignments</p> <ul style="list-style-type: none"> • Homework 2
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5	Thurs, Feb 16 th	<p>Topics</p> <ul style="list-style-type: none"> • Network revenue management • Overbooking <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapters 8, and 9
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6	Thurs, Feb 23 rd	<p>Topics</p> <ul style="list-style-type: none"> • Markdown management • Customized pricing <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapters 10 and 11 <p>Assignments due at start of class</p> <ul style="list-style-type: none"> • Homework 2
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7	Thus, Mar 2 nd	<p>Topics</p> <ul style="list-style-type: none"> • Consumer choice models • Pricing with strategic consumers <p>Read before class</p> <ul style="list-style-type: none"> • Gellego, Phillips, and Sahin <p>Assignments due at start of class</p> <ul style="list-style-type: none"> • Fjord Motor Case • Modelling Project Proposal
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8	Thus, Mar 9 th	<p>Topics</p> <ul style="list-style-type: none"> • Behavioral issues in pricing and midterm review <p>Read before class</p> <ul style="list-style-type: none"> • Phillips, Chapter 10 • Özer and Zheng, “Behavioral Issues in Pricing”, Sections 1–3
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	Thurs, Mar 16 th	SPRING BREAK – NO CLASS
	9 Thus, Mar 23 rd	Midterm
MODULE 4	10 Thurs, Mar 30 th	Topics <ul style="list-style-type: none"> • Introduction to supply management • Inventory management Read before class <ul style="list-style-type: none"> • Özer, “Introduction to Inventory Management” • Özer, “Introduction to Inventory Management Under Demand Uncertainty”
	11 Thurs, Apr 6 th	Topics <ul style="list-style-type: none"> • Supply chain coordination Guest speaker <ul style="list-style-type: none"> • Huseyin Topaloglu, Cornell University
	12 Thurs, Apr 13 th	Topics <ul style="list-style-type: none"> • Process Design and Quick Response Assignments due at start of class <ul style="list-style-type: none"> • Zara Case
MODULE 5	13 Thurs, Apr 20 th	Topics <ul style="list-style-type: none"> • Vendor-managed inventory • Behavioral issues in supply chain management Class activities <ul style="list-style-type: none"> • Forecast sharing game Read before class <ul style="list-style-type: none"> • Özer and Zheng, “Behavioral Issues in Pricing”, Sections 4 – 6 Assignments due at start of class <ul style="list-style-type: none"> • Barilla Case
	14 Thurs, Apr 27 th	Project presentations
	TBD	Final exam