

Data-Driven Demand Learning and Dynamic Pricing Strategies in Competitive Markets

Introduction

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Hasso Plattner Institute (EPIC)

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Outline

- Motivation: Dynamic Pricing under Competition
- Goals of the Course & Grading
- Introduction: Lecturer & Students
- Structure of the Course
- What will be expected from you?

Motivation

- Opportunities:
 - Online markets are transparent
 - Prices can be easily adjusted
 - Market data (offer prices, sales) can be analyzed
 - Existing rule-based pricing strategies are suboptimal
- Challenges:
 - Stochastic demand, Unknown customer behavior
 - Many competitors, Steadily changing markets
 - Derive successful data-driven repricing strategies

Application: Selling Books on Amazon



The Making of a Fly: The Genetics of Animal Design (Paperback) by Peter A. Lawrence

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Price at a Glance

List Price: \$70.00
Used: from **\$35.54**
New: from **\$1,730,045.91**

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All

New (2 from \$1,730,045.91)

Used (15 from \$35.54)

Show New Prime offers only (0)

Sorted by Price + Shipping

New 1-2 of 2 offers

Price + Shipping	Condition	Seller Information	Buying Options
\$1,730,045.91 + \$3.99 shipping	New	Seller: profmath Seller Rating: ★★★★★ 93% positive over the past 12 months. (8,193 total ratings) In Stock. Ships from IN, United States. Domestic shipping rates and return policy . Brand new, Perfect condition, Satisfaction Guaranteed.	<input type="button" value="Add to Cart"/> or Sign in to turn on 1-Click ordering.
\$2,198,177.95 + \$3.99 shipping	New	Seller: bordeebok Seller Rating: ★★★★★ 93% positive over the past 12 months. (125,891 total ratings) In Stock. Ships from United States. Domestic shipping rates and return policy . New item in excellent condition. Not used. May be a publisher overstock or have slight shelf wear. Satisfaction guaranteed!	<input type="button" value="Add to Cart"/> or Sign in to turn on 1-Click ordering.


Data-Driven Demand Learning and Dynamic Pricing Strategies - Introduction

Suboptimal Response Strategies in a Duopoly

	<i>(small)</i>	<i>(big)</i>	profnath over previous bordeebook	bordeebook over profnath
8-Apr	\$1,730,045.91	\$2,198,177.95		1.27059
9-Apr	\$2,194,443.04	\$2,788,233.00	0.99830	1.27059
10-Apr	\$2,783,493.00	\$3,536,675.57	0.99830	1.27059
11-Apr	\$3,530,663.65	\$4,486,021.69	0.99830	1.27059
12-Apr	\$4,478,395.76	\$5,690,199.43	0.99830	1.27059
13-Apr	\$5,680,526.66	\$7,217,612.38	0.99830	1.27059

Which strategies are applied? Response Times? Relevant factors?

How to find Smart Pricing Strategies?



The Making of a Fly: The Genetics of Animal Design (Paperback)
by Peter A. Lawrence

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Price at a Glance

List Price: 670.00

Used: from **\$42.56**

New: from **\$18,651,718.08**

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All **New** (2 from \$18,651,718.08) **Used** (11 from \$42.56)

Show **New** Prime offers only (0) Sorted by Price + Shipping 1

New 1-2 of 2 offers

Price + Shipping	Condition	Seller Information	Buying Options
<p>\$18,651,718.08 + \$3.99 shipping</p>	<p>New</p>	<p>Seller: profmath Seller Rating: ★★★★☆ 93% positive over the past 12 months. (8,278 total ratings) In Stock. Ships from NJ, United States. Domestic shipping rates and return policy. Brand new, Perfect condition, Satisfaction Guaranteed.</p>	<p>Add to Cart or Sign in to turn on 1-Click ordering.</p>
<p>\$23,698,655.93 + \$3.99 shipping</p>	<p>New</p>	<p>Seller: bordeebok Seller Rating: ★★★★☆ 93% positive over the past 12 months. (127,332 total ratings) In Stock. Ships from United States. Domestic shipping rates and return policy. New item in excellent condition. Not used. May be a publisher overstock or have slight shelf wear. Satisfaction guaranteed!</p>	<p>Add to Cart or Sign in to turn on 1-Click ordering.</p>

Are there better strategies? Any ideas? Are you interested?

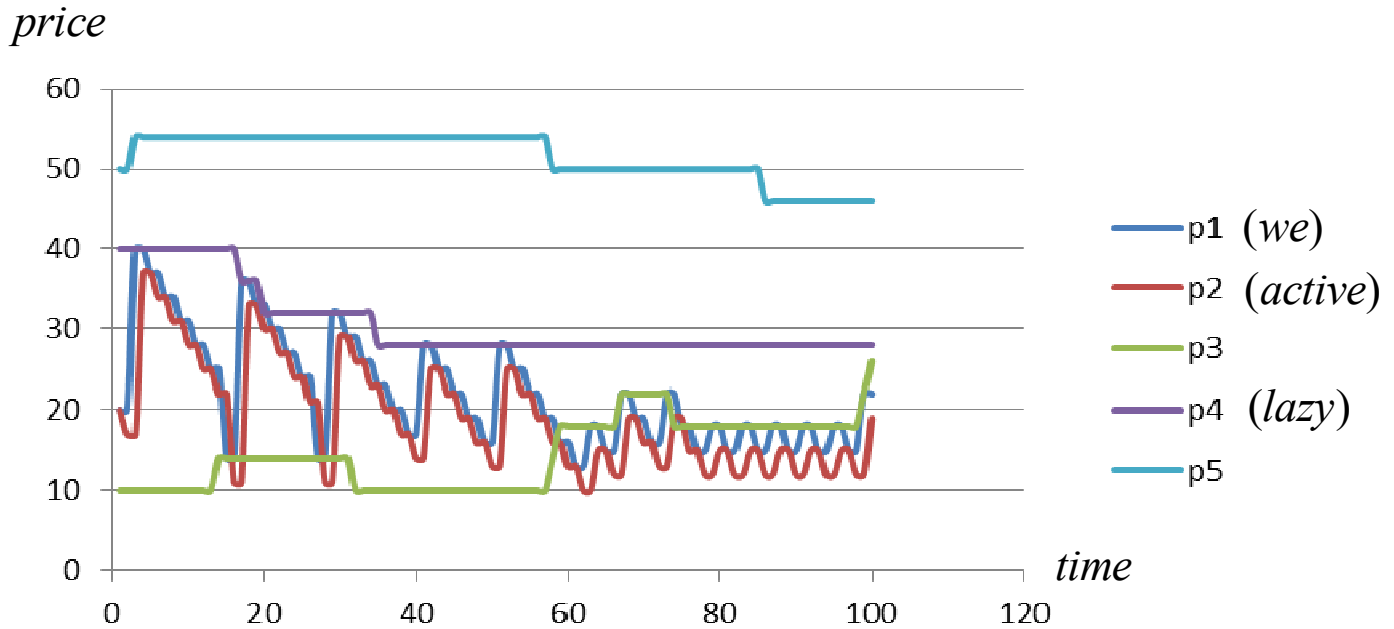
Technical Information

- Credits: 4 SWS (V/Ü), 6 ECTS (graded)
- When? Monday/Tuesday 13.30 - 15.00, weekly
Start: April 18, 2017, End: July 18, 2017
- Where? D-E 9/10
- Who? Rainer Schlosser, rainer.schlosser@hpi.de
Martin Boissier, martin.boissier@hpi.de
- Slides? HPI, Teaching, Summer 2017

Goals of the Course & Grading

- Goal: Build Data-Driven Dynamic Pricing Strategies for Competitive Online Markets
- Learn: Demand Estimation + Optimization + Simulation
- Do: Apply Approaches, Measure Performance
- Grading:
 - 10% Regular Attendance / Personal Engagement
 - 20% Performance / Design of Strategies
 - 30% Presentations
 - 40% Documentation / Paper (End of Semester)

Example: Dynamic Pricing Strategies under Competition



Prerequisites

- Programming

 - Parameters, Data Preparation & Analysis

 - Loops, Recursions

- Basic Mathematical Background

 - Sets, Vectors

 - Probabilities, Random Variables, Expected Values

- More does not harm

 - Regression Analysis

 - Machine Learning Techniques

 - Game Theory

Introduction: Lecturer & Students

- Lecturer: Background / Education
 Interests / Field of Research
 Expectations

- Students: Background / Education?
 Interests / Field of Research?
 Expectations?

Structure of the Course

- Meetings: Lectures on „Dynamic Pricing“:
 - (i) Customer Behavior
 - (ii) Demand Estimation
 - (iii) Pricing Strategies
 - (iv) Pricing Simulation Platform
 - (v) Dynamic Pricing Challenge
- June/July: Apply & Improve Data-Driven Strategies
Input/Support, Questions/Answers, Presentations
- Aug/Sep: Documentation of Projects Results

What will be expected from you?

- Use Machine Learning to Estimate Demand / Sales Probabilities
- Implement Algorithms to Compute Optimized Prices
- Simulate the Outcome of Dynamic Pricing Strategies
- Measure the Performance of Strategies
- Document your Results



Overview

2	April 24/25	Customer Behavior
3	May 1/2	Demand Estimation
4	May 8/9	Pricing Strategies I
5	May 15/16	no Meeting
6	May 22/23	Pricing Strategies II
7	May 29/30	Dynamic Pricing Challenge & Price Wars Platform
8	June 5/6	Workshop / Group Meetings
9	June 12/13	Presentations (First Results)
10	June 19/20	Workshop / Group Meetings
11	June 26/27	no Meeting
12	July 3/4	Workshop / Group Meetings
13	July 10/11	Workshop / Group Meetings
14	July 17/18	Presentations (Final Results), Feedback, Documentation (Aug/Sep)

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