# UNIVERSITY of **HOUSTON**

## Empirical Industrial Organization
## Static and dynamic demand estimation on markets for differentiated products

Spring Semester 2017
10:00 am – 11:30 am, Tuesday and Thursday, McElhinney Hall, Room 104

**Contact information**

**Instructor:**
Prof. Andrea Szabo                 E-mail: aszabo2@uh.edu
Office: 209 B McElhinney Hall      Website: www.uh.edu/~aszabo2
                                   Office hours: By appointment.

**Course Description**
This is a specialized course which provides a graduate-level introduction to static and dynamic demand estimation on markets for differentiated products. It differs somewhat from the course offered under the same class number in previous years.

We will estimate demand systems of differentiated product markets, which will give us a framework to estimate own and cross price elasticities, estimate markups, measure market power, evaluate mergers, quantify the benefits of a new product, evaluate the effect of discontinuing a product, and examine how information asymmetry (advertising) affects demand and the resulting substitution patterns.

The second half of the class introduces recent advances in dynamic durable goods models and models of storable goods to study the consumers' inventory behavior and intertemporal substitution. In relation to these models, we will discuss some of the single agent dynamic models. Specifically, we provide a framework to estimate discrete choice dynamic models, such as the optimal investment model of Rust (1987), Hotz and Miller (1993) and Bajari, Benkard and Levin (2007).

We are going to study examples from a wide range of industries, including automobiles, ready to eat cereals, personal computers, direct broadcast satellites and cable TV, and digital camcorders. We will look at examples of dynamic demand estimates using scanner data for some delicious food items, such as ketchup, yogurt, Pepsi and Coke.

## Prerequisites
Students are expected to have taken PhD level Microeconomic Theory and Econometrics classes. Students also need to have basic knowledge of dynamic optimization. Programming in STATA and MATLAB will be required to complete homework assignments.

## Textbook and software
There is no specific textbook for this class. We will be using a combination of lecture notes and journal articles. The required articles are listed below in each section.

You will be required to use STATA and MATLAB software packages. Public versions of these are available in the department's graduate computer lab. STATA is available for purchase at a discounted price at the Cougarbyte website and MATLAB is available for free for UH students.

Students should familiarize themselves with the software packages in order to program the homework exercise. Although we will briefly discuss how to implement specific estimation methods in MATLAB, the class does not provide an introduction to basic computer programming.

## Course Requirements
The class schedule below contains the main papers we are going to discuss during each class. Students are expected to complete the assigned readings before attending class. For each topic, I will provide an overview of the literature, and we will discuss the assigned paper in detail. Depending on the class, we may spend more time on the overview and less on the details. Students are required to fully understand the assigned papers regardless of how much time we spend on them in class. All of these papers will be part of the final exam.

The course has some difficult econometrics, and it is expected that students have a basic comfort level with estimation. It is also expected that students will do requisite background readings in econometric theory where necessary. This class will be rather demanding.

There will be 1 homework assignment, an in-class presentation, and a final exam. See below.

## Assignments and Grading
The final grade is based on one homework exercise (which should be submitted in two parts, see the syllabus), an in-class presentation and a final exam.
For the homework exercise, students will implement some of the estimators discussed in class. Because of the complexity of the assignment and because each student may need different amounts of time to complete the exercise, I suggest starting the assignment as soon as it is posted. Please be prepared to work on the homework for several weeks. The due dates for the homework assignment are listed in the class schedule.

The final exam will be posted in Blackboard after the last day of classes. You will be able to access it any time until **May 4, 11.59 pm**. Once you access it, you will have 24 hours to complete the exam and upload your answers in Blackboard.

Each assignment is worth 33% of your final grade. To receive any grade other than "F" or "Incomplete", a student is required to complete all three assignments. There is no exception.

**<u>Class Website</u>**
All assignments and handouts will be posted on the class website in Blackboard. Go to http://www.uh.edu/blackboard and click the white "Blackboard Learn" button. Log in with your CougarNet ID and password. Please do not email me homework files, upload everything on Blackboard.

**Tentative Course Schedule:**

| Class # | Date/Day | | | Topic | Problem Set |
|---|---|---|---|---|---|
| **Welcome to IO** | | | | | |
| 1 | Jan | 17 | T | Reiss, P. C. and Wolak, F. A. (2003): "Structural Econometric Modeling: Rationales and Examples from Industrial Organization" in *Handbook of Econometrics*, North Holland, 2007. | |
| 2 | | 19 | Th | Keane, Michael P. (2010): "Structural vs. atheoretic approaches to econometrics," *Journal of Econometrics*, 156(1), 3-20. Rust, J. (2010): "Comments on: "Structural vs. atheoretic approaches to econometrics" by Michael Keane," *Journal of Econometrics*, 156(1), 21–24. | |
| **I. Static models of product differentiation** | | | | | |
| 3-4 | Jan | 24, 26 | T, Th | Berry, S. (1994): "Estimating Discrete-Choice Models of Product Differentiation," *Rand Journal of Economics*, 25(2), 242-262. | |
| 5-6 | Jan/ Feb | 31, 2 | T, Th | Berry, S., J. Levinsohn, and A. Pakes (1995): "Automobile Prices in Market Equilibrium," *Econometrica*, 63(4), 841-890. | |
| 7-8 | Feb | 7, 9 | T, Th | Nevo, A. (2001): "Measuring Market Power in the Ready-to-Eat Cereal Industry," *Econometrica,* 69, 307-342. | |
| 9-10 | | 14, 16 | T, Th | Nevo, A. (1998): "A Practitioner's Guide to Estimation of Random-Coefficients Logit Models of Demand," *Journal of Economics and Management Strategy,* 9(4), 513-548. | |

| 11-12 |       | 21, 23 | T, Th | Petrin A. (2002): "Quantifying the Benefits of New Products: The Case of the Minivan", *Journal of Political Economy*, 110, 705-729. | Th: PS 1, Part 1 Due |
|-------|-------|--------|-------|-------------------------------------------------------------------------------|----------------------|
| 13    |       | 28     | T     | Berry S., J. Levinsohn, and A. Pakes (2004): "Differentiated Products Demand Systems from a Combination of Micro and Macro Data: The New Cars Market," *Journal of Political Economy*, 112(1), 68-105. |  |
| 14    | March | 2      | Th    | Petrin, A. and A. Goolsbee (2004), "The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV," *Econometrica,* 72(2), 351-381. |  |
| 15    |       | 7      | T     | Goeree M. (2009): "Limited Information and Advertising in the U.S. Personal Computer Industry," *Econometrica*, 76(5), 1017–1074. |  |
| 16    |       | 9      | Th    | Leung, T.C. (2013): "What is the True Loss Due to Piracy? Evidence from Microsoft Office in Hong Kong," *The Review of Economics and Statistics*, 95(3): 1018–1029 |  |
| 17    |       | 14     | T     | *No class. Spring Break.* |  |
| 18    |       | 16     | Th    | *No class. Spring Break.* |  |
| **II. Dynamic (demand) models** | | | | | |
| 19    |       | 21     | T     | Overview of dynamic programming. Value function. Markov Perfect Equilibrium Concept. | PS 1, Part 2 Due |
| 20    |       | 23     | Th    | Rust, J. (1987): "Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher," *Econometrica* 55(5), 999-1033. |  |
| 21    |       | 28     | T     | Rust, J. (1994): "Structural Estimation of Markov Decision Processes," in: Handbook of Econometrics, Vol. 4 Ch. 51, 3081-3143.<br><br>Hotz, V. J. and R. A. Miller (1993): "Conditional Choice Probabilities and the Estimation of Dynamic Models," *Review of Economic Studies* 60(3), 497-529.<br><br>Bajari, P., L. Benkard and J. Levin (2007): "Estimating Dynamic Models of Imperfect Competition," *Econometrica* 75(5), 1331-70. |  |
| 22    |       | 30     | Th    | Lal, R. and R. Rao (1997): "Supermarket Competition: The Case of Every Day Low Pricing," *Marketing Science*, 16(1), 60-80.<br><br>Erdem, T., S. Imai and M. P. Keane (2003): "Brand Quantity Choice Dynamics Under Price |  |

| | | | | Uncertainty," *Quantitative Marketing and Economics*, 1, 5-64.

Pesendorfer, M. (2002): "Retail Sales: A Study of Pricing Behavior in Supermarkets," *The Journal of Business,* 75, 33-66. | |
|---|---|---|---|---|---|
| 23 | Apr | 4 | T | Berto Villas-Boas, S. (2009): "An Empirical Investigation of Welfare Effects of Banning Wholesale Price Discrimination," *The RAND Journal of Economics*, 40(1), 20-46.

Carranza, J. E. (2006): "Estimation of demand for differentiated durable goods," WP. | |
| 24 | | 6 | Th | Hendel, I. and A. Nevo (2006): "Measuring the Implications of Sales and Consumer Inventory Behavior," *Econometrica*, 74(6), 1637-1673.

Hendel, I. and A. Nevo (2006): "Sales and Consumer Inventory," *RAND Journal of Economics*, 37(3), 543-561. | |
| 25 | | 11 | T | Hendel, I. and A. Nevo (2013): "Intertemporal Price Discrimination in Storable Goods Market," *American Economic Review*, 103(7), 2722-2751. | |
| 26 | | 13 | Th | Melinkov, O. (2013): "Demand for Differentiated Durable Products: The Case of the U.S. Computer Printer Market," *Economic Inquiry*, 51, 1277-1298.

Gowrisankaran, G. and M. Rysman (2012): "Dynamics of Consumer Demand for New Durable Goods," *Journal of Political Economy,* 120, 1173-1219. | |
| 27 | | 18 | T | Gowrisankaran, G., M. Rysman and G. Wei Yu (2015): "Computing Price-Cost Margins in Durable Goods Environment", WP. | |
| 28 | | 20 | Th | Escobari, D. (2014): "Estimating dynamic demand for airlines," *Economic Letters*, 124, 26-29.

Lazarev, J. (2013): "The Welfare Effects of Intertemporal Price Discrimination: An Empirical Analysis of Airline Pricing in U.S. Monopoly Markets," WP. | |
| | | | | **Closing** | |
| 29 | | 25 | T | Einav, L. and J. Levin (2010): "Industrial Organization: A Progress Report." *Journal of Economic Perspectives*, 24(2), 145–162. | |

| | | | | Aguirregabiria, V. and A. Nevo (2013): "Recent Developments in Empirical Dynamic Models of Demand and Competition in Oligopoly Markets", *Proceedings of the Econometric Society World Congress.* | |
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| 30 | | 27 | Th | Discussion of final exercise | |