PROPOSAL
Estimating Market Power and Strategies
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DESCRIPTION OF OUR BOOK

Our book will describe and compare the various techniques for estimating market power (the ability to profitably set price above marginal cost) and strategies (game-theoretic plans used by firms to compete with rivals). We will begin with a systematic, textbook presentation of all the approaches developed by the major researchers in the field. Most existing methods for estimating market power are based on the assumption of a static equilibrium and use standard econometric techniques (such as ordinary least squares and instrumental variables).

Next, we will describe new econometric techniques that can be used to estimate these models. Using real world data and Monte Carlo experiments, we will compare these new techniques to each other and to traditional methods.

In the following section, we will show how researchers can use a generalized maximum entropy approach to estimate strategies directly. In contrast, virtually all of the previous literature estimates only the degree of market power and ignore the role of strategies.

Finally, we will examine dynamic models of oligopoly. We will survey the existing literature (concentrating on our work in this area).

We will provide detailed enough instructions on how to use each techniques that a graduate student or a researcher can easily employ them. We plan to provide detailed computer programs to accompany the text.

IMPORTANCE

Because research in this area is exploding, many universities offer courses on estimating market power and strategies. Thus, our textbook should find an eager audience.

This research is important. It provides evidence that can be used by policy makers in devising optimal antitrust laws. It is used in court cases — and presumably will be increasingly employed in the future. It also allows academics to test theoretical models that were previously accepted on faith.

GAPS IN THE LITERATURE

Our book will fill two gaps in the literature. First, although many graduate programs teach empirical industrial organization courses, no existing industrial organization textbook covers this material. Existing graduate level textbooks cover theoretical issues exclusively. The few industrial organization textbooks that also cover empirical issues (such as Carlton and Perloff's *Modern Industrial Organization*) summarize the results of such studies without explaining how to conduct such research. The only well-known survey pieces on these techniques (such as Bresnahan, 1989) are now over a decade old and do not cover many recent approaches.

Second, many graduate students and faculty members who want to work in this area have no ready source of information that explains the basic techniques. Because of space restrictions, many journal articles are too terse and do not fully explain how to employ these techniques. Students and faculty at other universities often ask us to explain the basics of these techniques and to supply them with software for both our own techniques and those of others.

NEW MATERIAL

Our book, although drawing heavily on our existing research, will reformulate others' research and present a substantial amount of new material. The early sections of the book will provide a new, consistent, logical presentation of the major findings from the last two decades.

We will show how these models can be estimated using a variety of new econometric techniques. We will compare and contrast these models using Monte Carlo techniques and real world data. This comparison is new work, which has not been previously published.

The final two sections of the book deal primarily (but not exclusively) with our work. In the section on estimating strategies, we will briefly discuss a few other studies (Bjorn and Vuong 1985, Bresnahan and Reiss 1991, Kooreman 1994) in addition to our work (Golan, Karp, and Perloff, forthcoming). In the section on dynamics, we will discuss several studies (Roberts and Samuelson, Slade, and others) in addition to our own (Karp and Perloff 1989, 1993, 1994, 1996). We will discuss new approaches to estimating dynamic models.

Our book treatment will differ substantially from that in our journal articles. The primary difference is that we will employ a step-by-step, textbook approach to explain how to use these techniques (whereas space limits on journal articles cause them to be terse and to skip steps). We will also provide detailed computer instructions using standard computer programs such as Shazam and Gams.

TABLE OF CONTENTS

The following table provides a brief outline of the book. It is followed by a more detailed description.

Chapter		Description
#	Topic	
Part I: Objective and Background		
1	Introduction	The problem, a brief history, model selection
2	Structural-Conduct-Performance	History
Part II: The New Empirical Industrial Organization Approaches		
3	Stylized Model	Set up of the problem using a stylized model; derivation of some theoretical results (e.g., relationship of HHI and market power in Cournot model)
4	Basic Structural Model	The traditional NEIO ("structural" or "modern") approach; problems with this approach (Perloff-Shen, etc.), aggregation
5	Variations on the Basic Structural Model	Residual demand model (Bresnahan), differentiated products (Hausman, Nevo, Berry, Pakes),...
6	Nonstructural Approaches	Comparative statics (Hall, Sullivan,...), reduced-form (Rosse-Panzar), other nonparametric (Varian, Ward), indirect (Sutton)
7	Simulations: Comparison of Models	Monte Carlo simulations from the Hyde and Perloff papers and new material
8	Cross-Market Comparison	SCP-Like Comparison Across Markets
Part III: New Estimation Methods for Market Structure Studies		
9	New methods	GMM, ME, GME, Empirical Likelihood, BMOM
10	Empirical Illustration of the Various Methods	Comparison of these methods for the standard structural model (real world or simulated example)
Part IV: Estimating Distributional Strategies		
11	Modeling distribution strategies	Describe problem, discuss literature
12	Price-Only Model	Airlines (and simulations)
13	Price and Advertising Model	Coke-Pepsi
Part V: Dynamics		

14	An Introduction to Multiperiod Games	Describe problem, survey literature
15	Supergames	Trigger strategies (Green-Porter, etc.)
16	Dynamic Oligopoly	Karp-Perloff, Roberts-Samuelson, Slade,...
17	Future Work	Other Markovian models (extension of our distributional model; Maskin-Tirole)
Part VI: Conclusions		
18	Conclusions	Summary, model selection, and future approaches
Part VII: Programs (Web Site, floppy, or CD)		
A1	Standard Static Models	Shazam or other programs
A2	Dynamic Model Programs	Shazam estimation and simulation programs
A3	GME Programs	Gams programs

Part I: Objective and Background

The two big questions that empirical industrial organization tries to answer are:

(1) How much market power do firms have?

(2) What factors (such as barriers to entry) determine market power?

To these questions, we add:

(3) What strategies do firms use and how do these strategies affect market power?

Before directly approaching these questions, we provide a historical context. We describe the traditional structure-conduct-performance (SCP) method and explain why researchers have switched to the "new empirical industrial organization" (NEIO) approach. The SCP studies (which date back to the Depression era) were largely descriptive, reduced-form attempts to answer the second question about the factors that determine market power. These studies presumed that government statistics about profits provided a good answer to the

first question — how much market power do firms have — and then tried to explain how market power varied across industries.

NEIO researchers reject the SCP approach. They argue that government statistics are inadequate and that we need to estimate market power. Starting with the work of Rosse (1970), Iwata (1974), Gollop and Roberts (1979), Just and Chern (1980), Applebaum (1979, 1982), and others, NEIO researchers have explicitly estimated structural models that allow them to estimate market power and to test many important hypotheses.

In Chapter 1, we discuss the key questions in a historical setting. In Chapter 2, we discuss the strengths and weaknesses of the traditional, SCP approach.

Part II: The New Empirical Industrial Organization Approach

The NEIO approach is now widely accepted and used. We concentrate on the most widely used variants.

Chapter 3: Stylized Model. We start by setting up the most common problem researchers face: How to estimate market power using aggregate data assuming firms produce nondifferentiated outputs. We lay out the standard static theoretical model. We explain why this method is consistent with but does not require one to use a conjectural variations approach. We show the relationship between many standard summary statistics and the Cournot and other theoretical models.

Chapter 4: Basic Structural Model. Using a textbook approach, we present the (now) standard approach to estimating a static, NEIO model using aggregate data. Much of

this chapter is based on Just and Chern (1980), Bresnahan (1982), Lau (1982), and Nevo (1998). We discuss the strengths and weaknesses of this approach.

Chapter 5: Variations on the Basic Structural Model. We present the best-known variations on the standard structural model. These include the residual demand model (Bresnahan), various differentiated product models (Hausman 1996, Nevo forthcoming, Berry 1994, Berry, Levinsohn, and Pakes 1995), and nonnested hypothesis tests (Gasmi, Laffont, and Vuong 1992).

Chapter 6: Nonstructural Approaches. We then turn to nonstructural models. Using the material from Chapters 2 and 3, we show the relationship between the structural and other models. We discuss the comparative statics approaches of Hall and Sullivan and the reduced-form model of Rosse and Panzar in some detail, comparing them to the structural models. We will also discuss (though possibly in less detail) the nonparametric work of Varian and Ward and Sutton's indirect approach.

Chapter 7: Simulations: Comparisons of Models. Using Monte Carlo simulation experiments, we compare several structural and nonstructural models. Some of this work is from Hyde and Perloff (1994, 1995), whereas other simulations will be new. We may also include some estimates based on actual data.

Chapter 8: Cross-Market Comparisons. The one strength of the SCP approach that has been lost in most recent research is a comparison across markets. Typical NEIO studies

focus on a single market. Here, we discuss the limited amount of cross-market, NEIO evidence currently available and talk about possible future research.

Part III: New Estimation Methods for Market Structure Studies

During the last few years, there have been several new econometric techniques introduced that are proving helpful in evaluating and analyzing market structure and power. After introducing the different methods and the relevant statistics, necessary for model and data evaluation, we proceed to compare these methods to traditional ones and to each other.

Chapter 9: New Methods. We present several important recently developed econometric methods. We concentrate on the generalized method of moments (GMM), empirical likelihood (EL), Bayesian method of moments (BMOM), maximum entropy (ME), and generalized maximum entropy (GME, Golan, Judge, Miller, 1996) approaches. All of these new methods can be viewed as examples of information econometrics and are based on the same philosophy of how to evaluate a nonexperimental data with minimum a priori assumptions. After summarizing the EL, GMM and BMOM, a detailed formulation of the GME is given, which we believe is the best available method suitable for evaluating the models discussed in Part IV.

Chapter 10: Empirical Illustrations of the Various Methods. We compare the various econometric techniques introduced in Chapter 9 as well as traditional methods such as the maximum likelihood (ML) rule using a detailed set of examples. We plan to use both simulated as well as real world examples.

Part IV: Estimating Distributional Strategies

Most studies to date have focused on estimating market power (the gap between price and marginal cost). These studies treat the strategies firms use as a black box. However, within the last few years, there have been a few attempts to explicitly estimate the strategies used by firms. By doing so, these studies provide a formal underpinning for the older studies of market power.

Chapter 11: Modeling Distribution Strategies. We lay out the theoretical foundations for estimating market strategies. Based on the recent game theoretical literature, we reformulate a generic oligopolistic model so that we can practically estimate the strategies of the competing firms. To be consistent with the available data, the formulation is done in a discrete form such that each strategy is viewed as a proper discrete probability distribution. We discuss Bjorn and Vuong (1985), Bresnahan and Reiss (1991) and Kooreman (1994), as well as our own work (Golan, Karp, and Perloff forthcoming).

Chapter 12: Price Only Model. We start by demonstrating our method using the relatively simple problem where two firms choose price. We use the GME rule to estimate the price strategies of United and American Airlines on various routes in which they have a duopoly. We compare this technique to standard structural model estimates. We also provide Monte Carlo evidence about the power of this technique. This material has not been previously published.

Chapter 13: Price and Advertising Model. We generalize the previous model to include multi-dimensional strategies. We illustrate it by analyzing the price-advertising strategies of Coke and Pepsi.

Part V: Dynamics

In all the models to this point, firms are assumed to engage in static, one-period games. We now turn to dynamic, multiperiod games.

Chapter 14: An Introduction to Multiperiod Games. We start by deriving relatively simple dynamic oligopoly models. We compare and contrast the open-loop and feedback approaches. Then, we briefly survey the literature.

Chapter 15: Supergames. We describe the work of Green and Porter and others who have developed and estimated trigger-price models.

Chapter 16: Dynamic Oligopoly. We carefully present the dynamic models of Roberts and Samuelson, Slade, and Karp and Perloff (Karp and Perloff 1989, 1993, 1994, 1996). We compare the various approaches.

Chapter 17: Extensions. We describe possible future research. For example, we suggest how Maskin and Tirole's theoretical work on Markovian models could be used in estimation. We lay out a dynamic version of our strategic model. We discuss new econometric approaches.

Part VI: Conclusions

In the final chapter, we draw conclusions and speculate about the future of research on this topic.

TIME FRAME

We will complete a 200 to 300 page manuscript in about one and a half years.

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(NOTE: The following is a random sample of the literature we plan to survey)

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