

Empirical Research in Operations Management

Management 245

Winter 2001

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Class hours: Friday 2pm-5pm, though occasionally rescheduled for guest speakers
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Objective of course

Most PhD students of operations management at schools such as UCLA focus almost exclusively on analytical methods, and will continue to do so after their graduation. This course is not intended to develop empirical researchers, as that requires a far longer and deeper program; rather, the objective is to broaden your horizons, to introduce you to a range of other research methods and paradigms you are probably less familiar with, and in the process, further your development as researchers (whether analytical or empirical).

Empirical research is, obviously, quite different in nature than most analytical research in operations. Roughly speaking, analytical research in OTM has one of two objectives: either to model and solve a specific problem in practice (let's call this the "OR approach"), or to model an abstract problem in order to derive qualitative insights about phenomena that occur in practice (the "economist approach"). In empirical research, the objective is more typically to use data about practical phenomena to describe and predict how those phenomena work; this could be called the "scientist's approach". The (social) scientist's stereotypical approach is to pick a phenomenon, explore existing theory, develop a set of hypotheses, collect data or conduct experiments, test the hypotheses, then discuss acceptance or rejection of the hypotheses. Let's not get hung up on labels (OR and economics are also scientific disciplines), but the research paradigms and corresponding value systems of the three perspectives are quite different.

Especially in recent years, the field of OM has gone through extensive soul-searching, with substantial disagreements about how to evaluate different strands of work. This is largely due to the field of OM as a whole being influenced by each of the three perspectives, but most people individually operating only within one perspective. My belief is that, by understanding each of the three approaches, you will be better at performing whichever type of research you choose to focus on.

Readings

The basic background texts for the course are:

- Greene, *Econometric Analysis, Third Edition*, Prentice-Hall, 1997. Chapters of this book are referred to as G in the outline below.

- Hair, Anderson, Tatham and Black, *Multivariate Data Analysis: Fifth Edition*, Prentice-Hall, 1998. Chapters of this book are referred to as HATB in the outline below.

Both books are excellent and well worth having, but will be made available to students in the class. Other articles will be distributed as we go forwards.

Course method

During the course, we will spend about half the time critiquing empirical papers in OM, focusing primarily on the logical correctness of the study. To do so, we will also need to spend some time studying the underlying empirical research methods.

Evaluation

Grades will be determined as follows:

- In-class presentations: every session will include several examples of research using the methods discussed in that session. At least one of those papers in each session will be presented by a student, briefly summarizing content (which everybody should be familiar with) but focusing on a careful critique of the methods and findings.
- Term paper: everybody will submit an individual term paper, conducting empirical research. I have some datasets available, and within the school there are many others. It would be good for you to start thinking EARLY about what you would like to do, and start trying to find data. I do have several datasets too as backup, but would much rather help you find something you really want to work on. The term paper should be a short empirical research note, consisting of a brief description of the question, why it is of interest, the data, the methodology, the analysis, discussion of the findings, and conclusions. It does not need the same level of preceding theoretical analysis as a full empirical research paper would require. The deadline for proposals will be the week after the course is completed; the deadline for complete papers will be June 30, 2001. After June 30, 2001, a grade of incomplete will be entered; after September 30, 2001, a grade of F will be entered.
- The term paper is experimental but meant to lead to something that could be published in a reasonable (but not top) journal; if you cannot come up with a reasonably promising by the end of the course, I may substitute the term paper requirement for a written exam, to be discussed on a case-by-case basis.

Questions:

- Need to find out what software (statistics, simulation) students are familiar with.

January 12

Session 1: Methodology of empirical research

Readings:

- Friedman, M. "The methodology of positive economics", in *Essays in Positive Economics*
- Chapter 1 in HATB

- C.J. Corbett and L.N. Van Wassenhove, “The Natural Drift (What Happened to Operational Research?)”, *Operations Research*, **41**, No. 4, July-August 1993, pp. 625-640.
- Scudder and Hill, “A review and classification of empirical research in operations management”, *Journal of Operations Management* 16, 1998, 91-101
- Verma and Goodale, “Statistical power in operations management research”, *Journal of Operations Management* 13, 1995, 139-152

January 19

Session 2: Basic regression analysis

Readings:

- Chapters 2 and 4 and 4A, HATB.
- Background: Chapters 6-13 in G.
- Lieberman and Demeester, “Inventory reduction and productivity growth: linkages in the Japanese automotive industry”, *Management Science*, vol 45 no 4, April 1999, 466-485
regression, causality
- Lieberman, Helper and Demeester, “The empirical determinants of inventory levels in high-volume manufacturing”, *Production and Operations Management*, vol 8 no 1, Spring 1999, 44-55.
regression
- Corbett and Kirsch, “International Diffusion of ISO 14000 Certification”, forthcoming in *Production and Operations Management*
regression, multicollinearity, heteroscedasticity

assignments in Excel; eg, using ISO data

February 2

Session 3: Advanced regression analysis

Readings:

- Chapter 5, HATB; focus on pp. 276-281 (introduction to logistic regression) and pp. 314-321 (example).
- Chapters 19-20 in G.
- Anderson, Daly and Johnson, “Why firms seek ISO 9000 certification: regulatory compliance or competitive advantage?”, *Production and Operations Management*, vol 8, no 1, september 1999, 28-43
- King and Lenox, “Lean and green? An empirical examination of the relationship between lean production and environmental performance”, forthcoming in *Production and Operations Management*, 2001
probit model
- Srinivasan, Kekre and Mukhopadhyay, “Impact of EDI technology on JIT shipments”, *Management Science*, vol 40 no 10, October 1994, 1291-1304.
logit model
- White, Pearson and Wilson, “JIT Manufacturing: A survey of implementations in small and large US manufacturers”, *Management Science* vol 45 no 1, January 1999, 1-15
logistic regression

February 9: CMIE conference

Session 4: Times series and panel data methods

Readings:

- Chapter 14 in G.
- Tsiriktsis and Lapré, 2000, “Knowledge Acquisition And Transfer In Service Settings: Customer Outrage In Airlines”, working paper #2000-13, Boston University, School of Management
panel data (TSCSREG)
- King and Lenox, “Lean and green? An empirical examination of the relationship between lean production and environmental performance”, forthcoming in *Production and Operations Management*, 2001
panel data

February 16

Session 5: Qualitative research

Readings:

- Yin, R.K., *Case Study Research: Design and Methods*, SAGE Publications. This is a classic, short introduction to case study research. Read Chapters 1, 2, 4 and 5.
- Eisenhardt, “Building Theories from Case Study Research”, *Academy of Management Review*, Oct 1989, 14(4): 532-550.
- Meredith, “Building Operations Management Theory through Case and Field Research”, *Journal of Operations Management* (16) 1998 441-454.

February 23: Paul Kleindorfer

Session 6: Multivariate statistics: factor analysis, path analysis, cluster analysis

Readings:

- Chapters 3, 9, 11 in HATB.
- Choi and Eboch, “The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction”, *Journal of Operations Management*, 17, 1998, 59-75
mail survey, measurement model, factor analysis, LISREL
- Mukherjee, Lapré and Van Wassenhove, “Knowledge driven quality improvement”, *Management Science*, vol 44 no 11, part 2 of 2, November 1998, S35-S48
factor analysis, regression
- Miller and Roth, “A taxonomy of manufacturing strategies”, *Management Science*, Mar 1994 285-304
cluster analysis, discriminant analysis
- Dennis & Meredith, “An empirical analysis of process industry transformation systems”, *Management Science*, Aug 2000 1085-1099
cluster analysis

March 2: Guest speaker: Sharon Novak, Kellogg

Session 7: Multivariate statistics: analysis of variance

Readings:

- Chapter 6 in HATB.
- Hendricks and Singhal, “Quality awards and the market value of the firm: an empirical investigation”, *Management Science*, vol 42 no 3, March 1996, 415-436
event study, test of means
- Ho, Tang and Bell, “Rational shopping behavior and the option value of variable pricing”, *Management Science*, vol 44 no 2, part 2 of 2, December 1998, S145-160
ANOVA
- Klassen and McLaughlin, “The impact of environmental management on firm performance”, *Management Science*, vol 42 no 8, August 1996, 1199-1213
test of means, ANCOVA, ANOVA, regression

assignments: ANOVA (Excel)

March 9

Session 8: Survey-based research in OM

- Chapters 1 and 2 of HATB.
- Malhotra and Grover, “An assessment of survey research in POM: from constructs to theory”, *Journal of Operations Management*, vol 16, 1998, 407-425
- Rondeau, Vonderembse and Ragu-Nathan, “Exploring work systems practices for time-based manufacturers: their impact on competitive capabilities”, *Journal of Operations Management* 18, 2000, 509-529.
mail survey, factor analysis, LISREL
- Dean, Jr. and Snell, “The strategic use of integrated manufacturing: an empirical examination”, *Strategic Management Journal*, vol 17, 1996, 459-480
mail survey, multiple regression
- Samson and Terziovski, “The relationship between TQM practices and operational performance”, *Journal of Operations Management*, 17, 1999, 393-409
mail survey, factor analysis, regression

March 16

Session 9: Experimental design, simulation, goodness of fit tests

- Chapters 1, 5 and 12 in Law and Kelton, *Simulation Modeling and Analysis*.
- Krajewski, Lee J.; King, Barry E.; Ritzman, Larry P.; Wong, Danny S. “Kanban, MRP, and Shaping the Manufacturing Environment”, *Management Science*, Jan 1987, 33(1): 39-57.
simulation, experimental design

assignment: simple simulations with Crystal Ball

- introduction to goodness-of-fit tests
- introduction to empirical fitting of copulas

assignment: given random data (eg Pellton), fit distributions, using Crystal Ball?