

What is Econometrics?

Econometrics means “economic measurement.” It is a unification of economic theory, mathematics, and statistics.

Economic measurement for the purpose of testing and developing economic theory. This is the classical econometrics interpretation.

We want to draw conclusions, make predictions, or take policy actions from empirical models developed from theoretical economic models.

Classical methodology is based on laboratory sciences: theory discovery and development. Modern approach develops probability models from economic models: theory is often taken as given but competing theories can be assessed.

Measurement of economic relationships. Theoretical models do not provide elasticities. I believe that this is the basic and substantive contribution.

What are the objectives of this course? What is the methodology to be followed?

- ***Applied versus theoretical econometrics...***
- ***Classical econometrics versus Modern...***
- ***Likelihood (i.e., Classical) versus Bayesian statistics or nonparametric statistics.***
- ***Neoclassical approach to science...***
- ***No “Data Mining...”***

Classical Methodology

State theory and hypothesis to be tested.	Consumption function $0 \leq MPC \leq 1$
Specify mathematical model.	$y = \beta_0 + \beta_1 x$ where $0 < \beta_1 < 1$
Specify econometric model.	$y = \beta_0 + \beta_1 x + u$
Obtain data.	$y_t = \beta_0 + \beta_1 x_t + u_t$ & $t = 1982, \dots, 1996.$
Estimate parameters.	$\hat{y}_t = -182.08 + 0.7064 x_t$
Hypothesis test and reject or fail-to-reject theory.	t-test of $\hat{\beta}_1$ suggests it is statistically significant – different from 0 – and 1.
Draw conclusion. Make prediction. Recommend policy action.	Hypothesis correct – fail to reject If $x = 7269.8$ then $y = ?$ Want $y = \text{target}$ then cut taxes so $x = ?$

**Problem: Do we really develop, test, and refute economic theories?
(Like other sciences? Not much. Ever?)**

Realistically, we want to describe, predict, and/or explain...

Some Basic Examples

Does one variable have a significant impact on another variable? (Holding other important things constant.)

Is the impact of one variable greater than the impact of another variable on a third variable? (Again...)

Any direction and magnitude arguments – integrated with theory...

Some Modern Examples

Market power question: Decreasing numbers of firms in some industries. Measure the impact on price of economies of size versus market power. Which is bigger? MC and MR functions derived from Supply and Demand.

Risk modeling question: Estimate mean and variance models that are consistent with economic model of risk behavior.

Consumer choice questions: Econometric models of choice can be derived from utility models.

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and then the related question – How do we do research?

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I believe – that the practice of science involves some form of objective measurement and use of analytical tools – otherwise we are using rhetoric. (Never underestimate the impact of strong rhetoric. Just be sure to recognize it.)

Plus, double-blind peer-review and publication... And then replication...

A Small Dose of Philosophy of Science

Falsification – versus for example Logical Positivism

This is what we practice – falsification – and it’s why economic science can be argued to be above some/many other social sciences ...

There are lots of examples of bad “research”?

- ***In politics...***
- ***In journalism...***
- ***In business...***
- ***In academics...***

However, your thesis or dissertation will not be one.

There are two broad types of research questions and lots of different potential tools that may be appropriate to those questions.

<i>Normative Questions and Tools</i>	<i>Positivistic Questions and Tools</i>
<i>What “should be” – prescribe. Explicit Objective Function</i>	<i>What “is” – describe. No Objective Function</i>
<i>Calculus & Comparative Statics Linear Programming Quadratic Programming Nonlinear Programming Dynamic Programming & Optimal Control ...</i>	<i>Budgeting Input/Output Models Computable General Equilibrium Models Statistics <u>Econometrics</u> Simulation ...</i>

So, econometrics is one tool in the economist toolbox.

But econometrics is more than the application of tools.

It’s not just tools, it’s a field of study and thought...

It’s more than drivin’ mules and poundin’ nails...

However, you do have to learn how to drive mules and pound nails before...

More on statistics...

Statistics is a foundational science for econometrics. Statistical theory will be used and/or referred to extensively. (As opposed to deriving...)

More on data science and data mining...

These show a lot of promise but have a lot of limitations – mainly in the communication of underlying structure, explanations, and answers – lots of times these methods work great but don't tell us the why. (Two examples.)

Data science can be used to predict and that's about the limit.

In the end using data science requires the asking of very clear and focused questions. And involves hard thinking or easy questions.

I don't think data science offers any shortcuts through statistics and econometrics.

More on data...

We don't question our data enough. We usually have observational data versus experimental data. Econometrics is doing more of this, and the BdM & F textbook is very good in this aspect.

Reading Assignment

Introduction

BdM & F: Chapters 1, 2, and 3.

Read fast Chapters 15, 16, and 17.