Introduction to Econ 671

Helle Bunzel

Fall 2006
We’ll talk about the organization of the course.

I’ll give an introduction to what econometrics is and what will be the focus of the course.
Frisch (1933) Introduces Econometrics

[...] There are several aspects of the quantitative approach to economics, and no single one of these aspects taken by itself, should be confounded with econometrics. Thus, econometrics is by no means the same as economic statistics. Nor is it identical with what we call general economic theory, although a considerable portion of this theory has a definitely quantitative character. Nor should econometrics be taken as synonomous [sic] with the application of mathematics to economics. Experience has shown that each of these three viewpoints, that of statistics, economic theory, and mathematics, is a necessary, but not by itself a sufficient, condition for a real understanding of the quantitative relations in modern economic life. It is the unification of all three that is powerful. And it is this unification that constitutes econometrics.
Econometrics is a unification of:

- Statistics
- Mathematics
- Economic Theory

Why is it not just Statistics?

- Lots of statistics is used, but:
- Statistic is mostly aimed at the natural sciences. In general the issues that interest econometricians are different. Such as
  - Serial correlation
  - Seriously flawed data, in ways that are different than those in other sciences.
  - Lack of ability to do controlled experiments.
Introduction
Notes to Frisch’s introduction in Econometrica.

- Why is it not just Mathematics?
  - Again, mathematics is heavily used, especially in theoretical econometrics, but we use it for specific purposes. Those purposes are defined by the economic theory and the statistics we want to use.
    - For example we’d use math to show certain theoretical properties of an economic theory, so we can verify that it is possible to apply certain statistical methods.

- Why is it not just Economic Theory?
  - Econometrics is build on economic theory. We always start of with an economic model, but this does tell us how to put it to the data. All economic theory models have to be converted to econometric models.
  - Example: Labor supply is continuous in models, but in the data, it is usually a 0-1 choice. Hence the invention of methods like Limited Dependent Variables.
In general the situation facing an econometrician is one where we have a specific economic model. Features of economics models:

- Very precisely defined relationships between specific variables.
- Typically nothing is stochastic in the model.
- The model does not take into various random acts of life. Examples are:
  - Snowstorm slows down production.
  - A flu epidemic reduces the available work force.
  - The manager breaks his leg.

This all implies that when we take the very precise relationship of the theoretical model to the data, we need to add something stochastic to all account for the factors the model couldn’t possibly take into account.

This does not mean that it is OK to leave out input prices.
Introducing a stochastic element changes the model from something that makes exact predictions (The firm will definitely produce 2 billion bags of taco chips at a price of 50 cents per bag) to one that makes probabilistic predictions (There is a "good chance" that the firm will produce an average of 2 billion bags of taco chips at an average price of 50 cents per bag).

What is the difference?

- If the firm produces 2 billion and 1 bags of taco chips, the deterministic model is wrong.
- This however would seem pretty close by the standards of the stochastic model.

Deterministic models require only that you find 1 counter example to reject them, whereas to reject a stochastic model, you need to see that model does not describe facts most of the time.
A major difference between econometrics and statistics performed in other natural sciences is that we are not able to perform controlled experiments.

- What is a controlled experiment in the context of economics?

As such, we are left with whatever data we can observe, and must try to get as much information from it as we can. Here theory is extremely important. The economic theory tells us how to organize the data and what to look for. Example:

- Productivity we can get from a simple production function. (Solow residual)
Suppose you want the question: *How do interest rates affect the economy?* answered. How to even measure the interest rate? There are so many out there.

- For examining personal saving, the model tells us that what matters is how much the individual gets in return.
- In a model of the behavior of banks it would be the inter-bank fund rate.
- In a model of housing demand it would be the mortgage rates.

So, economic theory tells us which data to use to answer which questions.

It tells us which variables are the effect and which are the cause, something we still have a hard time making out just from the data.
Introduction

The problem is that we very rarely have exactly the data we need to examine the model and even the data we do have, may be imprecisely measured.

Some frequently encountered data problems:

- The data may be badly measured or vaguely defined (The interest rate)
- Some variables cannot be measured. Expectations, effort are examples.
- We may not have an explicit functional form defining the relationship between the variables. The the possibilities are endless.
- The assumptions made on the stochastic properties of the model may not be met by the data, in which case the methods of estimation and inference may be wrong.
- The economic model may not include all relevant variables.
These are the issues of econometrics in general. So what is the difference between applied and theoretical econometrics?

Roughly:

- Theoretical econometricians develop methods
- Applied econometricians use the methods.

The lines are very blurred, though.

People who do theory must analyze what happens if methods are incorrectly applied. They must know what the issues facing applied econometricians are.

People who do applied work will frequently run into specific problems that have not been dealt with in that form before, and therefore be forced to modify existing methods or even develop new ones.

Conclusion: One cannot do good theory without an extensive knowledge of the applications. One cannot do applied work without having a firm grasp of the theory.
Main differences between a Ph.D. course in econometrics and other econometrics courses:

1. This course will be MUCH more theoretical for the reasons outlined above.

2. You will be required to acquire a much deeper understanding of what exactly you are doing. It is very important to have a precise idea of what the concepts are.

Next we will take an economic model and see what is required to rewrite it such that we can do econometric estimation with it. Your TA will review matrix algebra the next two weeks.
This is the only time we will do this in detail. The rest of the course focuses mainly on learning the methods used in econometrics. This is a tools course in that sense. Especially in this first part the focus is to build tools that will be used for econometrics. You should come out of this course with the ability to modify methods if the canned packages do not fit your needs and you should have a good idea which method to use when. In addition you should be comfortable with the computer program MATLAB and be able to program most methods yourself.