Think of a Number:

Pluralism and the Teaching of Quantitative Methods

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Background

- I am a Senior Lecturer in Economics & Admissions Director in the School of Economics at the University of East Anglia (UEA).

- I have over 20 years of teaching experience in Higher Education, having taught at the University of Bradford (1995), University of Hull (1996-1999), University of Abertay, Dundee (1999-2000), University of Bath (2000-2011) and UEA (2011-present).

Background

- I have taught econometrics (almost) every year at various levels since my first academic appointment in 1999.

- I have taught year 1 statistics, computing and data analysis skills on and off since 2000.

- I have taught year 1 mathematics since 2011.

- I have also provided support for statistics at UEA through ICARUS (2011-14).

- I am Fellow of the HEA and Associate of the Economics Network

Background

Mathematics and statistics are an integral part of the Economics discipline in HE sector.

Academic Perspective:

Today few academic articles get published without formal mathematics or econometric analysis.

Employer Perspective:

Employers expect graduates of economics to have good quantitative skills. (What does this actually mean?)

Methodological Pluralism

Pluralism can be considered in the context of theories, methods, methodologies, approaches, models, explanations and assumptions. Essentially a diversity of views about the nature of the economy and those involved within it.

Theoretical pluralism relates to the existence of schools of thoughts and questions concerning the nature of their boundaries.

Methodological pluralism recognises the existence of many methodological positions and rejecting prescriptivism when it comes to the choice of methods.

Methodological Pluralism

It is certainly true that a monist perspective currently exists in the way research methods is conducted in economics.

Econometrics is the dominant (only?) method. The pros and cons of methodological monism have been frequently debated in the literature (e.g. Blaug, 1980; Dusek, 2008).

I am not here to talk about the philosophical roots of econometrics, if for no other reason that I am not an expert (or even close to being a expert in this area).

Instead from a pedagogical perspective I believe the teaching and assessment of econometrics remains largely narrow in focus and it is in this area that I want to consider for the reminder of this presentation.

Methodological Pluralism

My ambition here is to look at, what I believe, the fundamental weaknesses in the way econometrics is taught and assessed in many HE institutions.

And to demonstrate an alternative way of teaching and, more specifically, assessing econometric knowledge.

The extent to which this can potentially generate a greater appreciation of pluralism will also be briefly considered.

Quantitative Methods and Econometrics

Econometrics:

…"the discipline in which one studies theoretical and practical aspects of applying statistical methods to economic data for the purpose of testing economic theories (represented by carefully constructed models) and of forecasting and controlling for the future path of economic variables". Sowey (1983)

The idea of "a model from the outset", as described by Franses (2004), dates back to the first developments in econometrics.

The format of a typical econometrics textbook has its origins in this traditional view of econometrics.

Quantitative Methods and Econometrics

How econometrics is "done" (Pinto, 2008):

1. Formulation of the problem (the initial question, what we want to know)
2. Collection of information (primary and secondary sources) and data transformation (how the variables are to appear), and problems (missing data).
3. Choose the econometric model.
4. Empirical analysis (parameter estimation), diagnosis (quality of the model)
5. Modification of the model.
6. Answer the initial question based on the interpretation of the model.

Quantitative Methods and Econometrics

Appears to be a preoccupation with points 4 and 5.

How do we know this? Here are some example syllabi associated with introductory econometrics:

At the end of the unit students will show:

1. a good understanding of the OLS regression methodology (what it does, its strengths and weaknesses, how to use it to test economic hypotheses);

2. a good understanding of IV and more general evaluation methods;

3. the ability to read and interpret economics articles which use standard econometric methods.

Quantitative Methods and Econometrics

Another example:

At the end of this course students should be able to
(1) Achieve full understanding of univariate and multivariate statistics
(2) Achieve full understanding of basic ideas of linear algebra, to perform basic matrix calculations such as sums, products, inverses etc as well as achieve full understanding of why matrix algebra is useful in econometrics
(3) Estimate the parameters of the regression model; to understand the basic properties of the estimators; to produce and read regression output from an econometrics software package.
(4) Construct general specification tests.
(5) Explain and prove the properties of the OLS estimator under spherical disturbances.

Quantitative Methods and Econometrics

The problem, as Franses describes, is that many textbooks and syllabi assume that most aspects of the model, such as relevant variables, the way they are measured, the data themselves, the functional form, are already available to the econometrician.

The problem appears to be exacerbated by the way econometric modules in UG teaching are assessed in many programmes.

How Quantitative Methods and Intro Econometrics is Taught and Assessed

Riethmuller and Thompson (2008) find that the final examination in quantitative methods dominates the share of the assessment; in about 45% of maths courses and 48% of statistics courses the final mark is based entirely on a (closed-book) final exam.

% of assessment	Statistics		Maths		Statistics & Maths	
	no.	%	no.	%	no.	%
0 < 10	0	0.0	1	4.5	0	0.0
10 < 20	0	0.0	0	0.0	0	0.0
20 < 30	0	0.0	0	0.0	0	0.0
30 < 40	1	4.0	1	4.5	0	0.0
40 < 50	0	0.0	0	0.0	0	0.0
50 < 60	3	12.0	2	9.1	0	0.0
60 < 70	2	8.0	2	9.1	2	28.6
70 < 80	1	4.0	0	0.0	0	0.0
80 < 90	5	20.0	6	27.3	2	28.6
90 < 100	1	4.0	0	0.0	0	0.0
100	12	48.0	10	45.5	3	42.9
Total	25	100.0	22	100.0	7	100.0

Share of assessment from final exam

How Quantitative Methods and Intro Econometrics is Taught and Assessed

The view from across the pond…

Grade Composition of Econometrics Courses

Task	Universities			Masters			Liberal Arts		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Exams	62.0	0	100	60.0	30	90	51.7	0	80
Quizzes	2.8	0	40	3.8	0	40	6.1	0	45
Project	10.3	0	80	12.8	0	40	20.5	0	45
Homework	22.2	0	75	21.0	0	60	18.5	0	35
Other	2.7	0	70	2.6	0	35	3.3	0	15
Total	100			100			100		

Source: Johnson et al. (2013), "Status of Econometrics in the Economics Major: A Survey

How are Quantitative Methods and Econometric Skills Developed?

Econometrics is intertwined with the orthodoxy.

"The current tendency is to far overemphasize econometric theory at the expense of practical empirical skills…lucky if an hour total is spent on issues of survey practices, understanding what variables actually mean, data 'cleaning', and many other considerations that divide quality data analysis from high-tech schlock". (Nelson, 2011)

"Focus in econometric textbooks and teaching materials is on presenting and explaining theory and technical details with secondary attention given to applications, which are often manufactured to fit the procedure at hand". (Becker and Greene, 2001)

How are Quantitative Methods and Econometric Skills Developed?

"The first task of university teacher…is surely to persuade his students that the most important things he will put before them are questions not answers. **He is going to put up for them the scaffolding, and leave them to build within it**". (Shackle, 1953)

This seems, or at least should be, particularly pertinent to how econometrics ought to be taught.

However, and as we have seen, all too often it is taught and assessed in a very narrow way.

My Approach to Teaching QM and Econometrics

In QM (statistics) we introduce a number of vignettes to illustrate the concepts:

Vignettes –

"Let's Make a Deal"

Simpson's paradox: university admissions

Birthday paradox

Lotteries

Students are also introduced to real-world data (from UK Data Service, newspaper articles) and the process of preparing data for statistical analysis in both Excel and more specialist statistical packages.

How I Teach QM and Econometrics

The 2nd year (introductory) econometrics module has a substantial econometric project.

As part of the syllabus students work with "real-data" drawn from the UK Data Service, specifically the Understanding Society dataset (previously the BHPS). This is something I have developed over the last 10-15 years (at UEA and previously the University of Bath).

The module is structured to enable students the opportunity not only to learn econometrics but also the practice of econometrics. This means appropriate attention is given to what I described as data preparation and preliminary data analysis, aspects which as we have seen appear to be largely overlooked in many econometrics modules taught elsewhere.

How I Teach QM and Econometrics

The project also provides students with an opportunity to chose topics they are interested in / relevant to their degree (particularly those on joint degree programmes).

For example there are variables in the dataset relating political interest, voting behaviour and political preference.

There are also variables relating to health status and social behaviour.

And of course there are many topics that can be explored using the tools and theories of economics (savings behaviour, consumption of addictive goods, happiness, labour market status).

How I Teach QM and Econometrics

Being able (and being encouraged) to draw upon other disciplinary perspectives certainly makes this module more pluralistic in outlook when compared to other econometric modules – even if the methodology remains firmly monist!

Am I claiming the way we teach year 2 econometrics at UEA is better than other institutions? Certainly not. But what we do is, I believe, provide students with a greater appreciation of the research process earlier on in their academic studies.

"Tell me and I forget, teach me and I may remember, involve me and I learn."

— Benjamin Franklin