

University of York
Department of Economics
and Related Studies

Econometric Theory (Generalized Method of Moments)

Spring Term, 2006/2007

- Lecturer: Professor Don Poskitt Room A/EC/011 Tel. 9905-9378
- Lecture time/venue: Tuesday, 09.15 - 10.15 in A/EW/104 and Thursday, 13.15 - 14.15 in A/EW/104 Weeks 3 to 10.
- Tutorials: To be determined.
- Office Hours: Tuesday 15.00-17.00 or by appointment.

1 Unit Overview

Econometrics provides us with a range of techniques that enable us to assess the size and likelihood of possible errors, to decide whether discrepancies between theory and practice can reasonably be attributed to chance and to judge the relative merits of predictions based on past observations. These techniques are based upon statistical ideas, thought of as the science of inductive inference.¹ The basic objective of this course is to build upon existing ideas and concepts developed in other courses (*Econometrics 2080003*, *Advanced Econometrics 2080040* and *Econometric Methods of Research 208003* in particular) and to outline the basic principles underlying what has become known as the Generalized Method of Moments.

2 Unit Aims and Objectives

This unit aims to provide a rigorous basis for the technique of analysis known as the Generalized Method of Moments (GMM). To examine various econometric techniques from a GMM methodological perspective and to introduce students to a number of current topics in econometric research. On completion of the unit a student should be

¹The word statistics derives from the Latin words *status*, meaning state, and *statista*, meaning statesman, and for many the word is synonymous with the collection and presentation of facts and figures that provide a partial description of the nation-state or economy. The word itself was coined by the German scholar Gottfried Achenwell and was based on the German counterpart of the, so called, "political-arithmetic" that was of interest in seventeenth century England.

able to understand the principles, properties and application of the GMM technique, and be familiar with the use of GMM as a general inferential tool.

At the outset it must be recognized that this is a theoretical rather than an applied unit, but an attempt will be made to motivate many of the topics by reference to (i) simple practical examples, and (ii) econometric and statistical techniques with which you should be familiar from other econometrics and business statistics courses. Indeed, we will find that GMM finds application in many areas of econometrics and business statistics, and that GMM may be viewed as a very general methodology that encompasses many econometric and statistical techniques.

3 Lectures and Topic Headings

This unit will be taught as an integrated programme of lectures and seminars. There will be two one-hour lectures per week, starting in Week 3. Lectures will continue until Week 10.

Some broad topic headings that indicate the material that may be discussed are:

- Classical Method of Moments
- Regression and the Method of Moments (OLS and IV).
- The Generalized Method of Moments.
- Identification
- Asymptotic Distribution Theory for GMM.
- GMM and Minimum Variance Unbiased Estimation.
- Hypothesis Testing and GMM Based Inference.
- Special cases of single equation and simultaneous equations GMM.
- Numerical Considerations.

It is unlikely that all of these topics will be covered in detail because of the limited time available in a single term (8 week) course. Lecture notes that outline some of the background results and address some of the topics listed above will be provided. These lecture notes contain many definitions and basic results, so that time during the lectures can be devoted to listening and understanding (rather than simply copying formulae). These notes are not comprehensive, however, and they are not intended to give a full discussion with all the associated detail. Reading more detailed expositions and doing additional examples will help to gain a sound understanding of the topics to be covered. It is, therefore, important to read and use a text, as well as the lecture notes.

4 Texts

There are several econometric text books that contain passing reference to the Generalized Method of Moments (GMM) and some of these texts are pitched at approximately the same level as this course. Of these texts two that make explicit reference to GMM and which are at a similar level to this course are Greene (1991) and Johnston and DiNardo (1997). There is no one single text book that covers the course material in exactly the same manner it is expounded in the course, but the nearest is perhaps Hayashi (2000). The following texts are also worthy of mention: Davidson and McKinnon (1993) and Gourieroux and Monfort (1995). These two texts are rather more advanced and should only be consulted by those who feel at home with the material and who wish to deepen their understanding.

5 Assessment and Seminars

There will be no formal assessment for this unit. During the term you will be required(asked) to complete three (3) assignment–seminar problem sheets. In the structure of this unit these assignments are regarded as being part of the learning process. There will be a series of one hour long supporting seminars beginning towards the middle of term. Precise details of the weeks in which these will take place will be provided in due course. Work in seminars will revolve largely round a discussion of previously distributed assignment–seminar problem sheets. You will be expected to attempt all of the questions on these sheets before attending the seminar at which they will be discussed.

References

- DAVIDSON, R. AND J. G. MCKINNON (1993): *Estimation and Inference in Econometrics*, Oxford University Press.
- GOURIEROUX, C. AND A. MONFORT (1995): *Statistics and Econometric Models*, volume 1,2, Cambridge University Press.
- GREENE, W. H. (1991): *Econometric Analysis*, New York: MacMillan.
- HAYASHI, F. (2000): *Econometrics*, Princeton: Princeton University Press.
- JOHNSTON, J. AND J. DINARDO (1997): *Econometric Methods*, New York: McGraw-Hill, fourth edition.