

# Topics in Integrated Panel Data Econometrics

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Recent years have seen a virtual explosion of papers in academic journals and discussion papers on the subject of unit roots and cointegration in panels of data with integrated time series. The advantages of panel data methods, within this macro-panel setting, include the use of data for which the spans of *individual* time series data is insufficient for the study of many hypotheses of interest. Other benefits include better power properties of the testing procedures (when compared to more standard time series methods) and the fact that many of the issues studied, such as convergence or purchasing power parity, lend themselves naturally to being studied in a panel context.

The econometrics literature has recognized the benefits of this topic of research. The papers cover a large number of topics, from theoretical treatments of the asymptotic properties of panel-data estimators to simulation studies of the finite sample properties of tests for unit roots and cointegration and empirical studies of, for example, purchasing power parity and exchange and interest rate pass through.

Difficult topics for research include those dealing with cross-sectional and/or spatial dependence in panels and the development of better tests for unit roots and cointegration. This vast new literature is sustained not only by increasingly powerful computing technology but by the expansion in the numbers of reliable panels of data available.

Starting from the perspective of the more standard dynamic panel data econometrics, this course will attempt to summarize, but much more to evaluate, consolidate and develop our understanding of the use of these methods in a general and internally consistent framework. The need is not only to start from sound theoretical principles, but to extend the scope of this rigour to the proper application of tools in empirical research.

Empirical applications are a crucial component of this development, and we will attempt not only to describe the theoretical background but to use several guiding data sets and examples to illustrate the implications and properties of the estimators and the testing principles. What is feasible, what is not, how one can go wrong, how one can improve, all forms part of the discussion.

We therefore aim to take stock, discriminate and discuss the significant strands which have characterized the development of the literature, and look (within an empirical framework) at its relationship to some important policy debates, for example, exchange rate or interest rate pass-through, which are topics of vital interest to central banks. Proper estimation of pass through, be it (of import unit values) in response to exchange rate changes or (of bank rates) in response to market rates, should be an essential part of the whole discussion of macro policy, since quite different decisions could emerge depending on what is considered to be reasonable 'numbers' for the policy parameters.. We discuss how, in many published studies of these topics, often by the central banks themselves, estimation and inference are inadequate and may thus in principle lead to ill-informed or unjustified recommendations.

We offer some broad solutions to the problems, albeit within the narrow class of generalisations involved in looking at a macro-panel setting. A brief reading list is given below. More references will be provided as necessary.

## Reading

\*Arellano, M. (2003): *Panel Data Econometrics*, Oxford University Press, Oxford.

Bai, J. and S. Ng (2004): A PANIC Attack on Unit Roots and Cointegration. *Econometrica*, 72, 1127-1177.

Baltagi, B. H. (2005): *Econometric Analysis of Panel Data*, 3<sup>rd</sup> edition, John Wiley & Sons, New York.

\*Baltagi, B. H., and C. Kao (2000): Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey. In Baltagi (Ed.) *Nonstationary Panels, Cointegration in Panels and Dynamic Panels*, Advances in Econometrics, 15, North-Holland, Elsevier, Amsterdam.

\*Breitung, Jörg and M.H. Pesaran (2005): Unit Roots and Cointegration in Panels. IEPR Working Paper No. 05.32

\* indicates good survey material

# Course Outline (preliminary)

## A. Some Basics of Panel Data Econometrics

## B. Panel Unit Root Tests

### *Panel Unit Root Tests for Cross-Sectionally Independent Panels*

1. Introduction
2. Panel unit root and stationarity tests
3. Simulation studies
4. Summary and conclusions

### *Panel Unit Root Tests for Cross-Sectionally Dependent Panels*

1. Introduction
2. Short-run dependence
3. Long-run dependence
4. Second generation panel unit root tests
5. Summary and conclusions

### *An Application of Panel Unit Root Tests to PPP*

1. Introduction
2. Data and results
3. Summary and conclusions

## **C. Panel Cointegration**

### ***Single Equation Panel Cointegration Tests for Cross-Sectionally Independent Panels***

1. Introduction
2. Overview of first generation panel cointegration tests
3. The effects of cross-sectional dependence on the asymptotic properties
4. Summary and conclusions

### ***Single Equation Panel Cointegration Tests for Cross-Sectionally Dependent Panels***

1. Introduction
2. Overview of second generation panel unit root tests
3. A comparison of size and power properties of first and second generation panel cointegration tests
4. Summary and conclusions

### ***System Panel Cointegration Methods***

1. Introduction
2. Overview of factor-based panel estimation methods
3. Estimation in the presence of structural breaks
4. Summary and conclusions

### ***PPP, ERPT and Panel Cointegration – empirical illustrations***