Time Series Econometrics in Energy

Academic Year: (2023 / 2024) **Review date: 24-05-2023**

Department assigned to the subject: Economics Department

Coordinating teacher: ESCRIBANO SAEZ, ALVARO

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 2

OBJECTIVES

This is an empirical course and the student will become familiar analyzing energy data and energy relationships using time series econometric techniques. The prerequisites necessary to follow the course are a basic knowledge of Statistics. The material taught in this course will lead the student to acquire the ability to use basic econometric tools for energy time series data, both at the univariate level as well as with single equations. These abilities will give the students the capacity to construct empirical energy models, predict and to test hypotheses based on those models.

DESCRIPTION OF CONTENTS: PROGRAMME

Part I: Single equation analysis based on energy time series

I.1 Univariate Models

I.1a Evolution & descomposition of univariant time series

- Stationary and non-stationary variables. Integrated processes, random walks, martingales and unit root testing
- Transformations of variables (logarithms & differencing)
- Trend and cyclical properties of macroeconomic variables
- Trend-Cycle decompositions: Beveridge-Nelson (BN) and the Hodrick-Prescott (HP) filter
- ARIMA Models: Impulse Response Functions and Forecasting

Empirical Applications:

- Energy prices and quantities

I.1b Non-linearity and Stationarity

- Non-linearity in parameters vs. Non-linearity in regressors,
- Structural change in the parameters and threshold variables
- Smooth Transition Autoregressive Models (STAR)
- Autoregressive Models with Conditional Heteroskedasticity (ARCH, GARCH)
- Non-linearity in the mean versus non-lineality in the variance

Empirical Applications:

- Modeling of energy prices in centralized markets (asymmetries and volatility)
- Asymmetries in the increases and decreases of petrol prices etc., ¿Rockets and Feathers¿ hypothesis, etc.

I.2 Single Equation Models

I.2a Specification and comparisons of single equation models

- Estimation & inference in static and dynamic regression models
- Specification of models from general to particular
- Specification testing: Consistency and nested models
- Exogeneity & Causality: Concepts & tests
- Error Correction Models (EC or EqCM) & Co-integration
- Spurious regression & cointegration

Empirical Applications:

- Micro-fundamentals of single-equation specification
- Electricity demand in Spain

I.2b Non-linear single-equation Models

- Estimation & inference in dynamic non-linear regression models
- Non-linear error correction models (NEC)
- Smooth transition regression models (STR) & structural change

Empirical Applications:
- Oil prices in Spain and Europe.

Part II: Student´s Empirical Project

LEARNING ACTIVITIES AND METHODOLOGY

The teaching method will be the following:
(1) Magistral classes, where the concepts will be developed in detail and the properties of macroeconomics models of time series will be covered. To facilitate understanding and learning of this material by the student, the students will have access to the class material (slides etc.) via the internet. They will also receive an ample list of complementary materials that will permit them to understand and go deeper into issues covered in class, and into some related issues of interest that may not have been covered in class.
(2) Discussion of the exercises done by the student, covering the estimation and specification of classic models in the literature, previously covered in class, such as the various exercises of estimation and forecasting with time series in various economies and different time periods.
(3) Discussion on current economic issues to which the student can use the knowledge acquired in the course to deepen their understanding.
(4) Practical classes in reduced groups where the students will learn to make arguments and reason in public, to use the necessary econometric programs (above all E-Views) to do estimation and testing of macroeconomic models of time-series. This will be done by the use of both algebraic and empirical exercises in class, with an emphasis on the applied nature of this course.
(5) Complete an empirical project by the end of the course that demonstrates that the student understands how to apply with rigor and economic reasoning the econometric techniques studied. The project should be well written and have the basic structure of a short scientific article: Introduction, literature review, model and estimation, description of the data used and their quality, empirical results, evaluation of the model and hypothesis tests, conclusions & future extensions.

ASSESSMENT SYSTEM

The mark for the course will consist of three parts: final exam (30%), regular assignments, class participation and defense of the empirical project (30%) and lastly the paper submitted as the empirical project carried out by the student and chosen in agreement with the professor (40%).

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

- Enders W. (2015). Applied Econometric Time Series (4 ed), John Wiley , 2015
- Escribano A. Peña J.I. and Villaplana P. (2011). Modeling Electricity Prices: International Evidence, , Oxford Bulletin of Economics and Statistics V. 73,, 622-650.
- Hendry D.F (2015). Introductory Macro-econometrics: A New Approach. Timberlake Consultants Ltd. , London SE26 5BN, UK. , http://www.timberlake.co.uk/intromacroeconometrics

ADDITIONAL BIBLIOGRAPHY

- Escribano A. (2004). Nonlinear Error Correction: The Case of Money Demand in the UK (1878-2000). , Macroeconomic Dynamics. 2004, 8,, 76-116.
- Franses Ph. H. and van Dijk D. (2000). Non-linear Time Series Models in Empirical Finance, , Cambridge , University Press.
- Wooldridge J. (2006). Introductory Econometrics: A Modern Approach , (3rd ed.), ., New York: South-Western College Publishing