TIME SERIES ECONOMETRICS (TES9140)
Extended syllabus, 2016 autumn

Course aims	This is course in time series econometrics with focus on applications in macroeconomics, international finance, and finance. We will cover univariate and multivariate models of stationary and nonstationary time series in the time domain.
Learning outcomes	After completing the course it is expected that the student is able to formulate and estimate econometric models based on different time series data, interpret outcomes of econometric analyses and draw appropriate conclusions.
Brief description	Difference Equations. Stationary Time-Series Models. Modelling Economic Time Series: Trends and Volatility. Testing for Trends and Unit Roots. Multiequation Time-Series models. Cointegration and Error-Correction Models. Nonlinear models
Credits	6 ECTS, fortnightly classes starting from week 1.
Assessment form	Mid-term exam (40%) and final exam (60%)
Lecturer	Ako Sauga and Juan-Carlos Cuestas
Chair	Chair of Business Mathematics, Statistics and Econometrics

Course contents (subject to change)

(Lecturer) Topic	Subject
(JCC) 1	Stationary time-series models. ARMA models. Stationarity restrictions for an ARMA(p,q) model. The autocorrelation function of AR(2), MA(1) and ARMA(1,1) processes. The partial autocorrelation function. Sample autocorrelations of stationary series. The Ljung-Box Q-statistics and testing for autocorrelation. Box-Jenkins model selection. Model diagnostics. The forecast function.
(JCC) 2	VAR modelling. Simultaneous equations. VAR models. The impulse response function. Variance decomposition. Hypothesis testing for VAR models. Granger causality.
(JCC) 3	Non-Stationary models I. Deterministic and stochastic trends. Unit root processes. Dickey-Fuller tests. Phillips-Perron tests. Nonlinear unit root tests. Introduction to fractional integration. Introduction to cointegration.
(JCC) 4	Non-Stationary models II. Linear combination of integrated variables. Cointegration and common trends. Testing for Cointegration: the Engle-Granger methodology. Error correction model ECM. The Johansen methodology. ARDL.
(Invited lecturer) 5	Structural VAR models SVAR.
(AS) 6	Seasonality. Deterministic and stochastic seasonality. Fourier analysis. Periodogram analysis. Seasonal ARIMA models. Seasonal filtering.

(AS) 7	Volatility modelling. ARCH and GARCH models. IGARCH, TARCH, EGARCH models.
(AS) 8	Advances in econometrics. State-space models and the Kalman filter. Markov switching models. BDS test. Fractional differentiation and ARFIMA models.

Textbooks:
W. Enders, 1995, "Applied Econometric Time Series"
C. Chatfield, 1996, "The Analysis of Time Series. An Introduction"
C. Brooks, 2008, "Introductory to Econometrics for Finance"
J. Johnston and J. DiNardo, "Econometric Methods".

Supplementary:
H. Lütkepohl, "New Introduction to Multiple Time Series Analysis"
J. D. Hamilton, "Time Series Analysis"

Mid-term exam is written exam. Topics are:
1. Stationary time-series models.
2. VAR modelling.
3. Non-Stationary models
4. SVAR models

Final exam consists of two parts:
- Test in Moodle, 15 questions (20 minutes).
- Two practical data analysis problems in Eviews (60 minutes).

Topics of data analysis problems:
1. Spectral analysis, interpretation of periodograms.
2. Seasonal ARIMA models, forecasting.
3. Modelling volatility: GARCH, TGARCH, EGARCH , GARCH-X models, interpretation of estimation results.
4. Linear model with time-varying coefficients as state space model.
5. Fractional differencing.