



Ph.D. in ECONOMICS – Universities of Milan and Pavia

Time Series Econometrics

Academic year 2018-19 – Spring Term

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Course Objective

The aim of the course is to teach students time-series analysis used in advanced economic research. Competence is developed regarding stationary and non-stationary multivariate models with special attention to: inference for stationary and ergodic time series; dynamic simultaneous equations; Vector autoregression (VAR) models, Impulse response functions, Variance decompositions, Structural VAR models; Cointegration, Vector error correction models.

Course requirements and assessment

The assessment is based on a written exam

Course Outline

The course is organized around the following topics:

STATIONARY ERGODIC UNIVARIATE MODELS. Stationarity and ergodicity, the LLN and CLT for stationary ergodic processes, feasible inference for the sample mean; Forecasting and Impulse Response for stationary processes, Wold decomposition theorem, ARMA models; estimation and model selection for ARMA models.

(Hamilton *Time Series Analysis*, ch. 1-7)

UNIVARIATE and MULTIVARIATE GARCH. (Hamilton *Time Series Analysis*, ch. 21)

NONSTATIONARY UNIVARIATE MODELS. Trend/Cycle decomposition, Beveridge-Nelson decomposition, Deterministic and stochastic trend models, Unit root tests.

(Hamilton *Time Series Analysis*, ch. 15-17)

STATIONARY MULTIVARIATE MODELS. Dynamic simultaneous equations models, Vector autoregression (VAR) models, Granger causality, Impulse response functions, Variance decompositions, Structural VAR models.

(Hamilton *TSA*, ch. 9-11)

NONSTATIONARY MULTIVARIATE MODELS. Spurious regression, Cointegration, Granger representation theorem, Vector error correction models, Structural VAR models with cointegration, Testing for cointegration, Estimating the cointegrating rank, Estimating cointegrating vectors.

(Hamilton *TSA*, ch. 18-20)



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