

# Time Series Analysis for Macroeconomics and Finance

Lecture: Tue, 3.15-4.45 p.m., classroom: SR 12  
Lab class: Thu, 9.15-10.45 a.m., PC Pool 4 (start: Oct 12)

## Aims and scope

The course conveys up-to-date techniques and methods for quantitative research in macroeconomics and finance. The lecture is accompanied by a computer tutorial and exercises (Thu: PC Pool #4, 9.15 to 10.45 a.m.). Applied problems are solved in the computer lab using Stata. Supplementary programming is done with a matrix-based language/software like Python, Matlab or Gauss.

## I Preliminaries

## II ARIMA and Error Correction (EC) models

### II.1 Basic time series analysis framework

- Unit root (UR) & stationarity tests and autocorrelations: AC/PAC functions and ARIMA
- Correlogram/Periodogram and spectral density
- Filter applications
- Causality in the time series context
- From distributed lags (DL) to ARDL to EC models

### II.2 Extensions: NARDL, testing for “bubble” dynamics, ARCH/GARCH models

## III Vector AR and Vector EC (VAR and VEC) models

### III.1 Structural/Reduced form (SF/RF-) VARs and mapping to RF-VAR

### III.2 Granger-causality, VAR out-of-sample forecasts, and Impulse Response (IR) functions

### III.3 Orthogonalization and Identification

### III.4 VECM and Johansen procedure (alternatively: MGARCH models)

## IV Selected problems and models

### IV.1 New approaches in the frequency domain: Breitung-Candelon-Granger-causality

### IV.2 Forecasting and time-varying measures

## Grading and Material

The final course grade is obtained from an oral presentation and a written term paper. A reader, problem sets, and data will be made available online.

## Literature

Beckett, S. (2013): *Introduction to Time Series Using Stata*, College Station: Stata Press

Hamilton, J. D. (1994): *Time Series Analysis*, Princeton: Princeton University Press

Kilian, L. and H. Lütkepohl (2017): *Structural Vector Autoregressive Analysis*, Cambridge: CUP

Lütkepohl, H. and M. Krätzig (2004): *Applied Time Series Econometrics*, Cambridge: CUP

Lütkepohl, H. (2005): *New Introduction to Multiple Time Series Analysis*, Heidelberg, New York: Springer