

COURSE: High-dimensional time series analysis

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COURSE DESCRIPTION

Introduction to multivariate time series analysis. Crosscovariance matrix, spectral density matrix. Optimal linear prediction. Yule-Walker systems. Vector autoregressions. Sparse estimation of VAR models. Estimation of High-dimensional covariance and precision matrices with applications in finance. Shrinkage estimators. Factor models and their applications.

LEARNING OUTCOMES

- ✓ Out of sample forecasting
- ✓ Dimensionality reduction and data compression
- ✓ Measuring time varying association

METHODOLOGY

Theoretical lessons and classes

ASSESSMENT

Written exam; weighting: 70%

Group assignment, 30%

OUTLINE

1. Multivariate Time Series
2. Vector autoregressive model
3. Sparse estimation: soft and hard thresholding, shrinkage, lasso
4. High dimensional covariance and precision matrices
5. Factor models

READINGS

Ruey S. Tsay (2014), *Multivariate Time Series Analysis with R and Financial Applications*, Wiley, ISBN: 978-1118617908.

Web page for the textbook: <http://faculty.chicagobooth.edu/ruey.tsay/teaching/mtsbk/>

Mohsen Pourahmadi (2013), *High-Dimensional Covariance Estimation*, Wiley

Stock, J.H., and M.W. Watson (2011), Dynamic Factor Models, in Clements, M.P., and D.F. Hendry (eds.) *Oxford Handbook of Economic Forecasting*, Oxford University Press.

M Forni, M Hallin, M Lippi, L Reichlin (2000), The generalized dynamic-factor model: Identification and estimation, *Review of Economics and statistics*, 82, p. 540-554

Fan J., Liao Y, and Liu, H. (2016) An overview of the estimation of large covariance and precision matrices, *The Econometrics Journal*, Vol. 19, p C1-C32.