

Financial Analytics

Instructor: *I.VRONTOS*

Course Code: 61233

Course Type: Compulsory of Course Group 3

Course Level: Graduate (MSc)

Year of Study: A'

Semester: 2nd

ECTS: 7,5

Language: English

Course Description

This module provides a broad introduction to the theory and empirical analysis of econometric models to financial applications. Statistics/Econometrics is concerned with the systematic study of empirical financial problems using observed data. The aim of the course is to develop the relevant econometric tools for analyzing empirical problems in finance such as optimal portfolio construction, performance evaluation, and risk management among several others. It presents and introduces the multifactor model, the basic theory of stationary processes, the Autoregressive Moving Average (ARMA) models and develops analytically the Box-Jenkins methodology for the empirical analysis of financial time series models. The course introduces the class of conditional heteroscedastic models (ARCH/GARCH/EGARCH) and presents estimation and forecasting techniques for practical implementation. It introduces the multivariate factor models, as well as the multivariate heteroscedasticity models for the analysis of time-varying volatilities and covariances/correlations. It describes analytically several empirical financial problems such as portfolio construction, performance evaluation and risk management. Illustrative examples applying econometric models and techniques to actual financial and economic data are also presented using the R package. The empirical analysis consists of (i) unit root testing to exchange rate series and financial series, e.g. stocks and indices, (ii) modeling and forecasting financial return series, (iii) performance evaluation of fund investments, e.g. mutual and hedge fund investment returns, (iv) optimal portfolio construction, and (v) estimating and forecasting risk measures.

Prerequisites

The students should have a basic statistical background. Specifically, basic knowledge in the fields of probabilities and distributions will be necessary for this course.

Target Learning Outcomes

The aim of this module is to provide students with advanced statistical and econometric skills required to analyze empirical financial problems. On completion of this module, students will be able to:

- Implement statistical and econometric models and techniques for the analysis of financial time series
- use advanced econometric estimation techniques and tools to analyze models used in financial applications
- model the expected returns of financial assets

- model the variances and covariances/correlations of financial returns
- interpret the concepts of return and risk in financial markets
- forecast financial returns
- assess the performance of portfolio managers
- understand modern portfolio theory
- solve mean-variance optimization problems
- estimate the risk of financial assets

Recommended Bibliography

Recommended textbooks:

- Hamilton, James D. *Time Series Analysis*. Princeton, New Jersey: Princeton University Press, 1994.
- Enders, Walter. *Applied Econometric Time Series*. New York: Wiley, 2010.
- Tsay, Ruey S. (2010). *Analysis of Financial Time Series*, New York: Wiley.
- Cowpertwait, Paul S.P., and Metcalfe V. Andrew. *Introductory Time Series with R*. New York: Springer Texts in Statistics, 2009.
- Cryer, Jonathan D., and Chan Kung-Sik. *Time Series Analysis with Applications in R*. Springer Texts in Statistics, 2010.
- Elton, E.J., Gruber, M.J., Brown, S.J., and Goetzmann W.N. (2014). *Modern Portfolio Theory and Investment Analysis*, 9th edition, Wiley.
- Sharpe, W.F., Alexander, G.J., and Bailey, J.V. (1999). *Investments*, 6th edition, Prentice-Hall.
- Vrontos, I.D. (2016) *Financial Econometrics*, Lecture Notes (In Greek).

Other Useful textbooks:

- Gujarati, Damodar N. *Basic Econometrics*. New York: McGraw-Hill, 2008.
- Harvey, Andrew. *Time Series Models*. Cambridge: MIT Press, 1993.
- Hendry, David F. *Dynamic Econometrics*. Oxford: Oxford University Press, 1995.
- Pindyck, R.S. and D.L. Rubinfeld. *Econometric Models and Economic Forecasts*. New York: McGraw-Hill, 1991.
- Shumway, Robert H. and David S. Stoffer. *Time Series Analysis and Its Applications with R Examples*. New York: Springer Texts in Statistics, 2011.
- Wooldridge, Jeffrey. *Introductory Econometrics: A Modern Approach*. South-Western College Publishing, 2009.
- Engle, Robert F. and C.W.J. Granger (eds.). *Long-Run Economic Relationships: Readings in Cointegration*. Oxford: Oxford University Press, 1992.
- Granger, C.W.J. and Paul Newbold. *Forecasting Economic Time Series*. San Diego, CA: Academic Press, 1986.
- Banerjee Anindya, Juan Dolado, J.W. Galbraith, and David F. Hendry. *Co-integration, Error Correction, and the Econometric Analysis of Non-Stationary Data*. Oxford: Oxford University Press, 1993.

Teaching and Learning Activities

One three-hour lecture per week, study of the model theory, empirical applications in R package, programming exercises as homework (some to be submitted) and assignments.

Assessment and Grading Methods

The final grade is the weighted average of the final examination grade (weight 80%) and the grade of two homework assignments that will be submitted (weight 20%). Please note that one needs to pass the final exam, i.e. the final examination grade is at least 5/10 (independently of the grades in the homework assignments) in order not to fail the course.