**Content**

| Course Code | Course Name | Semester | Theory | Practice | Lab | Credit | ECTS |
|---|---|---|---|---|---|---|---|
| ECON419 | Financial Econometrics and Modeling | 7 | 3 | 0 | 0 | 3 | 6 |

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| Prerequisites | |
| Admission Requirements | |

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| Language of Instruction | French |
| Course Type | Elective |
| Course Level | Bachelor Degree |
| Objective | To model the dynamic functioning of financial systems.<br><br>To analyse the processes of price formation and evolution in financial markets.<br><br>To introduce the methods of dynamic analysis required to study these phenomena. |
| Content | The course covers the fundamental components of time series (trend, seasonality, cyclicality) and the concept of stationarity, followed by the model identification process using autocorrelation and partial autocorrelation functions. It addresses the construction, estimation, and diagnostic checking of autoregressive (AR), moving average (MA), ARMA, and ARIMA models within the Box-Jenkins methodology. In its later parts, the course provides an introductory treatment of conditional heteroskedasticity (ARCH/GARCH models) as well as cointegration and error correction models (VECM). All topics are supported by hands-on applications using statistical software<br><br>Dimension and space.<br><br>Information and knowledge.<br><br>Risk and uncertainty.<br><br>Systems theory.<br><br>Feedback systems.<br><br>Price formation and stochastic processes.<br><br>Linear and nonlinear processes.<br><br>The vector autoregressive (VAR) model.<br><br>Forecasting system outputs. |
| References | Gilboa, Decision making under risk and uncertainty<br>Kantz and Schreiber, Nonlinear Time Series Analysis<br>Kalman, System Theory<br>J.D. Hamilton Time Series Analysis |

**Theory Topics**

| Week | Weekly Contents |
|---|---|
| 1 | Structure and Functioning of Financial Systems: Foundations of Dynamic Modelling |
| 2 | Dimension, State Space, and Time in Dynamical Systems |
| 3 | Information, Knowledge, Expectations, and Price Formation in Financial Markets |
| 4 | Risk, Uncertainty, and Stochastic Modelling of Financial Prices |
| 5 | Systems Theory and Feedback Mechanisms in Financial Systems |
| 6 | Linear Dynamical Systems: Equilibrium, Stability, and Dynamic Analysis |
| 7 | Nonlinear Dynamics: Chaos, Bifurcations, and Attractors |

| Week | Weekly Contents |
|---|---|
| 8 | Financial Time Series: Stationarity, Dependence Structures, and Model Specification |
| 9 | Vector Autoregressive (VAR) Models: Theoretical Foundations, Estimation, and Diagnostic Testing |
| 10 | Dynamic Analysis of VAR Models: Granger Causality, Impulse Response Functions, and Variance Decomposition |
| 11 | Forecasting Financial System Outputs and Evaluating Forecast Performance |
| 12 | Complex Financial Systems: Leverage, Liquidity, Network Interconnections, and Systemic Risk |
| 13 | Modelling Financial Dynamics Using Statistical and Mathematical Software: Applications and Policy Analysis |
| 14 | |