



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Economiche, Aziendali e Statistiche		
ACADEMIC YEAR	2023/2024		
MASTER'S DEGREE (MSC)	STATISTICS AND DATA SCIENCE		
INTEGRATED COURSE	STATISTICAL METHODS AND MODELS FOR FINANCIAL MARKETS - INTEGRATED COURSE		
CODE	23158		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	SECS-S/03, SECS-S/01		
HEAD PROFESSOR(S)	VASSALLO ERASMO	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	VASSALLO ERASMO SOTTILE GIANLUCA	Professore Associato Ricercatore a tempo determinato	Univ. di PALERMO Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	<p>SOTTILE GIANLUCA Monday 10:00 12:00 Ufficio del docente Wednesday 10:00 12:00 Ufficio del docente</p> <p>VASSALLO ERASMO Monday 14:30 15:30 Ufficio docente o da remoto via Teams Tuesday 14:30 15:30 Ufficio docente o da remoto via Teams</p>		

DOCENTE: Prof. ERASMO VASSALLO

PREREQUISITES	The course requires knowledge of statistical inference, statistical modeling and programming in R. Basic knowledge of SAS and Python is also particularly useful.
LEARNING OUTCOMES	<p>Knowledge and understanding</p> <p>Acquire: 1. Statistical tools and techniques useful to the analysis of financial phenomena as well as measurement, estimation and interpretation with use of appropriate statistical software; 2. Understanding the evolution of financial phenomena, searching the sources of statistical data. 3. Skills on electronic spreadsheets, statistical and econometric software and skills on script writing with R.</p> <p>Applying knowledge and understanding</p> <p>Be able to: use independently statistical tools to answer financial questions and modeling and forecasting of short and long-term dynamics by using open-source softwares.</p> <p>Making judgments</p> <p>Be able to: identify scope and conditions of the proposed instruments, read correctly the results and evaluate their implications for analysis of the financial markets.</p> <p>Communication skills</p> <p>Be able to: explain conditions, tools and results of the analysis also to a non-technical audience through oral presentations or written reports.</p> <p>Learning skills</p> <p>Be able to: consult official reports and statistics from Istat, OECD, Eurostat, Bank of Italy, Italian stock exchange, etc. and relative scientific publications with analysis of the national and international literature.</p>
ASSESSMENT METHODS	<p>Written and oral test for both courses. The final mark takes into account both tests. The written exam focuses on practical skills and interpretation about the resolution of a problem of financial statistics usually with the use of a statistical model for time. During the course, the teacher will share a short article (or more than one), a book chapter, or a part thereof in English with the students, which will be the subject of analysis and debate, also aimed at a presentation or independent discussion by the students.</p> <p>series or cross-section series. The written test takes about an hour and it is structured so that the student can successfully use different strategies and alternatives analysis. In particular, it is required attention to meaning and interpretation of the data and results. The oral exam is focused on all the topics of the syllabus and, besides, mathematical and statistical proofs or short exercises can be requested. The oral exam takes about half an hour. The student's assessment takes into account some factors in both written exam and oral exam: knowledge of concepts and subjects, practical use skills, proper use of statistical language. For each of these 3 dimensions is given a rating: absent, poor, adequate, good, excellent. The minimum rating 18 is given in the case of sufficient knowledge of the arguments, while the maximum rating 30 is attributed to a full and mature knowledge of the arguments. The overall evaluation is a simple mean of the two evaluations for the two tests. Only if reports and homework are carried out during the course and such as to be sufficient to evaluate the student's skills, the student can request to use the evaluation of the reports in place of the traditional exam.</p>
TEACHING METHODS	Lessons in classroom, specific lectures, tutorials, labs and homeworks with wide use of R statistical software. Preparation of teaching materials and slides uploaded on the course website. Comparison with Python procedures. During the course it will be possible to organize workgroups, analysis and reports, autonomous presentations of the students also in homework mode to be discussed in the classroom. Free participatory software such as kahoot, wooclap, etc. may be used.

**MODULE
STATISTICAL MODELS FOR VOLATILITY**

Prof. ERASMO VASSALLO

SUGGESTED BIBLIOGRAPHY

- 1- Lai T.L. e Haipeng X. (2008). Statistical Models and Methods for Financial Markets. Springer: New York. (Capp: 2, 4, 8 e 11). ISBN 978-0-387-77827-3, ed.2008.
- 2- Ruppert D. (2004). Statistics and Finance. Springer: New York. (Capp: 2, 3, 10 e 11). ISBN 978-1-4419-6876-0, ed.2004.
- 3- Tsay R.S. (2010). Analysis of Financial Time Series. Wiley: New York. (Capp: 1, 2 3, 7, 8 e 10). ISBN: 978-0-470-41435-4, ed. 3-2010.
- 4- Vassallo E. (2018). Statistica Economica con R. Amazon: Dublin. ISBN: 978-1977619426, ed.2018.
- 5- Slide e materiali aggiuntivi del docente con approfondimenti teorici e specifiche applicazioni sui software R, SAS e Python. I materiali vengono caricati sul portale didattico.

AMBIT	21031-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	108
COURSE ACTIVITY (Hrs)	42

EDUCATIONAL OBJECTIVES OF THE MODULE

The student will acquire knowledge and skills useful to the professional activities involved in the analysis of financial markets and market risk, in order to plan the best portfolio investments. The student must acquire skills on theoretical and practical elements aimed at analyzing financial systems and financial markets by providing the necessary tools to the professional activities. In addition, the student will acquire knowledge about the main features of these systems and will have the ability to assess their special features.

SYLLABUS

Hrs	Frontal teaching
6	Financial instruments. Prices and financial returns. Index numbers of equity markets and use of index numbers in the financial and banking sector. Linear and nonlinear models. Complete specification tests for economic analysis models (functional specification, homoskedasticity, restrictions, etc.).
6	Financial time series; stationary and volatility. Arima models.
6	Arch / Garch models, symmetric and asymmetric models with normal and non-normal distributions.
6	CCC and DCC Multivariate Garch and VaR. Financial instruments.
Hrs	Practice
6	Statistical sources of the financial and banking data. Use of R, SAS, PYTHON softwares.
6	Statistical applications with real data through different statistical software. Further examples also with Gretl and Stata.
6	Analysis with specific R/Python libraries

**MODULE
PENALIZED STATISTICAL MODELS**

Prof. GIANLUCA SOTTILE

SUGGESTED BIBLIOGRAPHY

Books for nonlinear regression:

- C. Ritz, J.C. Streibig (2008). Nonlinear Regression with R. Springer New York, NY. (Chap. 1, 2, 3, 4, 5, 6, 7)
- D.M. Bates, D.G. Watts (1988). Nonlinear Regression Analysis and Its Applications (Chap. 2, 3, 4, 6, 7)
- S. Huet, A. Bouvier, M.A. Poursat, E. Jolivet (2004). Statistical Tools for Nonlinear Regression: A Practical Guide With S-PLUS and R Examples. (Chap. 1, 2, 3, 4, 5, 6, 7)
- R. Koenker (2005) Quantile Regression. Cambridge University Press. (Chap. 2, 3, 4, 6, 7)
- C. Davino, M. Furno, D. Vistocco (2013). Quantile Regression: Theory and Applications. Wiley Series in Probability and Statistics. (Chap. 1, 2, 3, 4, 6)

AMBIT	21031-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	54
COURSE ACTIVITY (Hrs)	21

EDUCATIONAL OBJECTIVES OF THE MODULE

The student will acquire the necessary knowledge and skills for the professional activities involved in the analysis of the financial markets. One of the goals is to provide the student with the theoretical and practical elements for an analysis of the financial system and the financial market by providing the necessary tools for professional activities. In addition, the student will acquire knowledge of different statistical methods applicable to these markets and be able to assess the unique characteristics and compare and discuss the results.

SYLLABUS

Hrs	Frontal teaching
2	Introduction to financial markets, and review of the multiple linear regression model
5	General and computational aspects of non-linear regressions
5	General and computational aspects of quantile regression and its extensions to non-linear models
Hrs	Practice
5	Forecasting applications through the use of non-linear regressions
4	Forecasting applications through the use of non-linear quantile regressions