Time series analysis

Academic Year: (2019 / 2020) **Review date: 19/05/2020 10:33:29**

Department assigned to the subject: Statistics Department

Coordinating teacher: ALBARRAN LOZANO, IRENE

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Actuarial Statistics

OBJECTIVES

The ultimate goal of this course is to provide the student knowledge and understanding of Time Series models that allow you to analyze stochastic phenomena they evolve over time. Special emphasis is placed on those models that, later, will be useful in the subjects engaged in Dynamic Financial Analysis.

Specific skills: to acquire knowledge and understanding to:
1. Understand and interpret the main characteristics that are present in the time series: trend, seasonality, temporal dependence stationary and innovations.
2. Use and interpret some of the dynamic univariate models which can be asked about such series. Specifically, the univariate models deterministic and ARIMA.
3. Generating and interpreting predictions by these models.
4. Use and interpret the GARCH models to measure the volatility associated with a particular financial asset.
5. Use volatility estimates to get prediction intervals to take into account whether at the time of this prediction, the market is in a very volatile time or not.
6. Learn the application of the foregoing on real series, using specific software.

Transferable skills:
1. Capacity for synthesis and analysis.
2. Knowledge of econometric software and the incorporation of the same in the professional work in the field of insurance and finance.
3. Learning of the follow-up to the economic reality and as such is emerging in the time and the use of econometric models to understand it.
4. Team work.
5. Critical reasoning.
Oral and written communication.

DESCRIPTION OF CONTENTS: PROGRAMME

The course starts by providing to the student knowledge and comprehension of the different types of information that were generated in the shape of time series, so that it could study in depth the properties of the same ones. With it it happens(passes) to be analyzed: a) the evolution that the local averages of the above mentioned information usually show, so much in the shape of systematical growth (that gathers the trend evolution from the analyzed dynamic phenomenon), as in cyclical form of annual regularity (seasonal nature); and b) the existing temporary dependence on the deviations that the real(royal) information shows on the mentioned footpath of tendency and seasonal nature: (stationary) short term oscillations. On the base of the previous thing the models interfere univariantes to explain the generation of individual series, using initially the hypothesis of which suspense does not exist on the future of the tendency and of the seasonal nature (you structure deterministes), to contemplate later schemes of unitary roots in which such components incorporate in every moment of the time shocks random (unpredictable), that are perpetuated towards the future, introducing this way the models ARIMA.

The course finishes with an introduction the models GARCH and the stochastic volatility models, that allow to represent the suspense of series of financial yields. The above mentioned models are implemented to obtain estimations of the volatility of real series. Also management of the risk illustrates its importance in some financial models like, such as models of the valuation of financial assets or risk management.

Each topic exercises must be conducted using the R software.

PROGRAM
Topic 1. Introduction. Classic approach of analysis of series of time: descriptive study of temporary series.
Topic 2. Box-Jenkins methodology.
Topic 3. Regression models for stationary and non-stationary time series.
Topic 4. Linear stationary models for time series.
Topic 5. Linear non-stationary models.
Topic 6. ARIMA model.
Topic 7. Conditional Heteroscedastic models: ARCH y GARCH.

LEARNING ACTIVITIES AND METHODOLOGY

Learning of this subject will be eminently practical. The course will have a part presencial in the classroom where both slate and audio-visual means will be used to present the abstract concepts (1 ECTS).

Also, practical classes will be realized in the computer classrooms where the students will learn to use the necessary software to implement the models in real data (0.5 ECTS).

Finally, after every module of the programme, the students will realize an empirical work with real(royal) information that will have to exhibit later in the classroom (1.5 ECTS).

ASSESSMENT SYSTEM

% end-of-term-examination/test:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

The 50% of the final grade will be obtained through a final review of evaluation of the acquired knowledge. The remaining 50% will be the result of continuously evaluating the student's ability to assimilate the knowledge and skills acquired to undertake practical work of data analysis and to expose the results you get.

In extraordinary exams: the most favorable criteria will be applyed between the continuous assessment system and 100% of the final exam.

BASIC BIBLIOGRAPHY

- BOX, G.E.P. Y JENKINS, T. Time Series Analysis, forecasting and control, Holden-Day, 1970

- COWPERTWAIT, P.S.P. and METCALFE, A.V. Introductory Time Series with R, Springer-Verlag , 2009

- MILS, TC Time series techniques for economists, Cambridge, 1990

- REINSEL,G.C. Elements of Multivariate Time Series Analysis (2nd edition), Springer., 1997

ADDITIONAL BIBLIOGRAPHY

- BROCKWELL, P.J. DAVIS, R.A. Introduction to Time Series and Forecasting (2nd edition), Springer. , 2002

- BROOKS, C. Introductory Econometrics for Finance, Cambridge. , 2002

- DAVIDSON, R., MACHINNON, J.C. Econometric Theory and Methods, Oxford. , 2004

- ENDERS, W. Applied Econometric Time Series (2nd edition), Wiley. , 2004

- KENNEDY, P. A guide to Econometric (5th edition), Blackwell, 2003