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AI en Finance

Academic Year: (2023 / 2024)   **Review date: 31-05-2022**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: PARRADO HERNANDEZ, EMILIO

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)
- Basic statistics
- Programming, ideally in python
- Basic machine learning, not mandatory

OBJECTIVES
- To understand basic concepts about financial markets, financial products and the different agents and institutions that operate in the financial markets
- Identify different scenarios of application of AI techniques in problems related with finance
- Understand and work in typical use cases of the application of AI techniques in financial markets

DESCRIPTION OF CONTENTS: PROGRAMME
1. Introduction to financial products, markets and institutions
1.1 Financial markets and institutions
1.2 Principal markets and indices
1.3 Financial services for retail costumers, corporate clients and investment banks
1.4 Fixed Income
1.5 Equity
1.6 Foreign Exchange
1.7 Derivatives
1.8 Regulation

2. Market structure

2.1. Macrostructure
2.1.1 Auctions
2.1.2 Order books, types of orders, OTC trading
2.1.3 Market making
2.1.4 Low latency trading and high frequency trading

2.2 Microstructure
2.2.1 Limited order books
2.2.2 Empirical analysis of financial data: returns, price correlations, volatility, intraday liquidity
2.2.3 Market Impact

3. Algorithmic trading
3.1 Introduction to trading
3.2 Data sources
3.3 Trading strategies
3.4 Backtesting

4. Roboadvisors
4.1 Introduction to roboadvisors
4.2 Roboadvisors platforms
4.3 Regulation

5. Sentiment analysis
5.1 Introduction to Natural Language Processing
5.2 Applications of sentiment analysis in finance

6. Analysis of Market Regimes with artificial intelligence
6.1 Introduction to machine learning for time series
6.2 Hidden Markov Models
6.3 Characterization of market regimes with Hidden Markov Models

7. Portfolio management
7.1 Introduction to investing portfolios
7.2 Portfolio configuration
7.3 Portfolio management with machine learning

ASSESSMENT SYSTEM

Continuous evaluation: three projects related with three of the blocks of the course. For each project the students will need to hand in a python notebook. Students will be allowed to work in groups.

Final written exam about the contents of the course

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

 - Marcos López de Prado Advances in Financial Machine Learning, John Wiley & Sons Inc, 2018

 - Robert Kissell The Science of Algorithmic Trading and Portfolio Management: Applications Using Advanced Statistics, Optimization, and Machine Learning Techniques, Academic Press, 2013