Academic subject: Econometrics and Portfolio Theory			
Degree Class:LM-40 – Matematica		**Degree Course:** Mathematics	**Academic Year:** 2020/2021
		Kind of class: Mandatory/Optional depending on the Curriculum	**Year:** 2 **Period:** 1
			ECTS: 7 divided into **ECTS lessons: 6.5** **ECTS exe: 0.5**
Time management, hours, in–class study hours, out–of–class study hours lesson: 52 exe: 8 in–class study: 60 out–of–class study: 115			
Language: Italian	**Compulsory Attendance:** no		
SubjectTeacher: Lorenzo D'Ambrosio	**Tel:** 0805442692 **e–mail:** lorenzo.dambrosio@uniba.it	**Office:** Department of Mathematics Room 16, III Floor	**Office days and hours:** Thursday 12-13 or by appointment
Prerequisites: Linear Algebra; Several variables calculus; A First Course of Calculus of Probability			
Educational objectives: **Econometrics:** Economic data analysis – Design and estimate of suitable econometric models. **Portfolio Theory:** Analysis of assets protfolios.			
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** 1) Estimate methods and estimator properties. 2) Test design for linear and nonlinear hypotheses. 3) Design of some diagnostic tests. **Applying knowledge and understanding:** Design of a suitable econometric model starting from real or simulated economic data, by using gretl **Making judgements:** Know how to provide theoretical grounds for the employed methodologies. **Communication:** Know how to use a suitable language to describe and solve problems. **Lifelong learning skills:** Operate independently to design models for economic data analysis		

Course program

Portfolio theory

1. **Introduction.** Financial transactions. Bonds and coupons, shares, dividends. Markets: primary market, secondary, OTC regulated. Contracts: forwards, futures, options. Derivatives and structured securities. Capitalization and discount. Examples of arbitrage. Computation of interest in a simple, compound and continuous capitalization scheme.

2. **Formal definitions of a cash flow stream.** Theory of financial equivalence. The value function in a spot contract. The value function of a forward contract: time-uniformity property. Discount and capitalisation factors: time-homogeneity property, the spot-forward consistency assumption, the separation property. Rates and yields with respect to a finite horizon: equivalent rates. Instantaneous rate: time-homogeneous laws, separable laws. Yield to maturity: equivalent yields. Linear and hyperbolic laws. Linearity of present value: value of a financial operation in an arbitrary point of time, fairness, internal rate of return with respect to a given value.

3. **Value and market prices function.** The characteristic assumptions of the market. Zero coupon bonds. Forward contracts. Implicit interest rate.

4. **The term structure of interest rates.** Spot term structures. Implied term structures.

5. **Evaluations of financial transactions.** Annuities and amortization plans. Present value of fixed and variables annuities. Internal rate of return of a financial transaction. Internal rate issues.

6. **Introduction to uncertainty analysis.** Return on a stock and a portfolio. Risk and aversion to risk. Short selling. Diversification. Set of opportunities. Set of least variance. Efficient portfolio. Efficient boundary.

7. **Portfolios of Risky Securities.** Portfolios consisting of two risky securities. Convexity and connection of the portfolio opportunities with any number of risky securities. Structure of the set of minimum variance and of the efficient frontier with any number of risky securities. Portfolio of minimum variance and portfolio of diversification. Equation of the efficient frontier. Portfolios theorem composed only of risky securities (Two Funds Theorem).

8. **Portfolios with a non-risky security.** Structure of the set of minimum variance and the efficient frontier with a non-risky title. Theorem of the two funds with non-risky title (Theorem of a single fund).

9. **Capital AssetPricing Model**. Market equilibrium. Capital market line. Beta of a portfolio. CAPM and price of the certainty equivalent.

Econometrics:
1. Regression Models
2. The geometry of linear regression
3. Statistical Properties of OLS Estimates

Teaching methods:
Lectures and exercise sessions

Auxiliary teaching:

Assessment methods:
Econometrics: Written and Oral exam

Bibliography:
Econometrics
1) R. Davidson – J.G. MacKinnon, Econometric Theory and Methods, Oxford University Press, 2004
2) Lecturer's notes

Portfolio Theory

3) D. Luenberger, Investimenti e Finanza, Casa Editrice Apogeo, Milano, 2007.

4) Castellani, De Felice, Moriconi, Manuale di finanza I, il Mulino

5) Castellani, De Felice, Moriconi, Manuale di finanza II, il Mulino