FINANCIAL MARKETS AND INVESTMENTS

MASTER IN MATHEMATICAL FINANCE
MASTER IN ACTUARIAL SCIENCES
2020 – 2021

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SYLLABUS

PART I – FINANCIAL MARKET STRUCTURE AND INSTRUMENTS

1. Market Organization and Structure
   1.1. Functions of the financial system
   1.2. Market Classification
   1.3. Financial assets Classification
   1.4. Trading in financial markets
   1.5. Security Market Indices

2. Equity Markets

3. Fixed-income Markets
   3.1. Defining elements
   3.2. Issuance, Trading and Funding
   3.3. Asset-backed Securities

4. Derivatives
   4.1. Basic Elements
   4.2. Forwards and Futures
   4.3. Option Contracts
   4.4. Swaps

5. Pooled Investments
   5.1. Investment Funds
   5.2. The process of portfolio management

PART II – THEORY OF PORTFOLIO MANAGEMENT

1. Portfolio Concepts
    1.1. Definitions of risk and return
    1.2. Emergence of portfolio theory

2. Mean – Variance Theory (MVT)
    2.1. Efficient Portfolios: the two-asset case
    2.2. Portfolios with a risk-free asset
    2.3. Finding the efficient Frontier
    2.4. Safety restrictions
    2.5. Internationally diversified portfolios

3. Return Generating Models
    3.1. Single-factor models
    3.2. Multi-factor Models
    3.3. Estimation risk versus model risk

PART III – SELECTING OF OPTIMAL PORTFOLIOS

1. Expected Utility Theory (EUT)
    1.1. Introducing utility
    1.2. Utility and risk aversion
    1.3. Foundations of utility theory
    1.4. Risk Tolerance functions
    1.5. Optimal Portfolios
    1.6. Basics on prospect theory

2. Alternatives to Utility
    2.1. Maximizing long-term growth
    2.2. Stochastic Dominance
    2.3. Safety Criteria
    2.4. Value-at-Risk
    2.5. Conditional expected shortfall
    2.6. Other risk issues

PART IV – MODELS OF EQUILIBRUM IN CAPITAL MARKETS

1. The Capital Asset Pricing Model (CAPM)
   1.1. Assumptions of standard CAPM
   1.2. Using CAPM
   1.3. Empirically testing CAPM

2. The Arbitrage Pricing Theory (APT)
   2.1. Assumptions of APT
   2.2. Estimating and testing APT
   2.3. APT versus CAPM

3. Market Efficiency
   3.1. Forms of efficiency
   3.2. Testing market's efficiency
   3.3. Week versus strong arbitrage

4. Behavioral Finance
   4.1. Anomalies in financial markets
   4.2. Behavioral issues and APT
   4.3. Anomalies in financial markets

BIBLIOGRAPHY

Textbooks
Joshi, M. S., and J. M. Paterson (2013). *Introduction to mathematical portfolio theory*. Cambridge University Press.

Elton E.J., M. J. Gruber, S. J. Brown and W. N. Goetzmann (2014), *Modern Portfolio Theory and Investment Analysis*, 9th Edition, Wiley.

Lecture Notes
Gaspar R.M. (2020), *Investments and Portfolio Management*, preprint.

ASSESSMENT

Students are evaluated based upon:
- Written Exam   70%
- Computer Exam   30%

CALENDAR

In this course there are both regular LECTURES and TUTORIALS.

LECTURES are of 3h per week – <u>Fridays from 10h to 13h.</u> LECTURES are <u>both presential (room: AF21, F1) and online (via MS TEAMS)</u>. Students must follow ISEG's rules about which students are allowed in the campus each week (see also concrete calendar below). When not allowed in the campus, students must attended lectures online.

TUTORIALS are of 45min per week and always take place <u>online</u>, on <u>Tuesdays, from 9h to 9.45h</u>.

Online QUIZES

During some of the tutorials students get the chance to see if they are following the materials via 4 online Quizzes. For tentative dates see the detailed schedule below.

Presential Lectures at ISEG

Health restrictions: Whenever allowed to be present at ISEG's campus, students must: (i) wear face masks all the time in the entire campus (including classrooms), (ii) keep physical distance (2 meters) from colleagues, professors and ISEG's staff, (iii) follow any other rules that DGS (the Portuguese Health Authority) may impose during the semester.

Electronic restrictions: When present in classrooms, students should ideally keep all electronic devices (computers, tablets, mobiles, etc.) totally turned off. If absolutely necessary they should at least be in mute mode, with cameras and microphones off, in order not to interfere with the professor's/room's network and devices, crucial to live stream the class to those that cannot be in the campus.

Students that do not obey DGS and/or the electronic rules described above, cannot attend presential classes. Students that belong to risk groups or feel sick should inform ISEG's administrative staff and should take all classes online.

Detailed Schedule

Find below a detailed schedule for this course that already account for the "Future U" week break, holidays, etc. <u>There may be minor schedule changes during the semester</u>. Those are always announced on AQUILA and TEAMs.

Date and Time	Group	Class Type	Place	Other Info
Week 1 – Only allowed on campus students with **ODD numbers**				
2020.09.15 TUE 09.00 – 09.45	S01	Tutorial 1	Online	Course Presentation
2020.09.18 FRI 10.00 – 13.00	S01	Lecture 1	AF21, F1 + Online	
Week 2 – Only allowed on campus students with **EVEN numbers**				
2020.09.22 TUE 09.00 – 09.45	S01	Tutorial 2	Online	StockTrak 1
2020.09.25 FRI 10.00 – 13.00	S01	Lecture 2	AF21, F1 + Online	
Week 3 – Only allowed on campus students with **ODD numbers**				
2020.09.29 TUE 09.00 – 09.45	S01	Tutorial 3	Online	StockTrak 2
2020.09.30 FRI 10.00 – 13.00	S01	Lecture 3	AF21, F1 + Online	
Week 4 – **NO students** allowed on campus. **"Future U" week with digital career related activities**. No regular classes.				
Week 5 – Only allowed on campus students with **EVEN numbers**				
2020.10.13 TUE 09.00 – 09.45	S01	Tutorial 4	Online	QUIZ 1
2020.10.16 FRI 10.00 – 13.00	S01	Lecture 4	AF21, F1 + Online	

		Week 6 – Only allowed on campus students with **ODD numbers**		
2020.10.20 TUE 09.00 – 09.45	S01	Tutorial 5	Online	Exercises 1
2020.10.23 FRI 10.00 – 13.00	S01	Lecture 5	AF21, F1 + Online	

		Week 7 – Only allowed on campus students with **EVEN numbers**		
2020.10.27 TUE 09.00 – 09.45	S01	Tutorial 6	Online	Exercises 2
2020.10.30 FRI 10.00 – 13.00	S01	Lecture 6	AF21, F1 + Online	

		Week 8 – Only allowed on campus students with **ODD numbers**		
2020.11.03 TUE 09.00 – 09.45	S01	Tutorial 7	Online	QUIZ 2
2020.11.06 FRI 10.00 – 13.00	S01	Lecture 7	AF21, F1 + Online	

		Week 9 – Only allowed on campus students with **EVEN numbers**		
2020.11.10 TUE 09.00 – 09.45	S01	Tutorial 8	Online	Exercises 3
2020.11.13 FRI 10.00 – 13.00	S01	Lecture 8	AF21, F1 + Online	

		Week 10 – Only allowed on campus students with **ODD numbers**		
2020.11.17 TUE 09.00 – 09.45	S01	Tutorial 9	Online	Exercises 4
2020.11.20 FRI 10.00 – 13.00	S01	Lecture 9	AF21, F1 + Online	

Week 11 – Only allowed on campus students with **EVEN numbers**				
2020.11.24 TUE 09.00 – 09.45	S01	Tutorial 10	Online	QUIZ 3
2020.11.27 FRI 10.00 – 13.00	S01	Lecture 10	AF21, F1 + Online	

Week 12 – Only allowed on campus students with **ODD numbers**				
2020.12.01 TUE 09.00 – 09.45	NATIONAL HOLIDAY, NO TUTORIAL			
2020.12.04 FRI 10.00 – 13.00	S01	Lecture 11	AF21, F1 + Online	

Week 13 – Only allowed on campus students with **EVEN numbers**				
2020.12.08 TUE 09.00 – 09.45	NATIONAL HOLIDAY, NO TUTORIAL			
2020.12.10 FRI 10.00 – 13.00	S01	Lecture 12	AF21, F1 + Online	

Week 14 – **NO students** allowed on campus. **MFWs defenses week**. Online classes.				
2020.12.15 TUE 09.00 – 09.45	S01	Tutorial 11	Online	QUIZ 4
2020.11.20 FRI 10.00 – 13.00	S01	Lecture 13	AF21, F1 + Online	