4MFCEZ41 – Financial Modeling and Applications

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Department: MSO
Semester: 2
Program: M1 Finance

Course level: Graduate
Domain: Management (Finance)
Teaching language: English (or French)
Number of in-class hours: 36
Number of course sessions: 7 x 3-hour classes + 10 x 1.5-hour tutorial sessions + Exam
ECTS: 6

Course description and objectives

The objective of this course is to show how to use Excel and VBA (Visual Basic for Applications) programming for financial modeling.
The course is divided in two parts.

Part 1 aims at presenting the main features of the VBA programming language in Excel. The course first covers the Excel object model: What are Excel objects, how do they behave and how are they organized? This is an important issue as understanding the Excel object model is a precondition for writing computer codes that are able to interact with Excel objects. The course then moves to the VBA language features: projects, modules, sub and function procedures, variable types and control structures (conditional statements and loop).

Part 2 shows how to use VBA programming in Excel to solve typical finance problems with real datasets. Chapter one is about the properties of stock returns. In application number one, we will see how to generate automatically summary statistics for a sample of stocks (mean return, volatility, skewness and kurtosis) while application number two will cover the estimation of the empirical density of returns using a kernel estimator. Chapter two covers portfolio theory by analyzing (through simulation), the effect of diversification on risk before moving to the computation of efficient portfolios and the efficient frontier using the Excel solver optimization toolbox. Chapter three is about option pricing. It shows first how to implement the Black-Scholes option pricing formula, and the Cox-Ross-Rubinstein (binomial) model for plain vanilla options. It also shows how to extend the binomial approach to price American options and barrier options and how to implement numerical algorithms that allow to invert these pricing methods to infer implied volatility Finally, it introduces Monte Carlo simulations for the pricing of path-dependent options.

Prerequisites

- Programming: basic knowledge (variables, tests, loops)
- Maths and statistics: basic linear algebra (matrix operations), basic statistics (basic moment estimators, joint distributions)
- Finance: portfolio theory (return, risk, diversification, efficient portfolio and efficient frontier), option markets (put and call option payoffs, option value determinants), option pricing basics (no arbitrage, binomial tree)

Assignments and grading

- 1 final exam (50%), 1 project (35%), class-participation (15%)

The numerical grade distribution will dictate the final grade. The passing grade for a course is 10/20.

Class participation: Active class participation – this is what makes classes lively and instructive. Come on time and prepared. Class participation is based on quality of comments, not quantity.
Exam policy: In the exam, students will not be allowed to bring any document (except if allowed by the lecturer). Unexcused absences from exams or failure to submit cases will result in zero grades in the calculation of numerical averages. Exams are collected at the end of examination periods.

Course structure

Session	Topic
	PART 1 – VISUAL BASIC FOR APPLICATIONS (VBA) IN EXCEL
1	CHAPTER 1: EXCEL OBJECT MODEL
2	CHAPTER 2: STRUCTURE OF VISUAL BASIC PROJECTS
3	CHAPTER 3: VISUAL BASIC LANGUAGE
4	CHAPTER 4: MISCELLANEOUS
	PART 2 – FINANCIAL APPLICATIONS
5	CHAPTER 1: PROPERTIES OF STOCK RETURNS
6	CHAPTER 2: DIVERSIFICATION AND EFFICIENT FRONTIER
7	CHAPTER 3: OPTION PRICING
12	**Final Exam**

Bibliography

- Jackson M. and M. Staunton, Advanced Modelling inf Finance using Excel and VBA, Wiley

MyCourse

This course is on MyCourse: **Yes** (Class handouts downloadable there)

Academic integrity

Be aware of the rules in Université Paris Dauphine about plagiarism and cheating during exams. All work turned in for this course must be your own work, or that of your own group. Working as part of a group implies that you are an active participant and fully contributed to the output produced by that group.

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Academic calendar

Dates (Monday/Sunday)		MSO
		M1 droit / SG / S.ECO/S.SSO **
06/01/20	12/01/20	1
13/01/20	19/01/20	2
20/01/20	26/01/20	3
27/01/20	02/02/20	4
03/02/20	09/02/20	5
10/02/20	16/02/20	6
17/02/20	23/02/20	Holidays
24/02/20	01/03/20	7
02/03/20	08/03/20	8
09/03/20	15/03/20	9
16/03/20	22/03/20	10
23/03/20	29/03/20	11
30/03/20	05/04/20	12
06/04/20	12/04/20	Holidays
13/04/20	19/04/20	
20/04/20	26/04/20	Review w.
27/04/20	03/05/20	Exams
04/05/20	10/05/20	