MATLAB and Simulink Italian Academic Forum

Insegnare con MATLAB e Simulink

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https://it.mathworks.com/matlabcentral/fileexchange/73917-computational-finance-matlab-oriented-modeling

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Finanza Computazionale – Laurea magistrale in 'Finanza e impresa'

Road map

1. Part I: Programming techniques.
   - a Main programming schemes
   - b Elements of Linear Algebra
   - c Financial Mathematics
2. Part II: Asset Allocation.
   - d Probability Theory
   - e Univariate and multivariate Statistics
   - f Optimization
3. Part III: Pricing of derivative contracts.
   - g Further elements on Probability
   - h Stochastic processes
   - i Monte Carlo method

Prerequisites: Calculus, Financial mathematics

Crash course di MATLAB come ripasso

MODULE 1: Programming techniques for financial calculus		
Lesson	**Contents**	**Lab Exercises**
1	MATLAB basics; Preliminary elements	Ex. 12
2	Vectors and matrices; Standard operations of linear algebra; Element-by-element multiplication and division	Example 1-2 + Ex. 13
3	Colon (:) operator; Predefined and user-defined functions	Ex.14-15-16-17-18-19-21
4	M-file: Scripts and Functions	Example 3-4 + Ex. 33
5	Programming fundamentals: if, else, and elseif scheme	Example 5-6-7 + Ex. 22-23-26-28-29-30
6	Programming fundamentals: for loops	Example 8 + Ex. 27-34-35-37
7	Programming fundamentals: while loops	Example 9 + Ex. 36-41-42-43
8	MATLAB graphics	Example 10-11 + Ex. 38-39-40
9	portfolio of assets; term structure of spot and forward prices	Ex. 31-32-43-44-45-46-47-48-49
10	Net Present Value of assets; Amortization schedules	Ex. 50-51-52-53-54-55-56
11	Interest Rate Swap; Zero coupon swap curve; expected return and variance of a portfolio	Ex. 57-58-59-60

theory -> 30min || lab -> 90min

Benefici/valore aggiunto nell'uso di MATLAB

MODULE 2: Portfolio selection		
Lesson	**Contents**	**Lab Exercises**
12	Preliminary elements in Probability Theory and Statistics	Example 63-64-66-69-72-75-81-82
13	Random variables; Probability distributions	Example 88-93 + Ex. 95
14	Continuous random variables; probability distribution function; cumulative distribution function	Example 96 + Ex. 99
15	Higher-order moments and synthetic indices of a distribution; Uniform distribution	Example 101-102 + Ex. 100-103
16	Normal distribution	Example 105-106 + Ex. 107
17	Log-normal distribution; Chi-square distribution	Ex. 108-109
18	Student-t distribution; preliminary concepts on optimization; Linear Programming	Example 112 + Ex. 110
19	Quadratic Programming; Non-Linear Programming	Ex. 113-115
20	Multi-objective optimization; Efficient solutions and the efficient frontier; Portfolio of equities: Prices and returns	Ex. 117-119
21	Risk-return analysis; Mean-Variance model	Example 120 + Ex. 122-131-132
22	Capital Market Line; Market portfolio	Ex. 133
23	Effects of diversification for an Equally Weighted portfolio; Mean-Mean Absolute Deviation model	Ex. 134-135
24	Mean-Maximum Loss model; Value-at-Risk	Ex. 136-137
25	Mean-Conditional Value-at-Risk model; Mean-Gini model	Ex. 138-139
26	Bond portfolio immunization	Ex. 141-143-144-145

MODULE 3: Derivatives pricing		
Lesson	**Contents**	**Lab Exercises**
27	Further elements on Probability Theory and Statistics; Introduction to Monte Carlo simulation; Stochastic process; Discrete random walk	Ex. 146
28	Wiener process; Brownian motion	Ex. 154
29	Ito's Lemma; Geometric Brownian motion	Example 160 + Ex. 161-162
30	Pricing of derivatives with an underlying security; Binomial model; A replicating portfolio of stocks and bonds	
31	Calibration of the binomial model; Multi-period case	Ex. 165-168
32	Black-Scholes model; Pricing of a European call: the dynamics of the option price; a hedging strategy	
33	Pricing equation for a call; Implied Volatility; Option Pricing via the Monte Carlo Method; Path Dependent Derivatives	Ex. 174-175-177-179-180

theory -> 90min || lab -> 30min

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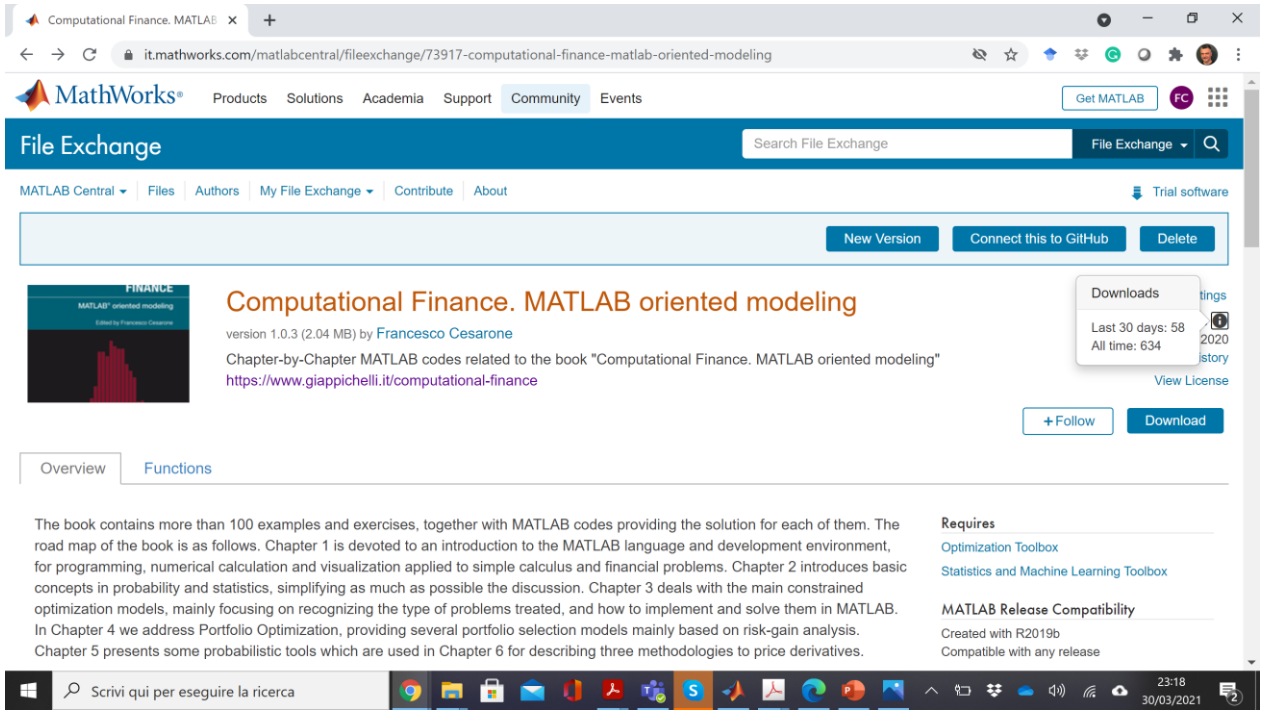
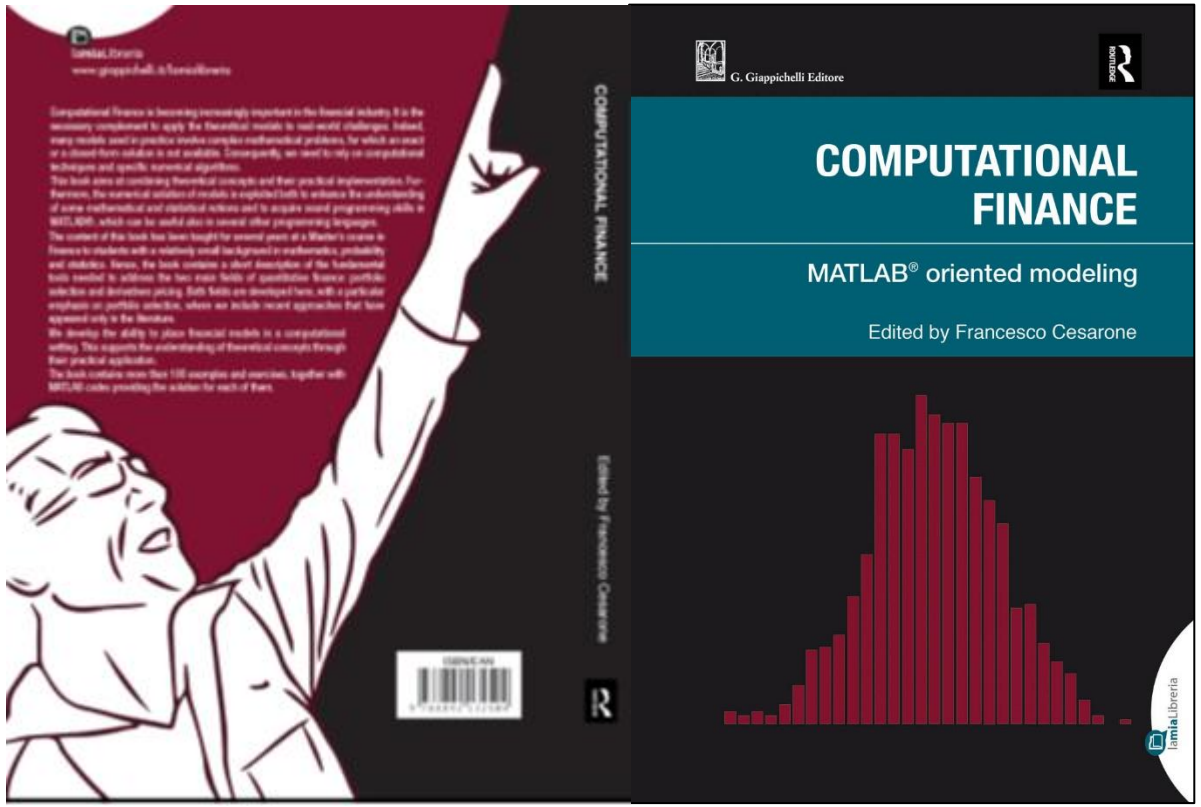
Risultati ottenuti, considerazioni personali





F Cesarone (2020), **Computational Finance. MATLAB oriented modeling**, Routledge-Giappichelli Studies in Business and Management, ISBN 978-0-367-49303-5

%% Grazie per l'attenzione