

Lectures on Financial Economics

by Antonio Mele

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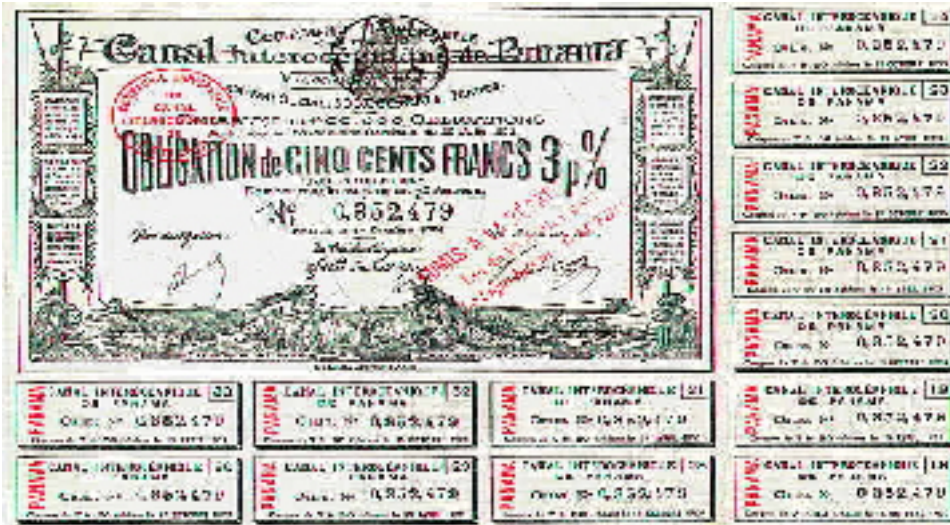
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January 2018

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Front cover explanations

Top: Illustration of the increased efficiency in maritime routing allowed by the Suez Canal (right panel) opened in 1869, and the Panama Canal (left panel) opened in 1913, two amongst the most enduring technological marvels with global economic and political implications.

Bottom: A 75 year 3% coupon bearing bond issued by the Panama Canal Company (“Compagnie Universelle du Canal Interocéanique de Panama”) in October 1884. The company defaulted in 1889 under the leadership of the Count Ferdinand de Lesseps, who during 1858 had also founded the Suez Canal Company (“Compagnie Universelle du Canal Maritime de Suez”).

Information about the author

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“Antonio Mele does not accept any liability for any losses related to the use of the models, data, and methods described or developed in these lectures.”

Contents

Introduction	15
I Foundations	29
1 The classic capital asset pricing model	30
1.1 Introduction	30
1.2 Portfolio selection	32
1.2.1 Wealth constraints	32
1.2.2 Portfolio choice: the “Capital Market Line”	32
1.2.3 Without the safe asset: the “Efficient Portfolio Frontier”	33
1.2.4 Risk-return trade-offs in the two asset case	34
1.2.5 The global minimum variance portfolio	35
1.2.6 The market portfolio	36
1.3 The CAPM	38
1.3.1 Restrictions on securities expected returns	39
1.3.2 Restrictions on alternative investment returns	40
1.3.3 Zero-beta CAPM	41
1.3.4 An excursion into risk-premiums and certainty equivalents	42
1.3.5 Back to CAPM: Equilibrium with expected utility	45
1.4 The APT	49
1.4.1 Exact APT	49
1.4.2 Risk-neutral tilts, or the fundamental theorem of asset pricing	50
1.4.3 Uncertainty and asset evaluation	53
1.4.4 The APT with idiosyncratic risk and a large number of assets	54
1.4.5 Systematic risk	55
1.5 Empirical evidence	55

1.5.1	Fama-MacBeth two-step regression	55
1.5.2	The high-beta anomaly	56
1.5.3	Macroeconomic forces	56
1.5.4	Fama & French model	56
1.5.5	“Lucky factors”	58
1.6	Market practice	58
1.6.1	Risk-parity	58
1.6.2	Black-Litterman	58
1.6.3	Smart beta	58
1.6.4	Factor investing	58
1.7	Appendix 1: Details regarding portfolio choice	59
1.7.1	The primal program	59
1.7.2	The dual program	60
1.7.3	Efficient portfolios generate efficient portfolios	61
1.7.4	Covariance of global minimum variance and efficient portfolio returns . .	61
1.8	Appendix 2: The market portfolio and the security market line	62
1.8.1	The tangent portfolio is the market portfolio	62
1.8.2	Tangency conditions	62
1.8.3	An alternative derivation of the SML	63
1.9	Appendix 3: Risk and risk aversion	64
1.9.1	Modeling and approximating risk-premiums	64
1.9.2	Stochastic dominance and mean-preserving spreads	66
1.10	Appendix 4: Money demand and liquidity traps	69
	References	71
2	Arbitrage, equilibrium and pricing	73
2.1	Introduction	73
2.2	The static general equilibrium in a nutshell	75
2.2.1	Walras’ Law	76
2.2.2	Competitive equilibrium	76
2.2.3	Optimality	77
2.3	The role of financial securities in markets with uncertainty	81
2.3.1	Commodity markets	81
2.3.2	Financial securities and rational expectations	82
2.3.3	Securities prices as shadow values	83
2.3.4	Gambles and securities	83
2.3.5	Arrow-Debreu securities	86
2.4	Arbitrage and replication: Introduction	88
2.4.1	Rain and sunshine	89
2.4.2	Replication and pricing: the role of complete markets	91
2.5	No-arbitrage: theory	92
2.5.1	Lands of Cockaigne	92
2.5.2	Enforced asset prices	93

2.6	Equivalent martingales, and equilibrium	95
2.6.1	Rational expectations	96
2.6.2	Stochastic discount factors	97
2.6.3	Equilibrium	98
2.7	Consumption-CAPM	104
2.7.1	Risk-neutral pricing and macroeconomic risks	104
2.7.2	The beta relation	106
2.7.3	CCAPM & CAPM	106
2.8	Infinite horizon	107
2.9	Further topics on incomplete markets	107
2.9.1	Nominal assets and real indeterminacy of the equilibrium	107
2.9.2	Nonneutrality of money	108
2.10	Appendix 1	110
2.11	Appendix 2: Proofs of selected results	111
2.12	Appendix 3: The multicommodity case	114
	References	116
3	Infinite horizon economies	117
3.1	Introduction	117
3.2	Consumption-based asset evaluation	117
3.2.1	Recursive plans: introduction	117
3.2.2	Asset pricing: the marginalist argument	119
3.2.3	Intertemporal elasticity of substitution	119
3.2.4	Lucas' model	120
3.3	Production: foundational issues	124
3.3.1	Decentralized economy	124
3.3.2	The social planner solution	125
3.3.3	Dynamics	126
3.3.4	Stochastic economies	128
3.4	Production-based asset pricing	133
3.4.1	Firms	133
3.4.2	Consumers	136
3.4.3	Equilibrium	137
3.5	Money, production and asset prices in overlapping generations models	137
3.5.1	Introduction: endowment economies	137
3.5.2	Diamond's model	140
3.5.3	Money	140
3.5.4	Money in a model with real shocks	145
3.5.5	Sunspots	145
3.6	Optimality	145
3.6.1	Production economies	145
3.6.2	Over-accumulation of capital	146
3.6.3	Bubbles	147

3.6.4	Money	147
3.7	Appendix 1: Finite difference equations, with economic applications	148
3.8	Appendix 2: Neoclassic growth in continuous-time	152
3.8.1	Convergence from discrete-time	152
3.8.2	The model	153
3.9	Appendix 3: Notes on optimization of continuous time systems	155
	References	158
4	Information, security design and financial contracting	159
4.1	Introduction	159
4.2	Theoretical challenges to frictionless markets: information problems	159
4.2.1	The economics of information	160
4.2.2	Adverse selection	162
4.2.3	Moral hazard	163
4.2.4	Signaling	170
4.3	The classics: capital structure and Modigliani-Miller propositions	170
4.3.1	The irrelevance of debt	170
4.3.2	Irrelevance through Arrow-Debreu security pricing	171
4.3.3	The cost of capital and financial frictions	171
4.4	Symmetric information again: full insurance	172
4.5	Debt and moral hazard	173
4.6	Debt and adverse selection with costly state verification	175
4.7	Capital structure and incomplete contracting	175
4.8	Appendix 1: Details regarding debt and moral hazard	176
	References	177
5	Continuous time models	179
5.1	Introduction	179
5.2	An introduction to no-arbitrage and equilibrium	180
5.2.1	Time	180
5.2.2	The origins: Black & Scholes	181
5.2.3	Asset prices as Feynman-Kac representations	185
5.2.4	The Girsanov theorem	187
5.2.5	The APT in continuous time	190
5.2.6	Example: no-arbitrage in Lucas tree	193
5.3	Distorsions and numéraires	199
5.3.1	Leading example: consumption-based probabilities	199
5.3.2	Numéraire pricing	200
5.4	Martingales and arbitrage	204
5.4.1	The information framework	204
5.4.2	Viability	205
5.4.3	Market completeness	206
5.5	Equilibrium with a representative agent	208

5.5.1	Constant investment opportunity sets	208
5.5.2	Stochastic opportunity sets	208
5.5.3	Arrow-Debreu densities and restrictions on expected returns	213
5.5.4	Interest rates	216
5.6	Martingale methods	218
5.6.1	Intertemporal budget constraints	218
5.6.2	The optimization problem	220
5.6.3	Marginal utility of income	221
5.6.4	Example: log-utility	222
5.6.5	Equilibrium	222
5.6.6	Continuous time Consumption-CAPM	223
5.6.7	Partial hedging in incomplete markets: introduction	223
5.7	Inaction: the economics of American options	223
5.7.1	Early exercise premiums: an introductory example	223
5.7.2	Gambles and securities again	225
5.7.3	Real options theory	226
5.7.4	Perpetual puts	227
5.7.5	Perpetual calls	228
5.8	Further topics on real options and controlled Brownian motions	231
5.8.1	Irreversible investments and the decision to invest	231
5.8.2	A model of determination of exchange rates in target zones	232
5.8.3	Liquidity constraints and optimal dividend policy	233
5.9	Portfolio constraints	237
5.9.1	Technical background	237
5.9.2	Artificial markets	240
5.10	Jumps	241
5.10.1	Poisson jumps	241
5.10.2	Interpretation	242
5.10.3	Properties and related distributions	243
5.10.4	Asset pricing implications	244
5.10.5	An option pricing formula	245
5.11	Continuous time Markov chains	245
5.12	Appendix 1: An introduction to stochastic calculus for finance	246
5.12.1	Stochastic integrals	246
5.12.2	Stochastic differential equations	256
5.13	Appendix 2: Self-financed strategies, from discrete to continuous time	261
5.13.1	With intermediate consumption	261
5.13.2	With final consumption only	261
5.14	Appendix 3: Proof of selected results	264
5.14.1	Proof of Theorem 5.3	264
5.14.2	Details regarding multibeta CAPM	264
5.14.3	Proof of Eq. (5.109).	265

5.14.4	Walras consistency tests	266
5.15	Appendix 4: The Green's function	267
5.15.1	Setup	267
5.15.2	The PDE connection	268
5.16	Appendix 5: Portfolio constraints	269
5.17	Appendix 6: Topics on jumps	271
5.17.1	The Radon-Nikodym derivative	271
5.17.2	Arbitrage restrictions	272
5.17.3	State price density: introduction	272
5.17.4	State price density: general case	273
	References	275
6	Taking models to data	277
6.1	Introduction	277
6.2	Data generating processes	277
6.2.1	Basics	277
6.2.2	Restrictions on the DGP	278
6.2.3	Parameter estimators	279
6.2.4	Basic properties of density functions	279
6.2.5	The Cramer-Rao lower bound	280
6.3	Maximum likelihood estimation	280
6.3.1	Basics	280
6.3.2	Factorizations	280
6.3.3	Asymptotic properties	281
6.4	M-estimators	283
6.5	Pseudo, or quasi, maximum likelihood	284
6.6	GMM	285
6.7	Simulation-based estimators	288
6.7.1	Three simulation-based estimators	289
6.7.2	Asymptotic normality	291
6.7.3	A fourth simulation-based estimator: Simulated maximum likelihood	294
6.7.4	Advances	295
6.7.5	In practice? Latent factors and identification	295
6.8	Asset pricing, prediction functions, and statistical inference	296
6.9	Appendix 1: Proof of selected results	301
6.10	Appendix 2: Collected notions and results	302
6.11	Appendix 3: Theory for maximum likelihood estimation	305
6.12	Appendix 4: Dependent processes	306
6.12.1	Weak dependence	306
6.12.2	The central limit theorem for martingale differences	306
6.12.3	Applications to maximum likelihood	306
6.13	Appendix 5: Proof of Theorem 6.4	308
	References	309

II	Empirical lessons and market inefficiencies	312
7	Neo-classical kernels and puzzles	313
7.1	Introduction	313
7.2	The equity premium puzzle	313
7.2.1	A single-factor model	313
7.2.2	Extensions	316
7.2.3	Equity premium and interest rate puzzles	317
7.3	Hansen-Jagannathan cup	318
7.4	Multifactor extensions	321
7.4.1	Exponential affine pricing kernels	322
7.4.2	Lognormal returns	323
7.5	Conditional CAPM	325
7.6	Pricing kernels and Sharpe ratios	325
7.6.1	Market portfolios and pricing kernels	325
7.6.2	Pricing kernel bounds	327
7.7	Conditioning bounds	329
7.8	Survivorship bias?	329
7.9	Appendix 1	330
7.10	Appendix 2: Proof of selected results	331
	References	334
8	Aggregate fluctuations in equity markets	335
8.1	Introduction	335
8.2	Empirical evidence: bird's eye view	336
8.2.1	Equity markets and the business cycle	336
8.2.2	Predictability	341
8.2.3	Risk-return trade-offs	343
8.3	Volatility: a business cycle perspective	344
8.3.1	Volatility cycles	344
8.3.2	Understanding the empirical evidence	346
8.3.3	What to do with stock market volatility?	351
8.3.4	What did we learn?	355
8.4	Rational market fluctuations	356
8.4.1	The dynamics of asset returns	356
8.4.2	Stocks as options	358
8.5	Time-varying discount rates or uncertain growth?	361
8.5.1	Two types of economies	361
8.5.2	Markov pricing kernels, asset returns and volatility	362
8.5.3	External habit formation	364
8.5.4	Large price swings as a learning induced phenomenon	368
8.5.5	Linearity-generating processes	375
8.6	Modeling market-to-book ratios	378

8.7	Appendix 1: Estimation of the market expected return	379
8.8	Appendix 2: Calibration of the tree in Section 8.3	380
8.9	Appendix 3: Asset prices in a multifactor model	382
8.10	Appendix 4: Arrow-Debreu PDEs	383
8.11	Appendix 5: Increasing risk and convexity	384
	8.11.1 The maximum principle	384
	8.11.2 Increasing risk	386
	8.11.3 Proof of Theorem 8.1	386
	8.11.4 A digression on a “macro-asset” derivative	387
8.12	Appendix 6: Dynamics of habit in Campbell and Cochrane (1999)	389
8.13	Appendix 7: An algorithm to simulate discrete-time pricing models	391
8.14	Appendix 8: Heuristic details of learning in continuous time	392
8.15	Appendix 9: Linear regime-switching economies	393
8.16	Appendix 10: Bond price convexity revisited	394
	References	395
9	Macrofinance	399
9.1	Introduction	399
9.2	Non-expected utility	401
	9.2.1 Recursive formulations	401
	9.2.2 Testable restrictions	402
	9.2.3 Risk premiums and interest rates	403
	9.2.4 Campbell-Shiller approximation	405
	9.2.5 Risks for the long-run	405
9.3	Heterogeneous agents and “catching up with the Joneses”	407
9.4	Idiosyncratic risk	409
	9.4.1 A static model	409
	9.4.2 Self-insurance and persistence of idiosyncratic shocks	411
	9.4.3 A model with countercyclical income inequality	411
9.5	Incomplete markets with homogeneous and heterogenous agents	413
	9.5.1 Idiosyncratic shocks unrelated to aggregate risk	413
	9.5.2 A two-agents economy	414
9.6	Disagreement and learning	417
	9.6.1 Learning with multiple signals	417
	9.6.2 Overconfidence and bubbles	418
	9.6.3 General equilibrium without frictions	422
9.7	Coping with Knightian uncertainty	430
	9.7.1 Prelude	430
	9.7.2 Uncertainty aversion and Ellsberg paradox	432
	9.7.3 Portfolio selection and market participation	434
	9.7.4 A model of multiple likelihoods	437
9.8	Production	442
9.9	Government spending and asset prices	444

9.10	Leverage and volatility	444
9.10.1	Primitives	444
9.10.2	Equity volatility: a decomposition formula	445
9.10.3	Bankruptcy	446
9.11	Multiple trees and the cross-section of asset returns	446
9.12	The term-structure of interest rates	446
9.13	Prices, quantities and the separation hypothesis	448
9.13.1	A closed-form expression for non-expected utility	448
9.13.2	Preferences for robustness	449
9.13.3	Irrelevance	449
9.14	Endogenous risk and the financial accelerator doctrine	450
9.14.1	Procyclicality	450
9.14.2	Premise: Asymmetric information, asset prices and business cycles	451
9.14.3	Credit cycles	451
9.14.4	Amplification	456
9.14.5	Amplification with a banking sector	456
9.14.6	Additional literature	457
9.15	Appendix 1: Non-expected utility	458
9.15.1	Detailed derivation of optimality conditions and selected relations	458
9.15.2	Details regarding models of long-run risks	461
9.15.3	Continuous time	461
9.16	Appendix 2: Economies with heterogenous agents	462
9.17	Appendix 3: Knightian uncertainty	467
9.18	Appendix 4: Credit rationing	469
	References	472
10	Information and other market frictions	478
10.1	Introduction	478
10.2	Prelude: imperfect information in macroeconomics	480
10.3	Informational efficiency: roadmap	483
10.4	Walrasian equilibria as informationally inefficient outcomes	484
10.5	Rational Expectations Equilibrium	486
10.6	Noisy Rational Expectations Equilibrium	487
10.6.1	Asymmetric information: information transmission	489
10.6.2	Differential information: information aggregation	493
10.7	Dealers markets: Introduction	496
10.7.1	Markets with symmetric information	497
10.7.2	With asymmetric information: bid-ask spreads	498
10.7.3	Inventory risk and bid-ask spreads	501
10.8	Markets with strategic players	502
10.8.1	The Kyle baseline model	503
10.8.2	Markets with multiple traders and dealers	504
10.8.3	Dynamic markets	510

10.8.4	Mandatory disclosure	513
10.9	Limits to arbitrage and further frictions	516
10.9.1	Liquidity trading	516
10.9.2	Price impacts and derivatives	516
10.9.3	Arbitrage imperfections	516
10.10	Over-the-counter markets	517
10.10.1	Background	517
10.10.2	Search	518
10.10.3	A model with symmetric information	518
10.11	Coordination failures in financial markets	523
10.11.1	Banking crises	523
10.11.2	Higher order beliefs and beauty contests	523
10.12	Appendix 1: The projection theorem	524
10.13	Appendix 2: Details regarding solutions of selected models	525
10.14	Appendix 4: Some foundations to pricing behavior in macroeconomics	530
	References	533

III Asset pricing and reality 536

11 Options and volatility 537

11.1	Introduction	537
11.2	Forwards and futures	538
11.2.1	Forwards: definition and pricing in frictionless markets	538
11.2.2	Forwards as a means to borrow money	539
11.2.3	Marking to market	539
11.2.4	Futures	539
11.2.5	Backwardation and Contango	540
11.3	Optionality and no-arb bounds	543
11.3.1	Model-free properties	543
11.3.2	Hedging	547
11.3.3	A case study: accumulators, decumulators	548
11.4	Evaluation	549
11.4.1	A pricing formula	549
11.4.2	Black & Scholes	550
11.4.3	Surprising cancellations and “preference-free” formulae	552
11.4.4	Future options and Black’s formula	552
11.4.5	Hedging	553
11.4.6	Endogenous volatility	554
11.4.7	Properties of options in diffusive models	555
11.5	Stochastic volatility	558
11.5.1	Statistical models of changing volatility	558
11.5.2	Implied volatility, smiles and skews	560

11.5.3	Option pricing with stochastic volatility	565
11.6	Trading volatility with options	573
11.6.1	Payoffs	573
11.6.2	P&Ls of Δ -hedged strategies	577
11.7	Local volatility	580
11.7.1	Issues	580
11.7.2	Implied binomial trees	580
11.7.3	The perfect fit, in continuous time	583
11.7.4	Relations with implied volatility	585
11.8	The price of (equity) volatility	587
11.8.1	One introductory example: range-based volatility	587
11.8.2	“Fear gauge” contracts	588
11.8.3	Forward volatility trading	593
11.8.4	Marking to market	594
11.8.5	Stochastic interest rates	594
11.8.6	Hedging	595
11.9	A digression on skewness	596
11.10	Dealing with market imperfections	597
11.11	Appendix 1: The original arguments of Black & Scholes	598
11.12	Appendix 2: Black (1976)	599
11.13	Appendix 3: Stochastic volatility	600
11.13.1	Hull & White equation	600
11.13.2	Extensions	600
11.13.3	Smile analytics	601
11.14	Appendix 4: Local volatility	603
11.15	Appendix 5: Variance contracts	605
11.16	Appendix 6: Skewness contracts	608
	References	609
12	Engineering of fixed income securities	612
12.1	Introduction	612
12.1.1	Relative pricing in fixed income markets	613
12.1.2	Many evaluation paradigms	613
12.1.3	Plan of the chapter	614
12.2	Markets and interest rate conventions	614
12.2.1	Markets for interest rates	614
12.2.2	Mathematical definitions of interest rates	617
12.2.3	Yields to maturity on coupon bearing bonds	619
12.2.4	Accruals, invoice, and clean prices on coupon bearing bonds	619
12.3	Duration and convexity hedging and trading	621
12.3.1	Duration	622
12.3.2	Convexity	624
12.3.3	Asset-liability management	624

12.4	Foundational issues in interest rate modeling	632
12.4.1	Tree representation of the short-term rate	633
12.4.2	Tree pricing	636
12.4.3	Introduction to calibration	637
12.4.4	Calibrating probabilities through derivative data	652
12.4.5	Extensions to trinomial trees	660
12.5	The Ho and Lee model	660
12.5.1	The tree	661
12.5.2	Price movements and the martingale restriction	662
12.5.3	The recombining condition and interest rate volatility	662
12.5.4	Model's solution	664
12.5.5	Calibration of the model	666
12.5.6	An example	666
12.5.7	Continuous-time approximations, with an application to barbell trading .	670
12.6	Beyond Ho and Lee: Calibration through Arrow-Debreu securities	674
12.6.1	Extracting Arrow-Debreu securities from the yield curve	675
12.6.2	Two model examples	678
12.7	Callables, puttable and convertibles with trees	687
12.7.1	Definitions and rationale	687
12.7.2	Callable bonds	690
12.7.3	Convertible bonds	694
12.8	Appendix 1: Bootstrapping and no-arbitrage restrictions	698
12.9	Appendix 2: Proof of Eq. (12.17)	702
12.10	Appendix 2: The Ho and Lee price representation	704
	References	706
13	Interest rates	707
13.1	Introduction	707
13.2	Bond prices and interest rates	708
13.2.1	A first representation of bond prices	708
13.2.2	Forward rates	710
13.2.3	A second representation of bond prices	710
13.3	Stylized facts	711
13.3.1	The expectation hypothesis	711
13.3.2	Bond returns predictability	712
13.3.3	The yield curve and the business cycle	714
13.3.4	Additional stylized facts about the US yield curve	716
13.3.5	Common factors affecting the yield curve	717
13.4	Models of the short-term rate: Introduction	721
13.4.1	Models versus representations	721
13.4.2	The bond pricing equation	722
13.4.3	Stochastic duration	726
13.4.4	Some famous models	727

13.4.5	The Monetary Experiment and interest rate volatility	733
13.4.6	Jumps	736
13.5	Multifactor models of the short-term rate	737
13.5.1	Stochastic volatility	737
13.5.2	Three-factor models	742
13.5.3	Affine and quadratic term-structure models	743
13.5.4	Unspanned stochastic volatility	744
13.5.5	Topics regarding estimation and trading strategies	745
13.6	No-arbitrage models: early formulations	747
13.6.1	Fitting the yield-curve, perfectly	748
13.6.2	Ho & Lee	749
13.6.3	Hull & White	750
13.7	The Heath-Jarrow-Morton framework	751
13.7.1	Framework	751
13.7.2	The model	752
13.7.3	The dynamics of the short-term rate	753
13.7.4	Embedding	753
13.7.5	Stochastic string shocks models	754
13.8	Interest rate derivatives	757
13.8.1	Fixed income market volatility and the persistence of the short-term rate	757
13.8.2	Hypothetical continuous payoffs	760
13.8.3	Forward martingale probabilities	761
13.8.4	European options on bonds	762
13.8.5	Callable and puttable bonds	765
13.8.6	Options on fixed coupon bonds	767
13.8.7	Interest rate swaps	768
13.8.8	Caps & floors	771
13.8.9	Swaptions	772
13.9	Market models	773
13.9.1	Models and market practice	773
13.9.2	Simply-compounded forward rate dynamics, and no-arb restrictions . . .	774
13.9.3	Applications to derivative evaluation	775
13.10	Volatility surfaces	779
13.10.1	Implied volatilities	779
13.10.2	Local volatilities and SABR models	780
13.11	Appendix 1: The FTAP for bond prices	784
13.12	Appendix 2: Certainty equivalent interpretation of forward prices	786
13.13	Appendix 3: Additional results on forward probabilities	787
13.14	Appendix 4: Factors and components	788
13.14.1	Factor sanalysis	788
13.14.2	Principal component analysis	788
13.15	Appendix 5: Proof of selected results	790

13.15.1 Comparison results regarding defaultable bonds	790
13.15.2 Proof of Eq. (13.116)	790
13.15.3 The martingale property of the forward swap rate	790
13.16 Appendix 6: Details regarding exponential-affine models	791
13.16.1 Derivation of the closed-form solution	791
13.16.2 Application to Fong and Vasicek model	791
13.17 Appendix 7: A few analytical details regarding the Hull and White model	792
13.18 Appendix 8: Expectation theory and embedding in selected models	793
13.18.1 Expectation theory	793
13.18.2 Embedding	793
13.19 Appendix 9: Additional results on string models	795
13.20 Appendix 9: Changes of numéraire and Jamshidian's (1989) formula	796
References	797
14 Risky debt and credit derivatives	802
14.1 Introduction	802
14.1.1 A brief history of credit risk and financial innovation	802
14.1.2 Plan of the chapter	805
14.2 Conceptual approaches to valuation of defaultable securities	805
14.2.1 Firm value, or structural, approaches	805
14.2.2 The structural approach in practice: the pricing of convertible bonds	820
14.2.3 Reduced form approaches: rare events, or intensity, models	822
14.2.4 Ratings	827
14.3 Credit derivatives and structured products based thereon	831
14.3.1 Options and spreads	831
14.3.2 Credit Default Swaps	832
14.3.3 Collateralized Debt Obligations (CDOs)	849
14.4 Managing loan losses	862
14.4.1 Regulatory framework	862
14.4.2 Foundations of risk-management	865
14.4.3 Credit risk and VaR	870
14.5 Procyclicality, credit crunches and quantitative easing	872
14.5.1 The 2007 subprime crisis	873
14.5.2 Top tier capital ratio targets and endogenous volatility	876
14.5.3 Credit crunches and quantitative easing	882
14.5.4 Where did QE go?	885
14.6 Appendix 1: Details on strategic defaulting	888
14.7 Appendix 2: Proof of selected results	889
14.8 Appendix 3: Transition probability matrices and pricing	890
14.9 Appendix 4: Bond spreads in markets with stochastic default intensity	892
14.10 Appendix 6: Conditional probabilities of survival	894
14.11 Appendix 7: Details regarding CDS index swaps and swaptions	895
14.12 Appendix 8: Modeling correlation with copulae functions	897

14.13 Appendix 9: Details on CDO pricing with imperfect correlation 899
References 900

Introduction

A. A brief description of the book

Lectures on Financial Economics is a graduate textbook that originates from a set of initial notes I wrote in support of graduate and advanced undergraduate lectures in financial economics, macroeconomic dynamics, financial econometrics and financial engineering. Unifying these notes is tantamount to engage into a long and patient journey into historical intellectual developments as well as the interactions of ideas and theories with actual markets behaviors. The book attempts at a “synthesis” of the state of knowledge accumulated during 65 years of initially intermittent but, later, incessant contributions to this very important field of economics.¹

Finance has the potential to oil the wheels of the real economy. While economists still debate about the benefits of finance for our society, more than a dozen of scholars researching into this field may be counted as Nobel Memorial Prize laureates in Economic Sciences. Progress was sometimes faster than any attempts at organizing our thoughts. Initially, efforts at synthesis focussed on the mathematical structures underlying the pioneering work leading to the foundations of finance. Later, synthesis became more problematic as research work proliferated through such disparate domains including, among others, the evaluation of derivatives instruments, the behavior of markets over the business cycle, information problems in corporate finance and asset markets and, last but not least, the then nascent econometrics of financial markets. The initial “classics” would often cover non-overlapping spaces, as reviewed in Section C of this Introduction. We are still struggling with the creation of a comprehensive treatment of financial economics. This book is an attempt at such a treatment, an attempt at linking various theories and ideas to empirical puzzles and, sometimes, established market practice.

Financial economics relies on sophisticated methods that have already received a comprehensive textbook treatment, since at least the early classics. While this book still aims at providing foundations and methodology, it is intended as a narrative of the historic milestones in the progress of thought. Empirical puzzles have motivated the emergence of new explanations of

¹In fact, nearly one century of contributions, once we account for those portions of this book dealing with markets plagued by Knightian uncertainty (Keynes, 1921; Knight, 1921) and those market failures identified by Keynes (1936). In Section B of this Introduction, I review the early contribution of Bachelier (1900).

financial market behaviors and, then, new foundations; likewise, new theories have prompted for additional testable predictions. This virtuous interaction has led to immense knowledge that I try to account for while trying to connect various areas in a single piece. I would have liked to write a “history of financial economics,” but, as noted, I only attempt at synthesizing as much as I can in this book. Section B of this Introduction provides motivation and historical perspective regarding the progress of knowledge that occurred during the last many decades, and a broad outline of the book.

Writing an account on the state of knowledge in financial economics is a significant challenge. I may count more than 200 models underlying the explanations in this book. Does model uncertainty disqualify financial economics from being a science? I am writing this Introduction with a humble but decisively optimistic view, even though underlying this view is the acknowledgment that we are dealing with such a large and sometimes fragmented field, and still far from being unified. But while we cannot rely on controlled experiments as in other fields, our models lead to predictions that are typically testable through the availability of myriads of data. I hope that this book will make the reader comfortable with the idea that financial economics is progressing on a well-defined path, that the two-hundred models I discuss belong to a common paradigm and, finally, that each of these models is very important, by shedding light into specific angles of the varied and complex structure of financial markets. This project has the potential to produce a durable impact once these learning objectives are met.

B. Overview and coverage

This book aims to track the milestones achieved in the history of thought in financial economics. Its objective is to provide a comprehensive reference while attempting at organizing almost one century of work, while relying on a rigorous analytical framework and, finally, while providing methodological tools that make it self-contained. At the same time, it endeavors to help explain real phenomena and how these phenomena and, sometimes, market practice, have helped economists reformulate previous theories. Furthermore, the book includes many examples and solved problems that illustrate the main lessons conveyed by the models analyzed in the book. I don’t provide supplementary material such as solutions, answers or other material to accompany the book. The book tries to be self-contained.

While our field is very large, the present work tries to cover as much as I can, while maintaining a balance between theoretical explanations and empirical evidence and identifying the practical relevance of our knowledge. The outcome is still patchy—again, a reflection of the nature of our field. However, I hope that I am managing to provide the reader with a coherent treatment of many disparate aspects of financial markets, those arising in idealized explanations (be they based on abstract or empirical methodologies), those that are most relevant to the market practice and, finally, those that may be of interest to scholars working in related fields.

The book is organized in three parts: (I) Foundations, (II) Empirical Lessons and Market Inefficiencies, and (III) Asset Pricing and Reality.

“*Part I: Foundations*” develops primordial tools for analysis while striving to keep track of historical backgrounds. For example, Chapter 1 deals with portfolio selection problems arising in the early 1950s and the initial theories of asset prices of the 1960s, works that are understood to be at the origins of financial economics. The next chapters in this Part provide refinements

of the initial theories, based on subsequent breakthroughs made to understand the role of asset prices in the general equilibrium of dynamic economies subject to uncertainty, in both finite (Chapter 2) and infinite horizon (Chapter 3). Historically, the apex of these developments was reached with the advent of ‘continuous time finance’ and its methods occurring in the 1970s. Continuous time models would elegantly address difficult problems including no-arbitrage pricing of redundant securities (derivatives, in some cases), or portfolio choices through dynamic programming. The ‘martingale methods’ of the 1980s-1990s would seal this toolbox with additional instruments, but they also paved the way to the analysis of incomplete markets and other market imperfections. It is the ‘golden age’ of financial theory, a famous expression proposed by Darrell Duffie in his classic *Dynamic Asset Pricing Theory* (2001, p. xiii).

This Part covers details of this progress but its perspective regards the economic significance of the problems we are dealing with. The goal of these lectures is to understand capital market fluctuations and, sometimes, the behavior of firms subject to financial constraints, or the role that these fluctuations and behaviors play in conveying information and resources back to society. Information asymmetries and market imperfections are actually a recurrent theme in these lectures. Thus, Chapters 1 through 3 deal with the idealized markets leading to the initial explanations of asset prices; for example, Chapter 3 deals with financial markets while attempting at taking a broad perspective, one in which finance is part of a general ecosystem—however, our discussions in this chapter (often, not always) rely on models without frictions. In these markets, asset prices relate to consumption, production, money, and the links arise through the behavior of fully rational individuals.

However, Chapter 4 points to serious conceptual difficulties in defining a general equilibrium, difficulties arising due to asymmetric information, and regarding the very existence of markets or the process of securities creation. Information problems are indeed powerful sources of inspiration for economists. More in detail, Chapter 4 does rely on information and provides the reader with an overview of theories of financial contracting and theories of debt. Why do corporations issue debt or equity, i.e., financial assets that may subsequently trade on secondary markets? Or, suppose that a firm receives funds to undertake a project; shouldn’t then the same firm lose some of its initial motivation in undertaking the necessary care while handling the project? How to incentivize this firm to exert the entrepreneurial efforts that would make its interests aligned to those of the investors? What is the optimal capital structure in an economy in which we may not be able to foresee all future contingencies? Next, Chapter 5 shows the beauties of continuous time finance applied to classical problems such as no-arbitrage pricing or portfolio selection (relying on dynamic programming), but also the theory of irreversible investments, the firms’ dividends distribution policy in the presence of liquidity constraints, or theories of financial contracting in continuous time.

Some theories are important because of their main qualitative conclusions, and it may not be needed to test for their ‘functional form’. But financial economics is also a field that lends itself so naturally to vast empirical investigations, where models may predict different outcomes according to parameter values. We need to assess the statistical relevance of certain theories and, even more fundamentally, we need to estimate a model to be used by decision makers, be they policy makers or private investors. Chapter 6 deals with theory and methods of statistical inference needed to deal with models arising in financial economics, relying on classical econometric tools such as maximum likelihood, methods of moments, and the relatively more modern simulation-based inference methods.

“Part II: Empirical lessons and market inefficiencies” is about explaining the main empirical facts and the challenges that these facts pose to financial economists. The first puzzles regard excess price volatility, that is, the difficulty of the early dynamic models to explain the aggregate market behavior. According to the early models, market volatility (and the premium required by investors to invest in a volatile environment) is one order of magnitude less than that we observe in the markets. Chapter 7 is an introduction to these critical problems and in particular to their measurement methods. These methods were developed mainly during the 1980s-1990s and, in part, the 2000s, and are obviously statistical in nature. At the same time, they rely on the principle of no-arbitrage: there are many ways we can price assets while only requiring absence of arbitrage; however, there is a benchmark amongst these ways, solely relying on security market data, which can be used to assess whether a model under scrutiny implies implausible parameter values (such as, say, the investors’ risk appetite).

To address the volatility puzzles, financial economists added explanations of capital market behavior based on a variety of assumptions: investors’ attitude to risk-taking (e.g., non-expected utility, or habit formation), idiosyncratic risk, incomplete markets or restricted market participation, heterogeneous beliefs, learning in contexts with incomplete information, a fully specified production sector, or Knightian uncertainty. This progress relied on foundational work made during the ‘golden age’ of financial theory described in Part I. It occurred in the 2000s-2010s and is described in Chapters 8 and 9. Interestingly, these new models addressed relatively older issues; for example, they predict that, under conditions, the aggregate equity premium and stock market volatility are both countercyclical, a fact known from earlier empirical research. But while these models were developed, financial economists also realized that they could explain additional ‘cross-sectional anomalies’ such as the value premium (the tendency for firms with low multiples to perform better in the future than those with high), or the hoary issue of predictability (the tendency of the market to reverse its trends after a while, maybe in tandem with the business cycle).

A common trait of these models is their adherence to the ‘separation hypothesis’, that is, the assumption that the real economy is not affected by capital market developments. Perhaps due to the dramatic counterfactual evidence brought about by the Great Recession of the late 2000s, a new research agenda relaxed this assumption, aiming to revitalize previous work made by macroeconomists on ‘financial accelerator’ mechanisms—the power of capital markets to exacerbate the business cycles. Integrating financial markets into the real sphere of the economy is the explicit intellectual acknowledgment of the crucial role that capital markets (frictions) play in society. Chapter 9 contains many links to this literature, and these links form the basis for additional discussions in various junctures of Part III.

Chapter 10 concludes this Part while pointing to other famous puzzles and frictions. Do capital markets provide useful information for society? How deep ‘price discovery’ is, that is, how well asset prices reflect the fundamentals in a world with heterogenous information? This chapter begins with the classical analysis of markets plagued with information problems. Investors obviously have different pieces of information, and some of them are even known to possess superior information. A ‘lemons problem’ arises: what are the incentives to trade with better informed investors? One answer is that trading may only arise when markets are somehow (informationally) inefficient: when information is not available symmetrically in the marketplace, we can only trade once we know the reason someone is also trading with us does not arise because our counterparty is better informed than we are. For example, the price we observe may not allow us to reverse-engineer the information of better informed traders;

this inefficiency (a price that is only partially revealing) may actually be what makes markets function.

For longtime, this price inefficiency has been modeled as arising, endogenously, from the presence of exogenous liquidity shocks. In fact, liquidity and information problems have long been understood as the two sides of the same coin. But liquidity is not only information, and this chapter describes alternative explanations for it. Remarkably, these information and related problems were tackled while, at the same time, economists were in the process of developing market microstructure theory, i.e., the theory of price formation in trading venues relatively more realistic than hypothesized during the golden age. However, capital markets and trading venues can be even much more complex than the literature had initially hypothesized: Chapter 10 explains that the presence of irrational traders, herding behavior and information cascades, information networks, information percolations, agents engaged in coordination games, or decentralized trading systems (e.g., over-the-counter markets), were all exciting topics of research from the 1990s through the 2010s, which still promise to improve our understanding of such a complex phenomenon as the price formation process. Chapter 10 concludes with a survey of topics regarding coordination failures in financial markets. Why do financial crises arise? What are the determinants of a bank-run? What makes agents coordinate to equilibrium outcomes where prices can deviate from fundamentals, as in the famous beauty contests introduced by John Maynard Keynes in his *General Theory of Employment, Interest and Money* (1936, chapter 12)? Remember, in these contests, the winners are those who pick up the most popular faces from many photographs, and are thus incentivized to forecast the forecasts of others, where everyone is doing the same thing. How do higher order beliefs affect price dynamics or the emergence of the risk of a bank run?

“*Part III: Asset pricing and reality*” aims just to this: to rely on the lessons drawn from Part II and cope (through the main analytical tools in Part I) with the main challenges posed by actual capital markets, arising from option pricing and trading, interest rate modeling, or credit risk and the associated derivatives. In a sense, Part II is about the big puzzles we face in fundamental research, while Part III is about how to live within our current and certainly unsatisfactory paradigms, so as to cope with demand for intellectual expertise.

The importance of these topics can never be emphasized enough. Investments or business cycles are clouded with uncertainty. While investing, decision makers put their jobs and the security of their families at risk, thereby affecting human capital accumulation and, hence, the life of future generations. Sometimes, the effects of poorly informed choices can be devastating. The infamous 2007-subprime crisis and the subsequent Great Recession certainly illustrate these mechanisms. In general, capital market volatility is huge, for one reason or another, illustrated by the theories and facts in Part II. It is, thus, a naturally human response to try and find a solution to cope with these risks.

Derivative securities are instruments to insure against risks related to certain investment decisions. As is well known, they are called ‘derivatives’ because their value is drawn from that of other securities. For example, if we are long a number of shares, we may wish to purchase put options on these shares (or on a dedicated index of them), which pay off when the average shares value is down; intuitively, then, the price of these options decreases with the price of the underlying securities. Louis Bachelier’s *Théorie de la spéculation* in 1900 is the first attempt at tackling these evaluation problems—problems that were tackled again during the golden age, based on no-arbitrage principles.

At the heart of this principle lie different assumptions, and one of them dictates that the underlying securities (or, in general, risks) should be well understood by all market participants. For example, the shares underlying the previous options should be traded in reasonably liquid markets, a condition for price discovery. It is most likely the case with many derivative securities such as the equity index options or the U.S. Treasury derivatives that are traded in well functioning Exchanges, but also with a variety of derivatives traded in over-the-counter markets (e.g., interest rate swaps or credit related products). However, if risks are poorly understood and price discovery is scarce, derivatives may be mispriced. A case of ‘toxicity’ may then arise: investors may inadvertently add too high doses of complex derivatives in their portfolios than justified by their risk-return trade-off profile. Unfortunately, financial history shows many cases of toxicity. The last chapter of Part III examines some details of one of them, related to the process of securitization of very risky mortgages.

Engineering can be defined as a set of processes and methods that attempt to use established scientific knowledge to solve practical problems, as with the case of steam engines utilized during the first Industrial Revolution. In fact, if it wasn’t for the previous mishaps, it would have been very tempting to title this Part “*Financial engineering.*” Instead, “Asset pricing and reality” reminds us that while our engines do certainly rely on scientific and rigorous knowledge, this knowledge seems to be more limited than in the domains of the physical sciences. It does not mean that financial economists are not in the process of building up financial engineering. Nor does it mean that financial innovation is unnecessary or toxic. We shall learn throughout the whole lectures that financial innovation may allow for risk-sharing (the transfer of some risks from those who are not willing to bear them to those who are) when the pre-existing markets are not diverse enough (i.e., incomplete). In fact, and interestingly, financial economists not only are inspired by the events they see (as with the previous revival of the financial accelerator hypothesis motivated by the Great Recession); sometimes, they lead to institutional changes: option markets would most probably not exist today without the golden age revolution of the 1970s.

Yet our most successful inventions regard risks that can at least be identified. Some of these inventions attract liquidity, which, in turn, generates price discovery and, then, liquidity again, over a virtuous circle. Liquidity begets liquidity: a product is more likely to trade if a trader knows he could easily trade it when, in the future, he will decide to get out from his current trade. Financial products are a little bit like a fax machine was at the time of its introduction: they are worth because others are willing to use them. Potential market makers and financial economists alike (see Chapter 10) are well aware of this chicken-and-egg problem: coordination may fail even when risks are well identified. The exposition in this Part is affected by a sort of survivorship bias: it regards products, trading methods and processes that have been successful. The exception is the description of credit related products at the epicenter of the 2007-2009 crisis.

Chapter 11 illustrates well the scope of Part III: while Part II describes theories and facts regarding asset market volatility, this chapter analyzes ways to trade it in the equity space. The technicalities can be actually complex: we have realized volatility, stochastic volatility, implied volatility and volatility surfaces, implied binomial trees and local volatility. Some models can be useful to buy-side institutions; others to sell-side firms engaged into pure intermediation activities. Furthermore, some unexpected developments occurred in financial theory during the 1990s-2000s, which gave rise to financial innovations regarding the way volatility is traded. It is another episode of financial history when theory had preceded market practice.

Chapter 12 and Chapter 13 repeat these analyses in the much more complex field that is fixed income. Fixed income securities are complex due to theoretical reasons (they track the time value of money), technical reasons (they have multiple dimensions, such as expiration or tenors of the various contracts) and, last but not least, because price discovery in these markets may be somehow hindered by their trading mechanisms (over-the-counter markets). Yet fixed income securities allow pension funds and other asset managers to mitigate interest rate risk, which can be much, much higher than that in equity markets. Interest rates have also very interesting business cycle properties, which policy-makers rely on while trying to predict the business cycle: for this reason, Chapter 13 also contains some links to fascinating topics arising in macroeconomics. Finally, Chapter 14 deals with the evaluation of debt subject to default risk and derivatives based thereon. It is a chapter focussed on practical aspects, with the exception of a few junctures devoted to the analysis of strategic default or the origins of the 2007-subprime crisis.

Engineering can be civil or electronic engineering, amongst many others. Likewise, a would-be “financial engineering” field should not be only about derivatives. For example, it should also deal with such issues as portfolio optimization in contexts with short-sale constraints, time-varying volatility (ARCH models, for example), Bayesian learning, and also with variance shrinkage methods. In general, this field should be a camaleon, just as it happens in the physical sciences: it should take the colors of the specific set of problems that is helping to address, in order to facilitate financial transactions, information processes (including, for instance, the design of volatility indexes with data stemming out from over-the-counter markets) and methods both in the buy-side and sell-side worlds. Some of these topics are covered throughout the lectures although their systematic treatment goes well beyond the scope of this work.

C. Discussion of related work

Financial economics has evolved while crossing a variety of boundaries. How did we track this progress? Ingersoll (1987), Huang and Litzenberger (1988) and Duffie (2001) are the first classics organizing more than thirty years of conceptual analysis, while O’Hara (1995) is the first classic organizing the theories of the 1980s on liquidity and market microstructure.

These works led to a sophisticated and consistent framework at the basis of subsequent progress, progress that occurred mostly in response to empirical challenges faced by the initial analyses; for example, during the mid 1990s and the early 2000s, new models were proposed to explain how aggregate market behavior links to the business cycle. Cochrane (2005), Back (2010) and Campbell (2017) provided further momentum to standardization of knowledge, teaching how part of this progress relates to the initial analyses. The early work of Campbell, Lo and MacKinlay (1997) offered a quite exhaustive overview of many statistical instruments that are still of paramount importance in the empirical modeling or statistical testing of financial markets phenomena.

Foucault, Pagano and Röell (2013) summarized further progress related to studies of market liquidity and microstructure. During the 2000s, Amaro de Matos (2001) and Tirole (2006) provided us with the first attempts at organizing knowledge acquired in the theory of corporate finance, while during the 1990s, Freixas and Rochet (1997) had already written a classic in the theory of banking. In the references section of this Introduction, I list additional references on works that attempt at organizing knowledge in financial economics.

I like to represent this book as being complementary to these very important works. The added value of mine is to provide general perspective into a large variety of topics, as well as details of the historical progress leading to our current understanding of each of these topics.

To illustrate, the Handbooks of the Economics of Finance (Constantinides, Harris and Stultz, 2003, 2013) currently undertake the ambitious task of dealing with many disparate topics arising in financial economics. However, these works are contributed by several authors and they are only partially coordinated. This book provides explicit linkages across chapters, which may help a reader interested in learning or reviewing several topics while accessing to a common language. For example, the book may be used as a reference in several courses in advanced training programs: adopting this book for a single course (e.g., a course in macro-finance) should allow the reader to access material for related courses (one in financial markets with frictions, say) while relying on a style that he or she is already familiar with. But the most remarkable feature of the efforts I have tried to accomplish in this book is the ambition to cover a wide range of topics, the milestones in the history of thought in this field, while maintaining a balance across theory, empirical evidence, historical contexts and, also, market practice. As explained, in the references section of this Introduction, I would like to bring a few additional textbook treatments of the field to the reader's attention, noting that these represent my own preferred readings, and apologizing with all omitted authors.

D. Audience and pre-requisites

The main audience for this book will be academics studying, teaching and researching in financial economics. The book also aims to appeal to applied researchers and other professionals servicing investment banks, institutional investors, central banks and governments. The inclusion of policy makers as part of the audience for this book is motivated by the widespread acknowledgment of the many interconnections between financial markets and the macroeconomy. Macro-financial linkages arising through the business cycle (or, say, market liquidity, microstructure and volatility) are themes that have motivated important work by financial economists; this work is very useful reading for those engaged in designing supervisory standards and macro-prudential policies. The main audience for this book will be financial economists, though. I'll return to additional factors explaining potential audience in Section E below.

The style of the book is eminently academic. It is primarily quantitative, even while, on many occasions, the book provides descriptions of markets and historical contexts. But appreciating this book in its entirety relies on a predisposition to quantitative reasoning. At the same time, quantitative reasoning is the means, not the goal of this work. Thus, in general, appreciating this book also requires to be genuinely passionate about economics. Finally, the book is suitable for both theorists and empiricists or fellows searching for concrete applications. Applied researchers will have access to a clear theoretical background needed prior to undertaking meaningful empirical research. Theorists will learn the nature of the empirical regularities and puzzles that have characterized our field since its very beginnings, knowledge that is indispensable prior to undertaking meaningful theoretical research.

Reading the book requires knowledge of economics and mathematics at a level required from a candidate to a Master of Science in Finance and Economics at the London School of Economics or to a PhD in Finance at the Swiss Finance Institute, two programs where I delivered many of the lectures inspiring this work. I also believe that the book may be accessed by a well-motivated student enrolled into a program such as, say, a Bachelor of Science in Economics

and Statistics at University College London. Therefore, reading this book requires maturity in both microeconomics and macroeconomics at the level of Varian (1992) and Blanchard (2017) textbooks, respectively. Moreover, some readers might already have gained motivation for finance while exposed to introductory finance textbooks such as Berk and DeMarzo (2016) and Bodie, Kane and Marcus (2014). Additional pre-requisites include knowledge of calculus, basic knowledge of time series and statistics, and an introductory exposure to stochastic calculus. Many technicalities are introduced and explained in appropriate junctures of the book, along with references to more advanced material.

E. Usage of the book

The reader of this book is a scholar in financial economics, a market practitioner, a policymaker, or a scholar in related fields such as macroeconomics.

A scholar in financial economics may (i) recommend this book to a specialized readership for a survey of work linked to his research articles; (ii) recommend portions of the book to advanced graduate or PhD classes as complements to his lecture notes; and, finally, (iii) value a book that attempts at a synthesis: for example, reading this book may help a young scholar develop a critical view of our current understanding of financial markets, thereby stimulating further and hopefully important research.

A market practitioner or a policy maker with an appropriate background (see Section D) may find a source of valuable information in this book. For example, certain parts of the book (Part III as well as some chapters in Part II) may provide a quantitative strategist or a risk manager with guidance on elaborating, estimating and implementing models for signal generation. Even more important, the book may help gain intellectual perspective into the many details that arise in market or policy practice.

Finally, the average reader may be a scholar in other fields. For example, a macroeconomist might be interested in financial economics from a broad and still rigorous perspective; this book may help shed light into his own research and, perhaps, lead him to recommend portions of it to his PhD classes. For example, some financial economists grew up by learning from some of the classics described in Section C of this Introduction, while at the same time reading the beautiful *Lectures on Macroeconomics* of Blanchard and Fischer (1989), which helped shape some research into macro-finance. Similarly, one objective of this book is to attract the attention of scholars in other fields. Oftentimes did scholars in other fields make “excursions” into financial economics and provide marvelous contributions, e.g., on the role of information in securities markets, idiosyncratic risk or financial accelerator mechanisms. I hope that the general perspective I endeavor to follow in this book may attract scholars from other fields and help render such excursions more frequent.

The book contains material that may be accessed to while learning about a number of topics, and/or be used as a reference for a number of courses, such as:

- Foundations of portfolio selection (Chapter 1)
- Foundations of financial economics (selected portions of Chapters 2, 3, 4, 5 and 10)
- Introduction to quantitative methods in finance (selected portions of Chapters 3; Chapter 5)
- Statistical methods of financial model validation (Chapters 6 and 7)

- Financial markets and the macroeconomy (Chapters 8 and 9)
- Information and financial markets (Chapters 4 and 10)
- Financial markets, debt and frictions (Chapters 4 and 10)
- Option pricing and volatility trading (Chapter 11)
- Fixed income markets and derivatives (Chapters 12 and 13)
- Credit markets and derivatives (Chapter 14)
- Derivatives and financial engineering (selected portions of Chapters 11 through 14)

The chapters indicated in parenthesis contain the relevant material for the suggested courses, which I have indeed experimented during the last 20 years or so.

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Disclaimer

This manuscript is still incomplete. Economic motivation and intuition are not always developed as they would deserve, some derivations are inelegant and, sometimes, the presentation is still a bit informal. Moreover, I still have to include (additional) material on monetary models of asset prices, theories of the nominal and the real term structure of interest rates, bubbles, asset prices implications of overlapping generations models, limits to arbitrage, theories of debt and capital structure and agency problems in continuous time, or financial frictions and their interconnections with business cycle developments. Finally, I still need to include more extensive surveys for each topic I cover, especially in Chapters 1, 3, 4, 6 and 7. Of the 14 Chapters I have drafted, Chapter 7 (and the present Preface!) are those in need of the most serious revamp. Moreover, I only started drafting Chapter 4. I am working towards revising these notes and filling these gaps. Meanwhile, any comments on this version of my work are very welcome.

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January 2018