Lectures on Financial Economics

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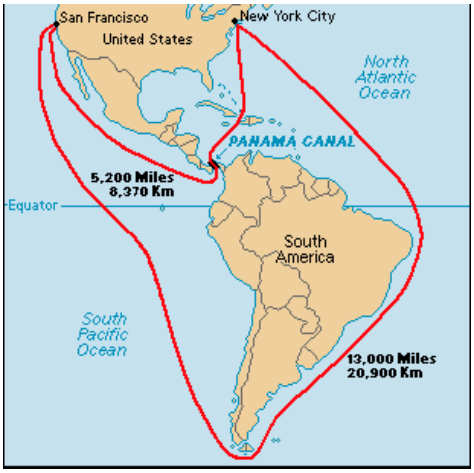

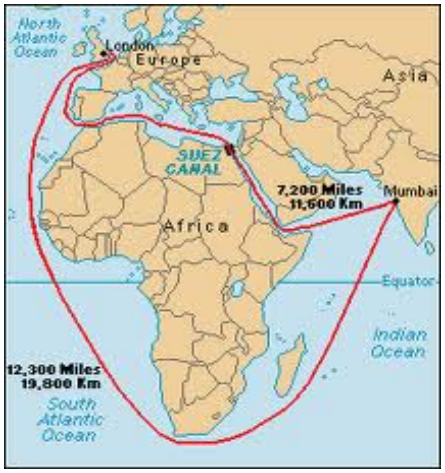

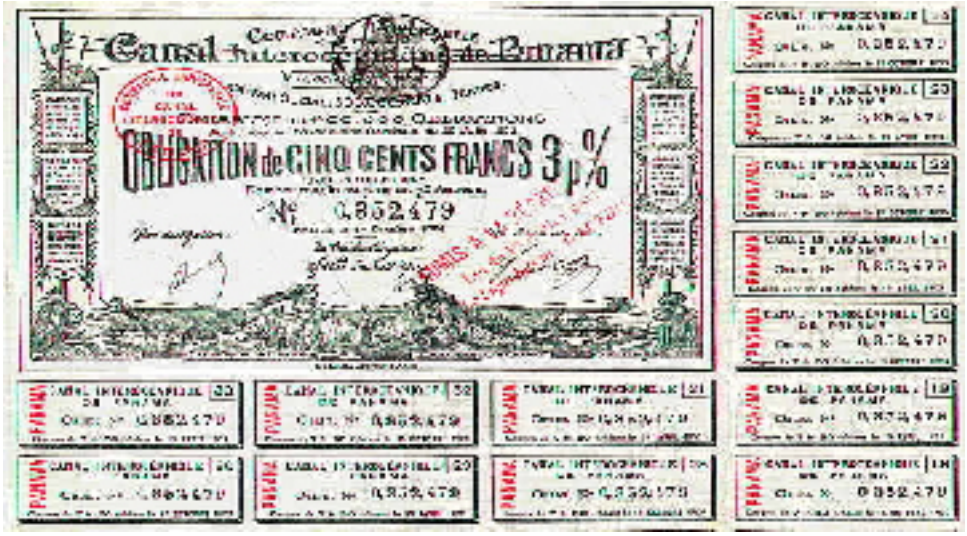

Front cover explanations

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

Antonio Mele holds a Senior Chair at the Swiss Finance Institute and is a Professor of Finance at the University of Lugano, after a decade spent as a tenured faculty at the London School of Economics. He is also a Research Fellow for the Financial Economics program at the Centre for Economic Policy Research (CEPR) in London. He holds a PhD in Economics from the University of Paris. His work spans a variety of fields in financial economics, pertaining to financial market volatility, interest rates and credit markets, macro-finance, financial markets and business cycles, information in securities markets in contexts with information networks and Knightian uncertainty, and has appeared in journals such as the *Journal of Financial Economics*, the *Review of Economic Studies,* the *Review of Financial Studies*, and the *Journal of Monetary Economics*. He authored or co-authored three books on themes regarding financial market volatility.

His work outside academia includes developing fixed income volatility indexes and related tradable instruments for Chicago Board Options Exchange and S&P Dow Jones Indices. He is currently a member of the *Securities and Markets Stakeholder Group* of the European Securities Markets Authority (ESMA), the supra-national supervisor of European financial markets, where he previously served as a member of its Group of Economic Advisers.

"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

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

[1] In 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 macroprudential 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 practictioner, 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 practictioner 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.

Antonio Mele
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