

Introduction

The word finance seems to have arisen from ideas of limits and boundaries. According to the Merriam-Webster dictionary, <https://www.merriam-webster.com/wordplay/financial-word-origins>, “the word fine comes from Anglo-French fin and Latin finis, both of which mean “end” or “boundary,” and in its earliest uses in English, fine referred to various ends, limits, and boundaries. The modern-day financial meaning of the word actually dates to the 15th century and refers to a sum imposed as punishment for an offense. Up until the 19th century, however, fine was also used for a sum paid as compensation or for exemption from punishment—in other words, money paid to avoid punishment or imprisonment. A common expression was to make fine, which referred to the exemption from punishment or the release from captivity by paying a sum of money. The word finance also emerged in the 15th century but from Anglo-French finer, meaning “to end” as well as “to pay,” and similarly in English referred to an end or payment. In the 18th century, the word came to refer to pecuniary resources and the management of funds”.

The word “fine”, in Italian, describes the goal, the purpose of an activity. Modern finance is not the end of a relationship between individuals, but the beginning of a formal association for a well-defined purpose. The cover of the book refers to the Ziggurath associated with ancient Mesopotamia (now mainly Iraq) appearing at around 2000 BCE. The motivation for the association between finance and ancient Mesopotamia has to do with the early examples of trade and its financing as discussed in the fascinating book by Professor Goetzmann (2016). The need to trade, to exchange things like grain and clay with precious metals, minerals, and wood from other regions was an early motivation for financing the construction and use of ships and most of all for writing financial contracts among traders to share resources and risks that would be too large for a single individual. Four thousand years ago finance was about goals and not about terminating contracts.

Finance includes a wide range of activities implemented by individual and institutional investors, financial institutions, corporations. These activities deal with two main purposes: managing a pool of financial wealth to pursue specific goals and finding the needed resources to spend (on consumption or investment) before income is realized. In the second half of the last century finance studies were highly contaminated by mathematics and by statistics, also due to the availability of easy-to-use data in the context of increasing econometric sophistication, however, in the last couple of decades, there has been more attention to understand behavior on the part

of individuals and institutions. This may be surprising considering advances in Big data and Artificial Intelligence, but there is no contradiction: improving processes and reducing costs magnifies the role of decision-makers who may spend more time in making decisions. Within corporations, finance is used more and more as a common language that is critical for dialogue among different functions and for strategic planning. However, even a final user in corporate finance or investment management needs to acquire basic technical knowledge which may facilitate the right interpretation of quantitative tools that are available off-the-shelf from a variety of platforms.

The book results from my experience of teaching undergraduate students at Bocconi University and executive programs at the SDA Bocconi School of Management. The guidelines that I have followed, in my courses and in this book, are as follows:

- discuss in a simple but rigorous way the most relevant models;
- present a balanced view of different theoretical positions when there is no academic consensus (for example on market efficiency);
- provide a guide for top down asset allocation, discussing relevant practical elements like parameter estimation and non-negativity constraints that are crucial for creating forward-looking portfolios;
- include in boxes several empirical examples that may help understanding the theory and introduce a few technical boxes (for example on issues like the origin of Markowitz model equations and the stochastic discount factor approach to value determination) that may be skipped by readers who are interested in applications and not on theory.

The result is a book that may be used mainly for undergraduate courses, even though the selection of topics, and the applied approach, may make it interesting also for Master of Science and Finance Executive programs. The undergraduate course that I have been teaching at Bocconi covers about 75% of the material in thirty-two classes lasting one and a half hour each. It is also possible to use the book for shorter courses, perhaps taught in the context of Master in Finance for executives or blocks of custom programs.

This book presents a selection of basic technical knowledge which will allow the reader to understand a wide range of topics, going from portfolio allocation to asset valuation, from expected return determination to basic knowledge of financial risk modelling, from understanding of market prices for liquid assets to basic concepts of private asset investment, with a final chapter on the investment implications of the new attention for sustainability.

The first chapter introduces the terminology and discusses the main types of asset classes and financial intermediaries. The second chapter proposes an unconventional choice: rather than introducing statistics and later applying it to financial problems, it is based on a close link between definitions and applications. This has the purpose of immediately raising the reader's attention in the context of issues related to risk modelling and understanding empirical evidence about long-run stock and bond returns. The third chapter is about describing preferences towards risk in the context of the

traditional utility function. Most of the chapter uses the simple mean-variance utility function which, albeit academically poor, has the advantage of being intuitive and based on the two crucial parameters of expected return and volatility that are central in most practical applications. The fourth chapter discusses most recent research about the way investors actually behave rather than a description of how they should behave in theory. Behavioral finance borrows deeply from psychology and several references are made to experiments that have highlighted differences between the theory and practice of investment, at least for retail investors.

An unconventional choice also characterizes chapters five and six where we present a description of the bond market, introducing important definitions of the yield to maturity (also crucial for modern technique of performance evaluation surveyed in chapter fourteen), spot and forward rates, drivers of the term structure as well as basic tools for managing bond portfolios like duration and immunization. Chapters seven and eight deal with portfolio allocation, starting from the simple case of a risk-free and a risky asset that allows a simple derivation of the capital allocation line, and then complicating the picture by considering two risky assets. Some time is spent on the two risky asset case that is used for building the intuition about the benefits of diversification. The move to the general number of risky assets includes a detailed analysis of the Markowitz optimization model, followed by several discussions about the practical use of the model from the point of view of an investor pursuing a top down asset allocation.

Chapter nine uses the Markowitz model as a way to understand the equilibrium pricing implications of the portfolio diversification model through the Capital Asset Pricing Model (noting that the mathematics of the efficient frontier may be used to derive the CAPM even without an equilibrium approach), also presenting a description of the methodology for empirically testing the CAPM. The CAPM is at the same time one of the models most rejected by academic empirical analyses and most used in practical applications, for example for the cost of equity computation. Rejections of the CAPM have created a long literature on anomalies that has inspired many investors in their search for a return/ risk trade-off that is superior to that offered by the market. These are reviewed in chapter ten, while chapter eleven is about the more general theory based on arbitrage pricing (APT). Empirical models for expected return determination on diversified portfolios are then discussed as potentially consistent with the APT. Important applications are in alpha measurement and performance evaluation.

Chapter twelve is about pricing assets based on fundamentals. Changing expectations of fundamentals are a key driver of price volatility and a long debate tries to understand whether movements are rational and mainly depend on cash flow expectations and time-varying expected returns. Chapter thirteen uses the pricing models to discuss the fascinating topic of market efficiency, a reference point of extraordinary importance for economic growth and resource allocation in decentralized competitive markets. The different implications of efficiency for market prices and returns are introduced together with a survey of the main results deriving from the various tests. This fascinating debate has no definite conclusions but highlight a series of

important points for corporations and investors. Chapter fourteen deals with private assets, that have become more and more central to the portfolios of many investors. Some investors are overexposed to private assets (for example households owning a house or entrepreneurs owning their company) and would benefit from diversification into public assets, but several other investors, mainly institutional, actively search for diversification into private assets. The case studies considered in the chapter concern private equity, private debt, and art. Chapter fifteen reconsiders several tools and issues that have been covered in the previous chapters and discusses them in the context of the debate about sustainability. This raises fascinating issues about the meaning of sustainability, the challenges associated with measuring it and the obstacles to achieving it (mainly in the form of non-traded assets and externalities), and the role of financial markets and intermediaries. Empirical results about the role of ESG investing for portfolio diversification and the pricing of environmental factors are also discussed.

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