1. Financial economics can be considered a subfield of general economics. We learn from microeconomics that capital, labor, land, and entrepreneurship constitute the four production factors for a general production economy. Financial economists study one of these input markets—the capital market.¹

2. Two objects are transacted in the capital market. The first is capital (i.e. money), and the second, the financial services rendered by various financial institutions.

3. Households supply capital, and firms and the government demand it.² The firms need money to create real assets (land, factories, equipments, and intangible assets like patents and goodwill), which generate cash inflows at future dates. In exchange for the money provided by households, the firms issue financial assets to the latter. Financial assets are pieces of paper that represent claims on the cash flows promised by the firms as repayments to the households. We say that these financial assets are backed up by the real assets, because without the latter, the financial assets are simply worthless paper (but see our discussion of asset bubbles in Lecture 6). Note that (i) real assets are net worth of an economy, but financial assets are not; (ii) households exchanging money for financial assets today expect to receive money back only at some future dates, and the value of money at one date is different from that at another; (iii) some financial assets are private contracts which...

¹Some subtle overlaps exist among these input markets. Land and capital are two distinct inputs for production, but real estates are studied by financial economists.
²These are in the aggregate sense; undoubtedly there are households borrowing money from other households.
are not marketable (e.g. bank loans), but others are securities that change hands constantly in financial markets.

4. There are at least three dimensions when it comes to the measurement of performances of a financial market. First, a financial market is \textit{perfect}, if trading incurs no transaction costs (no taxes, brokerage fees, bid-ask spreads, or bankruptcy costs), if information is symmetric among traders, if all traders are price-takers, and if traded assets are infinitely divisible. Second, a financial market is \textit{informationally efficient}, if the transaction price of each traded asset always reflects in an appropriate manner the relevant information currently possessed by some or all market participants. Third, a financial market is \textit{complete}, if all conceivable assets that traders might want to trade are already traded in the market. As we shall see in subsequent lectures, the classic portfolio and asset pricing theories were developed under the assumption of perfect markets, and mostly under the assumption of complete markets also. The recent developments in finance theory that consider imperfect, inefficient, and/or incomplete markets have been important, and some of the materials are covered in the course \textit{market microstructure} for doctoral students.

5. Perfect markets leave no room for \textit{financial institutions}. In the real world, in contrast, markets are imperfect, and imperfection is the reason that all kinds of financial institutions arise. Consider the four prototypes of financial institutions: commercial banks, investment banks, mutual funds, and insurance companies.

6. First, why do commercial banks exist? Unlike in the Walrasian market described in the textbook, where demanders and suppliers of a good can gather at one marketplace, where the good is transacted at one single price, in the real world one of the two parties may have problems locating the other. Commercial banks arise to search for and match the demanders and the suppliers in the credit market. Commercial banks borrow money from households (by creating deposits and other money market instruments), and then lend it to the firms and consumers (by making loans). Thus commercial banks arise because information regarding the presence and whereabouts of the demanders
and suppliers is not freely available to market participants. Commercial banks also perform other functions. They can perform screening and pick out the good investment projects for firms. They can also monitor the firms to make sure that they use the investors’ money in the most profitable way. Also, by creating deposits, they transform long-term illiquid real assets possessed by firms (the borrowers) into short-term liquid assets (deposits) possessed by households. In perfect markets, firms can screen their own projects and lenders can monitor their borrowers without costs. Thus perfect markets would leave no room for commercial banking.

7. Second, why do investment banks arise? Investment banking mainly covers underwriting, securities trading, mergers and acquisitions, and financial innovation. If a firm wants to raise funds from households directly (instead of borrowing from commercial banks), then for both costs and information reasons it may use the underwriting services rendered by an investment bank. Again, this can only happen in imperfect financial markets, because a firm would naturally like to underwrite the corporate securities it issues on its own if markets were perfect. Investment banks also help firms engage in mergers and acquisitions (M&A). If markets were perfect, then firms would be able to reach their takeover targets and/or attract potential acquirers without costs, and they would not pay an investment bank for such services. Finally, investment banks play a crucial role in financial innovation in the real-world imperfect markets. If markets were perfect, they would not possess any advantage over individual investors in creating and marketing new financial assets.

8. Third, why do mutual funds arise? Suppose that households are risk averse in the sense that they are willing to gamble their money only when they expect to make a profit. Risk averse households would in general like to diversify their investments by allocating their money among a wide range of assets. When markets are perfect, this creates no problems. When markets are imperfect, say trading incurs fixed costs, it becomes beneficial for households with similar preferences to pool their money together and hire a manager to make the investment decisions on their behalf. This is why mutual funds arise in the real-
world imperfect markets.

9. Fourth, insurance companies emerge in the real-world imperfect markets for essentially the same reasons: like commercial banks, they help households locate other households interested in signing insurance contracts with them. Individual households would not be able to gather a large number of households to engage in efficient risk sharing. For the same reason, efficiency requires that there be a small number of large insurance companies, rather than a large number of small insurance companies.\(^3\)

10. Although financial institutions emerge as responses to market imperfections, their existence may further create other forms of market imperfections, and may put households in a disadvantageous position in competing with institutions in asset trading. First, institutions have more bargaining power against small households. Second, they can trade large quantities to enjoy economies of scale whereas the small households cannot. Finally, they are professionals and may develop and accumulate expertise that households do not have through the learning-curve effect. The phenomenon that institutional trading accounts for more and more trading volumes in financial markets is referred to as institutionalization.

11. The study of households’ behavior in the capital market gives rise to the Investments course for undergraduate students, which evolves into Investment Management for MBA students, and Capital Market Theory for PhD students. The study of firms’ behavior gives rise to the course Financial Management for undergraduate students, which evolves into Finance Theory for MBA students and Corporate Finance Theory for PhD students. These are all required courses.

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\(^3\)One key difference between a commercial bank and an insurance company lies in the differing repayment procedures specified in a deposit contract and an insurance contract. While in both cases, households must render money to the institution when signing the financial contract, subsequent repayments under an insurance contract may depend on the result of a time-consuming costly investigation, unlike under a deposit contract, which typically allows the households to retrieve money rather easily. Indeed, there are no better ways than defining the different institutions by the contracts that they sign with households. It is these financial contracts that make these institutions distinct.
12. The study of financial markets has focused on financial intermediation and asset pricing theory in the past, and is now placing more attention on the design of trading rules and regulation in securities markets. Three courses in this aspect offered to PhD students are *Continuous-Time Finance (Financial Engineering)*, *Theory of Financial Institutions*, and *Market Microstructure*.

13. Let me say a bit more about the contents of *Market Microstructure*. In perfect markets (depicted by the Walrasian trading process), there is no need to classify demanders and suppliers: they are all standing on an equal level. In the real world, where markets are imperfect, informationally inefficient and incomplete, we need to discuss how trading proceeds under different trading mechanisms. The prototypes of trading mechanisms are auctions and bargaining, and in their substantiation, we classify mechanisms into quote-driven and order-driven dealership markets and ECNs (electronic communication networks). In a quote-driven mechanism, dealers first set the bid and ask prices and specify depths (maximum quantities that they are willing to trade at the posted bid and ask prices), and then public investors upon seeing these terms of trade decide whether to place quantity orders. In an order-driven mechanism, dealers may and may not exist, but the distinct feature is that traders when submitting orders do not see the transaction price. Our Taiwan Stock Exchange is one such example (so is Tokyo Stock Exchange). In an order-driven mechanism traders bear price risks when submitting orders. There are a wide range of order strategies one may use, including limit orders, market orders, stop-loss orders, and so on. A Walrasian demand schedule can be approximated by an infinite number of limit orders. Nowadays more and more dealership markets have introduced ECNs, and public investors’ orders are matched and executed automatically according to computer programs that the markets set up in advance. Financial scholars are endeavoring to find out whether ECNs dominate completely the dealership markets or the other way around.

With market imperfections, the real-world traders may be classified (according to their trading motives) into: the *dealers* (who trade for their own accounts), the *market makers* (who set prices to absorb orders from the public traders), the *brokers* (who earn fees for their services
of placing orders for individual clients), and public traders. The public traders can be either large traders or small traders, and may either possess superior information or trade to meet some liquidity or portfolio requirements. We call traders whose trades are motivated by information advantages the speculators, and traders who trade to smooth their intertemporal consumption patterns, to hedge risks, to rebalance portfolios, or to meet some liquidity constraints the liquidity traders. Although traders are assumed fully rational in most financial theories, casual observations suggest that irrational traders do exist; the study of irrational investors’ behavior and their impact on financial markets is called Behavioral Finance. Traders who mistakenly regard useless noise as valuable information (and act accordingly on it) are called noise traders.

14. The current and the next two sections intend to give some ideas about corporate finance theory. A firm’s finance-related problems can be divided into two categories: financing (the right side of its balance sheet) and investments (the left side of its balance sheet). First, the firm must decide how to raise funds from households: what securities should be issued? At what prices? How much to borrow from commercial banks? At what terms? Second, if repayments are not clearly specified, the firm must decide at its discretion how much earnings it should distribute as dividends, and how much it should re-invest within the firm. These are the firm’s financing and dividend policies. Second, the firm must spend money on the most worthy investment projects. This is the capital budgeting or investment problem discussed in the Financial Management course.

15. An important theorem in corporate finance, known as Modigliani-Miller Proposition 1 (MM Proposition 1), gives a simple answer to the above questions regarding the firm’s financing arrangements. It says that two firms with the same assets must have the same equilibrium market value if financial markets are perfect. The idea is that arbitrage opportunities will arise if their market values differ. When markets are not only perfect but also complete, then different financing arrangements must lead to the same value of the firm, and so only the firm’s investment decisions can affect its market value, not its financing decisions.
16. An important conceptual problem in the study of corporate finance is investors’ unanimity. Publicly-owned corporations have shares constantly traded, and it is difficult for a loyal manager to decide who his investors (or bosses) are. If product markets are competitive and financial markets are perfect and complete, then Irving Fisher’s theorem says that loyal managers should simply do everything they can to maximize the firm’s market value; a criterion called the *net-present-value* (NPV) rule. Following this rule in making financing and investment decisions will make the investors happy, whoever they might be.

17. The assumption that managers are loyal to their investors does not seem consistent with empirical evidence. With self-interested managers, there will be conflicts of interest between managers and investors, and such conflicts lead to inefficient investment decisions, lowering investors’ welfare. This is referred to as a *corporate agency problem*. For example, the manager may spend investors’ money for personal perquisite consumption, or to behave too conservative when making investment decisions. Managers are not the only people who have incentive problems in the corporate financial environment. When the firm issues both equity and debt, there are generally conflicts of interest between shareholders and debtholders. It is now a standard view of corporate finance theorists that the capital structure and organization form of a company must be carefully chosen to minimize the costs resulting from these agency problems. The standard techniques to analyze corporate agency problems are treated in a *Game Theory* course.

18. Financial economists have recently gone beyond the boundary of capital market to conduct an integrated analysis of cross-market interactions. Some have studied the interactions between financial markets and product markets, and others have considered the interactions between financial markets and other input markets; for example, they study the effects of various financial arrangements on the behavior of employees, materials suppliers, corporate executives, and so on. Because of MM’s Proposition 1, one must abandon perfect markets assumption to analyze the interactions between the product and the financial markets. Financial economists have long recognized the need of analyzing cap-
itas markets of several physically separated economies (or countries). Unlike goods and services markets and other factor markets, capital markets are found to be highly integrated. This line of study has earned itself a title of *International Finance*. Financial markets are integrated for at least two important reasons. First, unlike other production factors, migration of capital is relatively easy. Second, price co-movements in different markets may be a consequence of information transmission from one market to another. For example, a new policy announced by the US Fed may lead to price responses in Asian stock markets.

19. Two basic disciplines that help the learning of finance are mathematics and economics. The relative importance of these basic disciplines depends on the learner’s ultimate purpose. For someone interested in Financial Engineering, economics may be less important than mathematics. (However, some profitable strategies adopted by famous hedge funds are macroeconomics-based, and they are actually game-theoretic in nature.) For someone interested in studying or practicing corporate finance, microeconomics and game theory are both important, but mathematics is less demanding. The following mathematics courses have proven very useful in the study of finance:
- measure theory;
- probability theory;
- stochastic processes;
- topology;
- functional analysis.

20. The major objects in finance are money, time, and uncertainty. In undergraduate *Financial Management*, students are trained to master the concept of time value of money and the trade-off between risk and return. To rigorously deal with uncertainty, finance researchers need some background in probability theory. As time is a concern, and uncertainty presents itself in a dynamic fashion, researchers need knowledge in stochastic processes.

21. Finance is the field in business school that emphasizes most on such economic concepts as market equilibrium and market-clearing prices. This may reflect two facts, that capital markets may approximate the ideal markets depicted in a microeconomics textbook better than other
markets (such as labor markets) do, and that asset prices are very important for all market participants. The latter leads to a huge body of literature in *asset pricing theory*.

22. One major result in asset pricing theory is that asset prices form a continuous linear functional on their payoff space, if markets are perfect. This fact underlies the entire theory of derivative asset pricing. To understand the mathematical properties of asset prices, one thus has to learn topology and functional analysis.

23. One may argue that to perform empirical research in finance, one does not need much training in mathematics and/or economics. This argument is certainly incorrect. To properly select a testable hypothesis the empiricist must know about finance theory, which creates a derived demand for both of the aforementioned disciplines.

24. The purpose of the current course intends to introduce some basic ideas about portfolio selections and asset pricing. For the most part of the course,  
- there is no production, and hence no theory of the firm;  
- there is no friction, and hence no role for money, specialists, and so on;  
- there is no information asymmetry, and hence no speculative trading;  
- there is only one consumption good, and hence allocative efficiency is addressed only to different states and different time points;  
- there is no continuous trading, and this simplifies mathematic treatments.

Also, the set of traded assets and the rules of matching and executing orders are exogenously assumed in this elementary course. (Hence we leave out completely the issues related to *financial innovation* and *market microstructure*.)

We deliver two important theories to students in such a context. The first one is the classic portfolio theory (and the CAPM), and the second one is the no-arbitrage asset pricing theory. These theories or techniques can be used to generate decent expected returns in securities trading while maintaining a tolerable risk exposure.