

## Finance and Financial Economics

### ***A debate about common sense and illogical models***<sup>1</sup>

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This document tries to answer to a frequent question of students and clients: are Finance and Financial Economics the same thing? My answer is NO: I think that they are very different, although the terms are very often confused and many Finance professor positions in many Business Schools have been filled with Financial Economists.

Two ways, among others, to see the differences: a) attend a class on "Finance for managers" taught by a sensible Finance professor and attend another taught by a "Financial Economist"; b) read a book on "Finance for managers" and another on "Financial Economics".

Financial Economics is a subject developed by economists whose main purpose is to elaborate "models" based on unrealistic assumptions. The conclusions and predictions of the "models" have very little to do with the real world: companies, financial markets, investors, managers... the most emblematic example is the CAPM.

The most used word in the Nobel Prize lectures of Fama, Shiller, Hansen and Sharpe was "model" (513 times).

This document contains facts and some opinions held by the author. I welcome comments (disagreements, errors, anecdotes...) that will help the readers and me to better differentiate between Finance and Financial Economics.

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A version in **Spanish** may be downloaded in: <https://ssrn.com/abstract=2900438>

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<sup>1</sup> Illogical: not logical; contrary to or disregarding of the rules of logic; unreasoning; an illogical reply. Synonyms for illogical: not making sense; absurd; false; groundless; implausible; inconsistent; incorrect; irrational; irrelevant; preposterous; senseless; unreasonable; unscientific; untenable

## 1. Books on Financial Economics

**Exhibit 1** has paragraphs from books titled *Financial Economics*. The reader can read them and judge whether the assumptions and conclusions have some relation to the world you know.

**Box 1** has a very instructive anecdote from Merton Miller (Nobel Prize winner in 1990). Miller says that the most important measure in *Financial Economics* is the expected rate of return. However, many financial managers of Banks and companies (and myself) have never calculated an expected rate of return.

**Box 1. Merton Miller** (2000, p. 3): "I still remember the teasing we financial economists, Harry Markowitz, William Sharpe, and I, had to put up with from the physicists and chemists in Stockholm when we conceded that the basic unit of our research, the expected rate of return, was not actually observable. I tried to tease back by reminding them of their neutrino –a particle with no mass whose presence was inferred only as a missing residual from the interactions of other particles. But that was eight years ago. In the meantime, the neutrino has been detected."

## 2. If you find a formula for expected returns that works well, would you publish it?

Coming back to the expected rate of return, the most important measure in *Financial Economics* according to Miller and to most Financial Economists. If you, dear reader, find a formula for expected returns that works well in the real markets, would you publish it? Before or after becoming a billionaire?

I agree with Brealey, Myers and Allen (2005, p. 154): "Only one firm conclusion emerges: Do not trust anyone who claims to know what returns investors expect".

## 3. Is the author of the predictions, or the author of the model that calculates expected returns, a billionaire?<sup>2</sup>

A question for the reader: What confidence do you have regarding the estimates (predictions) for the expected rate of return for investing in stocks, currencies, commodities ... that are published in specialized magazines, newspapers or heard on the radio or on TV? I apply the logic of the previous section: if the author of the prediction is not billionaire, I neither read nor hear.

## 4. Economics and Financial Economics, are they similar to Physics?

The expected (by many, see for example **Exhibit 2**) similarity of Economics or Financial Economics to Physics is far from the truth. The ability to describe the reality, to explain causes and effects, to predict... of Physics is vastly superior to that of Economics or Financial Economics.

As for the hypotheses. To suppose an absence of friction or that a slightly elliptical orbit is circular is much less far from the reality than the typical hypotheses of Economics and Financial Economics: *homogeneous expectations*, description of a person ...

Some people also say, "Economics is to Finance as Physics is to Mechanical Engineering". What do you think?

## 5. An emblematic example of an illogical model: the CAPM

The most emblematic example of "model developed by financial economists" is the CAPM. Fernández (2015a) shows that it is an absurd model because its hypotheses and its conclusions / predictions are opposed to reality. The most extravagant hypothesis is that investors have homogeneous expectations for each of the stocks, bonds ... (all investors expect the same return and the same volatility for each of the stocks) and the prediction most contrary to the reality is that the Equity portfolio of all investors is identical in composition: shares of all traded companies ("the market portfolio").

Another absurd assumption is to define risk as volatility. Just talk to wise investors to realize that there are many who like volatility. What investors do not like is bankruptcy or suspension of payments (unless they have a "short" position).

If all investors had identical expectations,

- A) Trading volume in financial markets would be very small. However, the trading volumes of many markets are huge.
- B) All valuations of the shares of a company should coincide. However, there are huge differences in stock valuations (analysts, investment banks, consultants, financial companies ...)
- C) The return required for the shares of a company should be identical in all valuations.
- D) The expected cash flows of the shares of a company should be identical every year in all valuations.

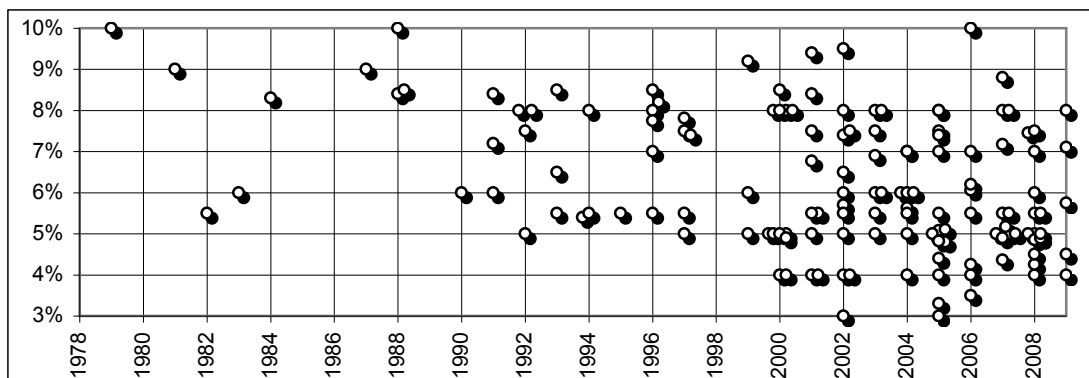
Since our world is not characterized by any of the four above characteristics, how can one even insinuate the hypothesis of homogeneous expectations?

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<sup>2</sup> This question is an adaptation to Finance of the following: *would you buy hair-restorer from a bald-headed seller?*

If, as the CAPM concludes, all investors should have the "market portfolio", how we explain the very different composition of the portfolios of a) mutual funds; B) pension funds; C) investment managers; D) private investors...

The following figure contains the evolution of the Market Risk Premium used or recommended by 150 Books on Corporate Finance or Company Valuation. 51 books use different MRP in various pages. Some confusion arises from not distinguishing among the Historical (HEP), the Expected (EEP) and the Required equity premium (REP, incremental return of a diversified portfolio over the risk-free rate required by an investor). 129 of the books identify EEP and REP and 82 identify EEP and HEP.



Source: *The equity premium in 150 textbooks* <http://ssrn.com/abstract=1473225>

**CAPM tests.** Numerous works and papers show that the CAPM does not fit the reality at all. According to Fama and French (2004) *"the failure of the CAPM in empirical tests implies that most applications of the model are invalid"*. Other tests of the CAPM include: Black, Jensen and Scholes (1972), Miller and Scholes (1972), Fama and Macbeth (1973), Gibbons (1982), Shanken (1992), Basu (1977, 1983), Litzenberger and Ramaswamy (1979), Banz (1981), Reinganum (1981), Keim (1983, 1985), Tinic and West (1984), Constantinides (1982), Lakonishok and Shapiro (1984, 1986), Statman (1980), Fama and French (1992, 2014), Kothary et al. (1995), Pettengill et al. (1995), Chung et al. (2001)... More articles that allow readers to conclude that the CAPM is an absurd model: *Beta = 1 Does a Better Job than Calculated Betas* (<http://ssrn.com/abstract=1406923>); *Are Calculated Betas Good for Anything?* (<http://ssrn.com/abstract=504565>)

**However, there are those who deny the obvious, with curious reasons.** For example, Roll (1977) says that CAPM tests cannot be done because two things are simultaneously analyzed: 1) that the market is an efficient portfolio a priori, and 2) the CAPM expression. Roll (1981) suggests that infrequent trading of shares of small firms may explain much of the measurement error in estimating their betas. Roll and Ross (1994) attribute the observed lack of a systematic relation between risk and return to the possible mean-variance inefficiency of the market portfolio proxies. Cremers (2001) claims that the data do not give clear evidence against the CAPM because it is difficult to reject the joint hypothesis that the CAPM holds and that the CRSP value-weighted index is efficient or a perfect proxy for the market portfolio. He also claims that the poor performance of the CAPM seems often due to measurement problems of the market portfolio and its beta. He concludes that *"according to the data, the CAPM may still be alive."* According to Levy (2010): *"The CAPM is Alive and Well"*.

**Consequences of the use of CAPM.** Users of the CAPM have made many errors valuing companies, accepting/rejecting investment projects, evaluating fund performance, pricing goods and services in regulated markets, calculating value creation... (many end up in trials and arbitrations)<sup>3</sup> and striking situations with the appearance of "science". *119 common errors in company valuations* (<http://ssrn.com/abstract=1025424>) contains a collection of errors seen in company valuations performed by analysts, investment banks, consultants and expert witnesses. Some of the errors are wrong betas and wrong market risk premia.

Box 2 shows some of the reasons why many teachers continue to teach the CAPM and claiming that it works.

**Box 2.** Comments from professors who continue to teach the CAPM and using betas calculated by regression (Source: *"Betas used by professors: a survey with 2,500 answers"* <http://ssrn.com/abstract=1407464>):

1. *If one does not use beta then what is there?*
2. *I do not use betas for personal investing, but I teach their use with both regressions and secondary sources.*
3. *I do not have much confidence in beta but we do not have any easy substitute.*

<sup>3</sup> Some of them have allowed me to pay for several months of my children's school and university.

4. *The model has received a Nobel Prize in Economics<sup>4</sup> and while not perfect, it is used extensively in practice.*
5. *We need to continue to use betas for at least 3 reasons: 1) still on the CFA exam, 2) the theory is still correct, only the lack of a true market prevents the correct calculation of beta (and there is no good substitute). 3) Need to understand the concept of beta to hedge an equity portfolio using futures contracts.*
6. *If you don't use betas, how do you adjust for risk? Almost every practitioner book uses betas*
7. *In consulting, it is essential to fully support your estimates.*
8. *I need a model anyway, and CAPM and betas are the safe bets that referees will not challenge.*
9. *I definitely use betas, because I haven't yet found a way to avoid teaching CAPM (still looking).*
10. *It is useful to defend an assessment and to look like a financial guru*
11. *To abandon a theory, it is necessary to have a better one*

According to the dictionary, a **theory** is “an idea or set of ideas that is intended to explain facts or events”; and a **model** is “a set of ideas and numbers that describe the past, present, or future state of something”. With the vast amount of information and research that we have, it is quite clear that the CAPM does not “explain facts or events”, nor does it “describe the past, present, or future state of something”.

## 6. Nobel Prizes in Economic Sciences awarded to financial economists

**Exhibit 3** enumerates the professors of *Financial Economics* that have gotten the Nobel Prize in Economic Sciences (and the reasons of the prize): 2013 (Fama, Hansen and Shiller), 1997 (Merton and Scholes), 1990 (Markowitz, Miller and Sharpe), 1985 (Modigliani).

**Exhibit 5** has some paragraphs from Sharpe (1964), the “foundational” paper of the CAPM. Sharpe acknowledges that to assume “homogeneity of investor expectations” is an “undoubtedly unrealistic assumption”. But he goes on to say that “since the proper test of a theory is not the realism of its assumptions but the acceptability of its implications (?), and since these assumptions imply equilibrium conditions which form a major part of classical financial doctrine (?), it is far from clear that this formulation should be rejected-especially in view of the dearth<sup>5</sup> of alternative models leading to similar results (?)”.

Fama (1976, see **exhibit 6**) also acknowledges, “The expected values and covariances that appear in [the CAPM and other models] are investors assessments of parameters that vary from one investor to another. It is not even logical to talk about estimates of these assessments obtained from market data”. However, he goes on to say “To conclude that a model has no value solely on the basis of the model's unrealistic assumptions is to forget what modeling is all about”. “The first purpose of a model is to improve understanding of some real-world phenomenon. If the phenomenon is a complicated one, like the adjustment of stock prices to new information, then to abstract from unimportant and potentially confusing details and to focus on the important aspects of the problem, we must impose some simple structure on the world. Since the structure is simplified and is thus not a completely realistic view of the world, we call it a model”.

Fama (2013, see **exhibit 7**, his Nobel Prize lecture) begins by saying that “The golden age of the CAPM is brief. In the 1980s, violations, labeled anomalies, begin to surface... and show that the CAPM is just a model and can't be expected to explain the entire cross-section of expected stock returns... the CAPM just doesn't work.” However, he finishes his speech affirming, “finance is the most successful branch of economics... The CAPM is one of the most extensively tested models in economics, it is well-known to students in areas of economics other than finance, and it is widely used by practitioners”.

**Exhibit 8** contains the most used words in the Nobel Prize lectures of Fama, Shiller, Hansen and Sharpe. The most used word was “**model**” (513 times), but they did not speak even once “homogeneous” nor “common sense”

## 7. In search of parameters (numbers) that do not exist

It is impossible to determine “the market risk premium” and “the market beta of a company” because such numbers do not exist due to the heterogeneous expectations of the investors.

We can know the beta of Microsoft expected by an investor asking him about it. However, it is impossible to determine the beta of Microsoft expected by the market because such a number does not exist. Even if we knew the betas expected by each investor for Microsoft, it would not make sense to talk about the beta expected by the market. This is based on the aggregation theorems of the microeconomics, which are actually non-aggregation theorems. A model that works perfectly at the individual level may not function at the aggregate level (the

<sup>4</sup> This type of argumentation is widely used in many fields: scientific congresses, radio, television, press... even in scholarly debates... I had the opportunity to hear it, over and over again, in a debate of 14-year-olds in which one of my daughters participated: “[a statement] is true because [Mr. XX] says it in his [publication zz]”. What does the reader think of this mode of reasoning?

<sup>5</sup> Dearth: scarcity that makes dear; an amount or supply that is not large enough.

market)<sup>6</sup>. For the CAPM, this means that although the CAPM could be an appropriate scheme for an investor, it is not valid for the market as a whole because investors do not have the same expectations of return and risk for all stocks. The value of each stock according to each investor is the present value of the expected flows discounted with a rate (which depends on the expected beta and the expected market risk premium). Different investors have different expectations of flows and different expectations of risk (expected beta and expected market risk premium).

Regarding the "**the market risk premium**", the paragraph above can be repeated by replacing "beta of Microsoft" with "expected market risk premium".

**Box 3** is illustrative of expectations obtained from surveys<sup>7</sup>.

**Box 3.** Greenwood and Shleifer (2014): "Over the last 20 years, increasing amounts of data on investor expectations of stock market returns have become available. We analyze these expectations obtained from six data sources: the Gallup investor survey, the Graham-Harvey Chief Financial Officer surveys, the American Association of Individual Investors survey, the Investor Intelligence survey of investment newsletters, Robert Shiller's investor survey, and the Survey Research Center at the University of Michigan. We also compare these investor expectations of returns with what financial economists call "expected returns" computed from aggregate data on dividends, consumption, and market valuations".  
"At a minimum, our evidence rules out rational expectations models in which changes in market valuations are driven by the required returns of a representative investor. Although prices may behave in a way that is observationally equivalent to such models, survey expectations are inconsistent with these models' predictions".  
"The evidence is not consistent with rational expectations representative investor models of returns".

## 8. To "kill" a model, do we need another model?

Copeland, Koller and Murrin (2000, pg. 225) say, among many others, "It takes a better theory to kill an existing theory, and we have not seen the better theory yet. Therefore, we continue to use the CAPM." We do not agree: common sense, experience and some business and financial knowledge are much better than a bad theory. The existing publications are more than enough to conclude that the CAPM does not explain the movements of the market. To not use a theory, it suffices to show that it does not work; it is not necessary to have another.

It does not make any sense to say "to 'kill' a model, we need another model". To stop using a financial model, it is enough to verify that it does not work and that it is much better to use common sense (in the description and analysis of the reality, in the establishment of criteria to evaluate alternatives of action, in the decision making and in its implementation).

Fernandez (2015a) reports on the beta calculation of "the transport activity of the electrical companies" done by a European Electricity Regulatory Commission. "We calculate the betas of all traded European companies. There is a great dispersion (from -0.24 to 1.16). We unlever the betas, calculate the average of the unlevered betas and relever it using the average debt to equity ratio of comparable companies. The levered beta proposed by the Commission for the transport activity is 0.471870073" (a precision of 9 figures after the decimal point!).

## 9. Techniques and models vs. logic and common sense

The previous sections already refer to this topic. **Box 4** of Yepes (professor of philosophy of the University of Navarra, who died in a mountain accident in 1996 being 43 years old) sheds more light on the topic.

**Box 4.** Yepes (1993, pg. 17-18). "Learning means being able to keep perceiving reality as it truly is: complex - and not trying to fit every new experience into a closed and pre-conceived notion or overall scheme.  
"Intellectually speaking, keeping young means never losing our capacity to learn. Old age comes when we no longer recognize novelty, reducing the richness of new events by trying to fit them through the lens of former experiences."

We all should try to explain a portion of "the world as it is", not of "the world as we model it".

## 10. The "transformation" of Economic professors into professors of Finance

In many U.S. universities, the Business Schools and Economics departments are independent organizations occupying different buildings. To live up to its name, the aim of Business Schools has always been to help its

<sup>6</sup> Mas-Colell et al. (1995, pg. 120): "It is not true that whenever aggregate demand can be generated by a representative consumer, this representative consumer's preferences have normative contents. It may even be the case that a positive representative consumer exists but that there is no social welfare function that leads to a normative representative consumer."

<sup>7</sup> Investor or manager surveys usually show the huge dispersion of parameters they use or expect. But the average of these parameters is not the parameter "**used or expected by the market**".

students (undergraduates, MBAs and managers) work well in their companies. Some of them used the case method.

For many years, some economics professors stated that Business Schools (especially those using the case method) had a "*non-scientific*" approach because, among other reasons, they were dedicated to analyzing concrete problems of specific companies or individuals and did not develop "*general methodologies*" as economists did.

Speaking of Finance, of which I know something about, the truth is that, based on repeating the "argument" above, some professors and deans of Business Schools thought it convenient to hire new professors with PhDs in Economics and transform them into Professors of Financial Economics<sup>8</sup>. The goal was to provide a "*more scientific*" content to the programs and "*raise the scientific quality*" of the research. A common diagnosis of many economists and financial economists on older professors was: "*they are not rigorous in their analyses, they look at particular cases, they teach with the case method instead of using the knowledge arising from the serious research, their approaches are very Far from the frontier of knowledge ...*".

A Finance professor at a Business School is, in general, very different from a professor of Financial Economics. Another issue is that in many Business Schools, Finance positions have been occupied by financial economists.

### 11. Research in Finance and "generally accepted statements" illogical and false

I still find a good definition of Research (at least for Finance) the following: "*studies that a) contribute to better understand the reality in which we live; b) allow to identify aspects to improve or change; and c) are useful to students, managers and other teachers.*" But in the last 30 years many Universities (and almost all financial economists I know) have replaced it with "*research is only what is published in Journals of recognized prestige*".

Some "*generally accepted statements*" illogical and false:

"Utility depends on the mean and variance of wealth"

"Stocks are usually trading for what they're really worth"

"Beating the indexes is almost impossible"

"To obtain higher returns implies assuming more risk"

"The goal of all companies is to maximize their profits"

"Companies make their decisions to maximize their value in the stock market"

"All small companies have greater risk than large ones"

"Efficient portfolios are those that given an expected return have lower volatility"

"The efficient portfolio of all individuals must necessarily be the market portfolio."

"Any known risky financial asset can be replicated with a portfolio of the market and the risk-free asset."

"The model with multiple betas arises because the beta risk changes with the economic cycle"

About databases frequently used, it is very enlightening to use them and the paper of Ljungqvist, Malloy and Marston (2009) with title "*Rewriting History*" (see **box 5**)

**Box 5. "Rewriting History".** "We document widespread *ex post* changes to the historical contents of the I/B/E/S analyst stock recommendations database. Across a sequence of seven downloads of the entire I/B/E/S recommendations database, obtained between 2000 and 2007, we find that between 6,594 (1.6%) and 97,579 (21.7%) of matched observations are different from one download to the next. The changes, which include alterations of recommendation levels, additions and deletions of records, and removal of analyst names, are non-random in nature: They cluster by analyst reputation, brokerage firm size and status, and recommendation boldness. The changes have a large and significant impact on the classification of trading signals and back-tests of three stylized facts: The profitability of trading signals, the profitability of changes in consensus recommendations, and persistence in individual analyst stock-picking ability."

### 12. The problems of some Business Schools

Some Business Schools that crammed their Finance departments full of financial economists with publications in "prestigious journals" have been encountering the same problem: complaints from students about the professors of the subject of Finance, especially in Executive-Education. How have they solved this problem? It would seem wise to return to a profile of more common-sense teacher, who would address specific problems that arise in companies and would be respected by managers. But no, most Business Schools have created new categories of professors (who do help managers, rather than teaching them models and the like) who they call in various ways: *Senior Lecturer, Adjunct Professor, Practice Professor, Professor of practice, Professor of professional*

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<sup>8</sup> Two additional facts that explain the speed of this process. 1) The salary of Finance professor in a Business School is and was superior in many universities to that of professor of the department of Economics. 2) A large number of Finance professors from Business Schools carried out consultancy work in banks and companies that reported, in many cases, income higher than their salary.

practice, Clinical Professor... Many departments (and most Finance Journals) continue to be dominated by financial economists with publications in prestigious journals. In **Box 6** it is surprising that only one institution says “ability to work with senior executives”.

**Box 6. What do some Business Schools say about their professors?**

*“Known for cutting-edge research and an innovative curriculum focused on leadership, entrepreneurship, global awareness, and social innovation... internationally-renowned leaders in their chosen fields of business theory and practice... talented, successful professors and well-respected leaders with specialized industry knowledge... a world-class group that is recognized internationally for strengths in a range of disciplines, top researchers with extensive teaching experience... Faculty members are leading economists, public policy experts, entrepreneurs, and executives of companies large and small. A business school is driven by the excellence of its faculty. Simple as that... our world-class faculty is comprised of applied researchers, market experts, entrepreneurs, inventors, and bestselling authors—all of them dynamic in the classroom. One of the nation’s finest research institutions, which means our professors are renowned in their fields. What distinguishes them is their dedication to developing a true learning environment. Our faculty work collaboratively to create and teach our skillfully crafted curriculum so that our students are highly prepared—and competitive—upon graduation. The profile includes the following dimensions: excellence and rigor in research, transformative teaching skills, impact in their field of knowledge, ability to work with senior executives”*

**Box 7. Some Business Schools on their PhDs in Finance (actually they are in Financial Economics)**

*“The PhD is for students seeking careers in research and academia. Doctoral candidates will have a strong affinity for quantitative reasoning and the ability to connect advanced mathematical theories with real-world phenomena. They will have an interest in the creation of complex models and financial instruments as well as a passion for in-depth analysis. The PhD in Business Economics combines economic analysis with the practical aspects of business. This degree is primarily intended to prepare students for careers in research and teaching. Students take courses in microeconomic theory, macroeconomic theory, statistics, econometrics, business history, the Business Education for Scholars and Teachers Series, and other doctoral level courses. A written general exam in microeconomic theory is required at the end of the first year. ... doctoral program in Finance for students interested in research careers in academic finance. The requirements of the program: Finance Seminar, coursework, general examination, research paper, and the dissertation. During the first 2 years, students take required and elective courses, and prepare for their general examination at the end of the 2nd year. Students are required to: complete a research paper by the end of December of their 5th semester, find a formal thesis advisor by the end of their 6th semester, and form their Thesis Committee by the end of their 8th semester... required courses: Microeconomics Theory 1, 2, 3 and 4 \\Statistical Methods in Economics \\Econometrics I \\Time Series Analysis\\Nonlinear Econometric Analysis\\Financial Economics\\Advanced Financial Economics 2 and 3\\Doctoral Seminar in Financial Economics \\Managerial Finance\\Corporate Finance\\Advanced Corporate Finance\\Financial Market \\Options and Futures Finance faculty and doctoral students study a wide spectrum of financial topics, including the pricing and valuation of assets, the behavior of financial markets, and the structure and financial decision-making of firms and financial intermediaries. Investigation of issues arising in these areas is pursued both through the development of theoretical models and through the empirical testing of those models. The PhD Program is designed to give students a good understanding of the methods used in theoretical modeling and empirical testing. All students are required to have, or to obtain during their 1st year, mathematical skills at the level of one year of calculus and one course each in linear algebra and matrix theory, theory of probability, and statistical inference. Students are expected to have adequate programming skills using languages such as FORTRAN, C, MATLAB, or GAUSS. It is particularly important to realize that a PhD in finance is not a higher-level MBA, but an advanced, academically oriented degree in financial economics, with a reflective and analytical, rather than operational, viewpoint.*

### 13. My personal experience

I finished the high school in the Sacred Hearts of Torrelavega (north of Spain)<sup>9</sup>, in 1974, then studied Electrical Engineering in San Sebastián (University of Navarra)<sup>10</sup> and the MBA in IESE (Barcelona)<sup>11</sup>.

<sup>9</sup> I am grateful to all my teachers who instilled in me the culture of effort (“If you want something, it’s going to cost you”) and of “common sense”, especially to Fr. Ángel Ramos, Florentino, Graciano, Jerónimo and Mauro, to the Mrs. Immaculate and to the professors Sámano (“being silly does not lead to anything”), Ramos, Piney, Parra, Navarro and Alberto.

<sup>10</sup> I thank the magnificent professors Bastero, Casellas, Cendoya, de la Morena, Flaquer, Jalón, Jiménez Conde, Jordana, Tejerizo... their dedication, good sense and the effort they put to inculcate us the habit of knowing the “foundation of what we say and do” (as opposed to studying “recipes” or acting “because so does the whole world” or “because someone says it”).

Later I worked for 4 years at PepsiCola in Madrid and Rome (accounting and finance department). Seeing the security with which many economists spoke and wrote about causes and effects of changes in variables (inflation, growth, GDP, unemployment...) I was hoping to be able someday to learn the relationship between those variables and to know the causes of their variations.

I was thinking about learning this at Harvard when I started in 1986 (I was 29) the PhD in Business Economics, which required a year in the economics department and another year in the Business School (with access to courses at the MIT). I heard that this PhD was intended to "*incorporate the rigor of economic science into the analysis of companies and markets*" and to me this seemed very promising.

I can summarize my first year in the economics department with one word: frustration. I studied macro- and microeconomics: almost everything was reduced to models in which "*rational agents*" (with little resemblance to people) took decisions in environments / markets / companies with very little resemblance to what is observed in the world. I also studied econometrics. The mathematical complexity of the courses was no problem for any Spanish engineer. The only subject I found to be interesting was Economic History, the only one that spoke of the reality (of the world) and not of esoteric worlds inhabited by presumed aliens.

An anecdote about the Models. One of the Macroeconomics courses was devoted almost exclusively to "*Overlapping generations models*". When I asked the professor if he was able to explain or recommend anything based on those unrealistic models, he told me that "*this is how science advances: with more research the models will be complicated, they will be closer to reality and then we will better explain what influences the profitability of investments, in saving and in consumption, and making recommendations that improve the social welfare*" (I obtained similar responses from several macro and micro professors).

I studied another course of Macroeconomics with prof. Mankiw who did try to establish bridges between the "models" and the real world. He also talked about important aspects of economic policies that are not clear (see **exhibit 4**), for example: A) is zero inflation desirable? B) Is it good or bad to have a budget deficit? C) Should laws stimulate savings? ...

After the disappointment of the first year, the following two years I had Finance seminars, attended many MBA and executive Finance courses, at both Harvard Business School (HBS) and MIT, and I also wrote a doctoral thesis<sup>12</sup>. I learned a lot in classes at HBS with Carliss Baldwin, Scott Mason, Tim Luehrman, Andre Perold, Paul Asquith, Richard Ruback and Robert Merton, and in classes at MIT with Franco Modigliani, Donald Lessard, John Cox, Frank Fabozzi and Chi-Fu Huang. About the market risk premium, professors were divided into two schools: the 8% and the 8.8% schools (all based these numbers on very strictly calculated historical averages). The cases provided a single beta for the company (usually 2 decimals) and the CAPM was used as if it were a revealed truth.

In 1989-90 I started teaching at IESE *Basic Finance* (for both MBAs and managers), 2 elective courses in the MBA ("*Options, futures and valuation of financial instruments*" and "*Investment Banking*") as well as in-company seminars on "*business valuation*". The first few years I taught my students the CAPM with the cases and with the foundation that I learned it: "*Is a model that is used a lot, very close to the reality, has been developed and is used by very smart people...*" But in the early 1990s I had a) access to databases, b) contacts with managers in classes and in consulting, c) contacts with professors from several countries within IESE and in conferences, d) time to think about what I had learned in the doctorate in the light of previous experiences... and I checked the problems that have the calculation of CAPM parameters (beta and risk premium) and the many nonsenses that could be said and done by applying the CAPM with blind faith.

After the PhD, I have had the enormous fortune of: a) being close to my family and people and professors of different disciplines who are very sensible and very intelligent, b) teaching more than 6000 people, c) having many conversations on various subjects with students and former students in which I learn many things, d) attending consultations with managers on subjects almost always related to valuation, e) attending more than 500 papers presentations in more than 70 academic conferences and in seminars (and speaking with many authors), f) attending conferences of Finance and valuation professionals... All these people have helped me, among other things, to: 1) clarify, focus and refocus the priorities of life and 2) realize that it is impossible to have reasonable quantitative models to evaluate companies, people or portfolios.

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<sup>11</sup> Teachers of good sense and good work were for me don José María Pujol and Professors Font, Pereira, Lucas, Agell, Pérez López, Abadía, Dionis, Ocariz, López Veraza ("*different people have different opinions and different expectations*"), ...

<sup>12</sup> On the doctoral theses (dissertations) I learned that they usually have a single reader of the entire document (the one who writes it). The director (depending on his dedication) reads a good percentage and the members of the dissertation committee a lower percentage. That is why I recommend to make a serious but quick thesis and to take note of all the ideas that arise when writing it to develop them, once finished the thesis, in articles that, if have interest, will have more readers.



What do I value most of the PhD? The nice and sensible people I met (Ignacio Mas, Mari Paz Espinosa, Ben Mondejar, F. Sal Ferigle, Peter Tufano, Richard Caves, Steve Kaplan, Sally Durdan, Rafael the Porta, Andreu Mas Colell, the previously mentioned professors ...), to know first-hand what it is known, what is not known and what many people presumes to know but it is really not known. Also, to eliminate my previously mentioned false expectations that, at least in my case, had produced insecurity about finance.

#### 14. What is Finance?

I must thank many professors at IESE for helping me be clear that my mission as a teacher is to learn and help my students and clients, among other topics, to:

1. Analyze and diagnose with common sense (and with the knowledge available) concrete situations of managers, investors, consultants, investment banks, commercial banks, auditors...
2. Make logical decisions based on the above.
3. Think of assumed "truths" that are false (Examples: "*net income is the money generated by the company*", "*the book-value of equity is the money invested by the shareholders in the company*").

Finance is a profession that requires interdisciplinary training and can help the managers of companies make sound decisions about financing, investment, continuity and other issues that affect the inflows and outflows of money, and the risk of the company. It also helps people and institutions invest and plan money-related issues wisely.

The concepts used in Finance are very simple. But for many people, they appear to be complicated because: a) many synonyms are used and new ones are continuously created; B) a word is used to designate different things; C) the use of words and phrases that have little or nothing to do with what they designate; D) confusion of terms; E) many terms are used in other languages; F) many people misinterpret accounting; G) believe in "experts" (who are not) who make statements with "*appearance of truth*". Examples: (a) book-value of equity, equity, capital and reserves, equity ...; Of b) return, profitability, cash-flow, working capital ...; Of c) ROE, Quantitative Easing ...; Of d) Cost of capital - required return - expected rate of return - historical profitability.

Can you teach Finance or work in Finance without knowing economics? Of course, you can. Some questions we try to answer (the students and me) in my classes:

*Get in the position of Mr. X, from ZZ Bank. Do you grant the credit he asks for? Why?*

*XXX has positive net income, does not distribute dividends and barely makes investments. Why does he need a credit?*

*Do you agree with the estimate of the loan required?*

*If you were Mr. X's financial adviser, would you advise him to go ahead with his plans? Why?*

*Why a profitable company like this one cannot repay the loan on time?*

*What is the most important risk associated with this loan? Does Mr. X have other alternatives? Pros and cons?*

*Why do you think XX repurchased shares?*

*Analysis of the XX business. What sells, how much? Customers. Increase. Production system. Keys to this business.*

*Do you think that it is a "profitable" company? For whom?*

*Compare the financial problems of XX with those of YY and ZZ.*

*Why is XXX considering a leveraged recap? What are its other alternatives? Why was XXX attacked?*

*Assess Mr. XXX response to the attack of ZZZ. What should he do now?*

*Is the price paid to the investors for their shares "fair"? How risky is the capital structure of the newly created firm?*

*Is value created by this transaction? From where (whom) does it come? To whom does it go?*

*What needs, interests, constraints... should be taken into account in structuring a transaction?*

*Evaluate XXX's decision to repurchase the block of 3% of its shares.*

*The so-called "zero-cost collar", does it really have a "zero-cost"?*

*Do you think that this financial product (swap, multi-currency mortgage, mortgage with floor, structured bond ...) is difficult to understand for Mr. ZZ? And for Mrs. LL?*

*What "manifest errors" does this valuation have?*

*Is it a sensible portfolio for these investors? What do you think about the way DDD manages it?*

#### 15. Types of professors of Finance and of Financial Economics

I have many friends that are very different professors. Also, keep in mind that teachers change with time. Nevertheless, there are some characteristics that greatly differentiate the classes and the writings of the professors:

1. Does he present "the world as it is" or "the world as we model it"?
2. Does he ground his conclusions on the observation and the logic or on models?
3. Does he mainly use Journals as a source of the "truth" about the behavior of investors and companies?
4. Does he state that "the CAPM hypotheses" closely approximate the operation of "financial markets"?

5. Does he consider volatility a good measure of risk?
6. Does he routinely have contact with company managers and investors?
7. Does he convey "*intellectual disdain*" for practitioners?
8. Does he claim that Finance is a part of Economics?
9. Has he been closer to a company than just passing by the entrance in a taxi?
10. Does he approach specific situations of companies, investors, managers...?
11. Does he approach/analyze specific decisions of managers and investors?

Two more points. We all know professors and professionals who are sensible in many respects but succumb to absurd models in some subjects. There are also very wise and sensible teachers who, in order to be able to maintain and ascend in their "*publish or perish*" environment, have to write about topics that their bosses and journal referees like (and in the way they like).

## 16. Typical phrases of several "financial economists"

This section contains some phrases that I have heard repeatedly in Congresses and seminars (meetings where almost all attendees are professors and students of doctoral programs):

- "*We help advance the frontier of knowledge*", "*we push back the frontiers of science*", "*we increase knowledge of science*"
- "*It is better not to talk to managers (practitioners) so as not to contaminate my scientific reasoning*"
- "*The problem of spending time with "practitioners" is that "they have no scientific knowledge"*"
- "*It is critical to differentiate between science and practice in financial research*"
- "*We contribute to increase the social welfare*" (an example is **box 5**)

**Box 5.** Sharpe (1990, conclusion): "*Happily, technological advances and greater understanding of the principles of **financial economics** are reducing costs and constraints of this type at a rapid pace. As a result, capital markets are moving closer to the conditions assumed in some of the simpler types of financial theory. Far more important: the combined efforts of theoreticians, empiricists and practitioners are increasing the efficiency with which risk is allocated among individuals, leading to **improvements in social welfare***".

## 17. Fifteen anecdotes with professors of Financial Economics

This section contains some curious statements made by Professors of "*recognized prestige*" in writing. Three of them were spoken and the author of this article was a witness.

1. "My research addresses the same issues as prof. Fernandez, but my research is more scientific and contributes to moving the frontier of knowledge"
2. Written by a professor of Financial Economics:
  - a. *The Multiples Method is based on the theory of valuation in the absence of arbitrage. It is, therefore, a valuation method with a **solid theoretical support**. Thus, from the prices of transactions or quotes of companies similar to the one we want to value, we obtain the multiple applicable to reach the value of the company we are valuing*".<sup>13</sup>
  - b. "*When valuing with multiples: typical and reasonable is to compare companies based on historical data*".
  - c. "*The next valuation by the multiples method **is very robust***". ("EV/Sales 2014") is the chosen multiple. This involves determining the value of a company (equity plus net financial debt) based on a multiple of the company's sales in 2014 (in this case €3.7 million). Five listed companies "comparable" to our Italian Company:

Company n.	1	2	3	4	5	average without Max and min
EV / Sales 2014	8.4	4.5	2.3	3.1	0.7	3.3
Country	Australia	China	USA	China	USA	

Using the 3.3 multiple results in an equity value of €9 million.

d. *In my valuation work I use the MRP (Market Risk Premium) calculated by Professor Damodaran because: a) it is a parameter obtained from objective data and not subjective beliefs (opinions). B) It is a parameter obtained with a well-defined and certainly rigorous methodology*".<sup>14</sup>

e. *The existence of different opinions about the MRP does not imply that there is no such value (which we know exists). We do not have the parameter but this does not imply that it does not exist. There are methods that have a **scientific basis** (such as that of Professor Damodaran) that should be used instead of unscientific and exoteric proposals.*

<sup>13</sup> The only publication that Professor XX has on company valuation (according to him) is a book of nearly 1000 pages titled *Financial Economics*. The book has many pages devoted to the CAPM but does not even mention the multiples method.

<sup>14</sup> The already mentioned book entitled *Financial Economics* has 1060 references to 227 authors but does not mention Damodaran once.

3. Only prof. Fernandez states that the expected return and the required return for a share may be different. All serious economists, endorsed by JCR journals, claim that they are equal. "
4. "The September 11, 2001 (Twin Towers of New York) attacks triggered extraordinary and unforeseen economic events that justify my client's refusal to accept the exercise of the option in May 2002: we have no obligation to accept the exercise of the put." (The put option agreement was signed on February 2001).
5. "Barclays knew before January of 2007 that Lehman was going to break in September of 2008 ""
6. "The sum of net income plus depreciation is the cash flow for the shareholders generated by the company".
7. "The floor of 2.5% makes the mortgage a very complex product, almost impossible to understand and totally inappropriate for Mr. XXX ""
8. July 2009. Harvard University. One of the directors of the Bank of Spain (BoS) said in a conference that given the great work done by the BoS, it would possibly give "private lessons" to other Central Banks on how to deal with a crisis. An assistant asked, "But they would be very short classes, right? It should only be said that in the face of a crisis, what should be done is nothing."
9. "The Bank of Spain is and has been one of the best supervisors and regulators in the world in recent years" (2015)<sup>15</sup>
10. "As the target company is much smaller than the buyer, the target company is not going to have much influence on the capital structure and on the risk of the resulting company. For this reason, the beta and the capital structure relevant to the valuation of the target company are those of the acquiring company."
11. "It is not correct to include the country risk of an emerging country because for global investors only systematic risk matters. Country-specific events will not be correlated with global market movements."
12. "The cost of capital measures the expected long-term average yield, which is based on expectations or projections".
13. "The legitimacy of the comparable transaction method is based on the fact that this method is used, in a generalized and predominant way, by financial analysts of investment banks, consultancies and stock exchanges to value companies".
14. "If a future investment had to be taken into account, its net present value should be assumed equal to zero. The most reasonable approach would be to assume that the investment is expected to yield a return that is equal to the expectations of the financial market (the required return), implying a net present value equal to zero."
15. "If the market is efficient, the best estimate of the future price is the price of today, as it incorporates all the available information. The market estimates that the most likely price variation is the "non-variation", i.e., zero."

## 18. Arbitrage Pricing Theory (APT) and smart betas

Rosenberg (1974), considered by many the creator of the APT: "Companies possessing similar characteristics may, in a given month, show returns that are different from the other companies. The pattern of differing shows up as the factor relation." According to APT, the expected return on a security is:

$$\text{Expected return} = R_f + b(1) \times rp(1) + b(2) \times rp(2) + \dots + b(n) \times rp(n)$$

$R_f$  = risk-free rate.  $b$  = beta of the asset to the particular factor,  $rp$  = the risk premium associated with the particular factor. Quite a few people call these betas "smart betas".

The arbitrage pricing theory (APT) is often viewed as an alternative to the capital asset pricing model (CAPM). Whereas the CAPM formula requires the market's expected return, APT uses the risky asset's expected return and the risk premium of a number of macroeconomic factors.

However, the expression "Arbitrage Pricing Theory" is false because this "theory" has nothing to do with Arbitrage. The "arbitrage" is very simple to understand: it consists of that if the price of a share of GM stock is €10 and the one of Ford is €9, the price of a financial instrument made up of one stock of GM and another of Ford should be €19. If it were higher (for example €23), investors would do "risk-free arbitrage": they would buy the shares (€19) and sell the instrument (€23) until prices were equalized. If it were lower (e.g. €16), they would do the opposite: they would sell the shares (€19) and buy the instrument (€16) until prices were equalized.

The Black and Scholes formula for valuing options is inspired by the arbitrage: a call on a Ford share is equal to a portfolio composed of: the purchase of  $\Delta$  Ford shares with a loan of B euros (the formula provides the values of  $\Delta$  and B). Both values ( $\Delta$  and B) depend on the expected volatility for the Ford stock and the portfolio replica of the option ( $\Delta$  Ford shares and B euro loan) has to be changed over the life of the option. That is why it is often called a *dynamic arbitrage*.

Bill Sharpe spoke at the CFA Institute Annual Conference (Seattle; May 5, 2014): "When I hear smart beta, it makes me sick... smart beta is a way to exploit stupidity... I think there are all kinds of confusion out there"<sup>16</sup>

<sup>15</sup> What do you think? I think that the Inspectors of the BoS (Bank of Spain) are very good and better than most of their European colleagues. But have their reports of the last 15 years been taken into account by their BoS directors and by the heads of the Ministry of Economy? Obviously, no.

<sup>16</sup> <http://www.businessinsider.com/sharpe-smart-beta-makes-me-sick-2014-5>

Many predictors have been explored in the literature: Dividend yield, short term interest rate, PER and payout ratio, the term spread and the default spread, inflation rate (money illusion), interest rate and dividend related variables, book-to-market ratio, value of high and low-beta stocks, consumption and wealth, aggregate financing activity, momentum, accounting profitability...

Goyal and Welch (2008) show that most of these models did not perform well for the last thirty years, that they were not stable, and that they were not useful for market-timing purposes. Campbell and Thompson (2008) conclude that: *"The basic lesson is that investors should be suspicious of predictive regressions with high R<sup>2</sup> statistics, asking the old question 'if you're so smart, why aren't you rich?'"* Harvey, Liu and Zhu (2015) revise 313 papers that study cross-sectional return patterns. They mention that *"at least 316 factors have been tested to explain the cross-section of expected returns"* and Cochrane (2011) refers to that as *"a zoo of new factors"*. They argue that *"it is a serious mistake to use the usual statistical significance cutoffs (e.g., a t-ratio exceeding 2.0) in asset pricing tests"* and conclude, *"many of the factors discovered in the field of finance are likely false discoveries"* and that *"most claimed research findings in financial economics are likely false."*

## 19. A fundamental problem: forgetting what is a person

**Box 6** contains two sentences from Ernesto Juliá that we should not lose sight of, at least, those of us who dedicate ourselves to teaching and to businesses. And especially when we are tempted to make generalizations and hypotheses like *"homogeneous expectations"*, *"all investors ..."*, *"all companies ..."*

**Box 6.** Juliá (2002, pg. 6): *"The variety of men and women is great and no classification will ever come to include them all ... Achieving a complete, definitive and adequate view of a human being is beyond the goals that another human being can achieve."*

## 20. "The Market thinks..."

When you hear phrases that begin like this (*"The market thinks that ..."*, *"the investors have reacted to ..."*, *"the managers believe ..."*...) remember **box 6**. It should also be remembered that:

- A) A transaction in the market requires someone who sells and someone who buys
- B) The databases usually provide us with only the price at which the last transaction of the day has produced.
- C) In all the markets there are people who buy, others who sell, others who do both and many other people whom on a certain day neither buy nor sell.
- D) There are large differences between companies due, among other things, to how their managers analyze the reality, their decision-making procedures, the criteria used to decide, the relationships between their employees and managers, ...
- E) There are large differences between investors due to, among other things, if they have a clear horizon of investment, ability to withstand declines, propensity to invest when there are declines, if they understand what a short position is, if they apply the question in section 3 (the author of the predictions or the model that helps to predict the future, Is a billionaire?), ...

## 21. Confusion between the expected rate of return and the required rate of return

As I have said, I have never estimated an expected rate of return, but I have helped several companies and investors to estimate required returns.

The document *"Expected and Required returns: very different concepts"* (<http://ssrn.com/abstract=2591319>) shows that they are very different concepts for the majority of investors<sup>17</sup>. Confusing those leads to many mistakes and wrong decisions.

The document *"All-shareholder return, all-period returns and total index return"* (<http://ssrn.com/abstract=2358444>) shows that there are different returns for different groups of shareholders.

## 22. Do I teach the CAPM to my students?

Of course, I teach the CAPM (the beta and the market risk premium) to my students because many people and companies are still using the model and I think they should understand what it is and for what little it serves. I also tell them that to calculate the required return to equity of a company there is an alternative formula that has the same rigor as the CAPM. This formula is:

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<sup>17</sup> *"There are many valuations that assume that the expected return is equal to the required return. Similarly, Expected Equity Premium (EEP) and Required Equity Premium (REP) are two very different concepts, although many books and financial literature do not distinguishing them. Both, the REP and the EEP differ for different investors. The topic of this short paper is "thinking about valuation": it is important to understand what we are doing."*

$$\text{required return to equity} = [2 \times (\text{CEO age})^{1/3}] / 87$$

(If the company is perceived to carry a lot of risk, it is recommended to substitute the age of the CEO by the one of his mother-in-law)

### 23. What many students expect from Finance courses?

Many students expect to receive a "*recipe book*" to analyze situations and make decisions. A common request of many students and managers: '*Give me a rule of thumb I can follow **without thinking***'

However, there is an abysmal difference between a) managers and professionals who apply "recipes", and b) those who use their experience and common sense to make decisions.

Finance is a "profession" that requires some technical knowledge, but it is not a science like the physics nor an application like the engineering<sup>18</sup>. The fundamental difference: people.

«**Experience** doesn't consist of the number of things one has seen, but of the number of things on which one has reflected». Pereda, José María. Santander.

"For any **complex problem** there is always a solution that is simple, neat, plausible, and **wrong**". Mencken, Henry Louis

### 24. Questions for the reader

These are questions related to economic issues sent to me by former students and friends.

What do you think about denominating as "**Quantitative Easing**" to describe the massive purchase of Government Bonds by the Central Bank?

For Europe, is more important the **Brexit** or the **Drexit**<sup>19</sup>?

Is the current **welfare state** sustainable? Does it contribute to the development of the "culture of effort"?

### 25. Conclusion

I have attempted to answer a frequent question of students and clients: Are Finance and Financial Economics the same thing? My answer is NO: I think that they are very different, although the terms are very often confused and many Finance professor positions in many Business Schools have been filled with Financial Economists.

Two ways, among others, to see the differences: a) attend a class on "Finance for managers" taught by a sensible Finance professor and attend another taught by a "Financial Economist"; b) read a book on "Finance for managers" and another on "Financial Economics".

Financial Economics is a subject developed by economists whose main purpose is to elaborate "models" based on unrealistic assumptions. The conclusions and predictions of the "models" have very little to do with the real world: companies, financial markets, investors, managers... the most emblematic example is the CAPM. We think that common sense, experience and some business and financial knowledge are much better than a bad theory and an absurd model.

This document contains facts and some opinions held by the author. **I welcome comments** (disagreements, errors, anecdotes...) that will help the readers and me to better differentiate between Finance and Financial Economics.

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<sup>18</sup> According to my dentist (55): "*A well-trained 18-year-old would make this arrangement faster than I: he has a better view than I do, his back does not hurt ... the problem is when unforeseen events arise ... and with almost all the patients some arise.*"

<sup>19</sup> Drexit: Draghi exit.

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**Exhibit 1. Paragraphs from books titled *Financial Economics* (all have about 1000 pages)**

"The key assumption ... is that investors are only interested in the expected return (their mean) and the variance of such returns when they are forced to discriminate between alternative investments." (?)

"Efficient portfolios are those that given an expected return have lowest volatility and, given a certain volatility, have highest expected returns." (?)

"If there is a safe asset and expectations are homogeneous, there is only one efficient portfolio of uncertain assets, the beta coefficient of each asset is well defined and the same for all individuals." "The efficient portfolio of all individuals must necessarily be the market portfolio." "This implies the occurrence of the so-called market clearing or, in other words, the total (aggregate) supply of financial assets, which we assume exogenous in the model to be equal to the total (aggregate) demand for assets." (?)

"The beta coefficient, as a risk measure of an individual asset, has become one of the most useful working tools for analyzing investment strategies and cost of capital, hedging analysis, portfolio management and any type of Financial analysis where an analytical and accurate measurement of risk is required." (?)

"Any financial asset whose beta risk is known may be replicated through a portfolio consisting of the market portfolio of uncertain assets and the risk-free asset." (?)

"The study of Financial Economics is justified by the consequences it has on social welfare." (?)

**Main assumptions of the CAPM.** All investors: a) have homogeneous expectations (same expected return, volatility and correlations for every security), b) can lend and borrow unlimited amounts at the risk-free rate of interest, c) can short any asset, and hold any fraction of an asset, d) plan to invest over the same time horizon, e) only care about the expected return and the volatility of their investments. f) There are no transaction costs (no taxes, no commissions...). g) All information is available at the same time to all investors. h) Each investor is rational and risk-averse, and wants to maximize his expected utility.

"The returns on financial assets cannot be explained by the CAPM. There is an absolutely widespread belief that other sources of risk, in addition to market risk, are relevant in the optimal portfolio selection process and therefore, the expected return on any asset will depend on more than the covariance of its return with the market. Multiple betas appear naturally." (?)

Problem of the CAPM contrasts: inability to observe the true market portfolio. Many assets are not traded in organized markets in order to continuously monitor their prices. Private companies, real estate, works of art and human capital are some relevant examples. Consequence: the CAPM is not testable in practice. The portfolio we use as an approximation to the true market portfolio may not be efficient and yet the real market portfolio is so that the CAPM as a theoretical model is correct. (?)

We obtain a model with multiple betas because the beta risk changes with the economic cycle and not because the agents are covered by explicit intertemporal decisions. (?)

In the presence of complete markets the financial equilibrium exists ... and financial assets have unique prices that satisfy the condition of absence of arbitrage or fundamental equation of valuation. The result is quite general (?)

... assuming homogeneous probabilistic beliefs and temporary and independent additive preferences between states we obtain that: the representative agent theorem under which the CCAPM is derived. (?)

**Exhibit 2. Preface by an economist in a book titled *Financial Economics***

A prominent professor of **physics** once noted that the power of mathematics in the work of the **physics** was unreasonable ("unreasonable power of mathematics"). We could decompose the explanation of this hyperbole into at least four components. The 1st notes the centrality of the mathematical theory in the physics. The 2nd notes that the predictions of this theory, are susceptible to very precise empirical verification. The 3rd observes that sometimes (and these are times that

matter for scientific progress), the theory is confirmed by the empirical exercise. The 4th notes that, on the theory verified, engineering has built a surprising complex of practical applications of enormous economic and social importance. About the Financial Economics developed in the last thirty years we could say the same (?). The theory, built on economic principles but **also** highly mathematical, has provided concrete predictions about the functioning of financial markets and, in particular, on the valuation of publicly traded assets. On the other hand, the availability of data and advances in statistical techniques has made empirical verification possible. Accompanied also by a certain sense of wonder, the predictions have proved to be often correct (and when it has not been so has caused them a profound revision of the theory) (?). Finally, Financial Economics emerged from highly academic universities and has led to an unexpected expansion and transformation of the financial markets themselves (?).

### Exhibit 3. Nobel Prizes in Economic Sciences awarded to financial economists

Source: [http://www.nobelprize.org/nobel\\_prizes/facts/economic-sciences/index.html](http://www.nobelprize.org/nobel_prizes/facts/economic-sciences/index.html)

The Nobel Prize in Economic Sciences has been awarded 48 times to 78 Laureates between 1969 and 2016. Nobel Prizes in Economic Sciences. Finance:

**2013** Eugene F. Fama, Lars Peter Hansen and Robert J. Shiller "for their **empirical analysis of asset prices**"

**1997** Robert C. Merton and Myron S. Scholes "for a new method to determine the **value of derivatives**"

**1990** Harry Markowitz, Merton Miller and William Sharpe "for their pioneering work in the **theory of financial economics**"

**1985** Franco Modigliani "for his pioneering analyses of saving and of financial markets"

Franco Modigliani (awarded in 1985) developed two important building blocks in macroeconomic models. In his *life-cycle theory of saving* Modigliani studied the consequences for household saving of changes in demography and economic growth. Together with Merton Miller he also laid the foundation for the field "*corporate finance*". The Modigliani-Miller theorem states the conditions under which the value of a firm in the stock market is influenced (or not influenced) by the dividend policy of the firm, and the way the firm finances its investment, e.g., via equity capital or borrowing.

Though **financial economics** relies on similar analytical techniques as traditional microeconomics, over time it has become a field of its own, with a huge expansion during the last two decades. The field financial economics is today built mainly on foundations laid in the 1950s and 1960s by Markowitz, Miller and Sharpe (jointly awarded in 1990). While Markowitz' contribution was to construct a microtheory of portfolio management of individual wealth holders, Merton and Sharpe developed equilibrium analysis in financial markets. More specifically, Sharpe developed a general theory for the pricing of financial assets. Miller made important contributions in the field of corporate finance (to begin with, partly in cooperation with Modigliani). In particular, Miller clarified which factors determine share prices and capital costs of firms.

Robert Merton and Myron Scholes were given the Prize (in 1997) for their analysis of price formation of so-called derivative instruments such as options, which are claims on underlying financial instruments including shares and foreign exchange. (The late Fisher Black, cooperating with Scholes, was also instrumental for this achievement.) These contributions were a necessary condition for the subsequent development of today's huge markets for various types of derivative instruments. These markets have increased the possibility for individual agents to choose adequate risk levels according to their own preference, regardless of whether they choose low or high exposure to risk.

The shared Prize to Markowitz, Miller and Sharpe was also an award for complementary contributions in financial economics, though the latter two had the advantage of standing on the shoulders of Markowitz. The Prize to Merton and Scholes may be regarded as a "follow up" of this Prize (¿?), since they (with the late Fisher Black) developed a theory of price formation for one specific type of important financial asset, namely "*derivative financial instruments*", such as options and futures.

### Exhibit 4. Mankiw, G. (2000), "*Intermediate Macroeconomics*". Some paragraphs about five leading debates over macroeconomic policy.

Pg. 811-2. The final chapter presents both sides in five leading debates over macroeconomic policy.

1. Should monetary and fiscal policymakers try to stabilize the economy? 2. Should monetary policy be made by rule rather than by discretion? 3. Should the central bank aim for zero inflation? 4. Should the government balance its budget? 5. Should the tax laws be reformed to encourage saving?

Few if any policies come with benefits but no costs... the study of economics should make you a better participant in our national debates.

SUMMARY. - Advocates of active monetary and fiscal policy view the economy as inherently unstable and believe that policy can manage aggregate demand to offset the inherent instability. Critics emphasize that policy affects the economy with a lag and **that** our ability to forecast future economic conditions is poor. As a result, attempts to stabilize the economy can end up being destabilizing.

- Advocates of rules for monetary policy argue that discretionary policy can suffer from incompetence, abuse of power, and time inconsistency. Critics argue that discretionary policy is more flexible in responding to changing economic circumstances.



- Advocates of a zero-inflation target emphasize that inflation has many costs and few if any benefits. Moreover, the cost of eliminating inflation-depressed output and employment-is only temporary. Even this cost can be reduced if the central bank announces a credible plan to reduce inflation, thereby directly lowering expectations of inflation. Critics claim that moderate inflation imposes only small costs on society, whereas the recession necessary to reduce inflation is quite costly.

- Advocates of a balanced government budget argue that budget deficits impose an unjustifiable burden on future generations by raising their taxes and lowering their income. Critics argue that the deficit is only one small piece of fiscal policy. Single-minded concern about the budget deficit can obscure the many ways in which policy, including various spending programs, affects different generations.

- Advocates of tax incentives for saving point out that our society discourages saving in many ways, such as by heavily taxing the income from capital and by reducing benefits for those who have accumulated wealth. They endorse reforming the tax laws to encourage saving, perhaps by switching from and income tax to a consumption tax. Critics argue that many proposed changes to stimulate saving would primarily benefit the wealthy, who do not need a tax break. They also argue that such changes might have only a small effect on private saving. Raising public saving by decreasing the government's budget deficit would provide a more direct and equitable way to increase national saving.

**Exhibit 5. Sharpe (1964). Paragraphs from his paper about CAPM** [The signs (??) are not in the original]

"We may arbitrarily select any one of the efficient combinations, then measure the predicted responsiveness of every asset's rate of return to that of the combination selected; and these coefficients will be related to the expected rates of return of the assets in exactly the manner  $E(R_i) = R_F + \beta_i [E(R_M) - R_F]$ ".

Pg. 425. "In equilibrium, the investor may obtain a higher expected rate of return on his holdings only by incurring additional risk". (??).

Pg. 433-4. "To derive conditions for equilibrium in the capital market... we assume homogeneity of investor expectations: investors are assumed to agree on the prospects of various investments-the expected values, standard deviations and correlation coefficients.

Needless to say, these are highly restrictive and undoubtedly unrealistic assumptions. However, since the proper test of a theory is not the realism of its assumptions but the acceptability of its implications (??), and since these assumptions imply equilibrium conditions which form a major part of classical financial doctrine (??), it is far from clear that this formulation should be rejected-especially in view of the dearth<sup>20</sup> of alternative models leading to similar results (??).

Under these assumptions, given some set of capital asset prices, each investor will view his alternatives in the same manner".

Pg. 440. "Assets which are more responsive to changes in Market return will have higher expected returns than those which are less responsive. This accords with common sense (??). Obviously the part of an asset's risk which is due to its correlation with the return on a combination cannot be diversified away when the asset is added to the combination. Since  $\beta$  indicates the magnitude of this type of risk it should be directly related to expected return".

**Exhibit 6. Fama (1976). Paragraphs from his book "Foundations of Finance"**

**Pg. 319:** "The expected values and covariances that appear in [the CAPM and other models] are investors assessments of parameters that vary from one investor to another. It is not even logical to talk about estimates of these assessments obtained from market data". "In contrast, with complete agreement, the assessed values of the parameters that appear in the pricing equations are common to all investors<sup>21</sup>, and they are presumed to be based on correct perception of the joint distribution of the expected market values of firms... The fact that assessments are assumed to be common to all investors and that investor perceptions are assumed to be correct allows us to go from theory to data".

**Pg. 133:** "In an efficient market, prices 'fully reflect' available information. The prices of securities observed at any time are based on 'correct' evaluation of all information available at that time".

**Pg 169:** "To conclude that a model has no value solely on the basis of the model's unrealistic assumptions is to forget what modeling is all about". "The first purpose of a model is to improve understanding of some real-world phenomenon. If the phenomenon is a complicated one, like the adjustment of stock prices to new information, then to abstract from unimportant and potentially confusing details and to focus on the important aspects of the problem, we must impose some simple structure on the world. Since the structure is simplified and is thus not a completely realistic view of the world, we call it a model".

Thus, in deriving testable implications of the hypothesis that the capital market is efficient, we structure the world in terms of a "market" that assesses probability distributions on future prices and then sets current prices on the basis of these assessed distributions. Strictly speaking, this implies that investors have monolithic opinions about available information and act singlemindedly to ensure that their assessment are properly reflected in current prices. What we really have in mind,

<sup>20</sup> <https://www.merriam-webster.com/dictionary/dearth> Definition of dearth:

1: scarcity that makes dear; specifically : famine. 2: an inadequate supply: lack <a dearth of evidence>.

<http://dictionary.cambridge.org/dictionary/english/dearth>: an amount or supply that is not large enough

<sup>21</sup> That is: *homogeneous expectations*

however, is a market where there is indeed disagreement among investors but where the force of common judgments is sufficient to produce an orderly adjustment of prices to new information. Such an intuitively appealing statement is, however, too unspecific to be the basis for formal tests. Formal tests require formal models, with their more or less unrealistic structuring of the world. And we are, after all, ultimately interested in judging market efficiency on the basis of tests. The models we have used so far are extreme simplifications of the world. In later chapters we discuss more sophisticated models, which are nevertheless still far short of, and are not meant to be, completely realistic views of the world. The simple models of this chapter have, however, been useful. They seem to lead to meaningful tests of market efficiency, tests which, on the whole, suggest a market that responds well to new information. At the very least, the test contribute to our understanding of the phenomenon of interest, the behavior of security prices, and this is all we require in order to conclude that the simple models from which they are derived are useful.

**Exhibit 7. Fama (2013). Paragraphs of his Nobel Prize Lecture “Two Pillars of Asset Pricing”**

[http://www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/2013/fama-lecture.pdf](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2013/fama-lecture.pdf)

B. The Problems of the CAPM. The golden age of the model is, however, brief. In the 1980s, violations, labeled anomalies, begin to surface: Banz (1981), Basu (1983), Rosenberg, Reid, and Lanstein (1985), Bhandari (1988)...

Viewed one at a time in the papers that discovered them, the CAPM anomalies seemed like curiosity items that show that the CAPM is just a model and can't be expected to explain the entire cross-section of expected stock returns.

In updated tests, Fama and French (1992) examine all the common anomalies.

Apparently, seeing all the negative evidence in one place leads readers to accept our conclusion that the CAPM just doesn't work. The model is an elegantly simple and intuitively appealing tour de force that lays the foundations of asset pricing theory, but its major prediction that  $\beta$  suffices to explain the cross-section of expected returns seems to be violated in many ways.

In my view, finance is the most successful branch of economics in terms of rich theory, extensive empirical tests, and penetration of the theory and evidence into other areas of economics and real-world applications. Markowitz' (1952, 1959) portfolio model is widely used by professional portfolio managers. The portfolio model is the foundation of the CAPM. The CAPM is one of the most extensively tested models in economics, it is well-known to students in areas of economics other than finance, and it is widely used by practitioners.

**Exhibit 8. Nobel Prize Lectures of Fama, Shiller, Hansen and Sharpe. Most used words.**

	Fama	Shiller	Hansen	Sharpe	Suma
model, models	107	<b>44</b>	<b>293</b>	69	513
market, markets	127	<b>204</b>	39	98	468
price, prices...	100	141	90	71	402
return, returns	<b>143</b>	40	23	57	263
asset, assets	84	16	39	96	235
risk, risks, risky, riskless	26	24	81	101	232
investor, investors	7	40	51	120	218
stock, stocks	76	96	1	25	198
portfolio	34	1	6	<b>148</b>	189
efficient, efficiency	34	73	22	41	170
value	27	37	33	56	153
expected	89	16	12	33	150
<b>economic, economics</b>	10	35	66	37	148
security, securities	8	4	6	90	108
dividend, dividends	24	81	0	0	105
financial	0	44	18	29	91
variance, covariance, volatility	17	25	6	32	80
assumption, assume	9	18	9	43	79
approach	10	1	60	8	79
future	9	46	18	4	77
empirical	19	0	48	4	71
equilibrium	26	1	26	14	67
average	32	10	11	14	67
expectations	1	8	57	1	67
data	6	24	36	1	67
regression	46	11	1	1	59
statistics, statistical	3	3	45	0	51
probability	0	7	32	4	43

stochastic	0	0	42	1	43
<b>finance</b>	12	22	3	4	41
money	1	25	0	8	34
hypothesis	18	4	8	0	30
flow, flows, cashflow	0	9	11	9	29
experience	2	5	2	1	10
<b>heterogeneous</b>	0	1	4	0	5
<b>homogeneous</b>	0	0	0	0	0
<b>common sense</b>	0	0	0	0	0
the ( <i>the most used word</i> )	636	764	829	700	2,929

#### Exhibit 9. Bodie and Merton (2000), Paragraphs of their book Finance.

<p><b>Pag. 2.</b> <b>Finance</b> is the study of how people allocate scarce resources <i>over time</i>. Two features that distinguish financial decisions from other resource allocation decisions are that the costs and benefits of financial decisions are (1) spread out over time and (2) usually not known with certainty in advance by either the decision makers or anybody else.</p> <p>Finance theory consists of a <u>set of concepts</u> that help you to organize your thinking about how to allocate resources over time and a <u>set of quantitative models</u> to help you evaluate alternatives, make decisions, and implement them. The same basic concepts and quantitative models apply at all levels of decision making, from your decision to lease a car or to start a business, to the decision of the CFO of a major corporation to enter the telecommunications business, to the decision of the World Bank about which development projects to finance.</p> <p>A <u>basic tenet of finance</u> is that the ultimate function of the system is to satisfy people's <i>consumption preferences</i>.</p> <p>5 good reasons to study finance: To manage your personal resources; To deal with the world of business; To pursue interesting and rewarding career opportunities; To make informed public choices as citizen and To expand your mind.</p> <p><b>Pag. 4.</b> Markowitz is the father of modern portfolio theory, the scientific study of how to trade off risk and reward in choosing among risky investments... he developed a mathematical model showing how investors could achieve <u>the lowest possible risk for any given target rate of return</u>. The Sharpe's theory is widely used today as the basis for making risk adjustments in many areas of finance theory and practice. In 1997 the Nobel Prize in economics was awarded to <b>financial economists</b>. The laureates were Merton and Scholes. The prize committee also mentioned a third scholar, Fischer Black, whose untimely death in 1995 at age 57 made him ineligible to share the prize.</p> <p><b>Pag. 7.</b> <u>The choices that a firm makes in all areas of financial decision making -investment, financing, and working capital management- depend on its technology and on the specific regulatory, tax, and competitive environment in which it operates.</u></p> <p><b>Pag. 17.</b> The players in finance theory are households, business firms, financial intermediaries, and governments... the <u>ultimate function of the system</u> is to satisfy the <u>preferences of people</u>, and the theory treats those preferences as given. Finance theory explains <u>household behavior</u> as an attempt to satisfy those preferences. The <u>behavior of firms</u> is viewed from the perspective of how it affects the welfare of households.</p> <p>Households face 4 basic types of financial decisions. 1) <i>Saving decisions</i>. 2) <i>Investment decisions</i>. 3) <i>Financing decisions</i>. 4) <i>Risk-management decisions</i>.</p> <p><b>Pag. 355.</b> Whether or not the CAPM is strictly true, it provides a rationale for a very simple passive portfolio strategy:</p> <ul style="list-style-type: none"> <li>• Diversify your holdings of risky assets according to the proportions of the market portfolio, and</li> <li>• Mix the portfolio with the risk-free asset to achieve a desired risk-reward combination.</li> </ul> <p>In corporate finance, the CAPM is used to determine the <u>appropriate risk-adjusted discount rate</u> in valuation models of the firm and in capital-budgeting decisions.</p>
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#### Exhibit 10. Dictionary

**Research** <http://dictionary.cambridge.org/es/diccionario/ingles/research> A detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding.

<http://www.merriam-webster.com/dictionary/research> Careful study that is done to find and report new knowledge about something; the activity of getting information about a subject. Studious inquiry or examination; *especially*: investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws

**Science** 1. a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws: the mathematical sciences. 2. systematic knowledge of the physical or material world gained through observation and experimentation. 3. any of the branches of natural or physical science. 4.

systematized knowledge in general. 5. knowledge, as of facts or principles; knowledge gained by systematic study. 6. a particular branch of knowledge.

**Theory:** an idea or set of ideas that is intended to explain facts or events-

**Model:** a set of ideas and numbers that describe the past, present, or future state of something.

**Logic.** noun 1. the science that investigates the principles governing correct or reliable inference. 2. a particular method of reasoning or argumentation: We were unable to follow his logic. 3. the system or principles of reasoning applicable to any branch of knowledge or study. 4. reason or sound judgment, as in utterances or actions: There wasn't much logic in her move. Synonyms: sense, cogency.

**Logical.** adjective 1. according to or agreeing with the principles of logic : a logical inference. 2. reasoning in accordance with the principles of logic, as a person or the mind: logical thinking. 3. reasonable

**Illogical.** Adjective. 1. not logical; contrary to or disregardful of the rules of logic; unreasoning: an illogical reply. Synonyms for illogical: not making sense: absurd; false; groundless; implausible; inconsistent; incorrect; irrational; irrelevant; preposterous; senseless; unreasonable; unscientific; untenable

**Common sense:** sound practical judgment that is independent of specialized knowledge, training, or the like; normal native intelligence. Synonyms: sound judgment; good sense; intelligence; logic; practicality; prudence; rationality; sense; wisdom; good reasoning

**Radical.** Adjective. 1. of or going to the root or origin; fundamental: a radical difference. 2. thoroughgoing or extreme, especially as regards change from accepted or traditional forms. 5. forming a basis or foundation. noun 10. a person who holds or follows strong convictions or extreme principles; extremist. 11. a person who advocates fundamental political, economic, and social reforms by direct and often uncompromising methods. Synonyms for radical: fundamental, basic, profound, essential, natural

**Opinion:** a belief, judgment, or way of thinking about something.

**Wishful thinking:** an attitude or belief that something you want to happen will happen even though it is not likely or possible. The attribution of reality to what one wishes to be true or the tenuous justification of what one wants to believe

**Cause:** something or someone that produces an effect, result, or condition; something or someone that makes something happen or exist. **Mystery:** something not understood or beyond understanding.

### Exhibit 11. Capital Asset Pricing Model (CAPM)

The CAPM came about when answering the following question: What equity and bond portfolio should an investor who has risk aversion form? Risk aversion means: given equal expected return, an investor will always prefer a lower risk portfolio.

a) An investor wishes to form an optimal portfolio. By optimal portfolio we mean that which has the lowest risk for a given expected return (the measure of the risk is the variance of the portfolio return). The investor forms a portfolio with N securities. The expected return of each security in the following period is  $R_i$  and the weight of each security in the portfolio is

$W_i$ . The sum of each security's weights in the portfolio is unity: 
$$\sum_{i=1}^N W_i = 1 \quad [1]$$

The portfolio's expected return,  $E(R_c)$ , and the expected variance of the portfolio return,  $\text{Var}(R_c)$ , are:

$$E(R_c) = \sum_{i=1}^N W_i E(R_i) \quad [2] \quad \text{Var}(R_c) = \sigma_c^2 = \sum_{i=1}^N \sum_{j=1}^N \text{Cov}(R_i, R_j) W_i W_j \quad [3]$$

$\sigma_c$  is the portfolio's expected volatility.  $\text{Cov}(R_i, R_j)$  is the covariance of the expected return of company i with the expected return of company j. We want to find the weight of each share ( $W_i$ ) which minimizes the expected variance of the portfolio return, for a given expected return R. Consequently, we have to solve:

$$\text{Min } \sigma_c^2 \quad \text{with conditions: } E(R_c) = R; \quad \text{and} \quad \sum_{i=1}^N W_i = 1 \quad [4]$$

For each expected return, there will be a different portfolio with a minimum variance. This portfolio is usually called the *efficient portfolio*. These efficient portfolios, taken together, form the **efficient frontier (EF)**.

This problem is solved by minimizing the following Lagrange equation:

$$\text{Lagrange} = \sigma_c^2 + \lambda(R_c - R) + \phi \left( \sum_{i=1}^N W_i - 1 \right) \quad [5]$$

To minimize, the Lagrange equation is derived with respect to  $W_1, W_2, \dots, W_N$  and is made equal to zero for each of the N derivatives. Derivative with respect to  $W_i$ :  $\frac{\partial \sigma_c^2}{\partial W_i} + \lambda \frac{\partial R_c}{\partial W_i} + \phi = 0$  We can simplify these expressions because:

$$\frac{\partial R_c}{\partial W_i} = E(R_i) \quad \text{and} \quad \frac{\partial \sigma_c^2}{\partial W_i} = \sum_{j=1}^N W_j \text{Cov}(R_i, R_j) = \text{Cov}(R_i, \sum_{j=1}^N W_j R_j) = \text{Cov}(R_i, R_c)$$

Consequently, the derivatives become:  $\text{Cov}(R_i, R_c) + \lambda E(R_i) + \phi = 0; \quad i = 1, 2, \dots, N \quad [6]$

If one of the securities is un risk-free bond, with a yield  $R_i = R_F$ , its covariance with the portfolio is zero:  $Cov(R_F, R_C) = 0$ .

Equation [6] for the risk-free bond becomes:  $\lambda R_F + \varnothing = 0$  [7]

The partial derivative also must be applicable to the portfolio c as a whole. In this case,  $R_i = R_C$ ;  $Cov(R_C, R_C) = Var(R_C)$

Consequently:  $Var(R_C) + \lambda E(R_C) + \varnothing = 0$ ; as  $\varnothing = -\lambda R_F$ :  $Var(R_C) = -\lambda (R_C - R_F)$

The parameters  $\lambda$  and  $\varnothing$  are:  $\lambda = -Var(R_C) / [E(R_C) - R_F]$ ;  $\varnothing = R_F Var(R_C) / [E(R_C) - R_F]$  [8]

Substituting  $\lambda$  and  $\varnothing$ :  $Cov(R_i, R_C) - \frac{Var(R_C)}{E(R_C) - R_F} E(R_i) + \frac{Var(R_C)}{E(R_C) - R_F} R_F = 0$ .  $i = 1, 2, \dots, N$

Isolating the expected return for the share i gives:

$E(R_i) = R_F + \frac{Cov(R_i, R_C)}{Var(R_C)} [E(R_C) - R_F]$ ,  $i = 1, 2, \dots, N$ . If we call  $\beta_i = \frac{Cov(R_i, R_C)}{Var(R_C)}$ , this gives:

$R_i = R_F + \beta_i (R_C - R_F)$ .  $i = 1, 2, \dots, N$ . [9]

It is important to stress that  $R_i$ ,  $Cov(R_i, R_j)$  and  $Var(R_i)$  are our investor's expectations for the next period (which may be one year, one month,...).

**b. Optimal portfolio if all investors have homogeneous expectations.** If all investors have the same time horizon and also identical return and risk expectations (volatility of each share and correlation with the other shares) for all shares, then the investors will have the same portfolio and this is the **market portfolio M** (composed of all the shares on the market). If  $E(R_M)$  is the market return expected by all investors (because they all have the same expectations):

$E(R_i) = R_F + \beta_i (E(R_M) - R_F)$   $i = 1, 2, \dots$  [10]

**This is the expression of the Capital Asset Pricing Model (CAPM).**  $[E(R_M) - R_F]$  is called Market Risk Premium (MRP), Equity Premium (EP), Equity Risk Premium (ERP) ... (all **expected**)

In equilibrium, the investors will have shares in all companies and the portfolio c will be the stock market. All investors will have a portfolio composed of risk-free assets and the diversified portfolio, which is the market. The equation of the line called *capital market line* (CML) is:  $E(R_i) = R_F + [(E(R_M) - R_F) / \sigma_M] \sigma_i$

Thus, according to the CAPM, the required return to an asset will be equal to its expected return and will be equal to the risk-free rate plus the asset's beta multiplied by the required market return above the risk-free rate.

**Basic assumptions** on which the CAPM is based. All investors:

- have homogeneous expectations (same expected return, volatility and correlations for every security),
- can lend and borrow unlimited amounts at the risk-free rate of interest  $R_F$ ,
- can short any asset, and hold any fraction of an asset,
- plan to invest over the same time horizon<sup>22</sup>.
- investors are risk averse and only care about the expected return and the volatility of their investments

**Main predictions of the CAPM.** The CAPM assumptions imply that all investors:

- will always combine a risk free asset with the market portfolio (the proportions will vary depending on their utility function),
- will have the same portfolio of risky assets (the market portfolio)<sup>23</sup>,
- agree on the expected return and on the expected variance of the market portfolio and of every asset,
- agree on the expected MRP and on the beta of every asset,
- agree on the market portfolio being on the minimum variance frontier and being mean-variance efficient,
- expect returns from their investments according to the betas.

As there are homogeneous expectations, constant utility functions and there is not disagreement about the price or the value of any security:

- trading volume of financial markets will be very small.

When the "homogeneous expectations" assumption is not met, the market M will no longer be the efficient portfolio for all investors. Investors with different expectations will have different portfolios (each one having the portfolio he considers most efficient), instead of the market portfolio M.

**Formulas for calculating the beta.** A share's historical beta can be calculated by means of any of the following formulas:

$\beta = Covariance(R_i, R_M) / Variance(R_M) = Correlation(R_i, R_M) \times Volatility(R_i) / Volatility(R_M)$

<sup>22</sup> Other assumptions are: no transaction costs (no taxes, no commissions...); all information is available at the same time to all investors; each investor wants to maximize his expected utility

<sup>23</sup> Very risk-averse investors will put most of their wealth in risk-free asset, while risk-tolerant investors will put most of their wealth in the market portfolio.

$$\beta_i = \text{Cov}(R_i, R_M) / \sigma_M^2 = \text{Corr}(R_i, R_M) \sigma_i / \sigma_M$$

where:  $R_i$  = security return;  $R_M$  = market return

**Other Relationships:**  $R = \text{Corr}(R_i, R_M) = \text{Cov}(R_i, R_M) / (\sigma_M \sigma_i) = \beta_i \sigma_M / \sigma_i$

$$R^2 = 1 - \sigma_\varepsilon^2 / \sigma_i^2 \quad \sigma_\square^2 = \sigma_i^2 - \beta_i^2 \sigma_M^2 = \sigma_i^2 - R^2 \sigma_i^2 = \sigma_i^2 (1 - R^2)$$

To calculate a share's beta, a regression is normally performed between the share's return ( $R_i$ ) and the market return ( $R_M$ ). The share's beta ( $\beta_i$ ) is the slope of the regression:

$$R_i = a + \beta_i R_M + \varepsilon \quad \varepsilon \text{ is the error of the regression.}$$

**Relationship between beta and volatility ( $\sigma$ ):**  $\sigma_i^2 = \beta_i^2 \sigma_M^2 + \sigma_\varepsilon^2$

where  $\sigma_i$  is the volatility of the return  $R_i$ , which can be inferred from the graph below, which represents the relationship between the market risk or non-diversifiable risk ( $\beta_i \sigma_M$ ), and the non-systematic or diversifiable risk ( $\sigma_\varepsilon$ )

### Some paragraphs of "CAPM: an absurd model"<sup>24</sup>

The CAPM is about **expected** return. If you find a formula that works well in the real markets, would you publish it? Before or after becoming a billionaire?

The CAPM is an absurd model because not only its **assumptions** but also its **predictions/conclusions** have no basis in the real world<sup>25</sup>.

With the vast amount of information and research that we have, it is quite clear that the CAPM is neither a theory nor a model because it does not "explain facts or events", nor does it "describe the past, present, or future state of something".

It is important to differentiate between a **fact** (something that truly exists or happens: something that has actual existence; a true piece of information) and an **opinion** (what someone thinks about a particular thing). The CAPM could be described as an *uninformed opinion*, and not as a *sensible opinion*.

Valuation is about **required** return. There are persons, papers and books that mix (or assume that are equal) expected and required returns.

The use of CAPM is also a source of litigation. Users of the CAPM make many illogical errors valuing companies, accepting/rejecting investment projects, evaluating fund performance, pricing goods and services in regulated markets, calculating value creation...

We may find out an investor's expected return for IBM by asking him. However, it is impossible to determine the expected return for IBM of the market, because this parameter does not exist. Different investors have different cash flow expectations and different expected (and required) returns to equity. One could only talk of the expected return of the market if all investors had the same expectations. But investors do not have homogeneous expectations.

On October 2014, I sent the article "CAPM: an absurd model" to several professors, professionals and Ph.D. students, telling them that "I will appreciate very much your opinion and criticism". I thank very much all the persons (from 32 countries) that answered the interesting comments and criticism that follow. I have learned a lot reading (and thinking about) all of them because are real opinions of real persons that know finance and have thought about the CAPM, the market return, the beta...

### Answers from readers

Professor of Macro. "Thank you very much for your exhaustive analysis. Congratulations. I have the same impression about the state of, in my case, Economics in general, its teaching and the nonsense that we economists do."

Financial Director. "I think it's great and I do not have much to contribute, just to mention the people who have jobs thanks to trying to" model the behavior of people."

Professor of Financial Accounting. "I find it very good. I propose to publish it in Journal X. It will generate debate."

<sup>24</sup> "CAPM: an absurd model" may be downloaded in <http://ssrn.com/abstract=2505597>

<sup>25</sup> **An assumption:** homogeneous expectations (same expected return, volatility and correlations for every security),

**Some predictions:** All investors: **a)** will always combine a risk free asset with the market portfolio; **b)** will have the same portfolio of risky assets (the market portfolio); **c)** agree on the expected MRP and on the beta of every asset, **d)** expect returns from their investments according to the betas.



Bank Manager. Prof. Krugman (2012) in "End this depression now!" (especially in Cap. 6, 'Dark economics age'), criticizes the so-called financial economists, such as those related to the CAPM, and whom Summers called "ketchup" economists. Krugman says that macroeconomics, with respect to crises, is divided into two streams, those of saltwater schools, which follow, in a sense, the lessons of Keynes, which are the schools of Atlantic universities, like Harvard, Yale and MIT, and freshwater, which are mainly from within the US territory, such as Chicago and California, who believe in the economy completely free, in the rationality of people and That markets work, and that they believe that crises are derived from microeconomic concepts led to macroeconomics, including the confusion of workers and companies. Well, it seems that there is also a definition of financial economist here, which deals with macroeconomics by applying microeconomic concepts, which would differentiate it from finance as such.

Finance and financial economics are different phenomena. Former is related with finance function of corporate sector and micro term. It is concerned with identifying financial requirements of a concern and making arrangements and decision of debt and equity from suitable sources so that risk is traded off and profits be maximised. Besides this it also covers distribution of return among stakeholders. Later phenomenon is macro term and related to finance function of economy by government. It deals with identifying public funding requirements of an economy and taking decisions about imposing taxes over the public in a rational manner to equate the unbalanced distribution of wealth.

Professor of Finance. I found the paper very lively and entertaining. Nice quotes and good read! I think the CAPM is a great model to teach because it makes sense on a theoretical level and it provides an excellent introduction to concepts such as opportunity cost of capital, specific versus systematic risk, etc... On the other hand I totally agree with you that it is an empirical failure. In my most recent paper I argue that its empirical failure is much deeper than previously thought: Basically we find that when we take the strong evidence for time-varying volatility into consideration (and that is so strong and pervasive for so many factors...), the performance of a strategy exploiting the beta anomaly improves remarkably. Put in other words, the CAPM beta does not price assets and conditional on volatility it performs much worse.

Finance is based on financial facts, when financial Economics has to do with assumptions. The assumption of financial facts is quiet away from the truth and beyond the reality: the finance has to do with the day to day running of the inside and outside facts dealing with finance in an organisation. Finance and Financial Economics are two entities with proper meaning each. The mixture of the two is unacceptable and might lead to a misunderstanding of their field of study. One is nearest practice, when the other is more theoretic.

Professor of Finance. I wish there were many more faculty of Finance such as you.

I share with you the concern that finance encompass a very relevant set of organizational decision which are at least overlooked by Financial Economics. Indeed, besides being in some cases useless, in that it does not inform sound financial decision making, in some cases financial economics might even be harmful for organizations (and thus society).

I was once a top Phd student. I had a scholarship from London Business School, and I refused offers from other top Schools as INSEAD, NYU, Wharton, etc. I was also interviewed by IESE in Barcelona. It was great.

However I went off to the Phd to study about financial and accounting decisions, which I see as very relevant. However, most of time I was studying financial economics. It really has some ridiculous models. Such as CAPM and APT and many others.

As you exemplify in the paper, the situation is so ridiculous that even didactic books diverge a lot about risk premiums. I did however complained a bit. What happened was that although I have passed in all exams with the required grades, my own supervisor instructed the Department I could no longer continue my studies there. It was really a difficult time I had to move to the University of Strathclyde in Glasgow to obtain my Ph.d.

Fortunately, I was able to solve the problem also in court as described in a research article.

The way I see in your paper, is that here and there you might want to revise the description because some financial economists have indeed tried to appropriate the word finance. For example there are many books called finance or corporate finance, which are mostly about financial economics. You need perhaps to work better on the distinction, and also describe this abuse of the term. There are also some power structures keeping financial economics in charge of finance. Nevertheless, you are going on a very important path.

Although I keep studying some financial issues, I now try to do it from the perspectives of social sciences or economic sociology. Perhaps I could advise with you some times either.

Professor of Finance. A great exposition on finance and financial economics! You have successfully busted nonsensical economic theories based on unrealistic, overstretched and contrived assumptions.

*Professor of Finance. After 50 years of involvement with teaching, training and research in the area of finance, I have some thoughts in the context of the theme of your paper, as follows:*

*1950s was the era of Business Finance; disrupted in 1958 by M&M 'Irrelevance' models.*

*That is where Financial Economics entered and was strongly promoted to replace 'descriptive' business finance by 'analytical' finance.*

*Harry Markowitz in 1952, had introduced variance- covariance as statistical, aka, analytical, tools for finance.*

*Interestingly, EMH is perhaps the longest living Hypothesis in human history.*

*Specifically, in the context of India, I have noted that*

*Economics arrived/ developed first. It was actually macroeconomics.*

*To deal with the issues of business, the discipline of Commerce was developed.*

*Economics soon realized loss of ground to Commerce, and went on to develop first micro-economics and then Business Economics.*

*The difference in finance and financial economics, as I have noticed is, finance built on accounting data, whereas financial economics built on statistical and mathematical models.*

*Mathematical modeling is today considered elegant, advanced and rigorous. But being difficult to understand for non-mathematical persons, that quite a few corporate executives are, accounting based finance is much more appreciated by them than mathematical modeling based financial economics.*

*Professor of Finance. Why are you so critic of your own profession :-)? I agree with you on most if not all of your statements (especially since I am a former physicist, my Ph.D. is in physics :-) but doesn't your point of view get you into trouble with your colleagues? P.S. all of Markowitz's investment theory is junk! So is Sharpe's.*

*Professor of Finance. Your article is great! In the last many years, I tried to tell the same to my PhD students. My last class always has the title: "thinking out of the box", that is: think about reality!!! Congrats!*

*Professor of Finance. You are correct: they are not the same thing. I believe financial economics is the application of economics to understand finance. Some businesspeople have a good understanding of finance, without understanding financial economics. And some financial economists do not know much about practical finance. A good example is Harry Markowitz's thesis, which was definitely about finance, but not—according to Milton Friedman—economics! Indeed, Friedman was right as Markowitz used tools of operations research to understand finance. So it was not, strictly speaking, financial economics, or any economics really. And yet! The field changes.*