Is it Ethical to Teach that Beta and CAPM Explain Something?

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My answer to the question in the title is NO. It is crystal clear that CAPM and its Betas do not explain anything about expected or required returns. There are mountains of evidence to support my stance.

If, for any reason, a person teaches that Beta and CAPM explain something and he knows that they do not explain anything, such a person is lying. To lie is not ethical. If the person "believes" that Beta and CAPM explain something, his "belief" is due to ignorance (he has not studied enough, he has not done enough calculations, he just repeats what he heard to others…). For a professor, it is not ethical to teach about a subject that he does not know enough about.

It is very important to differentiate between a **fact** *(something that truly exists or happens)* and an **opinion** *(what someone thinks about a particular thing)*. It is a fact that Beta and CAPM do not explain anything about expected or required returns.

I welcome comments (disagreements, errors…) that will help the readers to think about using and teaching CAPM and calculated betas. The paper already incorporates more than 80 comments.

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JEL Classification: G12, G31, M21

1. [Facts, evidence, real world] vs. [models, theories, opinions]

We all should try to explain a portion of "*the world as it is*", not of "*the world as we model it*". I agree with Ricardo Yepes, professor of philosophy of my university, who wrote: "*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***".

According to the Merriam-Webster 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 completely clear that the CAPM and the betas do not "*explain facts or events",* nor do they *"describe the past, present, or future state of something".*

All models have simplifying assumptions (i.e. no friction, returns normally distributed…) but to assume homogeneous expectations is not a simplifying but an absurd assumption (perhaps valid to describe a society of aliens on another planet). The CAPM is an absurd model or an absurd theory (absurd meaning *having no rational or orderly relationship to human life*) because its assumptions and the conclusions it generates have no basis in the real world.

Finance is a "profession" that requires some technical knowledge, but it is not a science like the physics nor an application like the engineering; the fundamental difference: people. Finance is not a collection of recipes and models.

2. Do I teach the CAPM to my students?

Of course, I do teach the CAPM (the beta and the market risk premium) to my students because many people, investment banks, institutions and companies are still using the model and I think they need to understand what it is, what it is not, why it is still widely used and why it does not explain anything. I clearly tell my students that although many people use CAPM, it does not explain anything and it is absurd.

3. Questions for a Professor that says that CAPM explains something

a) The CAPM calculates "expected returns". If CAPM has some usefulness, why are you not a millionaire?
b) To decide which shares to buy (with your money), have you used the CAPM?
c) Have you used Betas and CAPM for anything related to your investments? If yes, how?
d) To calculate the price to pay for a company (with your money), would you use the CAPM?

4. Sharpe. Paragraphs from his foundational paper about CAPM

It is interesting to review some paragraphs from Sharpe (1964), the "*foundational*" paper of the CAPM.

Pg. 433-4. *"In order 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 **(??)**…* [The underlining and question marks are not in the original.]

*"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[1] 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." **(??)***

Pg. 440-1. *"… 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…* $E(R_i) = R_F + \beta_i [E(R_M) - R_F]$"[2].

5. The CAPM does not work

Numerous works and papers show that the CAPM does not fit reality at all. Fama (2013, Nobel Prize lecture) said that "*The golden age of the model [CAPM] is, however, 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".* According to Fama and French (2004) *"the failure of the CAPM in empirical tests implies that most applications of the model are invalid".* **Exhibit 2** contains many tests of the CAPM.

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[1] Definition of dearth (*Merriam-Webster*). 1: scarcity that makes dear; *specifically*: FAMINE. 2: an inadequate supply: LACK ● a *dearth* of evidence; (*Cambridge*): an amount or supply that is not large enough.

[2] Exhibit 1 contains a derivation of the CAPM.

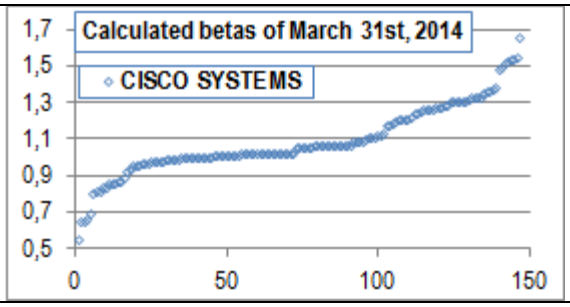
Fama (1976) affirms that "*The expected values and covariances that appear in [the CAPM and other models] are investors' assessments of parameters that vary from one investor to another. It is not even logical to talk about estimates of these assessments obtained from market data*".

Carelli *et al.* (2014)[3] calculate betas of 1,385 US companies on March 31, 2014: "*147 betas for each company using monthly, weekly and daily returns and using different intervals: from a year to five years. The … median of the difference [maximum beta - minimum beta] was … 1.03.*"

Source: Carelli et al. (2014)

Summary of the 147 betas for each company calculated on March 31, 2014.
Betas calculated for 1,385 US Companies

	Beta MAX - Beta min	Beta average	St.Dev of 147 betas/company
Average	**1,17**	1,18	0,24
Median	**1,03**	1,15	0,21



Fernandez (2006)[4] calculated betas of 3,813 US companies using 60 monthly returns each day of December 2001 and reports that the median of [maximum beta / minimum beta] was 3.07 for the whole sample (2.11 for the companies in the S&P 500).

Exhibits 3 and 4 contain problems with calculated betas and calculated Market Risk Premium.

6. Why so many people continue using CAPM

Box **1** shows some of the reasons why some professors continue to teach the CAPM and claim that it works.

Box 1. 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.*
4. *The model has received a Nobel Prize in Economics[5] 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.*

Other professors argue that "*I teach CAPM because it is based on the important concept of diversification and it is an easy recipe for most students*". I think that we can teach diversification without the CAPM. More important, business and management (which include investing and valuation) are about common sense, not about recipes.

Some professors continue denying the obvious, for 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 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 concludes that *"according to the data, the CAPM may still be alive."* According to Levy (2010): "*The CAPM is Alive and*

[3] "Which is the right "*Market Beta*?", http://ssrn.com/abstract=2509849. The authors calculate betas of 1,385 US companies on March 31, 2014: 147 betas for each company.

[4] *"Are Calculated Betas Good for Anything?"*, http://ssrn.com/abstract=504565

[5] This type of argumentation is widely used in many fields: scientific congresses, radio, television, press... even in scholarly debates… *"[a statement] is true because [Mr. XX] says it in his [publication zz]"*. What does the reader think of this mode of reasoning?

Well". Some authors find discrepancies between the CAPM and the market and try to explain what is wrong… with the market!

7. Some consequences of using the 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 arbitration)[6] and striking situations with the appearance of "science". *119 common errors in company valuations* (http://ssrn.com/abstract=1025424) contains a collection of errors found in company valuations performed by analysts, investment banks, consultants and expert witnesses. Some of the errors are unreasonable betas and unreasonable market risk premia. An example is 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!).

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): *"Out of this debate only one firm conclusion emerges: Do not trust anyone who claims to know what returns investors expect".*

8. Confusion between the expected rate of return and the required rate of return

I have never estimated an expected rate of return (I do not know how to do it), 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[7]. Confusing those leads to many mistakes and wrong decisions. The CAPM is about expected returns.

Box 2 has a very instructive anecdote from Merton Miller (Nobel Prize winner in 1990) about the CAPM. Miller says that the most important measure in *financial economics* is the *expected rate of return*. However, many financial managers of banks and companies, professors (and myself) have never calculated an expected rate of return.

Box 2. Miller, M. (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".*

9. How to use betas to calculate required returns and to be a reasonable person

A way is in Fernandez (2013)[8]: *"As the expected equity cash flows (ECF) are riskier than the cash flows promised by government bonds and also riskier than the cash flows promised by the Debt of the company, the* ***required return to equity*** *(shares) (Ke) should be higher than risk-free rate (R_F) and also higher than the required return to Debt (Kd):*
$Ke = R_F + RPs$ ". RPs is the share risk premium

Company valuation using discounted cash flows is based on the valuation of Government bonds: it consists of applying the procedure used to value the Government bonds to the debt and shares of a company. This is easy to understand. But company valuations are often complicated by 'additions' (formulae, concepts, theories…) that make them more difficult to understand and provide a more *"scientific", "serious", "intriguing", "impenetrable",…* appearance. Among the most commonly used 'additions' are: WACC, beta (β), market risk premium, beta unlevered… These 'additions' are unnecessary complications and are the source of many errors

We may want to calculate RPs (share risk premium) as a product: RPs = β MRP.

The MRP (**market risk premium**) is the answer to the following question: *Knowing that your money invested in long-term Government bonds will provide you a return of R_F% almost for sure, which additional return do you require from another investment (in a portfolio with shares of most of the companies with shares traded in the financial markets) to feel compensated for the extra risk that you assume?* In 2012 about 75% of the MRP used for the USA market was in the

[6] Some of them have allowed me to pay for several months of my children's school and university.

[7] *"There are many valuations that assume that the expected return is equal to the required return. They are two very different concepts, although many books and financial literature do not distinguish them. The topic of this short paper is "thinking about valuation: it is important to understand what we are doing."*

[8] "*Cash Flow Discounting: Fundamental Relationships and Unnecessary Complications*" http://ssrn.com/abstract=2117765

range between 4% and 6.5%[9]. The MRP is also called "*equity premium*", "*equity risk premium*", "*market premium*" and "*risk premium*".

The β (**beta**) is a specific parameter for each company. We know that β=0 corresponds to Government bonds (no risk) and β=1 to an investment with a risk similar to that of the market. About 80% of the betas used in valuations are in the interval between 0.7 and 1.5. A beta lower than 0.7 could be applicable to companies with Equity Cash Flows (ECF) that are highly predictable (electric companies and other utilities in countries with expectations of very few surprises and sensible managers…). A beta higher than 1.5 could be applicable to new companies with great uncertainty about the market acceptance of their products, companies with managers with little common sense… Using beta and MRP, $Ke = R_F + \beta$ MRP. Note that we have not used any assumption of the CAPM.

According to the CAPM, all investors should use the same β and the same MRP. On top of that, the β of each company and the MRP are parameters that "exist" and we should be able to estimate accurately with appropriate statistical tools. We do not share this view and we think that the β of each company and the MRP should be computed for each company and every investor using common sense (experience[10] and some business and financial knowledge) about the company, its industry, the national economies…[11]

Calculating a qualitative beta. Given the instability and the meaninglessness of calculated betas, some companies calculate a qualitative beta of companies or investment projects. Example: A real company uses the MASCOFLAPEC method (from the initials of the parameters used to evaluate the risk of each project) to estimate the beta. Each parameter is scored from 1 to 5 according to its contribution to the risk. Each factor also has to be weighted. In the example below, the sum of the scores of each parameter, bearing in mind its weight, was 3.5. Multiplying this number by 0.5, we obtain a beta of 1.75. Note that with this system (owing to the parameter 0.5) the beta can vary between 0.5 and 2.5. If a parameter equal to 0.6 were used, then the beta could vary between 0.6 and 3.0.

Alternatives to MASCOFLAPEC:

MARTILLO**: M**anagement; **A**sset quality; **R**isk exposure; **T**rade analysis: product/market; **I**RR of new investments; **L**everage; **L**iquidity; **O**ther relevant factors.

BAMIFLEX: **B**usiness: product / demand / market; **A**ccess to credit: capacity to obtain finance; **M**anagement: managers, shareholders...; **I**ndebtedness, solvency and long-term survival; **F**lows: resource generation (capacity to pay debts) and return; **L**iquidity of the shares; **Ex**posure to other risks: foreign exchange, country, interest rate, raw materials...

These methods are simply an aid to common sense. The beta that should be used to value a company will depend on the risk that the *valuer* 'sees' in the expected flows of the company.

Calculation of a "*common sense beta*": MASCOFLAPEC

			Risk					
			low	average	substantial	high	very high	*Weighted*
Weight			**1**	**2**	**3**	**4**	**5**	*risk*
10%	**M**	Management	1					*0.1*
25%	**A**	Assets: Business: industry / product ...					5	*1.2*
3%	**S**	Strategy				4		*0.1*
15%	**C**	Country risk				4		*0.6*
10%	**O**	Operating leverage				4		*0.4*
15%	**F**	Financial leverage		2				*0.3*
5%	**L**	Liquidity of investment					5	*0.2*
5%	**A**	Access to sources of funds			3			*0.1*
2%	**P**	Partners				4		*0.0*
5%	**E**	Exposure to other risks (currencies...)		2				*0.1*
5%	**C**	Cash flow stability			3			*0.1*
100%								*3.5*
		Beta of equity =	3.5	x	0.5	=	**1.75**	

[9] "MRP Used in 82 Countries in 2012: A Survey with 7,192 Answers", http://ssrn.com/abstract=2084213 .

[10] "***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.

[11] Another method for family business is explained by my friend Guillermo Fraile, IAE professor, in his classes: the *HMDYWD* (initials for *How much do you want, Dad?)* method. It is not a joke: it does not make sense to say that Ke (required return to equity) is a magnitude shared by all investors; but it does to talk about Dad's Ke.

10. 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:

Expected return = Rf + b(1) x rp(1) + b(2) x rp(2) + ... + b(n) x rp(n)

Rf = risk-free rate. b = beta of the asset to the particular factor, rp = the risk premium associated with the particular factor. Many 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: 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 share 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.[12]

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"*[13]

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^2 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 this 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".***

11. Another fundamental problem: forgetting that "the market" is a group of persons

Box 3 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 recipes, generalizations and hypotheses like *"homogeneous expectations", "all investors ...," all companies ... ", "the market expects…"*

Box 3. 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."*

When you hear phrases that begin like this (*"The market thinks that ...", "the investors have reacted to ...", "the managers believe ..."*) remember **box 3**. 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 of the last transaction of the day.
C) In all the markets there are people who buy, others who sell, others who do both and many other people who on a certain day neither buy nor sell.
D) There are large differences between companies due, among other things, to how their managers analyze reality, their decision-making procedures, the criteria used to decide, the relationships between their employees and managers...

[12] 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 Δ Ford shares with a loan of B euros (the formula provides the values of Δ and B). Both values (Δ and B) depend on the expected volatility for the Ford stock and the portfolio replica of the option (Δ Ford shares and B euros loan) has to be changed over the life of the option. That is why it is often called a *dynamic arbitrage*.

[13] http://www.businessinsider.com/sharpe-smart-beta-makes-me-sick-2014-5.

E) There are large differences between investors due to, among other things, whether they have a clear investment horizon, ability to withstand declines, propensity to invest when there are declines, if they understand what a short position is…

12. An alternative to the CAPM and "smart betas"

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 enormous 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. The fundamental difference: people. Finance is not a collection of recipes and models.

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 survive 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).

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.

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 (Example: *"net income is the money generated by the company"*).

Section 9 has some insights about the only alternative to CAPM and calculated betas: common sense, experience, pondering, logic and knowledge of business and managers.

13. Conclusion

As it is crystal clear that Betas and CAPM do not explain anything about expected or required returns it cannot be ethical to teach that Betas and CAPM explain something.

If, for any reason, a person teaches that Beta and CAPM explain something and he knows that they do not explain anything, such a person is lying. To lie is not ethical. If the person "believes" that Beta and CAPM explain something, his "belief" is due to ignorance (he has not studied enough, he has not done enough calculations, he just repeats what he heard to others…). For a teacher, it is not ethical to teach about a subject that he does not know enough about.

CAPM is about expected return. It is clear that both, the assumptions and the predictions/conclusions of the CAPM, have no basis in the real world. On the other hand, if you find a formula for expected returns that works reasonably well in the real markets, would you publish it? Before or after being billionaire?

Valuation is about expected cash flows and about required returns. We all admit that different investors may have different expected cash flows, but many affirm that the required return (discount rate) should be equal for everybody. And some affirm that expected returns should be equal to required return.

Most professors teach that the expected cash flows should be computed using common sense[14] about the company, its industry, the national economies… However, some professors teach the CAPM to calculate the discount rate (instead of using again common sense): they acknowledge that there are problems estimating two ingredients of the formula (the beta and the MRP), but, nevertheless, continue using it. That is a schizophrenic approach: to be a "*democrat*" for the expected cash flows but a "*dictator*" for the discount rate.

It is very 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).* It is a fact that Beta and CAPM do not explain anything about expected or required returns.

I still find a good definition of research (at least for Finance) to be the following: *"studies that a) contribute to better understand the reality in which we live; b) allow the identification of 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".* Brooks

[14] By "common sense", we mean good judgment, experience and some financial knowledge. Merriam-Webster dictionary, Common sense: *"sound and prudent judgment based on a simple perception of the situation or facts".*

et al. (2016), (*Why Does Research in Finance Have so Little Impact?* https://ssrn.com/abstract=2936544) argue that *"individual and institutional incentives have fostered insularity and a consequent homogeneity in the discipline"* and *"illustrate that this narrow agenda lacks relevance to the financial services sector, the economy or wider society compared to other areas of business and management research*".

Frey and Iselin (2017, *Economic Ideas You Should Forget*) show the weaknesses of various traditional economic concepts and ideas. The book (with 71 authors) rejects major economic ideas including the Coase Theorem, Say's Law, Bounded Rationality, Bayesianism, CAPM and more. It also provides a vast overview of the economic profession and currently dominant thought.

This document contains facts and some opinions held by the author. **I welcome comments** (disagreements, errors…).

"We don't know a millionth of one percent about anything".—Thomas Alva Edison (1847-1931)

Exhibit 1. 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. But risk is measured as volatility (σ) or variance (σ^2). To define risk as volatility is an **absurd assumption**. 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).

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: $\sum_{i=1}^{N} W_i = 1$ [1]

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

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

σ_c is the portfolio's expected volatility. 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:

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

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

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

Consequently, the derivatives become: $Cov(R_i, R_c) + \lambda E(R_i) + \varnothing = 0$; $i = 1, 2, \ldots, N$ [6]

If one of the securities is a 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 λ 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 λ and $\varnothing$: $Cov(R_i, R_c) - \frac{Var(R_c)}{E(R_c) - R_F} E(R_i) + \frac{Var(R_c)}{E(R_c) - R_F} R_F = 0.$ $i = 1, 2, \ldots, N$

Isolating the expected return for the share i gives:

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

$$\mathbf{R_i = R_F + \beta_i (R_c - R_F).} \qquad i = 1, 2, ..., N. \qquad [9]$$

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[15], 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):

$$\mathbf{E(R_i) = R_F + \beta_i [E(R_M) - R_F]} \qquad i = 1, 2, ... \qquad [10]$$

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: $\mathbf{E(R_i) = R_F + [(E(R_M) - R_F) / \sigma_M] \sigma_i}$

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:
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 R_F,
c. can short any asset, and hold any fraction of an asset,
d. plan to invest over the same time horizon.
e. investors are risk-averse and only care about the expected return and the volatility of their investments[16]

Main predictions of the CAPM. The CAPM assumptions imply that all investors:
a. will always combine a risk free asset with the market portfolio (the proportions will vary depending on their utility function),
b. will have the same portfolio of risky assets (the market portfolio)[17],
c. agree on the expected return and on the expected variance of the market portfolio and of every asset,
d. agree on the expected MRP and on the beta of every asset,
d. agree on the market portfolio being on the minimum variance frontier and being mean-variance efficient,
e. expect returns from their investments according to the betas.

As there are homogeneous expectations, constant utility functions and there is no disagreement about the price or the value of any security:
f. 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:

β = Covariance (R_i , R_M) / Variance (R_M) = Correlation (R_i , R_M) x Volatility (R_i) / Volatility (R_M)

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

where: R_i = security return; R_M = market return

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

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

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[15] The **most extravagant and absurd hypothesis**: all 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).

[16] Other assumptions are: no transaction costs (no taxes, no commissions…); all information is available at the same time to all investors; each investor is rational and risk-averse, and wants to maximize his expected utility.

[17] 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.

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 ($ß_i$) is the slope of the regression:

$R_i = a + ß_i R_M + \varepsilon$ ε is the error of the regression.

Relationship between beta and volatility (σ): $\sigma_i^2 = ß_i^2 \sigma_M^2 + \sigma_\varepsilon^2$

σ_i is the volatility of the return R_i. ($ß_i \sigma_M$) is the non-diversifiable risk and (σ_ε) is the non-systematic or diversifiable risk

Exhibit 2. Some papers about the CAPM

A huge amount of papers have been written about the CAPM. We review some of them.

The CAPM of Sharpe (1964), Lintner (1965) and Mossin (1966) asserts that the expected return for any security is a function of three variables: expected beta, expected market return, and the risk-free rate. Sharpe (1964) and Lintner (1965) demonstrate that, with some senseless assumptions, a financial asset's return must be positively linearly related to its beta (ß): $E(R_i) = a_1 + a_2 E(ß_i)$, for all assets i. $E(R_i)$ is the expected return on asset i, $E(ß_i)$ is asset i's expected market beta, a_1 is the expected return on a "zero-beta" portfolio, and a_2 is the market risk premium: $E(R_M) – R_F$

Original tests of the CAPM focused on whether the intercept in a cross-sectional regression was higher or lower than the risk-free rate, and whether stock individual variance entered into cross-sectional regressions.

Miller and Scholes (1972) report that the sample average of the standard error of the beta estimates of all NYSE firms is around 0.32, as compared to the average estimated beta coefficient of 1.00. Thus, a random draw from this distribution of betas is going to produce any number between 0.36 and 1.64 ninety-five percent of the time. It is this imprecision in individual beta estimates (or the better known "*errors in variables*" problem) that motivated portfolio formation techniques of Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973).

Scholes and Williams (1977) found that with nonsynchronous trading of securities, OLS estimators of beta coefficients using daily data are both biased and inconsistent.

Subsequent work by (among many others) Basu (1977), Banz (1981), Reinganum (1981), Gibbons (1982), Litzenberger and Ramaswamy (1979), Keim (1983, 1985)[18] and Fama and French (1992) suggests that either:

1. expected returns are determined not only by the beta and the expected market risk premium but also by other firm characteristics such as price-to-book value ratio (P/B), firm size, price-earnings ratio and dividend yield (it means that the CAPM requires the addition of factors other than beta to explain security returns), or
2. the historical beta has little (or nothing) to do with the expected beta and the historical market risk premium has little (or nothing) to do with the expected market risk premium, or
3. the heterogeneity of expectations[19] in cross-section returns, volatilities and covariances, and market returns is the reason why it makes no sense to talk about an aggregate market CAPM (although at the individual level expected CAPM could work). Each investor uses an expected beta, an expected market risk premium, and an expected cash flow stream to value each security, and investors do not agree on these three magnitudes for each security.

Roll (1977) concluded that the only legitimate test of the CAPM is whether or not the market portfolio (all assets) is mean-variance efficient. Roll (1981) suggests that infrequent trading of shares of small firms may explain much of the measurement error in estimating their betas.

Constantinides (1982) points out that with consumer heterogeneity *"in the intertemporal extension of the Sharpe-Lintner CAPM, an asset's risk premium is determined not only by its covariance with the market return, but also by its covariance with the m − 1 state variables"* (m is the number of heterogeneous consumers). He also points out that the assumption of complete markets is needed for demand aggregation.

Lakonishok and Shapiro (1984, 1986) find an insignificant relationship between beta and returns and a significant relationship between market capitalization and returns

Shanken (1992) presents an integrated econometric view of maximum-likelihood methods and two-pass approaches to estimating historical betas.

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[18] Basu (1977) found that low price/earnings portfolios have higher returns than could be explained by the CAPM. Banz (1981) and Reinganum (1981) found that smaller firms tend to have high abnormal rates of return. Litzenberger and Ramaswamy (1979) found that the market requires higher rates of return on equities with high dividend yield. Keim (1983, 1985) reports the January effect, that is, seasonality in stock returns. Tiniç and West (1984) reject the validity of the CAPM based on intertemporal inconsistencies due to the January effect.

[19] Lintner (1969) argued that the existence of heterogeneous expectations does not critically alter the CAPM in some simplified scenarios and said that "*in the (undoubtedly more realistic) case with different assessments of covariance matrices, the market's assessment of the expected ending price … for any security depends on every investor's assessment of the expected ending price for every security and every element in the investor's assessment of his NxN covariance matrix (N is the number of securities), as well as the risk tolerance of every investor."*

The next table contains the main differences between the "CAPM world" and the real world

CAPM	Real world
Homogeneous expectations All investors have equal expectations about asset returns	**Heterogeneous** expectations. Investors DO NOT have equal expectations about asset returns
Investors only care about expected return and volatility of their investments	Investors also care about jumps, crashes and bankruptcies
All investors use the same beta for each share	Investors use **different** betas (required betas) for a share
All investors hold the market portfolio	Investors hold **different** portfolios
All investors have the same expected market risk premium	Investors have **different** expected market risk *premia* and use **different** required market risk *premia*

The poor performance of the CAPM has inspired multiple portfolio based factors. The hardest blow to the CAPM was published by Fama and French (1992): they showed that in the period 1963-1990, the correlation between stocks' returns and their betas was very small, while the correlation with the companies' size and their (P/B) was greater. They concluded *"our tests do not support the most basic prediction of the Sharpe-Lintner-Black CAPM that average stock returns are positively related to market betas".* The authors divided the shares into portfolios and found that the cross-sectional variation in expected returns may be captured within a three-factor model, the factors being: 1) the return on the market portfolio in excess of the risk-free rate; 2) a zero net investment portfolio that is long in low P/B stocks and short in high P/B stocks, and 3) a zero net investment portfolio that is long in small firm stocks and short in large firm stocks. The following table shows the article's main findings.

Main findings of Fama and French's article (1992)

Size of the companies	Average beta	Annual average return
1 (biggest)	0.93	10.7%
2	1.02	11.4%
3	1.08	13.2%
4	1.16	12.8%
5	1.22	14.0%
6	1.24	15.5%
7	1.33	15.0%
8	1.34	14.9%
9	1.39	15.5%
10 (smallest)	1.44	18.2%

Beta of the companies	Average beta	Annual average return
1 (high)	1.68	15.1%
2	1.52	16.0%
3	1.41	14.8%
4	1.32	14.8%
5	1.26	15.6%
6	1.19	15.6%
7	1.13	15.7%
8	1.04	15.1%
9	0.92	15.8%
10 (low)	0.80	14.4%

P/B Price / book value	Average beta	Annual average return
1 (high)	1.35	5.9%
2	1.32	10.4%
3	1.30	11.6%
4	1.28	12.5%
5	1.27	14.0%
6	1.27	15.6%
7	1.27	17.3%
8	1.27	18.0%
9	1.29	19.1%
10 (low)	1.34	22.6%

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.

Lakonishok, Shleifer and Vishny (1994) argue that the size and P/B effects are due to investor overreaction rather than compensation for risk bearing. According to them, investors systematically overreact to corporate news, unrealistically extrapolating high or low growth into the future. This leads to underpricing of "value" (small capitalization, high P/B stocks) and overpricing of "growth" (large capitalization, low P/B stocks).

Kothary, Shanken and Sloan (1995) point out that using historical betas estimated from annual rather than monthly returns produces a stronger relation between return and beta. They also claim that the relation between P/B and return observed by Fama and French (1992) and others is exaggerated by *survivor bias* in the sample used and conclude: *"our examination of the cross-section of expected returns reveals economically and statistically significant compensation (about 6 to 9% per annum) for beta risk".*

Pettengill, Sundaram and Mathur (1995) find *"a consistent and highly significant relationship between beta and cross-sectional portfolio returns".* They insist: *"the positive relationship between returns and beta predicted by CAPM is based on expected rather than realized returns".* They remark that their results are similar to those of Lakonishok and Shapiro (1984)

Fama and French (1996) argue that survivor bias does not explain the relation between P/B and average return. They conclude that historical beta alone cannot explain expected return.

Kothary and Shanken (1999) insist on the fact that Fama and French (1992) tend to ignore the positive evidence on historical beta and to overemphasize the importance of P/B. They claim that, while statistically significant, the incremental benefit of size given beta is surprisingly small. They also claim that P/B is a weak determinant of the cross-sectional variation in average returns among large firms and it fails to account for return differences related to momentum and trading volume.

Berglund and Knif (1999) propose an adjustment of the cross-sectional regressions of excess returns against betas to give larger weights to more reliable beta forecasts. They find a significant positive relationship between returns and the beta forecast when the proposed approach is applied to data from the Helsinki Stock Exchange, while the traditional Fama-MacBeth (1973) approach as such finds no relationship at all.

Elsas, El-Shaer and Theissen (2000) "*find a positive and statistically significant relation between beta and return in our sample period 1960-1995 as well as in all subperiods we analyze"* for the German market. They claim, *"Our empirical results provide a justification for the use of betas estimated from historical return data by portfolio managers".*

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".*

Bartholdy and Peare (2001) argue that five years of monthly data and an equal-weighted index provide the most efficient estimate of the historical beta. However, they find that the ability of historical betas "to explain differences in returns in subsequent periods ranges from a low of 0.01% to a high of 11.73% across years, and at best 3% on average". Based on these results, they say *"it may well be appropriate to declare beta dead".*

Chung, Johnson and Schill (2001) use size-sorted portfolio returns at daily, weekly, quarterly and semi-annual intervals and find in every case that the distribution of returns differs significantly from normality. They also show that adding systematic co-moments (not standard) of order 3 through 10 reduces the explanatory power of the Fama-French factors to insignificance in almost every case.

Zhang, Kogan, and Gomes (2001) claim that *"size and book-to-market [B/P] play separate roles in describing the cross-section of returns. These firm characteristics appear to predict stock returns because they are correlated with the true conditional market beta of returns."* Avramov and Chordia (2001) test whether the Zhang, Kogan, and Gomes (2001) scaling procedure improves the performance of the CAPM and consumption CAPM. They show that equity characteristics often enter beta significantly. However, "*characteristic scaled factor models*" do not outperform their unscaled counterparts.

Shalit and Yitzhaki (2002) argue that the OLS regression estimator is inappropriate for estimating betas. They suggest alternative estimators for beta. They eliminate the highest four and the lowest four market returns and show that the betas of 75% of the firms change by more than one standard error.

Avramov (2002) shows that small-cap value stocks appear more predictable than large-cap growth stocks, and that model uncertainty is more important than estimation risk: investors who discard model uncertainty face large utility losses.

Griffin (2002) concludes that country-specific three-factor models are more useful in explaining stock returns than are world and international versions.

Koutmos and Knif (2002) propose a dynamic vector GARCH model for the estimation of time-varying betas. They find that in 50% of the cases betas are higher during market declines (the opposite is true for the remaining 50%). They claim that the static market model overstates unsystematic risk by more than 10% and that dynamic betas follow stationary, mean reverting processes.

McNulty et al. (2002), say that "*although Apple's stock was almost twice as volatile as IBM's during the five years (1993-1998) we looked at (52% volatility for Apple; 28% for IBM), its correlation with the market's movement was only one-fourth as great (0.105 for Apple; 0.425 for IBM)… resulting in a beta of 0.47 for Apple compared with 1.09 for IBM".* They also point out that for a *"UK-based multinational, a two-day shift in the sampling day (using Friday's stock prices rather than Wednesday's) to calculate beta, generated quite different betas of 0.70 and 1.41."*

Fama and French (2004) affirm that "*the failure of the CAPM in empirical tests implies that most applications of the model are invalid*".

Merrill Lynch and Bloomberg adjust betas in a very simple way: Expected beta = 0.67 historical beta + 0.33. Of course, this "Expected beta" works better than the "historical beta" because "$\beta = 1$ *does a better job than calculated betas"*[20].

Thompson *et al.* (2006), in their paper "Nobels for Nonsense", show evidences against Markowitz and the CAPM: a) the correlation between the return and the volatility of the Ibbotson Index in 1926-2000 was negative (-0.32); b) 65% of the portfolios chosen randomly had a higher return than the CAPM could predict; c) an "equal weight index" had in 1970-2002 an annualized return 4.8% higher than the S&P 500. They conclude that *"the use of flawed models by true believers can cause mischief not only for individual investors but also for the economy generally".*

Bossaerts, Plott. and Zame (2007) suggest a new approach to asset pricing and portfolio choices based on unobserved heterogeneity and offer a novel econometric procedure to test their novel model (they name it CAPM+ε). Then, they apply the

[20] Fernandez and Bermejo (2009) (http://ssrn.com/abstract=1406923) compute the correlations of the annual stock returns (1989-2008) of the Dow Jones companies with a) β Rm; and with b) Rm; and find that the 2nd correlation (assuming β = 1 for all companies) is higher than the first one for all companies except Caterpillar and GM. Rm is the return of the S&P 500. Carvalho and Barajas (2013) study the betas in the Portuguese market and conclude that *"the results could reinforce the position of those who affirm that calculated betas do not work better than beta = 1".*

econometric tests to data generated by **large-scale laboratory asset markets** and they claim that CAPM+ε is not rejected. OK in a laboratory, but in the real financial markets?

Aktas and McDaniel (2009) show cases *"where CAPM-generated costs of equity are less than zero; less than the risk-free rate and less than the company's marginal cost of debt".* They calculate betas using 60 and 120-monthly returns. They also refer to a COMPUSTAT file with *"8361 total companies with listed betas. Totally 925 of these are negative".*

Magni (2009, 2010) explains the incorrectness of the CAPM and its development. He also points out that Dybvig and Ingersoll (1982) were the first that noticed that CAPM is at odds with arbitrage pricing.

Shalit and Yitzhaki (2010) argue (with theoretical papers) that the only problem of CAPM is relying on the Normal distribution.

Levy and Roll (2010), with a provocative title (The Market Portfolio May Be Mean/Variance Efficient after All) affirm that "*many conventional market proxies could be perfectly consistent with the CAPM and useful for estimating expected returns… if one allows for only slight estimation errors in the return moments".* They call this data-massage "*a reverse-engineering approach": "we find the minimal variations in sample parameters required to ensure that the proxy is mean/variance efficient."* This paper is an example of "***using the hammer to fit the data into a model*";** its graphic representation are the 2 charts in page 2486 about which the authors surprisingly say that "*sample betas are quite close to betas that have been adjusted*". Levy and Roll (2010) is an experiment because they use monthly returns of only the 100 biggest US companies in the period Dec. 1996- Dec. 2006 (in that period the average returns of all companies were positive). They work with historical returns but claim to prove or disprove something for the CAPM that deals with expected returns.

Brennan and Lo (2010) designate an efficient frontier as "i*mpossible*" when every efficient portfolio has at least one negative weight. They prove that the probability of an impossible frontier approaches 1 as the number of assets increases and with sample parameters. Levy and Roll (2011) refer to Brennan and Lo (2010) and admit that "*sample parameters lead to an impossible frontier"… "But a slight modification of the parameters leads to a segment of positive portfolios on the frontier".*

Levy (2011) argues that although behavioral economics contradicts aspects of expected utility theory, CAPM and M-V (mean-variance rule) are intact in both expected utility theory and cumulative prospect theory frameworks. He says that there is furthermore no evidence to reject CAPM empirically when ex-ante parameters are employed. De Giorgi, Hens and Levy (2012) conclude (in an only-theoretical paper) that *"the CAPM is intact also in CPT (Cumulative Prospect Theory) framework".*

Giannakopoulos (2013) finds that *"regarding the Levy/Roll (2010) approach, the results for the optimizations are very sensitive to the choice of the portfolio used, the market returns and standard deviation, as well as to the choice of the risk free rate… it is possible to manipulate these results, up to a certain point… in order to accomplish a better outcome and improve the robustness of the model".* And also that when we "*feed the models with their real market values, the performance of the models is not robust enough in order to justify global acceptance".*

Dempsey (2013) concludes that *"unfortunately, the facts do not support the CAPM*." He also notes that "*A good deal of finance is now an **econometric exercise in mining data**… The accumulation of explanatory variables advanced to explain the cross-section of asset returns has been accelerating, albeit with little overall understanding of the correlation structure between them. We might consider that the published papers exist 'on the periphery of asset pricing'. They show very little attempt to formulate a robust risk-return relationship that differentiates across assets."* He finishes with a sensible recommendation: *"we must seek to understand markets on their own terms and not on our own".*

Stassopoulos (2013) affirms that "*Rear-View Mirror Is Misleading***",** that **"***the past is no guide to future performance*" and that the "*rear-view mentality is not the only problem that bedevils traditional methods of assessing future risk*". Nevertheless he also advices learning from the past: "*think of plausible reasons why a stock has failed to reach our price target, grouping them under four general headings: compliance, financial, operational and strategic".*

Antoniou, Doukas, and Subrahmanyam (2014) argue that "*the security market line (SML) accords with the CAPM by taking on an upward slope in pessimistic sentiment periods, but is downward sloping during optimistic periods*". "*High beta stocks become overpriced in optimistic periods",* "*CFOs can use the CAPM for capital budgeting decisions in pessimistic periods, but not optimistic ones". "Betas are calculated using 24 to 60 monthly returns (as available)"*

Gilbert *et al.* (2014) report that *"beta, varies across return frequencies".* They show that *"Berkshire has a market beta below 0.60 when estimated with daily return data but a beta of about 0.95 when estimated with quarterly data".* They conclude that *"beta differences across frequencies occur even in large and liquid stocks and cannot be explained by microstructure and trading frictions."* They calculate the betas using returns over the previous 60 months.

According to Greenwood and Shleifer (2014), *"the evidence is not consistent with rational expectations [of] representative investor models of returns".*

A model that works perfectly at the individual level may not function at the aggregate level (the market)[21]. For the CAPM, this means that although the CAPM could be an appropriate scheme for an investor, it is not valid for

[21] 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".*

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).

Exhibit 3. Problems with calculated betas

According with the CAPM "the market" "assigns" an expected beta to every company and beta may be calculated with a regression of historical data. When we calculate betas using historical data we encounter several well-known problems:

1. They depend very much on which **stock index** is used as the market reference.
2. They depend very much on **the historical period (5 years, 3 years…)** used[22].
3. They depend on what **returns (monthly, yearly…)** are used to calculate them.
4. They **change considerably from one day to the next[23].**
5. Very often we do not know if the beta of one company is lower or higher than the beta of another.
6. Calculated betas have **little correlation with stock returns**.
7. **$\beta = 1$** has a higher correlation with stock returns than calculated betas for many companies.
8. The **correlation coefficients** of the regressions used to calculate the betas are very small.
9. The relative magnitude of betas often makes very **little sense**: companies with high risk often have lower calculated betas than companies with lower risk.

Damodaran (1994) calculates the beta of Disney using daily, weekly, monthly and quarterly returns of the last 3, 5 and 10 years, with respect to the Dow 30, the S&P 500 and the Wilshire: the betas ranged from 0.44 to 1.38. Damodaran (2001) calculates different betas for Cisco versus the S&P 500 ranging from 1.45 to 2.7.

Fernandez (2004)[24] shows the calculated betas of Coca-Cola and other companies on September 30, 2003. Betas were calculated with respect to different indexes, and using different frequencies (daily, weekly, biweekly and monthly), and different periods (6 months, 1 year and 5 years). The calculated betas of Coca-Cola varied between -0.08 and 0.82; and those of Merck between 0.05 and 1.48.

Fernandez (2006)[25] calculated betas of 3,813 US companies using 60 monthly returns each day of December 2001 (that is, 31 betas per company) and reports: 1. The median of [maximum beta / minimum beta] was 3.07 for the whole sample (2.11 for the companies in the S&P 500). 2. Industry betas: the average of [maximum beta / minimum beta] was 2.7. 3. Constructing portfolios in the Fama and French (1992) way on December 1 and on December 15, 2001, 71.3% of the companies changed from one portfolio on December 1 to another on December 15.

Different beta sources provide us with different betas. Bruner *et al.* (1998) found sizeable differences among beta providers. Fernandez (2009b)[26] shows betas provided by 16 webs and databases: the betas of Coca-Cola ranged from 0.31 to 0.8; and the betas of Wall-Mart Stores from 0.13 to 0.71.

Copeland, Koller and Murrin (2000) recommend *"checking several reliable sources because beta estimates vary considerably"*. But about the CAPM, they conclude (see their page 225), *"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 that a bad theory.

Fernandez (2009b) reports 2,510 answers from professors from 65 countries: 1,791 respondents used betas. 97.3% of the professors that justify the betas use regressions, webs, databases, textbooks or papers, although many of them admit that calculated betas *"are poorly measured and have many problems"*. Only 0.9% of the professors justified the beta using exclusively personal judgment (named *qualitative betas, common sense betas, intuitive betas, logical magnitude betas and own judgment betas* by different professors). The Webs and Databases

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[22] Brigham and Gapenski (1977, pg. 354, footnote 9) report an illustrative anecdote in this respect: *"A company that supplied betas told the authors that their company, and others, did not know what was the most appropriate period to use, but that they had decided to use 5 years in order to eliminate apparent differences between the betas provided by different companies, because big differences undermined the credibility of all of them".*

[23] Some authors, such as Damodaran (2001, pg. 72), acknowledge that company betas vary considerably, but claim that industry betas (the beta of the portfolio composed of the companies in a given industry) vary very little. They therefore recommend using the calculated beta of an industry. However, although industry betas vary less than company betas, they still vary significantly and using them can lead to serious errors.

[24] *"On the instability of betas: the case of Spain"*, http://ssrn.com/abstract=510146.

[25] *"Are Calculated Betas Good for Anything?"*, http://ssrn.com/abstract=504565.

[26] "*Betas used by Professors: a survey with 2,500 answers*", http://ssrn.com/abstract=1407464.

most cited by the professors were: Yahoo Finance; Bloomberg; Damodaran Website; Value Line; Google Finance; Reuters; DataStream; Morningstar; Barra; MSN.

Exhibit 4. Problems calculating the Market Risk Premium

Other error of many CAPM users is to assume that "*the market*" has an expected MRP (market risk premium). They consider the MRP as a parameter "*of the market*" and not a parameter that is different for different investors.

Fernandez, Aguirreamalloa and Corres (2011)[27] show that the average MRP used in 2011 for the USA by professors, analysts and company managers were 5.7%, 5.0% and 5.6% (standard deviations: 1.6%, 1.1% and 2.0%). They also found a great dispersion in the MRP used even if it was justified with the same reference: those that cited Ibbotson as their reference used MRP for USA between 2% and 14.5%, and those that cited Damodaran as their reference, used MRP between 2% and 10.8%. Figure 2 shows the dispersion of the MRP used by 2,915 respondents in 2014.

Fernandez (2009)[28] reviews 150 textbooks on corporate finance and valuation written by authors such as Brealey, Myers, Copeland, Damodaran, Merton, Ross, Bruner, Bodie, Penman, Arzac… and finds that their recommendations regarding the MRP range from 3% to 10% (see figure 3), and that 51 books use different MRP in various pages. Some confusion arises from not distinguishing among the four concepts that the MRP designates: the Historical, the Expected, the Implied and the Required equity premium (incremental return of a diversified portfolio over the risk-free rate required by an investor).

Figure 2. MRP used in 2014 for the USA by 2,915 respondents. *Source: Fernandez et al. (2014)*

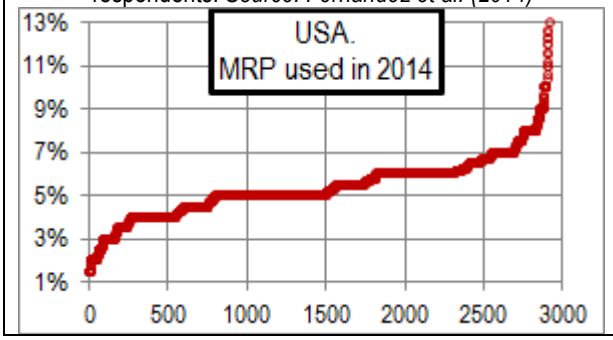
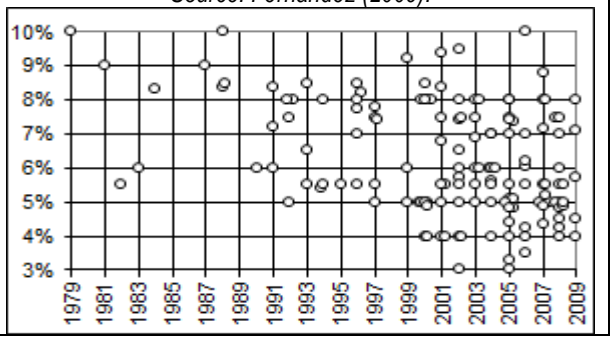


Figure 3. Market Risk Premium used by 150 Textbooks *Source: Fernandez (2009).*



Expected, required and historical parameters

Fernandez (2006b)[29] claims that "*the equity premium (EP or MRP) designates four different concepts: Historical Equity Premium (**HEP**); Expected Equity Premium (**EEP**); Required Equity Premium (**REP**); and Implied Equity Premium (**IEP**)*" and highlights *"the confusing message in the literature regarding the equity premium and its evolution. The confusion arises from not distinguishing among the four concepts and from not recognizing that although the HEP [should be] equal for all investors, the REP, the EEP and the IEP differ for different investors". "The CAPM assumes that REP and EEP are unique and that **REP = EEP**"*. Different authors claim different relations among the four equity premiums defined. These relationships vary widely:

- **HEP = EEP = REP:** Brealey and Myers (1996); Copeland *et al.* (1995); Ross *et al.* (2005); Stowe *et al.* (2002); Pratt (2002); Bruner (2004); Bodie *et al.* (2003); Damodaran (2006); Goyal and Welch (2008); Ibbotson (2006).
- **EEP is smaller than HEP:** Copeland *et al.* (2000, HEP-1.5 to 2%); Goedhart *et al.* (2005, HEP-1 to 2%); Bodie *et al.* (1996, HEP-1%); Mayfield (2004, HEP-2.4%); Booth (1999, HEP-2%); Bostock (2004, 0.6 to 1.8%); Dimson *et al.* (2006, 3 to 3.5%); Siegel (2005b, 2 to 3%); Ibbotson (2002, < 4%); Campbell (2002, 1.5 to 2%); Campbell (2007, 4%).
- **EEP is near zero:** McGrattan and Prescott (2001); Arnott and Ryan (2001); Arnott and Bernstein (2002).
- *"that no one knows what the REP is"*: Penman (2003).
- *"it is impossible to determine the REP for the market as a whole, because it does not exist"*: Fernandez (2002).
- *"different investors have different REPs"*: Fernandez (2004).

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[27] "*US MRP Used in 2011 by Professors, Analysts and Companies: A Survey*", http://ssrn.com/abstract=1805852

[28] "*The Equity Premium in 150 Textbooks*", http://ssrn.com/abstract=1473225. 129 of the books identify EEP and REP and 82 identify EEP and HEP.

[29] "*Equity Premium: Historical, Expected, Required and Implied*" http://ssrn.com/abstract=933070.

The Historical Equity Premium (HEP) is not a good estimator of the EEP. Although Mehra and Prescott (2003) state that *"...over the long horizon the equity premium is likely to be similar to what it has been in the past"*, the magnitude of the error associated with using the HEP as an estimate of the EEP may be substantial. Shiller (2000) points out that *"the future will not necessarily be like the past"*. Booth (1999) concludes that the HEP is not a good estimator of the EEP and estimates the later in 200 basis points smaller than the HEP[30].

Survivorship bias[31] was identified by Brown, Goetzmann and Ross (1995): they pointed out that the observed return, *conditioned on survival* (HEP), can overstate the unconditional expected return (EEP). However, Li and Xu (2002) show that the survival bias fails to explain the equity premium puzzle: *"To have high survival bias, the probability of market survival over the long run has to be extremely small, which seems to be inconsistent with existing historical evidence"*.

Constantinides (2002) says that the conditional EEPs at the beginning of the 21st century are substantially lower than the estimates of the unconditional EEP (7%) *"by at least three measures"*.

Dimson *et al*. (2003) highlight the survivorship bias relative to the market – *"even if we have been successful in avoiding survivor bias within each index, we still focus on markets that survived"* – and concluded that the geometric EEP for the world's major markets should be 3% (5% arithmetic). Dimson *et al*. (2006) admit that *"we cannot know today's consensus expectation for the equity premium"*, but they conclude that *"investors expect an equity premium (relative to bills) of around 3-3½ percent on a geometric mean basis"*, substantially lower than their HEP.

Regressions to find the EEP. Attempts to predict the MRP typically look for some independent lagged predictors (X) on the MRP: $MRP = a + b \cdot X_{t-1} + \varepsilon_t$ Many predictors have been explored in the literature:

- Dividend yield: Ball (1978), Rozeff (1984), Campbell (1987), Campbell and Shiller (1988), Fama and French (1988), Hodrick (1992), Campbell and Viceira (2002), Campbell and Yogo (2003), Lewellen (2004), and Menzly, Santos, and Veronesi (2004).
- The short-term interest rate: Hodrick (1992).
- Earnings price and payout ratio: Campbell and Shiller (1988), Lamont (1998) and Ritter (2005).
- The term spread and the default spread: Avramov (2002), Campbell (1987), Fama and French (1989), and Keim and Stambaugh (1986).
- The inflation rate (money illusion): Fama and Schwert (1977), Fama (1981), and Campbell and Vuolteenaho (2004a,b), and Cohen, Polk and Vuolteenaho (2005).
- Interest rate and dividend-related variables: Ang and Bekaert (2003).
- Book-to-market ratio: Kothari and Shanken (1997).
- Value of high and low-beta stocks: Polk, Thompson and Vuolteenaho (2006).
- Consumption and wealth: Lettau and Ludvigson (2001).
- Aggregate financing activity: Baker and Wurgler (2000) and Boudoukh *et al*. (2006).
- Momentum: Fama and French (2012)
- Accounting profitability: Fama and French (2014)

Goyal and Welch (2008) show that most of these models did not performed well for the last thirty years, were not stable, and 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^2 statistics, asking the old question "**If you're so smart, why aren't you rich?"***

Harvey, Liu and Zhu (2014) 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 that *"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."***

[30] He also points out that the nominal equity return did not follow a random walk and that the volatility of the bonds increased significantly over the last 20 years.

[31] "*Survivorship*" or "*survival*" bias applies not only to the stocks within the market (the fact that databases contain data on companies listed today, but they tend not to have data on companies that went bankrupt or filed for bankruptcy protection in the past), but also for the markets themselves: *"US market's remarkable success over the last century is typical neither of other countries nor of the future for US stocks"* (Dimson *et al* 2004).

Other estimates of the EEP. Siegel (2002, page 124): "*the future equity premium is likely to be in the range of 2 to 3%, about one-half the level that has prevailed over the past 20 years*" [32]. Siegel (2005a, page 172): *"over the past 200 years, the equity risk premium has averaged about 3%".* Siegel (2005b): *"although the future equity risk premium is apt to be lower than it has been historically, U.S. equity returns of 2-3 percent over bonds will still amply reward those who will tolerate the short-term risk of stocks".*

McGrattan and Prescott (2001) forecasted that the real returns on debt and equity should both be near 4%. Arnott and Ryan (2001) claim that the expected equity premium is near zero. Arnott and Bernstein (2002) also conclude that *"the current risk premium is approximately zero".* In June 2002, Ibbotson forecasted *"less than 4% in excess of long-term bond yields",* and Campbell *"1.5% to 2%".*

Bostock (2004) concludes that equities should offer a risk premium over government bonds between 0.6% and 1.8%. Grabowski (2006): *"after considering the evidence, any reasonable long-term estimate of the normal EEP as of 2006 should be in the range of 3.5% to 6%".* Maheu and McCurdy (2006) suggest an EEP of between 4.02% and 5.1%.

We can know the EEP of an investor asking him about it. However, it is impossible to determine the EEP of the market because such a number does not exist. Even if we knew the EEP of each investor, it would not make sense to talk about the EEP of the market. This is based on the aggregation theorems of the microeconomics, which are actually non-aggregation theorems[33].

Implied equity premium (IEP). Damodaran (2001a, 2006, 2nd edition) says that *"the implied premium for the US and the average implied equity risk premium has been about 4% over the past 40 years".*

There is not an IEP, but many pairs (IEP, g) which are consistent with market prices. Even if market prices are correct for all investors, there is not a unique REP common for all investors. In a simple Gordon model, there are many pairs (IEP, g) that satisfy equation (1): (1) $P_0 = ECF_1 / (R_F + IEP - g)$

A unique IEP requires the assumption of homogeneous expectations for the expected growth (g), that is, for the Expected ECF (Equity cash flows).

Exhibit 5. Comments of professors and executives that do not think that the "*CAPM is an absurd model"*

The paper "*CAPM: The Model and 307 Comments About It*", http://ssrn.com/abstract=2523870 contains interesting comments from professors, finance professionals and Ph.D. students to the article "*CAPM: an absurd model*" [34]: **236** basically agree about using the adjective "absurd" to describe the CAPM and **71** do not agree for several reasons. I thank all of them very much: I have learned a lot reading (and thinking about) their opinions: real opinions of real persons that know finance and have thought about the CAPM, the beta... The following are some of them.

1. Just because there is no uniform consensus about the MRP, it does not follow that the MRP does not exist. There is no consensus about the value of shampoo, but that does not mean there is no market equilibrium price.
2. CAPM is **based on fact** as much as the proposition that objects falls at a speed unrelated to their weight.
3. What about market implied Cost of Equity – does this not come closer to what current expectations are?
4. As Prof. Box's immortal quote highlights "*All models are wrong, some models are useful*." Models have unrealistic assumptions. Model building is similar to map building: Maps are not realistic, but they are useful. A realistic map would not fit in a pocket.
5. I wouldn't call that model absurd so much as I would call it a vision of what the world would look like **if people stopped being people** and so stopped learning, experimenting, and colliding with one another.
6. The CAPM has never been properly tested. Domestic asset-pricing tests identify multiple factors but a five-year beta estimation-period does not capture risk changes over time. At a minimum, supplementary factors figure prominently in asset-pricing tests because they are more current than estimated beta and, thus, act as updates for the unobserved true beta. In the paper from the attached link, we undertake asset allocation with ex ante returns. In future research, ex ante returns I think will be the basis of the only definitive test of the CAPM.
7. **Beta is not dead** and the **Nobel-laureate work** resulting in CAPM is not absurd, in my opinion.
8. CAPM was never purposed to describe the "real world", as we know it. CAPM *is* a model and *is* a theory. The real problem is not with CAPM itself, but with how people, both the practitioners and academics, home used it. They are like **little boys** that found a **big hammer** and started using it where they should not be using it, with accompanying consequences.

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[32] Siegel also affirms that: *"Although it may seem that stocks are riskier than long-term government bonds, this is not true. The safest investment in the long run (from the point of view of preserving the investor's purchasing power) has been stocks, not Treasury bonds".*

[33] 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**".

[34] "*CAPM: an absurd model*" may be downloaded in http://ssrn.com/abstract=2505597 .

9. It seems you are not familiar at all **with Milton Friedman's** classical paper "*The Methodology of Positive Economics*". The first principle is that "*wrong assumptions do not matter whatsoever*".
10. I **don't think** that dismissing a model/theory/whatever in favor of mere *"common sense"* is an actual improvement in economics or finance, unless you prove (via a model/theory/whatever) that the spontaneous combination of agents driven by mere *"common sense"* takes to a superior result.
11. Models often describe an ideal world, where idealistic hypotheses aim to *"control"* some crucial variables. These models are paradigms, and the fact the world goes differently tells what variables must be further investigated (an example I like is Modigliani-Miller: it does not describe reality, it tells what reality could be, and as reality is different we must understand where the model does not fit reality to know what to investigate).
12. As **regulators** use/consider CAPM, market agents are forced to take it seriously, no matter what they could really think (the same happens with Value at Risk, you know).
13. There are a ton of papers that deride the CAPM as nonsense. It's like saying that returns are not normally-distributed.
14. If investors have different expectations and costs of capital then how does arbitrage play into differing expectations?
15. **I do not like qualitative models** because I can get any answer that I like.
16. **Incomplete models are very helpful,** exactly because they show us what they are leaving behind, and what else must be accounted for.
17. CAPM could be a good or a bad model. However, if it is bad, it is neither because its assumptions are unrealistic nor because some of its predictions are completely wrong.
18. **I don't think you can teach "*common sense*" without using an idealized / abstract (even absurd) model at first.**
19. **You make yourself contestable** if you use common sense instead of a clearly stated procedure. I think this is the biggest incentive for using the CAPM, everybody seems to be using it, so **just run with the herd.**
20. You say that it is absurd to think that expectations can be the same for all investors. While this is probably true, I am sure that you would appreciate that, **in the absence of such a simplifying assumption, no usable economic model could be built.** Indeed, expectations are crucial not only for CAPM, but for virtually all economic actions (investments, consumption, the Phillips curve, uncovered interest parity, etc.),
21. I teach CAPM as a kind of **religion/belief**. You neither can prove nor falsify it.
22. Every model has limitations and tries to explain (only) something.
23. I don't know if absurd is the best adjective. I think "**nonsensical**" is how I used to describe it to my students.
24. I think it is very **useful in teaching** students the basic concepts of risk and return.
25. CAPM is a **mathematically robust framework** that is as good as its assumptions are. As a "framework" (or glasses through which one looks at the world), it allows one to state his estimates of the inputs, at the same time allowing others to argue weather estimates are correct or not.
26. I think the real problem with CAPM is (1) lack of understanding why it was suggested, (2) techniques and assumptions behind putting it together, and hence (3) applying it to solving problems it's not meant for. I leave aside topic of blatant misuses of CAPM when people mix together benchmark rates for assets valued in different currencies, different time frame and differing risk profile.
27. Models have to be internally consistent. Challenging models' assumptions is irrelevant (see Friedman's essays). If a black box works, use it. If "**ugly**" assumptions help with positive analysis, normative analysis, and forecasting make them. The single period CAPM is irrelevant.
28. Think about the absurdity of CAPM in the context of **Fiduciary Prudence**. How can it be prudent for fiduciaries to be investing in reliance on theories that are absurd? If CAPM is absurd, then reliance on it by fiduciaries may be popular ("**everybody is doing it**"), but it can never be prudent. If investing in CAPM is absurd, how can trading on expectations for future valuation ever be anything more than speculation? How can speculating ever be prudent? What is the alternative for fiduciaries?
29. CAPM, as we know, is an "***inadequate theory***" but it is not absurd.

30. Dictionary

Absurd 1. ridiculously unreasonable, unsound, or incongruous <an absurd argument>. 2: having no rational or orderly relationship to human life. Meaningless. utterly or obviously senseless, illogical, or untrue; contrary to all reason or common sense; laughably foolish or false.

Cause: something or someone that produces an effect, result, or condition; something or someone that makes something happen or exist.

Common sense: sound practical judgment that is independent of specialized knowledge, training, or the like; normal native intelligence. Sound and **prudent** judgment based on a simple perception of the situation or facts. Synonyms: sound judgment; good sense; intelligence; logic; practicality; prudence; rationality; sense; wisdom; good reasoning

Ethical. Relating to beliefs about what is morally right and wrong.

Ethics. Noun. The study of what is morally right and wrong, or a set of beliefs about what is morally right and wrong.

Ignorant. Adjective. Not having enough knowledge, understanding, or information about something.

Illogical. Adjective. 1. not logical; contrary to or disregardful of the rules of logic; unreasoning: an illogical reply. Synonyms:

not making sense: absurd; false; groundless; implausible; inconsistent; incorrect; irrational; irrelevant; preposterous; senseless; unreasonable; unscientific; untenable.

Liar. Noun. A person who tells lies.

Lie. Noun. Something you say that you know is not true.

Logic. noun 1. the science that investigates the principles governing correct or reliable inference. 2. a particular method of reasoning or argumentation. 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. 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.

Mistake. Noun. An action, decision, or judgment that produces an unwanted or unintentional result.

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

Mystery: something not understood or beyond understanding.

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

Radical. Adjective. Of or going to the root or origin; fundamental. Thoroughgoing or extreme, especially as regards change from accepted or traditional forms. Forming a basis or foundation. Noun. a person who holds or follows strong convictions or extreme principles; extremist. A person who advocates fundamental political, economic, and social reforms by direct and often uncompromising methods. *Synonyms* for radical: fundamental, basic, profound, essential, natural.

Research A detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding. 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.

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

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Comments from the readers

Thank you for saying what needed to be said, and saying it with such unabashed clarity and panache!

The article raises some excellent points. Of course, one reason I enjoyed the paper is that it fits well what I have been teaching for the past 20 years at Wharton (but not my first 10 years of teaching, mostly at Berkeley). A second reason is that he does a more complete job than I ever did in explaining these things. A third reason is that he summarizes the literature with such succinct syntheses that are easy to grasp without having to wade through (again) those readings. A fourth reason is that he turns the focus to the ethics of teaching and relying on a bankrupt theory. And finally, the article keeps moving at a good pace.

One implication of this work is that public utility hearings and personal lines insurance regulatory hearings, most of which rely on the unreliable and unconscionable, are like the emperor with no clothes. Yet the courts themselves have gone a whoring after the thin veneer of quackery "science" in their judicial deliberations, requiring the use of such ridiculous models in justifying electrical rates and insurance prices.

Thank you for sharing your ideas again, in which I fully agree. Great new definition of research: *"research is only what is published in Journals of recognized prestige".*

Regarding the CAPM, I think the ethical is to teach it as something historical. As a model that was proposed, but that has nothing to do with reality. CAPM and similar models reminds me of the medical theories of the Middle Ages. They fixed arbitrary assumptions about the human body (which were generally false), and built a theory on them, which obviously did not work and which today seems ridiculous because it has no basis to contrast.

No it is not ethical. But if you were a Ph.D. student in finance at the University of Chicago 30 some years ago and said that, you would have been kicked out of the doctorate program the next day!

I agree but mostly with your paragraph 2. Put differently, it's unethical to teach absolutes. 2 + 2 can equal 22. There are alternatives to CAPM and Betas, but as long as the courts continue to recognize the 1970s models, I'm afraid we are stuck "also" teaching them. People want confirmation bias, not stuff that hurts their brains.

I have to disagree. Saying the CAPM doesn't explain anything is too strong of a statement, in my opinion. To see why, we can ask a simple question: Do investors use the CAPM when they make investment decisions? The answer is a resounding "YES!" Here are 3 examples of studies that document this: First, a recent article by Berk and Binserbergen (FAJ, 2017 - *How Do Investors Compute the Discount Rate? They Use the CAPM)* analyzed mutual fund investor behavior and found that investors use the CAPM to set their discount rate. Second, Pinto, *et al.* (2015 - *Equity Valuation: A Survey of Professional Practice)* find that more than 2/3 of investment professionals they surveyed use the CAPM. Third, Graham and Harvey (JACF, 2002 - *How do CFOS make capital budgeting and capital structure decisions?*) also find the CAPM is preferred by over 2/3 of the respondents to their survey of Fortune 500 CFOs. Hence, investors that put their money on the line (i.e., not simply as an academic exercise) use the CAPM and this could mean either one of two things: either (1) the CAPM is useful enough for investors to use or (2) professors were fooling and are fooling students/investors all the time. I think the former is much more likely and that implies the CAPM must explain a decent amount of something for investors to be willing to routinely put their money on the line expecting a required rate of return that is consistent with the CAPM.

On a side note, the fact that the CAPM is preferred by investors over multi-factor models (e.g., Fama-French) in all three studies referenced above is also telling. Investors do not appear to price those additional factors when making their investment decisions. Therefore, the better question seems to be whether those additional factors that are often used to augment the CAPM actually explain something appears more relevant.

We all know the short answer to that question: NO

My answer is in one recent book: *L'arrogance de la finance*. Title says it all!

Your thoughts and comments on CAPM resound well with me.

To me theory is just theory. CAPM etc. as it is, only reflects certain point (as you pointed it out in the table CAPM world). We still need to use logic (our input and expertise) if we need to apply any theories in real life.

The epistemological *Instrumentalism* evident in your quote from W Sharpe is typical of some US economists and is shared, for example, by M Freedman. In a world of homogeneous expectations, I suppose the 'expected' return and the 'required' return would be the same, whereas in the real world different economic agents may have different required returns depending on their personal circumstances and beliefs.

I think your words are very sensible and they may coveys a new movement. Since CAPM assumption are really unrealistic nobody takes in to consideration of CAPM when they are investing. Althoug it is known by regardful academicians or investors, there is not alternative way of calculating asset price and risk so they have to use this method. Again you mention about that, finance journals accept the papers which are supported by the literature. This situation leads to using this method without thinking. Majortiy of the academics and scientists find redundant to interrogate a method that was discovered by a Nobel prized scientist. Because of your courage, I congratulate you. Questionning a universal consent theory or method may be leads to a new and efficient method. I support your critical approach.

I have been teaching MBA students for the last 30 years! And have had similar (guilt) feelings while teaching various concepts. In my view it is not that the Beta and the CAPM do not explain anything. But the problem is that when we teach these concepts at the MBA level we do not sensitize them to the limitations of the framework. I have had instances, while teaching PhD classes, where students with a prior MBA have remarked "But then, why were we not told about all this in the MBA?" But to be fair to the CAPM and Beta, I have had the same ethical conflicts/ guilt feelings while explaining techniques like Regression, for example. Students go out thinking that they have got a magic wand; very often they do not even realize that the regression estimates are just that: estimates!

I always critical to CAPM and encourage my students to question this approach.

I love the direct attack on ideas that are obviously false but have become accepted among scholars as gospel.

I totally agree with you.

I hopefully just passed my last cfa exam. And I would like to thank you for providing some balance to the superficial quasi-science I have had to dig through. The whole self-confirming cfa machinery is fascinating: I'm originally a mathematician, but never studied any statistics, so I read the regression analysis chapters of the cfa level II very thoroughly, hoping to finally understand how to use it 100% right. And discovered that their example of removing seasonal effects, adding an extra variable made all the variables insignificant. It took them two months to answer my question, and all I got was: thanks, we will revise this section in the next edition. That none in the industry of making cfa exam material and helping students pass had sufficient understanding or curiosity to catch this, confirms your claim that there are too few economists thinking critically about the teachings of others.

I agree with your premise that the CAPM beta does not explain anything, i.e. there is no empirical support for the CAPM. As such any expected returns generated from this model are worthless. However, I differentiate between CAPM and MPT. When you add all kinds of restrictive unrealistic assumptions to MPT, you arrive at CAPM. What I think you are overlooking is that beta is still part of MPT. As a risk measure in this case, it suffers from autocorrelation, noninearity, and other problems. BUT it is still a forecast of future risk. We don't need to be explanatory to be a reasonable predictor - Friedman's positive economics. Beta within MPT is predictive. You have to be careful because you have to have enough securities in your beta-chosen portfolio to diversify away the non-systematic risk but it is still predictive as any simple forecasting model tends to be. I prefer variance and LPM to the beta but without the burden of having to explain CAPM, beta is a risk measure with some predictive MPT abilities.

I do teach MPT beta and with CAPM I say it is a nice explanation for the common sense idea that additional risk in your portfolio should be rewarded with additional return. However, I point out it is a failed theory as there is no empirical support for it.

The paper comes off as a bit of a Quixotesque stab at a defenseless strawman. CAPM is described as a special case of a broader theory by William Sharpe in his little book titled, Investors and Markets, Portfolio Choices, Asset Prices and Investment Advice. Here is an excerpt from Sharpe's extremely humble introduction to his book:

If you were to attend an MBA finance class at a modern university you would learn about subjects such as portfolio optimization, asset allocation analysis, and Capital Asset Pricing Model, risk-adjusted performance analysis, alpha and beta values, Sharpe Ratios and index funds. All this material was built from Harry Markowitz's view that an investor should focus on the expected return and risk of his or her overall portfolio and from the original Capital Asset Pricing Model that assumed that investors followed Markowitz's advice…If you were to attend a Ph.D. finance class at the same university you would learn about no-arbitrage pricing, state claim prices, complete markets, spanning, asset pricing kernels, stochastic discount factors and risk-neutral probabilities. All these subjects build on the view developed by Kenneth Arrow that an investor should consider alternative outcomes and the amount of consumption obtained in each possible situation. Techniques based on this type of analysis are used frequently by financial engineers, but far less often by investment managers and financial advisors.

Much of the author's published work is in the first category, starting with "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk" (1964). The monograph Portfolio Theory and Capital Markets (1970) followed resolutely in the mean/variance tradition, although it did cover a few ideas from state/preference theory in one chapter. The textbook Investments (Sharpe 1978) was predominately in the mean/variance tradition, although it did use some aspects of the state/preference approach when discussing option valuation. The most recent edition (Sharpe, Alexander and Bailey 1999) has evolved significantly, but still rests on a mean/variance foundation.

This is not an entirely happy state of affairs. There are strong arguments for viewing mean/variance analysis as a special case of a more general asset pricing theory (albeit a special case with many practical advantages). This suggests that it could be preferable to teach MBA student, investment managers, and financial advisors both general asset pricing and the special case of mean/variance analysis. A major goal of this book is to show how this might be accomplished. It is thus addressed in part to those who could undertake such a task (teachers, broadly construed). It is also addressed to those who would like to understand more of the material now taught in the Ph.D. classroom but who lack some of the background to do so easily (students, broadly construed).

You may want to take out the drama and build on the work of Kenneth Arrow, John Cochrane and Stephen Ross.

The question that arises is: If CAPM is a bad model, what should we use to measure cost of capital.There are several alternatives, with varying degrees of persuasiveness. My own favorite, mainly because it's easy to implement, is to derive the cost of capital implied by current prices within the Gordon Growth Model. This is to some extend hostage to market forecasts regarding a company's long-term returns (ROE) and asset growth (g), but analyst consensus is probably OK for most listed equities.

I will provide you with a full explanation, including strengths and weaknesses for using CAPM and its beta, however, as a starting point in order to make the explanation clear, CAPM must always be compared with multifactor models, which includes several risk factors (several betas) instead of a single market risk factor (CAPM beta), which strengthen the explanatory property of the model and hence can help incorporate more specific factors to be precisely measured in order to imply the accurate required return. However, CAPM is still believed the best single factor model to consider when the risk free rate (government yield) precisely account for sovereign, currency and inflation risks. So in conclusion to answer your question, yes it is ethical to teach that beta and CAPM explain something as they are the best ex-post return indication at the end, however, in my view when you are targeting the forecast horizon, utilizing the same ex-post/historically based beta and CAPM will bias the required return towards past cycle. Instead, a counter argument would state that a buildup model or a model like Fama and French or Pastor-Stambaugh Model would have a better explanatory power in case you estimate the betas based on past cycle regression analysis, while assuming the separate factors based on future analysis and forecast. So in conclusion, CAPM is the best and most feasible model to use, however, a more accurate model would be a multifactor model, yet it might not be time efficient, and at the end the results will not deviate a lot. It must be noted that the multifactor model also has a disadvantage, which is allowing analysts subjectivity contribution a part in determining the return required, which might bias results, or impact analysis due to lack of available information.

That's a pretty provocative abstract. I would readily agree that CAPM is not very useful at the stock level, both because beta is noisy and dynamic and there are priced non-market risk factors and latent asset classes. And that is not a particularly controversial position, as even Sharpe agrees with that conclusion in the interview on the AFA homepage Masters of Finance. Asset pricing theory does not say that stock-level discount rates can be predicted accurately. This would be similar to saying that it is unethical to teach the law of gravity because it is not useful for predicting the behavior of small particles.

I LOVED your most recent publication. It's eerie how in line your thinking is with mine.

Notwithstanding the many basic flaws in beta and CAPM, I believe that it is not unethical for a professor to teach them, as long as their use is put in the right context.

The reasoning behind my position goes as follows:

(1) There is no law (comparable to a law of physics for example) that exist to value a company. A physics law is generally expressed by one or more mathematical equations the variables of which are well defined; we know how to compute or measure each of these variables.

(2) For valuing a company, there exist some mathematical models, the DCF probably being the most important and widely used one. However, this model (like some others) does not prescribe how its variables should be computed, the rate of return (or the cost of capital) being one of them. This point I believe is one important reason why valuing a company will never be a "pure" science.

(3) The way to circumvent these weaknesses is through some kind of convention that is widely used amongst investors. If there would not be a convention, valuations could be all over the place - or in other words, the standard deviation around valuations could be unduly large, probably rendering the valuation exercise meaningless. The role of this convention is thus to narrow down the scattering and provide a somewhat more precise meaning to valuations. As I said above, in order to

work, this convention must be widely used by market participants. In that respect, several different conventions could do the job.

(4) Though beta and CAPM are based on an ill defined concept of risk and do not tell much about explicit risks and thus about expected returns, they have up to now, fulfilled the role of this very much needed widely used convention.

Therefore and irrespective of the intrinsic merits of beta and CAPM, I think it is ethical to still teach them in the context of a needed convention, at least until a better replacement gains wide acceptance.

A final thoughts maybe on beta and CAPM: as the stock market is often looked at as an advanced indicator, beta (and thus CAPM) is not only backward looking, but is also forward looking because at any point in time stock price volatility reflects the anticipations of the investors. Not that this is the case here, but I find this point is often overlooked in discussions on beta and CAPM.

I would argue that while CAPM and Beta may not "explain" expected and required returns in the real world, as a teaching device to help students understand the forces that would influence inverstors' requirements and risk assessments it is quite useful to teach these concepts. In addition, they also provide beginning students with insight into how markets adjust to bring expected returns more in line with investors' required returns. Thus, I would suggest it is both ethical and efficient to utilize the CAPM in teaching introductory-level financial management.

To say CAPM does "not explain anything" appears to contradict the definition of R^2 and the fact that R^2 is nonzero in CAPM regressions.

I found your paper interesting. It motivated me to think more about teaching the uses of beta and the CAPM. I have always approached beta / CAPM as a useful way of thinking about risk and return while being skeptical of the “accuracy” of their predictions. The ethical dimension of teaching beta can even be extended as discussed in the paper by Professor Horrigan (*The Ethics of the New Finance*, Journal of Business Ethics 6 (1987) 97-110) where he questions the ethics of several pillars of modern finance theory, including the CAPM. While I don’t agree with all of his conclusions, I do think he provides some insightful ways of viewing these principles.

You raise some important considerations in your paper. A recent paper by Jonathan Berk and Jules van Binsbergen on "How do Investors Compute the Discount Rate? They use the CAPM" published in the Financial Analysts Journal (vol 72, No. 2, Q2 2017) published by the CFA Institute (http://www.cfapubs.org/doi/abs/10.2469/faj.v73.n2.6). While they recognize that the CAPM does not explain particularly returns well, since mutual fund investors use the CAPM to make their investment decisions, practitioners should use the CAPM.

Your NO seems to me too strong. I think it must be qualified and nuanced (which you certainly do in the paper).I just say two things here. First, I am always very skeptical to bringing ethics into the battlefield of scientific ideas. Especially so when the victory on the battlefield is assured!

Second, there are certain pedagogical benefits for undergraduate students from the CAPM concept.

In the 1980s I was a student at Bocconi University, then Lecturer.

At the time the books we studied and taught on corporate valuation devoted the final chapter to what we used to call "the final touch of appraisal". In that chapter it was said that the appraisal ended with the evaluator drawing the appropriate conclusions on the basis of his/her experience, all things considered, bla bla bla. The evaluator just put a number, whatever, probably suggested by someone, I do not know.

We do not use those books anymore, thanks also to the CAPM. The concept is useful as an introduction for undergraduates to certain ideas of finance, usually in a curriculum where they have space for just one course of Corporate Finance, put there in a corner (as is here at Palermo). From that "touch and go" with the CAPM (which they have diffulties in grasping, anyway), they go on to become Certified Public Accountants and perhaps to making corporate evaluations. In that course, at least they have an idea about some financial concepts.

We cannot teach them Asset Pricing with the stochastic discount factor à la Cochrane. Not to say that, who knows, they might fall in love with those ideas and decide to study Finance... Then they will go deeper and find more nice surprises!

Beta and CAPM are too idealized to be of real impact. Interpretation - we can model anything we like; it just may not be reality. Hence of limited value. As parallel, I'd take lesson learned from oil & gas. Classic model was built on physics (more precisely elastic rock behavior equations). It works neatly and models fit most data reasonably (measured by risk reduction in dry holes). Then come Unconventional Shales (e.g., Bakken, Eagle Ford, Macellus, Permian) which turn geoscience on its head. Hydraulic fracturing is not elastic (but engineered fractures induced using lots of horsepower & proppants).

Response - new way of thinking, new model(s) still work in progress, and new paradigm propells innovation / rapid experimentation. (It is much easier to experiemnt on $7MM Shale well than min. $120MM classic deepwater hypothesis testing.)

Bottom line - there is so much data of different types, different scales, and just more drilling (2-3 order of magnitude greater than classic), the paradigm shifts to machine learning. In a nutshell, machine-learning model* may differ greatly from what are used to.
Back to relevance of Beta and CAPM (like elastic, well behaved rock model), will give way to more empircal data-driven machine learning approach.

Really interesting and stimulating paper … especially for mid-level executives like myself, frequently asked to let the top management (or colleagues of other functions: e.g. IT, Organization, Compliance, etc.) to understand why some "traditional" relationships they studied at the university once upon a time don't work, moreover under the new financial markets' paradigm.

I have for a number of years told my students (investments classes) that although CAPM, Beta, and the EMH are widely discussed in textbooks, the simple fact remains that they do not work in the real world. People are not rational and Beta is inter-temporally unstable. I think you are very brave to take the "ethics" approach. We live i a curious world in which the academy seems to be stuck on what's wrong and ignores what is right.

It is not correct to suggest CAPM has no value in investment. As the industry increasingly considers the notion of factor investing, and the significance of 1, 2, 3 or even 4 explanatory factors, it is clearly not just about forecasting return, but also return attribution. The basic single factor CAPM can be extended to multiple factors beyond market, and I have to remove the market (effectively CAPM) to predict other factors of consequence. If it doesn't work, then the entire universe of quantitative equity managers have been chasing their tails for the last 25 years --- me included, while that value added realized was simply a mirage. Everyone that follows the model doesn't need to be a multi-millionaire, because if the general model is known publically, then a bit more might be needed to extend beyond to outperform an index.
We know that Investors must be paid for undiversifiable risk, and we know that higher return is associated with higher risk – at security level, consider the return between a Treasury bond or T-bill versus an S&P 500 index fund, or a small-cap vs. large-cap stock. Moreover, would I expect that a more volatile, higher growth technology company to have a higher return than a utility company? Of course. One of the better points in the paper is your discussion of distinguishing: "confusion between the expected rate of return and the required rate of return". Of course, investors required rate of return may differ significantly from an expected rate return.
Suggesting it might be unethical to teach CAPM is equivalent to suggesting portfolio optimization is flawed --- in both cases, it isn't the mathematical model or frame-of-reference, but it is the assumptions and input variables that can be of concern. The simple trade-off between risk (premium) and return is as basic to investing as it gets to describe the significance of systematic market risk, which is often left out of other types of return models, such as the dividend discount model (DDM). Under your criteria, teaching the DDM is quite unethical as well. Linear regression models are probably overly simplistic, but they serve an important purpose, and you can't prove that they are theoretically invalid for performance attribution or implying excess return (vs. market)---a very different notion that being valid from a practical standpoint. To be clear, an impractical model that is theoretically correct can't be unethical.
There might be some useful points, but I would not recommend this paper to anyone as it stands. The industry has progressed well beyond simple CAPM for investing, but it remains representative of the basic relationships and can be the backbone to more sophisticated and useful investing purpose. I think you need to get over the idea that the theoretical basic CAPM needs to be discredited for some academic purpose. I suspect this isn't what you wanted to hear, but I think you can consider what you are trying to accomplish in a much more useful and practical manner.

You focus on the fact that data don't match the CAPM. I focus on the mathematics and why data don't match the CAPM.
I have a PhD in Electrical Engineering with over half century of mathematical and statistical modeling, the last quarter century specifically on least squares (LS) for use in target tracking with radar. The problem is that CAPM modeling is utter and total nonsense. I address this in https://ssrn.com/abstract=2556958 *(Yes, the CAPM is Absurd: OLS is misunderstood and incorrectly modeled mathematically)*. It supports your contention that the CAPM is absurd. The larger problem is that the mathematical and statistical communities fail to actually understand LS, especially relative to its application to statistically described errors. I have a paper in review that describes LS in detail when dealing with statistically described errors.
It is important to keep in mind the difference between statistics and sample statistics at this point and not confuse them. Stochastic processes and random variables are defined only in terms of statistics, not sample statistics. An expected value is defined only in terms of statistics, not sample statistics. A sample average is defined in terms of sample statistics. Likewise, a variance is defined only in terms of statistics; whereas, a sample variance is defined in terms of sample statistics. LS is about sample statistics, not statistics. We actually deal with the interaction of sample statistics with statistics in modeling LS as a linear signal processing system combined with statistical estimation theory.
Not only is the CAPM a patently absurd model for the reasons explained in detail by Fernandez, the CAPM is based on the total absence of both OLS understanding as well as correct mathematical and statistical modeling.

The CAPM should be completely scrapped. Instead, the well established and appropriately suited OLS should be correctly used rather than be cannibalized with obsessive attempts to justify the preposterous delusion that α must be zero, and with the ridiculous and disastrous force-fitting of the mismatched β into the CAPM. You might find it advantageous to not just say that the CAPM doesn't work, but why and what to do about it – as I've pointed out.

Indeed finance research (Asset Pricing) has become irrelevant to the industry because of its religious adherence and blind faith to the CAPM theory. Finance researchers however have to continue the CAPM story spinning in order to publish papers and keep their jobs. This resulted in ivory towers in which the more well published a finance professor is, the further his theory is away from reality. New PhDs find it hard to publish papers because they have to learn to spin stories rather than explain reality.
Not all is lost though. Markowitz's mean variance efficient frontier theory still holds quite well as a tool for diversification implementation. Market efficiency concept is quite useful, except that it should measure relative to "perceived value" instead of true intrinsic value. Finally we can keep the idea of "equilibrium" price, but we should abandon the idea that market price is equilibrium price. Instead we should construct a model of price discovery modeling how the current price tries to move towards its "perceived value". In this model, we may have to incorporate a bit of technical analysis. I have been looking forward to such a model since my PhD days. Technical analysis is not the "truth" but it helps in modeling price discovery. Perhaps the world's turmoil in financial markets are all due to the usage of Beta and CAPM. Even sovereign funds uses Beta and CAPM. Hence the urgency of inventing a better pricing model is great. I pray that you can be the champion that finally develops a model that is useful.

I agree with you almost completely and will assign your paper to my students for further study. As an independent director for three public companies, I found it useless to teach the practitioners about the use of Beta or CAPM. You are right to point out the fact that Beta fails to explain either the realized return or expected return. It is time to teach something more useful and more fundamental.

Ethics has nothing to do with theoretical models. If you have a theory, you should test it either in the laboratory or provide empirical evidence, which support the theory. You can never know if the model is "right" or "wrong". If I teach these models, I am committed to show the body of empirical research about these models. Kmenta, for example, compares the empirical evidence to criminal justice. It seems more and more evident that many people sit in jail on an offense they did not commit. Empirical evidence can be misleading - and therefore in statistics we have type one and type two errors - exactly like in court

CAPM should be taught as part of the history of the development of required returns by investors. CAPM is a good building-block in which to develop further ideas and formulas leading the students up to the most current recent research (e.g. 5-factor of Fama and French).

Same ideas, but different solutions. I have gingerly taught beta for many years. It does have some value, but it is not a perfect solution to the question of how to deal with risk. I am rewriting my financial analysis book to address the issue of what is risk, how to measure it, and how to analyze projects/investments with different kinds of risk. I think you are absolutely right and wrong. That is a great start to the horrible angst I always feel when talking about beta as The Solution.

We teach many topics where there is great difference between the abstraction and the actual reality. To do things properly I believe we have to teach both. That does not necessarily mean to throw away the theoretical abstraction.

While I agree that CAPM and beta in the conventional sense are of no use to investors, real beta (the movement in earning and so valuation driven by the movement in markets) is a key valuation component for a number of financial services businesses. Asset Management Co A has an operating margin of 10% and consequently a 10% move in the value of the underlying assets will either double or eliminate profit, ceteris paribus. AM Co B with a 20% operating margin has precisely half the market sensitivity or real beta. If earnings certainty is the measure of risk then real beta is important. The value of a very well diversified (by underlying asset class) AM Co with a high operating margin will be more valuable (it has a lower real beta and therefore it should have a lower actual beta) than a lower margin concentrated (by asset type) AM Co. In this case the beta of the business should represent its earnings sensitivity to market movements and reflect the NPV of its cashflows.

Just a thought, maybe the difference is between explaining and describing. Newton never explained gravity; he did however describe it mathematically. Of course the description provided by CAPM and Betas have quite a bit fuzzier math than Newton's, and in addition to the existence of a feedback loop in the system which might be problematic (from a scientific point of view). The extent to which human action really can be mathematically modelled is in any case probably suffering from overreach both by academics and practitioners, resulting from the tendency of regarding every problem as a nail when the only tool one has is a hammer.

I do agree with you strongly concerning the CAPM, but tell me which predicting model we can use in practice as reliable one?

Thank you very much for your interesting and insightful work. This would be a helpful material for my MBA teaching. Really appreciate your contribution to the academics.

CAPM is often used as a way to benchmark the return and risk, NOT really intended to explain anything empirically.

I appreciate your against academic mainstream research approach, useful for practitioners and students in the real world. According with you a) The CAPM and beta have a poor explanatory power; b) Teaching without explain its limitation is unethical; c) The wide application of the model impose to teach it in classes. The real problem is that academics and practitioners as a whole does not accept any alternative model. And it can occur even if the method is both simple and presents a scientific rigor.

A couple of observations about CAPM:

- Good theory informs our thinking and understanding of how the market works, but doesn't necessarily provide an analytical path to a reliable answer.
- I've spent a fair amount of time doing valuation work in the mining industry. In the industry, the starting points for almost every DCF M&A analysis are real discount rates of 8% for base metals, 6% for silver and 5% for gold. These discount rates are the accepted industry norms, but you would have trouble figuring out where they came from. Other than two global mining companies, I don't think anyone in the industry really understands or uses CAPM. But interestingly, when I led the valuation practice at EY, I hired Mike Samis, who is a mining engineer with a finance PhD, with a mandate of providing our mining clients with access to more sophisticated decision analytics. Mike's analysis, using real options techniques and CAPM, combined with econometrics studies of metal price uncertainty, showed that the 3% variance observed in the market between base metal and gold discount rates is explained by the differences in systematic risk in the metal prices. So good tool in the right hands.
- I attended a local valuator workshop where we discussed how various firms were applying CAPM to derive discount rates. My takeaway was that very few of the valuators that spoke actually knew much about CAPM; there was a surprising diversity of view around some of the key components in the deriving equation. But the ready availability of data from Capital IQ , the relative simplicity of the high level equation, and the patina of credibility available make CAPM an economical (if no necessarily reliable) way of deriving discounts rates without the bother of contacting market participants, etc.

So good tool and something that we should understand at a theoretical level, but not that useful in replicating market participant pricing.

I understand your position, but you are exaggerating to make your point. The CAPM framework does provide a methodology and a framework that has merit because it is measurable and repeatable. If you are going to throw stones, you need to propose a replacement methodology.

CAPM is a benchmark and as such very useful and tells us a lot about whether strategies in stock investing are actually useful to the retail consumer. Without CAPM we could not have shown that the Oxford Club is ripping off subscribers selling strategies that can be achieved with indexing. We show that the newsletter editor, Alex Green is not as skilled at picking stocks as his marketers portray him to be. All of CAPM is useful from this perspective including beta. Read, http://www.cfapubs.org/doi/full/10.2469/dig.v43.n3.22

I was a colleague of both Jack Traynor and Fisher Black at Arthur D. Little, Inc. way back when. I disagreed with their views then. I pointed out that a single factor model was carrying oversimplification to a ridiculous level. Basically I did not like the model at all, because it assumes that the rational goal is the maximize money whereas I think it is to maximize purchasing power. CAPM implies that your investments should be the same no matter what the ration of human capital to money is; I think that is a silly result). I even tried a multi-factor model using Barron's data on business sector returns: that showed that two factors explained a great deal and it was not difficult to identify those factors: precious metals and oil. Later, around 1980, I came across a paper by John Hicks (if I remember correctly, from 1931, commenting on Marchall's view of risk) that argued (properly, in my view) that in the context of a portfolio of investments the preferred measure of risk of an asset should be the marginal contribution of the asset to the standard deviation of the portfolio. So in that paper Hicks basically derives tha CAPM and then goes on to say something like: "if everybody held exactly the same estimates of the variance-covariance matrix of all assets then life would be very simple: everybody should hold the market and the marginal contributions would be the same for everybody. But life is not that way if only because not all wealth is fungible but also because opinions differ." That article seems to never be cited. I was working in New York at the time and tried to get a copy from the Public Library, they refused because the pages of the Journal were so brittle that they might crumble if placed on a Xerox machine. A discussion then followed in which I argued that that fact was a cogent reason for trying to preserve copies

of the journal on paper that would not crumble in a period of 50 years. I did get a copy, but it stayed with my employer when I left a year or so later.
In my teaching career I basically used Hick's approach and language whenever I had to "teach" beta and CAPM.

I absolutely and positively agree with your argument. The only reason I teach CAPM in my class is that I am not as famous as those who won Nobel prize in economics with papers dealing with CAPM.

You make quite a summary of the internal critics within academia. However your piece should have gain inbring less Panglossian. In fact few pages suffice to recognize the limits of the MPT. Finance get lost because of the over reliance on data mining and fragmentation of knowledge. It is not only a problem of Finance but from any modern science. It took 200 years to apply math and probability systematically. Finance has no general theory and will never have. The loop is closing with Behavioral Finance. But again this is applied science to the field of finance. I have difficulty to think along your syllogism that teaching CAPM is unethical. If it will be the one and only tool, the fact that you align so much arguments demonstration the limitations is in itself ethical in the sense this is open for debate to find the rights and the wrongs of it, i.e. the purpose of practical ethics. Pure ethics has nothing to do with finance as there is no morality intention in finance which can be applied by saints and dictators.
Beta help us to understand correlation in a pure statistical manner and nothing more and are useful for daily money management to assess the sensitivity of anything versus variables. It is very useful practically. With this purpose you can make money with it.
I find you hard also on the fact that CAPM has no value to derive the value of the firm. I don't agree either as it can put the relative value in perspective. Although I don't follow you in many aspect was a good for thought.

I fully agree with your points on this.

In physics, professors still teach Newtonian mechanics even though we all know that it is not the correct description of the universe and that Einsteins equations are more correct. Also, Einsteins equations although they describe the behavior of huge macro objects quite well, completely fails to describe the subatomic particles where quantum mechanics equations must be used.
So, it is as simple as you claim and in my opinion it has nothing to do with ethical and unethical behavior but simply that professors when teaching the CAPM should put it in some sort of historical context and build up to a discussion of newer asset pricing models.
This is how it is done in physics. In physics the professors still teach Newtonian mechanics before they teach Einstein mechanics and quantum mechanics because you need to understand Newtonian mechanics before you can appreciate Einstein mechanics and quantum mechanics.
So, overall, I still believe that the CAPM needs to be taught and teaching CAPM has nothing to do with ethical and unethical behavior, but is not only necessary but very important from both the historical and conceptual perspective.

I read your paper and found it to be quite insightful. My background is in taxation and accounting. Most of my colleagues in taxation don't view it as a "science". It's basically a bunch of rules, some of which make sense, but many of which don't. Accordingly, a lot of the academic research in taxation is behavioral in nature. In accounting, some colleagues have mentioned to me that a certain amount of published accounting research is glorified data mining ("scientific method for dyslexics" or "Let's throw some data against the wall, see what sticks, and then go back in time to create a model").
I only mention this because most business disciplines rely on "models" that often don't work. This does not mean that these disciplines are "unethical". Far from it. The world is full of models that are "true" in certain "moments of time" or in certain "time periods" (but not in others.)
On the other hand, I have a hard time with business research that is conducted in an unethical manner. In my opinion, this problem can occur when scientific method is grafted onto a discipline that, by its nature, is not a science. I think this applies to many business disciplines.
P.S. -- As an aside, I know of many folks who have made money in the stock market by applying common sense.

An area you may be interested to look at is the efficient market hypotheses. While proving it to be incorrect is difficult I believe you can find categorical evidence from the Close Brothers FTSE100 income and growth investment trust through the dotcom crisis. It was a derivatives construct that could be hedged to deliver exceptional returns after accounting for the counterparty risk, which you could also hedge out. And before you ask, yes I did make a load of money from that trade although I had to do the calculations about a million times as I kept thinking that it couldn't be right that you can get free money. Large swathes of conventional financial markets teaching, is wrong or it doesn't work.

I agree with you that CAPM doesn't truly explain anything, in the sense that it does not provide any kind of recipe for people to follow. Yet I would not describe its use as inherently unethical. If it is presented as a recipe on which to base concrete

action, then it would seem to be unethical. But if it is presented as a property of some mass of firms, recognizing that that mass is not an acting entity, one might offer reasonable observations as to how that massed statistic has changed over time.

A very useful critique of betas and CAPM. I would teach it as a starting point for the more important stuff that does explain more about the real world. That's probably what most finance scholars do too.

Though I agree with your assessment: CAPM and its related concept of beta do not account for investors' required returns, that theory is far from being the only one that is taught by finance instructors for no valid reason (other than they appear in finance textbooks).
As an example, it is often taught that the return on retained earnings is "the same as the return on common stock", which is, at best, a short-sighted fallacy. On a related subject, it is also commonly taught that the cost of common equity is the same as the return on common equity, which is just plain silly.
If it can indeed be assumed that such blunders are the result of improper training, I think, with all due respect, that considering them "lies" is a bit extreme: one can only lie when knowingly making false statements.
In the case at hand, the instructors should know that what they are teaching is false, but they just don't because they have not exercised any critical thinking on those subjects.
That doesn't make it "right", but it's a far cry from being unethical: it's just simply and objectively "wrong".

I wouldn't go that far. To me it is not unethical, it is dumb! Dumb people tend to overlook circularities.

A number of things we teach are not correct or at least imprecise and students get the idea they are Gospel truths. Textbooks (especially undergraduate level) present the notion that net present value computations in capital budgeting assumes the corporate tax rate solely determines the tax savings. Thus, the weighted average cost of capital can be presented incorrectly. The MM and Miller gain to leverage formulation are often used as the standard in textbook formulas yet these formulations say nothing about changes in the cost of capital or how growth affects the gain to leverage. The Dividend Valuation model is presented as if it is separate from the debt-equity choice.

A couple quick comments:
- I enjoy teaching the CAPM, however it follows and is discussed in the context of correlation/covar and risk.
  - o I always start by emphasizing all the borderline silly assumptions that must be in place to make it valid. Teaching "Investments," incoming students, even MBAs, typically understand "beta" as only a variable to plug into a formula. Some understand its relationship with the market (S&P here).
  - o No one understands its statistical derivation before my class, but they have to learn that by calculating their own betas. I think the attentive ones notice that the R^2 isn't very high.
- While I tell them about multi-factor analysis, for time, that is left to a future class and colleague. Betas from the CAPM are just one of the risk measures we discuss, but Alpha is the key takeaway – whether benchmark or risk/factor adjusted.

I share this because I think claiming CAPM does not "explain anything" or it's "not ethical" to teach it sounds a bit extreme. I fully recognize that there could be plenty of instructors who are and have been teaching for decades that CAPM/beta are valid/essential/etc. I would hope – most of us teach this particular concept with more nuance and qualifiers. Maybe that's asking a bit much and you know otherwise.

I have read with interest your paper on the "ethicity" of some of our teaching. As you solicit some comments, here is what I have to say.
To your question "Do I teach the CAPM to my students?" I can repeat the answer you give: of course I do, because it exists, many people use it, and if one wants to live and work in this world must know it. And I add, as you do: be aware, that this is only a "game of the mind", a mathematical model nice and elegant "per se", very far away from reality. It is good to understand what others talk about; it may be useful for your academic career, if you dream one; it definitely is of no use if you program to become rich.
Please note that almost the same could be repeated with what is at the very roots of CAPM, that is Portfolio Theory. Just note a couple of things:
(1) no one knows (at least: as far as I know) if the market portfolio is efficient
(2) in a market where options are traded, a risk-free portfolio can be constructed by combining a stock, a call and a put. But then the region of the risky opportunities will touch the vertical axis, its frontier will no longer be a hyperbola, and no market portfolio will actually be individuated
(3) the theory lies upon the knowledge (among other things) of the variances/covariances matrix. No one, at an academic or professional level, looks to really dispose of a proxy, at least, of it.

Going back to CAPM: of course, as you say, to assume homogeneous expectations is not a simplifying, but an absurd assumption. But it is, I think, just as absurd as thinking that an operator can reasonably estimate mean returns and variances/covariances concerning some hundreds of risky assets.

I completely agree that a huge confusion between expected and required rate of return reigns all around: also by people one should think to be above all suspicion. I myself wrote something on the subject in a not too fortunate paper I dedicated to the WACC a couple of years ago.

But I don't agree when you write I have never estimated an expected rate of return (I do not know how to do it). In my view, if one is able to use a "required rate of return", he knows the distribution of the future random income; then, he only misses a market price of the asset, and the expected rate will follow at once.

Of course, if one only disposes of market data, the expected rate or return cannot be calculated: but in the same situation, what should one do of his required rate?

Perhaps, the fact that CAPM (and portfolio theory) deals with "expected returns" add to the confusion. It can be, admittedly, rather puzzling having to do with the expected values (in the probabilistic sense) of the random variables "next year returns of risky assets": and so, with the expectations of expected returns.

A last remark. Personally, I have some moral problem also when I present the basic, standard theory for pricing of the derivatives.

My simple understanding, at least how I teach it, of CAPM is an economic fiction for benchmarking a particular security's movement (volatility) risk in the context of the summed movement of the market from which the security derives. It does not explain risk, it merely is an observation tool of movement. In the brave new OECD world of identifying and assessing risk in the context of pricing it for the GVC, CPAM would have a very limited application anyway confined to TPMs appropriate to intragroup financial services and financing, such as perhaps securities portfolio leasing if that even occurs intragroup (perhaps intra-banking groups?).

The major contribution of CAPM is that it quantifies the amount you cannot make in the stock market--it focuses on the return to the market and suggests that you will make that (or some portion of it based on the amount of risk you choose to take) if and only if you have a diversified portfolio. It specifically, and Sharpe specifically, states that beta is only an appropriate measure of risk within a diversified portfolio. And within that framework it explains reasonably well the return you get.

Is beta useful? Yes, ex ante to help me define the level of risk I want to take in my portfolio, and ex post to see if I achieved that level (or better or worse) compared to the market (however defined). So on balance, I have no moral dilemma teaching CAPM--recognizing that there are limitations and enhancements to it over time, it still does a reasonable job of explaining return versus risk and allows me, if I can get the data, to define whether those I may have hired to manage my money are doing a reasonable job of that (most do not by a fair margin).

More important, it seems to me, is that we teach CAPM to instruct our student on better investments. You ask in your questions of professors, "If you believe in CAPM, why aren't you a millionaire?" And there are a couple of reasons for that that answer the question you ask.

- In order to become a millionaire getting market average return, which CAPM suggests you will get, you need to start with a fairly large amount of money--the amount depends on the length of the compounding period and the average market return.
- It is precisely because I studied CAPM that I am such. The theory taught me that unless you can pick stocks better than the rest (something we have never been able to do replicably), you will get the average market return for the risk you took. The market is (relatively) perfect. The lesson that taught me was to move to markets that are not perfect--places where individual knowledge and skills will receive an excess return. I know of two such markets in my arena--the market for real estate, where prices are not uniform and where there are "deals" that provide what would, in the CAPM model, be called "large alpha"; and the market for human capital (skills). Deals arise from both things in my area, then--lack of good knowledge of appropriate prices of real estate within the market and skill in managing real estate after it is acquired. Lucky me, I can do the latter and have found some good properties in the former.

I teach CAPM to my students. My comment to my students is that CAPM is useful if you want to accept an "average" return. If, on the other hand, you are "greedy" and want an above average return, you need to go to a market that is imperfect and will use your skills to allow you to make money. If you have those skills and apply them well, you will make an above average return.

I suspect that on balance you intend your article as a conversation starter. Fair enough. But it really should, in my view, recognize the monumental contribution Sharpe made in 1964 and thereafter. There is a reason pension funds and investment bankers use CAPM. And it has nothing to do with picking individual stocks. It has to do with managing risk and gauging the appropriateness of the return you have received. (PhD finance, Stanford 1972, and one of Sharpe's students from 1969)

I agree that the CAPM is almost meaningless. I think you are a little too harsh calling users either liars or ignorant.

After reading just the title and abstract, I had a quick comment. You may well already have considered this, but just in case not, I wanted to mention it. Could it be that the widespread use of CAPM and beta make them important, even if they are theoretically flawed? Suppose, for example, that CAPM and beta are not a theoretically robust or correct way to think of the world. Nonetheless, many investors, analysts, etc., still use these tools. The very fact of this use may make the flawed constructs important, inasmuch as they influence investor behavior. If this is so, then perhaps the ideas should be taught, but in a way that focuses on the behavioral impact of the theory, rather than on the theory as an ideal/correct description of the world. There may be many problems with this thought, and it may be something you have already considered well, but I just wanted to mention it in case it is of any use.

I disagree with the title here. We need to put them in the context of time. And I guess majority agree that both were the first and important steps in understanding finance. Advising someone to drive automobile from 50s on highway today is likely unethical. But in 50s automobile was great tool.

There are a lot of problems with the CAPM as you have pointed out in many of your papers. I have long wondered why this model has become so widespread and popular.
One reason, most likely, is its simplicity. It is convenient to ignore a lot of real world complexities and the model does this.
The CAPM probably became popular because it provides an excuse to forget about "idiosyncratic risks" that are of no concern to a "diversified investor" but that may be of great concern to "real" people.
Examples of idiosyncratic risks are chemical spills, workplace safety issues, labor strikes, etc., etc.
Conveniently, none of this matters in the CAPM. In other words, the teaching of the CAPM and its widespread application has given rise to enormous social and environmental externalities that are now threatening our communities and society.
So this is what the CAPM explains: It explains the unfettered growth of enormous threats we now face as a civilization on this planet and the markets' inability to stop it. And this is what we have to start pointing out when we teach it. So our focus as finance professionals must now shift to ESG factors and impact investing. Hopefully, we can make the transition fast enough.

What you try to prove makes some sense. However, Beta and CAPM are two major break throughs happened in the history of Stock Market Research. These concepts at least refined our thoughts on risk associated with securities. Is it not?

I respond as an old man who entered the securities industry in 1959, fascinated by securities valuation and related research. I have been a member of the CFA Institute since 1964. I am not a CFA. My valuation/securities research began well before the days of powerful computers. Analysis was done using adding machines, slide rules or Friden calculators for multiplication and division and one's own study of the business of the company, how "the wheels went 'round" in it and at the end of the exercise was it worthwhile to invest in it. An opinion.
With the advent of the computer and its increasing power to compute and quickly solve complex equations the thought seemed to arise that the output was science; as certain as laws of physics, chemistry and mathematics. When I first entered the securities business, an older colleague made clear to me that the symbol and prices displayed on the ticker tape bore no connection to the business of the underlying company other than name. That is, market pricing is driven by many factors all dependent upon human emotion and reactions to news and data. No science there. The closest pass at interpreting what price and volume action meant was a reading of the tea leaves as shown by simple charts, moving averages and point and figure displays (which tried to break down intra-day movements). Warren Buffet began here using the very fundamental analysis of Graham and Dodd.
Have computers made decisions and findings more accurate and finite? I would say not in the field of pricing securities. And not when one relies on references to market based prices as inputs to complicated equations of statistical inferences or those that may solve science issues such as Brownian motion or thermodynamics or time and motion.
Thus, I surmise that I understand your point and agree that it is certainly irresponsible for anyone to declare in a classroom or any other forum that these tools of analysis are as fundamental as is Pi or the atomic weight of an element. These tools may be useful to generate a conclusion but that conclusion is really only an estimate and interpretational opinion that is based on instantaneous, contemporary information and thus useful for only that reference time period. Maybe the result is a smart guess (SG) rather than a smart wild ass guess (SWAG).

I am excited for your paper. I puke all over beta/CAPM in my investment class and now have an academic paper to support my lecture.

Teaching these concepts is not an ethical matter. The job of an educator is to teach the concepts and to explain their significant limitations. Re beta, it measures the past and is by definition limited in its usefulness. The CAPM is a valuation model and vulnerable to lots of manipulation based upon the assumptions used. So long as your students understand the pitfalls of relying on the CAPM, they are well served. As I always told my colleagues in merchant and investment banking, "the model is not the business; the model is only a model of what might happen".

I often find highly educated "quant" types think you are uneducated when you take on this debate. They have trouble accepting the observed data as it doesn't agree with their elegant course teachings. Many of these types of people are gatekeepers for billions and trillions of dollars. The results of education now is potentially worse than in the middle ages if lecturers/professors knowingly teach pupils untruths, just because it is convenient, and also if pupils just **learn what to think, rather than how to think**.
Sadly finance is not the only area where observed data and history is being ignored in place of commonly accepted theory.

CAPM and beta … I admit to thinking more on this after my email to you. Even with the qualifiers I put on the topic of beta in my class, students and investors are bombarded with beta everywhere. The limitations and qualifiers are probably long forgotten when students plug it into a WACC calculation or any of the other myriad of uses. I recently have had students calculate a beta relative to a stock's industry or sector just to understand more of what this regression coefficient can mean. I suspect much of the lesson is lost of the majority of them, though. Thanks for getting me thinking about it more.

Teaching it no -- but using it without understanding the limitations of its assumptions YES!

I agree with your comment on CAPM. However, CAPM is not totally useless. So long as we accept the fact that beta is a variable, not a constant, which changes over time, CAPM does provide another reference point for valuation. I caution my students: CAPM must be used in conjunction with macroeconomic and fundamental data over a long period of time.

Yes, it is worthwhile to rethink over what we may take for granted in our teaching and research practice. In addition, CAPM has led to new problems among researchers and practitioners who use the model quite often. Your insightful arguments are quite inspiring. I agree with most of your points.

I agree that CAPM is not the best way to appraise a firm or any type of investment in the real world. The assumptions are unreal and way too many. Nevertheless, I also think that studying it may be a way to train the brain and stimulate people studying economics and finance to find a better way to evaluate an investment in the real world. To be clearer, CAPM and the computation of betas may be a starting point for a student to understand which are the underlying mechanisms of valuation. Then, a student that wants to start a carrier in this field must be enough curious to find a more appropriate way of appraisal in the real world. But I do not think that it is not ethical to teach CAPM and Betas. Because also in Macroeconomics there are lots of models with underlying assumptions that cannot fit in the real world, but I think it is always good to teach them, then it is the student that wants to pursue a certain type of career that must have the intelligence to make a model flexible or to create a new one that could be applied on a real-world situation.

I teach CAPM and beta in my classes, but I caution my students that they have little to none explanatory or predictive value. I justify teaching these subject by the fact that 1) all the proposed alternative (three-factor, five-factor) models were based on the same methodology and 2) no credible alternative to beta and CAPM has been proposed so far. I think, it is a pretty accurate statement.

After a second thought, I changed my answer to "YES". But I think a professor should also point out what is the problem and why the CAPM and beta are dead and useless.
My answer is the same as yours "NO". My reason is CAPM or beta is invalid and is dead. A professor with integrity should educate student the true and only true. The expected excess rate of return is a parameter (or constant, not a dependent variable) and should not depend on the other variable beta (the beta's major component is covariance). The prerequisite of covariance is the EXPECTED rate of return (a constant parameter). I.e., without the expected rate of return, the covariance or variance cannot be calculated. I thought this is a common sense of Statistics and Mathematics. For detail, please see the paper: "*Yes, CAPM Is Dead,"* Journal of International Business, 20, No. 2, Spring 2015, 144-158 (with Mark Stohs).

I find it very difficult to teach CAPM and Beta as required by our curriculum. However, we have 9 professors teaching the same core course so getting everyone on board to change it is… a challenge. Thank you for continuing to publish on this problem. I also make your articles available to my students who are interested in pursuing careers in investing.

I think the issue is much broader than Beta and CAMP.

Interesting although the fact is that in deal negotiations investment banks use the model to value companies. In other words it is a negotiation tool, not a model to pick stocks. What do students expect from an MBA degree? That they learn the "tools" that are used in the real world to negotiate deals. So that is the implicit contract we have with our students so teaching it is ethical I think.

Isn't Factor Investing subject to the same criticisms? Has any investor ever made a fortune using Fama-French-Doe factors (other than scheming management fees out of investors)?

The paper by Bali & Engel shows that when the econometrics is done properly, the CAPM is priced, http://pubsonline.informs.org/doi/abs/10.1287/mnsc.2016.2536

In answer to the question I think it is alright to teach some things with limitations, like Newtonian mechanics. However because CAPM is more like father Christmas in that it is designed to shut down inquiry rather than stimulate thought, I very much agree with you. Any approach to valuation must first start from information theory and not a completely bogus set of assumptions.

According to my knowledge about CAPM, you are absolutely right.

I completely agree with your brave statements! Finance is mostly theory which is not widely understood by everyone! The purpose of science is to draw conclusion based upon empirical observation. Many texts in finance and economics (fancy and complex theoretical mathematical equations designed to impress) does not do this hence the scientific value is limited. An economic and finance professor that has not understood this is naïve and can do more harm than good.

Unless your name is Jim Simons (Renaissance Technologies) there does not exist a magic bullet to invest money in the market and that include Nobel Prize winning portfolio theory and CAPM. Since Jim signs a no-disclosure legal agreement with all his employees and they are also not allowed to work for another financial firm for 10 years I think after they have left their jobs at Renaissance the chance of an ordinary person learning how Renaissance's algorithms works is close to zero and therefore we should waste no time trying to find out.

Portfolio theory and CAPM is nothing more than sophisticated trend following and trend following is no magic bullet. Trend following has instead become a snake oil for desperate sale people https://www.trendfollowing.com/

The purpose of Business schools that teaches economics and finance should mostly be give the student the tools to do empirical analysis but also some theoretical analysis in moderation. Every professor in economics and finance should start their lecture by saying: Warning what I am about to tell you know is mostly based on loose theories and cannot be observed in reality. The only reason I am telling you about it is because I don't have anything better to teach but hopefully it will motivate you to describe the world in a better way. Another example of economics and finance weak connection to reality is economics and finance text books refusal to describe where money comes from. Many people think that the money banks loan out is money that already exist and the bank own. This incorrect and a very dangerous delusion! The fact is that the majority of money is created from air by greedy commercial banks when they make loans.
http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/qb14q102.pdf

Even though today central banks also creates money from air by quantitative easing (QE) and they has a monopoly on issuing coins and bills. The coins and bills are however a very small fraction of the money in circulation in the economy.
Why should anyone pay interest and amortization on something that did not exist to begin with? It is close to impossible to find a textbook in economics and finance that describes this.

Let's just conclude that the academic world can be very brutal.

I agree that the CAPM is flawed. There needs to be better theory and as yet we do not have it. The CCAPM is no better.