The CAPM is an absurd model because its assumptions and its predictions/conclusions have no basis in the real world. The use of CAPM is also a source of litigation: many professors, lawyers… get nice fees because many professionals use CAPM instead of common sense to calculate the required return to equity. Users of the CAPM make many illogical errors valuing companies, accepting/rejecting investment projects, evaluating fund performance, pricing goods and services in regulated markets, calculating value creation…

According to the dictionary, a theory is “an idea or set of ideas that is intended to explain facts or events”; and a model is “a set of ideas and numbers that describe the past, present, or future state of something”. With the vast amount of information and research that we have, it is quite clear that the CAPM is neither a theory nor a model because it does not “explain facts or events”, nor does it “describe the past, present, or future state of something”.

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

We all should try to explain a portion of “the world as it is”, not of “the world according to a wrong theory” nor of “the world if men were not men”. Ricardo Yepes, professor of philosophy of my university, 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”. The definition of wishful thinking is also interesting: “an attitude or belief that something you want to happen will happen even though it is not likely or possible”.

We may find out an investor’s expected IBM beta and expected market risk premium (MRP) by asking him. However, it is impossible to determine the expected IBM beta and the expected MRP of the market (for the market as a whole), because these two parameters do not exist. Different investors have different cash flow expectations and use different expected (and required) returns to equity (different expected market risk premium and different expected beta). One could only talk of the beta and the market risk premium if all investors had the same expectations. But investors do not have homogeneous expectations.

Sections 11 and 12 show how to calculate required returns in a sensible way and how to use betas being a reasonable person.

1. Main assumptions of the CAPM
2. Main predictions of the CAPM
3. Why CAPM is an absurd model?
4. Why many people still are using CAPM?
5. Schizophrenic approach to valuation
6. Consequences of using the CAPM
7. Papers about the CAPM
8. Problems with calculated betas
9. Problems calculating the Market Risk Premium
10. Expected, required and historical parameters
11. How to calculate required returns?
12. How to use betas and to be a reasonable person
13. Conclusion

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1 Absurd means 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. Source: [http://www.merriam-webster.com/dictionary/absurd](http://www.merriam-webster.com/dictionary/absurd)
1. Main assumptions of the CAPM

All investors:
- have homogeneous expectations (same expected return, volatility and correlations for every security),
- can lend and borrow unlimited amounts at the risk-free rate of interest,
- can short any asset, and hold any fraction of an asset,
- plan to invest over the same time horizon.

2. Main predictions of the CAPM

The CAPM assumptions imply that all investors:
- will always combine a risk-free asset with the market portfolio,
- will have the same portfolio of risky assets (the market portfolio),
- agree on the expected return and on the expected variance of the market portfolio and of every asset,
- agree on the expected MRP and on the beta of every asset,
- agree on the market portfolio being on the minimum variance frontier and being mean-variance efficient,
- expect returns from their investments according to the betas.

As there are homogeneous expectations and there is not disagreement about the price or the value of any security:
- trading volume of financial markets will be very small.

3. Why CAPM is an absurd model?

The CAPM is based on many unrealistic assumptions. It could be said that “all interesting models involve unrealistic simplifications”. It is true and CAPM has some assumptions that are convenient simplifications, but other assumptions (specially the homogeneous expectations) are obviously senseless (although they could be reasonable in another planet).

None of the CAPM predictions happens in our world (the only one that we cannot test is the market portfolio being mean-variance efficient).

Still, many professors affirm that “the CAPM is not testable” or “it is difficult to test the validity”. CAPM is a model a) based on senseless assumptions, and b) none of its predictions happens in our world. Which other test do we need to reject the model?

4. Why many people still are using CAPM?

Fernandez (2009b) shows that many professors acknowledge that there are problems estimating two ingredients of the CAPM formula (the beta and the MRP [market risk premium]), but, nevertheless, they continue using it for several reasons:
- “Has received a Nobel Prize in Economics”,
- “While not perfect, it is used extensively in practice”. “Beta is simple and it is used in the real world”. “Fortune 500 firms use the CAPM to estimate their cost of equity”.
- “If one does not use beta then what is there?” “No substitution so far. There are no better alternatives”. “There is no other satisfactory tool in finance” “We need another model to substitute CAPM and betas and 3-factor models”
- “Calculated betas are on the CFA exam”. “Referees want to see them as the underlying model”
- “Almost every practitioner book uses betas such as the McKinsey publications” “Regulatory practice often requires it”
- “Beta allows you to defend a valuation, impress management and come across as a finance guru”. “That point estimate gives the impression of truth”.
- “In consulting, it is essential to fully support your estimates”. “It is a useful tool to compare one stock with another”

2 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; each investor cares only about return and volatility.
3 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.
4 Although Roll (1977) concludes that the only legitimate test of the CAPM is whether or not the market portfolio is mean-variance efficient, I think that we have enough evidence to conclude that: 1) the CAPM does not help to explain the financial markets, and 2) users of the CAPM make many errors valuing companies, accepting/rejecting investment projects, evaluating fund performance, pricing goods and services in regulated markets, calculating value creation… But I have to thank some CAPM users that allowed me to participate as expert witness in several trials, arbitrage procedures and consulting projects usually originated by senseless results of the CAPM.
Some professors argue that “although the empirical evidence does not justify the CAPM, I teach it 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 and, more important, business and management (which includes investing and valuation) is about common sense, not about recipes.

5. Schizophrenic approach to valuation

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

That is the schizophrenic approach: to be a “democrat” for the expected cash flows but a “dictator” for the discount rate.

Most professors teach that the expected cash flows should be computed using common sense and good judgement about the company, its industry, the national economies… However, some professors teach the CAPM to calculate the discount rate (instead of using again common sense6): they acknowledge that there are problems estimating two ingredients of the formula (the beta and the MRP), but, nevertheless, continue using it.

We may find out an investor’s expected IBM beta by asking him. However, it is impossible to determine the expected IBM beta for the market as a whole, because it does not exist. Even if we knew the expected market risk premiums and the expected IBM betas of the different investors who operated on the market, it would be meaningless to talk of an expected IBM beta for the market as a whole. A rationale for this is to be found in the aggregation theorems of microeconomics, which in actual fact are non-aggregation theorems. A model that works well individually for a number of people may not work for all of the people together7.

6. Consequences of using the CAPM

Just an example: calculation of the beta of electrical companies done by a European Electricity Regulatory Commission. “We calculate the betas of all traded European companies. Leveraged betas were calculated using 2 years of weekly data. The Market Index chosen was the Dow Jones STOXX Total Market Index. There is a great dispersion (from -0.24 to 1.16) and some odd betas (negative and higher than one). We decided to maintain all betas… To unlever the betas, we assumed that the beta of the debt is zero for all companies. Then, the Commission calculates the average of the unlevered betas and relever it using an objective debt to equity ratio based on the average debt to equity ratio of comparable companies. The levered beta proposed by the Commission for the transport activity is 0.471870073”

The Commission acknowledges that calculated betas have a “great dispersion (from -0.24 to 1.16)” but calculates the average of all of them and finally provides betas with a precision of 9 figures after the decimal point!

Fernandez and Bilan (2007) contains a collection of errors seen in company valuations performed by analysts, investment banks, consultants and expert witnesses. Some of the errors are wrong betas and wrong market risk premia. The most common error consists in using the historical industry beta, or the average of the betas of similar companies, when this magnitude does not make sense. As we have already mentioned, 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...

7. Papers about the CAPM

Many papers have the explicit or implicit assumption that “the market” has a “true beta” for each security and an expected MRP (common to all investors): we have to refine our statistical methods to estimate this figures. Other papers find discrepancies between the CAPM and the market and try to explain what is wrong… with the market!

The CAPM of Sharpe (1964), Lintner (1965) and Mossin (1966) asserts that the expected return for any security is a positive 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 (β): E (Ri) = a1 + a2 E (βi), for all assets i, E (Ri) is the expected return on asset i, E (βi) is asset i’s expected market beta, a1 is the expected return on a “zero-beta” portfolio, and a2 is the market risk premium.

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6 We mean common sense, experience and some financial knowledge.
7 Mas-Colell et al. (1995): “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.”
Subsequent work by (among many others) Basu (1977), Banz (1981), Reinganum (1981), Litzenberger and Ramaswamy (1979), Keim (1983, 1985) 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 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. Consequently, it makes no sense to refer to a “market” expected beta for a security or to a “market” expected market risk premium (or to a “market” expected cash flow stream), for the simple reason that they do not exist.

<table>
<thead>
<tr>
<th>CAPM</th>
<th>Real world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homogeneous expectations</td>
<td>Heterogeneous expectations. Investors DO NOT have equal expectations about asset returns.</td>
</tr>
<tr>
<td>All investors use the same beta for each share</td>
<td>Investors use different betas (required betas) for a share</td>
</tr>
<tr>
<td>All investors hold the market portfolio</td>
<td>Investors hold different portfolios</td>
</tr>
<tr>
<td>All investors have the same expected market risk premium</td>
<td>Investors have different expected market risk premia and use different required market risk premia</td>
</tr>
<tr>
<td>The market risk premium is the difference between the expected return on the market portfolio and the risk-free rate</td>
<td>The market risk premium is NOT the difference between the expected return on the market portfolio and the risk-free rate</td>
</tr>
</tbody>
</table>

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.

Roll (1977) concludes 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.

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

9 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. Tinic and West (1984) reject the validity of the CAPM based on intertemporal inconsistencies due to the January effect.

10 Lintner (1969) argued that the existence of heterogeneous expectations does not critically alter the CAPM in some simplified scenarios and says 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.”
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.

<table>
<thead>
<tr>
<th>Size of the companies</th>
<th>Average annual return</th>
<th>Beta of the companies</th>
<th>Average annual return</th>
<th>P/B</th>
<th>Annual return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (biggest)</td>
<td>0.93 10.7%</td>
<td>1 (high)</td>
<td>1.68 15.1%</td>
<td>1 (high)</td>
<td>1.35 5.9%</td>
</tr>
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<td>2</td>
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<td>2</td>
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<td>1.32 10.4%</td>
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<tr>
<td>3</td>
<td>1.08 13.2%</td>
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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. They also claim that the Fama and French statistical tests were of such low power that they could not reject a beta-related risk premium of 6% observed by Fama and French (1992) research and overemphasize the importance of P/B. They claim that the relation between P/B and average return revealed in 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.

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Pettengill, Sundaram and Mathur (1995) find “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)

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.”

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.

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 P/B 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 the 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.

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 beta estimates 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 “β = 1 does a better job than calculated betas”.

8. Problems with calculated betas

According with the CAPM “the market” assigns a beta to every company and that beta may be calculated with a regression of historical data. Of course, every investor should use this “market beta”. As we have already mentioned, the first problem is that this “market beta” does not exist.

When we calculate betas using historical data we encounter several well-known problems:

1. They change considerably from one day to the next.
2. They depend very much on which stock index is used as the market reference.
3. They depend very much on the historical period (5 years, 3 years…) used.
4. They depend on what returns (monthly, yearly…) are used to calculate them.
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. β = 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.

Fernandez and Bermejo (2009), "β = 1 Does a Better Job than Calculated β", http://ssrn.com/abstract=1406923. They 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. In fact, in most of the cases (62.5%) in the sample the beta =1 provides a better correlation than calculated betas."

Some authors, such as Damodaran (2001, p. 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.

Brigham and Gapenski (1977, p. 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"
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)\textsuperscript{14} shows the calculated betas of Coca-Cola, PepsiCo, AT&T and Merck 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; those of PepsiCo between 0.3 and 0.92; those of AT&T between 0.32 and 2.1; and those of Merck between 0.05 and 1.48.

Fernandez (2006)\textsuperscript{15} calculated betas of 3,813 US companies using 60 monthly returns each day of December 2001 and reports:
1. The median of the maximum beta divided by the minimum beta was 3.07 for the whole sample (2.11 for the companies in the S&P 500 and 1.77 for the 30 companies in the DJIA).
2. Industry betas are also unstable: on average, the maximum beta of an industry was 2.7 times its minimum beta.
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.

\textbf{Different beta sources provide us with different betas.} Bruner et al. (1998) found sizeable differences among beta providers. Fernandez (2009b)\textsuperscript{16} shows betas provided by 16 webs and databases: the betas of Coca-Cola ranged from 0.31 to 0.8; the betas of Walt Disney from 0.72 to 1.39; and the betas of Wall-Mart Stores from 0.13 to 0.71.

Copeland, Koller and Mann (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, being wary of all the problems with estimating it.” 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 most cited by the professors were: Yahoo Finance; Bloomberg; Damodaran Website; Value Line; Google finance; Reuters; DataStream; Morningstar; Barra; MSN.

\section*{9. 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 (2009)\textsuperscript{17} reviews 150 textbooks on corporate finance and valuation written by authors such as Brealey, Myers, Copeland, Damodaran, Merton, Ross, Brurer, Bodie, Penman, Arzac… and finds that their recommendations regarding the MRP range from 3% to 10%, 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).

Fernandez, Aguirreamalloa and Corres (2011)\textsuperscript{18} 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%.

\textsuperscript{14} “On the instability of betas: the case of Spain” http://ssrn.com/abstract=510146
\textsuperscript{15} “Are Calculated Betas Good for Anything?”, http://ssrn.com/abstract=504565
\textsuperscript{16} “Betas used by Professors: a survey with 2,500 answers” http://ssrn.com/abstract=1407464
\textsuperscript{17} “The Equity Premium in 150 Textbooks”, http://ssrn.com/abstract=1473225. 129 of the books identify Expected and Required equity premium and 82 identify Expected and Historical equity premium.
10. Expected, required and historical parameters

Fernandez (2006b) 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)… confusing message in the literature. 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 relationships among the four equity premiums defined. These relationships vary widely:

- **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).

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 estimator of the EEP is 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 HEP20. Mayfield (2004) concludes that EEP = HEP − 2.4% = 5.9% over the yield on T-bills (4.1% over yields on T-bonds).

Survivorship bias was identified by Brown, Goetzmann and Ross (1995) as one of the main reasons why the results based on historical analyses can be too optimistic. 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”.

Pastor and Stambaugh (2001) present an estimation of plus or minus 280 basis points around 4.8%.

Constantinides (2002) says that the conditional EEPs at the end of the 20th century and the beginning of the 21st 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 (2006c) 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% 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 · Xt−1 + et. Many predictors have been explored in the literature:

- **The inflation rate (money illusion)**: Fama and Schwert (1977), Fama (1981), and Campbell and Vuolteenaho (2004a,b), and Cohen, Polk and Vuolteenaho (2005).

20 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.
21 “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)).
• Interest rate and dividend related variables: Ang and Bekaert (2003).
• Book-to-market ratio: Kothari and Shanken (1997).
• Consumption and wealth: Lettau and Ludvigson (2001).
• Momentum: Fama and French (2012)

Goyal and Welch (2007) recommended “assuming that the equity premium is ‘like it always has been’”. They also show that most of these models have not performed well for the last thirty years, that are not stable, and that are not useful for market-timing purposes.

Campbell and Thompson (2007) say: “The basic lesson is that investors should be suspicious of predictive regressions with high R² statistics, asking the old question ‘If you’re so smart, why aren’t you rich?’”

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”22. 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% 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 between 4.02% and 5.1%.

11. How to calculate required returns?

The easiest way is in Fernandez (2013)23: “As the expected equity cash flows (ECF) are riskier than the cash flows promised by the Government bonds and also riskier than the cash flows promised by the Debt of the company the required return to equity (Ke) should be higher than risk-free rate (Rf) and also higher than the required return to Debt: Ke = Rf + RPs (shares risk premium)”.

Company valuation using discounted cash flows is based on the valuation of the 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…) to complicate its understanding and to provide a more “scientific”, “serious”, “intriguing”, “impenetrable”,…. appearance. Among the most commonly used ‘additions’ are: WACC, beta (β), market risk premium, beta unlevered, value of tax shields… Most of these ‘additions’ are unnecessary complications and are the source of many errors

12. How to use betas and to be a reasonable person

We may want to calculate RPs (shares risk premium) as a product; RPs = β MRP

The MRP (market risk premium) is the “shares risk premium” of the investor applied to the whole market (or to a portfolio with shares of most of the companies traded in the stock markets). The MRP is the answer to the following question: Knowing that your money invested in long-term Government bonds will provide you a return of Rf% almost for sure, which additional return you require to another investment (in a portfolio with shares of most of the companies with shares traded in the financial markets) for feeling compensated for the extra risk that you assume? In 2012 about 75% of the MRP used for the USA market were in the range between 4% and 6.5%24. 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 of 0.7 (or lower) could be applicable to companies with

22 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”.
Equity Cash Flows highly predictable (electric companies and other utilities in countries with expectations of very few surprises and sensible managers…). A beta of 1.5 (or higher) could be applicable to new companies with high uncertainty about the market acceptance of their products, companies with managers with little common sense…

Using beta and MRP, Ke = Rf + β MRP

Calculating a qualitative beta. According to the capital asset pricing model (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 and good judgement about the company, its industry, the national economies…

Given the instability and the meaninglessness of historical betas, companies are increasingly resorting to calculating a qualitative beta of companies or investment projects. Example: A 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 attached example, 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.

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<tr>
<th>Weight</th>
<th>Risk</th>
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<td>10% M Management</td>
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<tr>
<td>25% A Assets: Business: industry / product…</td>
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<td>10% O Operating leverage</td>
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<td>15% F Financial leverage</td>
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<td>5% L Liquidity of investment</td>
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<td>5% A Access to sources of funds</td>
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Beta of equity = 3.5 x 0.5 = 1.75

Alternatives to the MASCOFLAPEC method: the MARTILLO method and the BAMIFLEX method:
M Management; A Asset quality; R Risk exposure; T Trade analysis: product/market; I IRR of new investments; L Leverage; L Liquidity; O Other relevant factors.

B Business: product / demand / market; A Access to credit: capacity to obtain finance; M Management: managers, shareholders…; I Indebtedness. Solvency and long-term survival; F Flows. Resource generation (capacity to pay debts) and return; L Liquidity of the shares; EX Exposure 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.

13. Conclusion

An anecdote from Merton Miller (2000, page 3) about the expected market return in the Nobel context: ‘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’.

Another method for family business is explained by my friend Guillermo Fraile, IAE professor at Buenos Aires, in his classes: the HMWDYWD (initials for How much do you want, Dad?) method. It is not a joke: it does not make much sense to talk about the KE as a magnitude shared by all investors; but it does make sense to talk about each investor’s Ke, including Dad’s.
Fama and French (2004) stated that “Unfortunately, the empirical record of the model is poor – poor enough to invalidate the way it is used in applications… Evidence mounts that much of the variation in expected return is unrelated to market beta.”

“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. Writer. Santander. Spain

Merriam-Webster dictionary:
- Common sense: “sound and prudent judgment based on a simple perception of the situation or facts.”
- Opinion: a belief, judgment, or way of thinking about something:: advice from someone with special knowledge :: advice from an expert
- Wishful thinking: an attitude or belief that something you want to happen will happen even though it is not likely or possible: The attribution of reality to what one wishes to be true or the tenuous justification of what one wants to believe.
- Cause: something or someone that produces an effect, result, or condition; something or someone that makes something happen or exist. Mystery: something hard to understand or explain

References


Grabowski, R. J. (2009), Problems with Cost of Capital Estimation in the Current Environment - Update I.


Griffin, J. M. (2002), "Are the Fama and French Factors Global or Country-Specific?" Review of Financial Studies,


Hirshey, J. and M. Pappas (1990), Managerial Economics, Thomson Learning (1990)


Kadlec, C. and R. Acaporn (1999), Dow 100,000: Fact or Fiction? Prentice Hall.


Kothary, S. P. and J. Shanken (1999), "Beta and book-to-market: is the glass half full or half empty?" Simon Sc. of Business WP 97-20.


Markowitz, Harry (1959), Portfolio Selection: Efficient Diversification of Investments, Cowles Foundation Monograph No. 16, New York: John Wiley & Sons, Inc.
Murphy, A. (2000), Scientific Investment Analysis, Quorum Books; 2nd ed.
Reinhart, W. J., "Portfolio Management: Theory, Behavioral Aspects and Applications"