

What is Capital Asset Pricing Model (CAPM)? What are CAPM Assumptions? What are the Critique of CAPM?

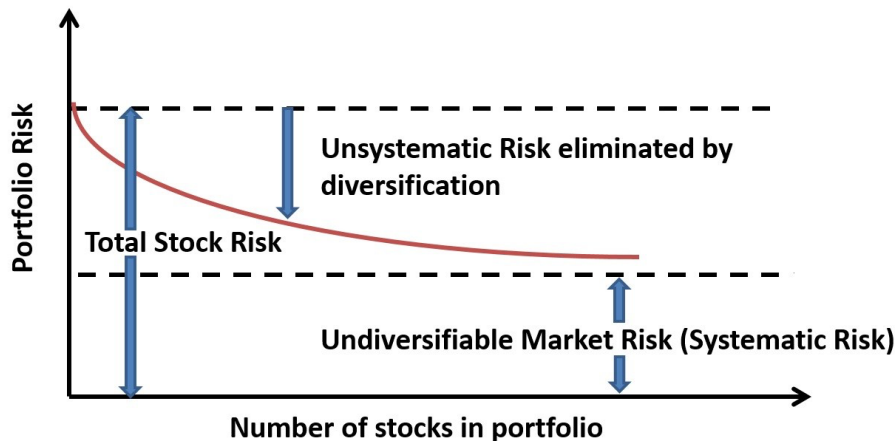
These are the key questions that students always ask when covering the topic CAPM. This is a guide to provide students with enough understanding when it comes to addressing the theory of CAPM.

The presence of CAPM could be traced back to Markowitz (1952), who began the modern age of Finance by showing how increasing diversification lowers portfolio's standard deviation and variance. His work was based on the idea that stock returns are normally distributed and that individuals would prefer to increase their wealth and also to minimize the associated risk. Thus, they require a high mean, low standard deviation portfolio. The portfolios that have the highest return for a given level of risk compile the mean-variance efficient frontier (MVE).

Even though the theory of Markowitz was spectacular and useful in this field, it had some inconveniences. For instance, it is applied by taking into account a very abstract concept in Economics, i.e. utility. Economic practice has shown that the models constructed based on the idea of utility are very difficult to be applied. And also the estimation of the benefits of diversification would require that practitioners calculate the covariance of returns between every pair of assets, which is very difficult. Finally, the critics of the model said that it's static one, which makes the results biased.

In the year that Markowitz's (1959) Portfolio Selection book was published, Treynor started working on the theory of asset pricing. His 1961 paper "Towards a theory of Market Value of risky assets", intended to lay the groundwork for a theory of market value that incorporated risk. He showed that the risk premium per share for the i^{th} investment is proportional to the covariance of the investment with the total of all investments in the market.

Sharpe (1964) and Lintner (1965) continued the work of Markowitz and constructed the famous Capital Asset Pricing Model (CAPM). Basically, the model was developed to explain the differences in risk premium across assets. The CAPM shows clearly that these differences are generated by the differences in the riskiness of assets, i.e. the higher the risk of an asset the higher the risk premium demanded by investors. The CAPM states that the only factor, which ought to be influential in the pricing of risky assets, is systematic risk or beta. Beta is measured relative to the mean-variance efficient "market" portfolio, which contains all possible assets held in proportion to their market values.



The theory of the CAPM predicts a linear relation between risk and return of the form:

$$E(R_i) = E(R_f) + [E(R_m) - E(R_f)]\beta_i$$

In words, the expected return on a security i is the expected return on a security in the portfolio m that has no risk $E(R_f)$ plus a risk premium which is equal to β_i , which is the sensitivity of the return of the asset i to movements of the return of the market multiplied by the difference between $E(R_m)$ and $E(R_f)$. In a given market (with perfect information and where all investors have similar expectations about the mean and standard deviation of the return of every risky asset), every asset will adjust its price until its expected return (after adjusted for risk) becomes equal to the return predicted $E(R_i)$.

Like many other models, CAPM is applied subject to a set of assumptions. The first assumption is that markets are efficient and the prices prevailing at any point in time are based on all available information. There are no transaction costs, no taxes and short selling is allowed. The second assumption of the model is that investors are risk averse. The model assumes that investors seek an optimum portfolio, which maximizes the return for an acceptable level of risk. A third assumption is that all investors have homogeneous assumptions regarding the returns associated with a stock. That is all investors have the same information and interpret it in the same manner. Furthermore, all investors are price takers and can not influence prices, and they face the same time horizon. Finally, the market portfolio not only exists, but is measurable and is positioned on the MVE frontier.

A very important consequence of this model is the separation theorem, which states that in the capital markets risk has two components: diversifiable (or nonsystematic) risk and non-diversifiable (systematic) risk. When pricing, the only significant risk is the systematic one, since investors can just get rid of the nonsystematic risk through diversification. Sharpe and Lintner show that the true measure of risk is the well-known coefficient beta.

Empirical evidence was in favor of the CAPM and the model became extremely famous in the modern portfolio theory. Things were clear: stocks with beta lower than 1 were considered passive and stocks which had beta higher than 1 were considered aggressive and risky. Depending on their attitude towards risk, investors would choose the stocks

in their portfolio according to the value of beta.

However, empirical tests of the validity of the CAPM have yielded mixed results. The standard finding is that betas matter in explaining excess returns, but other things may matter as well. A highly publicized paper by Fama and French (1973) even challenged whether betas do matter, suggesting that differences in return on stocks are better explained, from an empirical rather than theoretical standpoint, by differences in firm size and in the ratio of book to market value. In defence of CAPM, these other factors could simply be picking up correlation to the true beta, which measures covariance with respect to expectations of future cash flow. However, the testing methodology developed by Fama and MacBeth has been criticised for numerous reasons. Roll (1977), for example, argued that although the CAPM must hold because it is a mathematical derivation from Markowitz's Modern Portfolio Theory: it cannot be tested, because the composition of the real market portfolio is unknown.



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