Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) describes the relationship between expected return and systematic risk when investing in an asset, especially in stocks. Accordingly, the expected return on a security equals the risk-free return plus a risk premium driven by the beta factor of that security.

The core question in making an investment decision is eventually: Precisely how much should one ask for prior to assuming the risk associated with that proposal. – Or, in the context of a portfolio: Which conditions seem fair and appropriate that an investor may consider adding another asset to an already existing well-diversified portfolio. - The answer to both questions can be found in the CAPM.

Developed – among others – by Sharpe, Markowitz and Miller, all Nobel Prize laureates, the CAPM describes the relationship between the systematic risk and the expected return for assets, foremost stocks. Therefore, the CAPM can be applied to determine the appropriate price of an asset on the basis of its expected return and given risk.

To start with: For making an investment, one will demand a fair compensation not lower than the Risk-Free Rate (RFR) over the anticipated holding period of the asset. - Second: For assuming additional risk, such as investing in a stock, which is anything but risk-free (unlike a government bond), additional compensation will have to be offered. Now, if the asset added has the same risk profile (volatility, standard deviation) as the overall market, then the additional compensation required matches exactly the Market Risk Premium (MRP). The MRP is defined as the difference between the return of the market (usually a market index) and the RFR. To determine the MRP, in practice a historical average over a long period of time (ideally, at least several decades) is used for this purpose. Should, however, the risk profile of the asset be higher (lower) than that of the market, then a multiplier – the beta factor – will be applied on the MRP. This factor ensures that the additional compensation in form of the risk premium is adequately increased (lowered).

Therefore, the beta factor indicates whether and by how much an asset is more (less) risky than the overall market. Mathematically, beta is a function of the volatility of an asset vis-à-vis the market, an indication of the correlation between them. An asset with a relatively higher risk vis-à-vis the market (i.e. higher volatility) has a beta of more than 1, such with a relatively lower risk of less than 1.

Applying this concept is actually straightforward: All it says is that an investor in a risky asset has to be compensated over the anticipated holding period with the (maturity-adequate) RFR plus the MRP multiplied by the beta factor for the asset (or comparable equally risky assets). – In pursuing this approach, an investor can now swiftly decide whether a proposition seems attractive or not.

Technically, the CAPM´s beta is a measure of an asset´s sensitivity to the non-diversifiable or systematic risk: This is the risk assumed when investing in any asset.

The concept of the Security Market Line (SML) is a by-product of the CAPM: It illustrates the relationship between the expected return and the systematic risk, the beta. The difference between the Capital Market Line and the SML is that the former illustrates the general relationship between return and risk (the standard deviation, therefore including both, systematic and unsystematic risk), whilst latter focuses on the relationship between return and systematic risk only (assuming the unsystematic risk already having been diversified away). – Should a specific investment yield a return above the SML, then this excess return is referred to as alpha. A positive alpha may point towards an investment opportunity being undervalued based on its underlying risk profile. Active investors therefore pursue strategies in identifying opportunities which can "create alpha".

Finally, the CAPM can also be used for calculating and optimizing the cost of capital for any project or an entire firm´s balance sheet. – Even though the CAPM has by times failed empirical tests, it is still broadly applied, foremost due to its conceptual simplicity.

CAPITAL ASSET PRICING MODEL
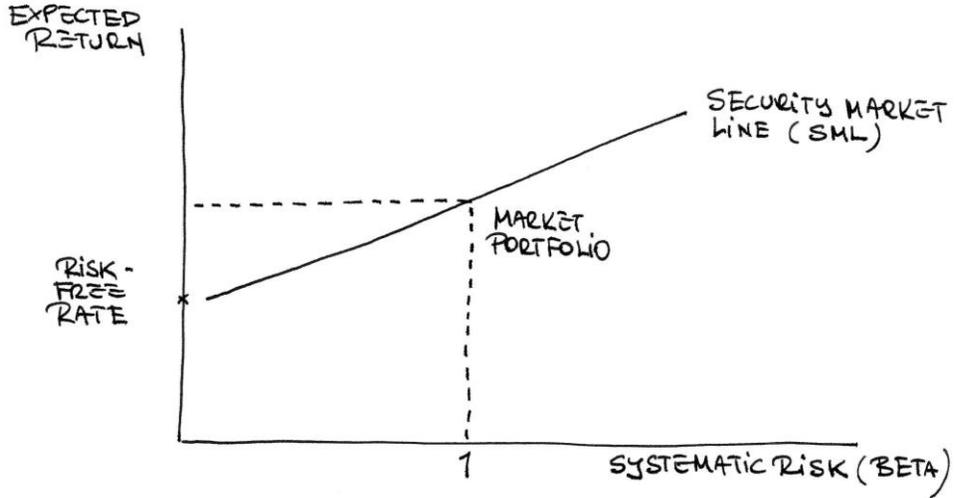
$$R = RFR + \beta \times [R(M) - RFR]$$

EXPECTED RETURN   RISK FREE RATE   BETA   MRP MARKET RISK PREMIUM

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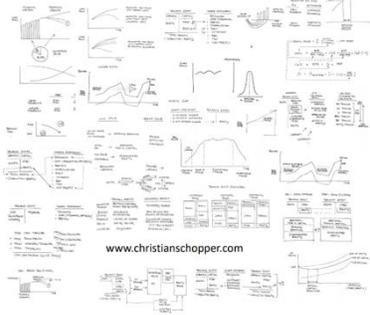
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