Estimating Discount Rates for DCF Valuations

Conceptual Overview

Every DCF model needs discount rates. This section is the toolkit for estimating them: the CAPM (and the Fama–French three-factor alternative) for the cost of equity; levering and de-levering betas to adjust a comparator firm's beta for differences in leverage; and the credit-spread approach for the cost of debt. The unifying principle is that only systematic risk is priced into discount rates — total risk matters for cash flows, but only the part of risk that cannot be diversified away matters for expected returns.

Detailed Breakdown

The CAPM

In equilibrium the expected return on asset j is

$$E(r_j) = r_f + \beta_j(E(r_M) - r_f), \quad \beta_j = \frac{Cov(r_j, r_M)}{\sigma_M^2}, \quad \beta_M = 1.$$

The CAPM's three claims: the risk–return trade-off depends on systematic risk (not total risk); the relationship is linear; and risk is the only priced factor. The market risk premium is $MRP = E(r_M) - r_f$. Beta is a relative measure of systematic risk — $\beta > 1$ means more systematic risk than the market; it measures sensitivity to market movements. The key idea: total risk drives expected cash flows, but only systematic risk drives discount rates.

Assumptions: a fixed set of risk-averse investors with a one-period horizon; mean–variance optimisation; a fixed set of risky assets; competitive, frictionless markets; a risk-free asset with an exogenous rate; and homogeneous expectations.

Using the CAPM in practice

Estimate three parameters: r_f, β, and the MRP. Key practical points:

- **Internal consistency:** r_f appears twice, so use the same risk-free proxy in r_f and in the MRP; r_M appears twice, so use the same market proxy in the MRP and in estimating betas.
- **Risk-free rate:** traditionally the yield on long-dated government bonds. Some valuers use a "normalised" risk-free rate during periods of abnormal central-bank intervention, but the observed yield is the cost of risk-free debt today.
- **Market portfolio:** domestic stocks are valued with a domestic CAPM — use a well-diversified domestic index (and a domestic government security for r_f). Choosing "the market" is arguably the most important practical choice, because it defines which assets and investors matter.
- **MRP:** hard to observe directly; estimated from historical data (with caution), and estimates vary meaningfully across studies, time periods and geographies.

Estimating beta

Two approaches: first-principles (examine fundamentals — competition, growth, operating and financial leverage, earnings variability) and direct estimation (regress the stock's returns on an appropriate market index; beta is the slope of the line of best fit). In practice a firm is valued using betas of comparator firms with the same operations, sourced from commercial data providers.

Fama–French three-factor model

$$E(r_j) = r_f + \beta_j^M E(MRP) + \beta_j^S E(SMB) + \beta_j^V E(HML).$$

A factor is something of such fundamental economic importance that it affects all assets and earns a risk premium. The three factors: the market (MRP), size (SMB = small minus big), and value (HML = high minus low book-to-market, i.e. value minus growth). A factor matters only if its premium is non-zero; empirical support for the size premium in particular has weakened in more recent samples. Despite its limitations, the CAPM remains the practitioner standard.

Levering and de-levering betas

A comparator firm has the same operations (operating risk) but usually a different leverage (financial risk), so its observed equity beta must be adjusted. With $k_{its} = k_u$,

$$\beta_u = (1-L)\beta_e + L\beta_d, \quad \text{if } \beta_d = 0: \; \beta_e = \frac{1}{1-L}\beta_u = \left(1 + \frac{D}{E}\right)\beta_u.$$

The procedure: de-lever the comparator's equity beta to get the unlevered beta β_u, then re-lever at the target firm's leverage. (For investment-grade firms $\beta_d \approx 0$ is fine; for highly levered firms estimate β_d and use the general formula.)

Worked example. Comparator $\beta_e = 1.2$ at $L = 0.5$: de-lever $\beta_u = (1-0.5)(1.2) = 0.6$. Target $L = 0.2$: re-lever $\beta_e = \frac{1}{1-0.2}(0.6) = 0.75$. Then CAPM with $r_f = 2\%$, $MRP = 6\%$: $k_e = 0.02 + 0.75(0.06) = 6.5\%$.

Cost of debt via credit spreads

A bond's value using promised cash flows defines its yield y: $P_0 = \sum_t \frac{C_t^p}{(1+y)^t}$. The yield is the promised (internal) rate of return. Default (credit) risk — measured by credit ratings — drives a credit spread:

$$y = r_f + CS, \quad CS = RP + DP,$$

where RP is a risk premium (for bearing risk, including default risk) and DP is a default premium (for the expected loss on default). Spreads are higher for longer maturities and lower ratings. If the default premium is small, $y \approx r_f + RP = k_d$,