The Cost of Equity (r_e)

The cost of equity (r_e) is the total rate of return that equity holders deserve for their level of risk. It has many names including the required return on equity, shareholders' cost of capital, and stock-holder's required return.

There are two methods to find the cost of equity.

We can use the Dividend Discount Model (DDM):

$$\boldsymbol{r_e = \frac{C_1}{P_0} + g}$$

or the Capital Asset Pricing Model (CAPM):

$$\boldsymbol{r_e = r_f + B_e\left(r_m - r_f\right)}$$

DDM to find the Cost of Equity

We can find the cost of equity using the Dividend Discount Model, also known as Gordon's Growth Model or the perpetuity with growth formula,

$$\boldsymbol{P_0 = \frac{C_1}{r_e - g}}$$

C_1 = cash flow received at $t = 1$. The cash flows go on forever, but grow by g every period. For stocks, the cash flow is the dividend.

g = effective growth rate of the dividend C_1 per period. It is also the capital return (price increase) of the stock.

r_e = effective cost of equity over a single period. It is the total return of the stock.

After re-arranging the equation to make r_e the subject, we get:

$$\boldsymbol{r_e = \frac{C_1}{P_0} + g}$$

Note that this is the familiar formula that separates total return into its income and capital components, but applied to an equity security (a stock or share).

$$r_{total} = r_{income} + r_{capital}$$

This makes sense since g is the capital return and $\frac{C_1}{P_0}$ is the dividend yield which is a stock's form of income return.

CAPM (or SML) to find the Cost of Equity

$$\boldsymbol{r_e = r_f + B_e(r_m - r_f)}$$

Where:

r_e = effective total return of the stock 'e'.

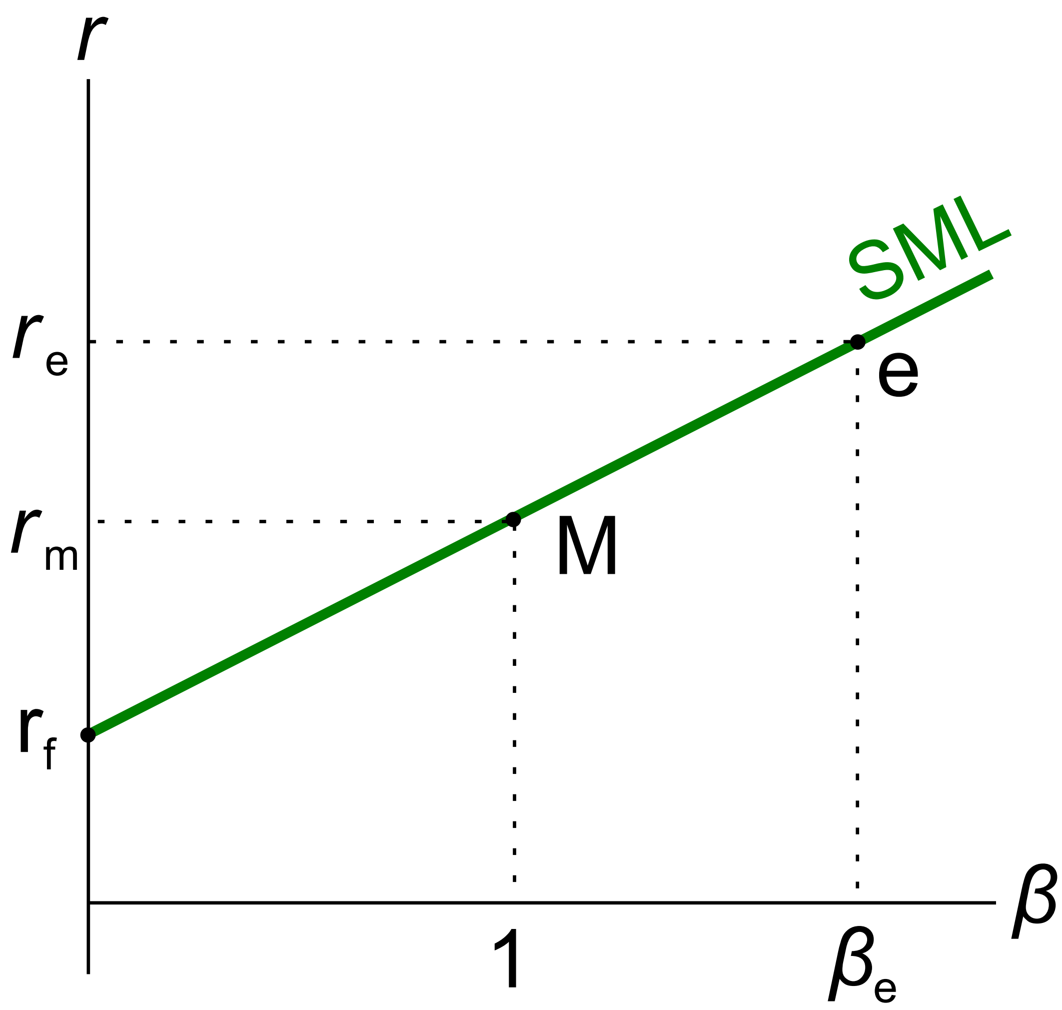
B_e = beta of the stock 'e'. The beta is a measure of systematic risk, defined as $B_e = \frac{cov(r_e, r_m)}{var(r_m)}$.

r_f = effective total return of the risk free asset (government treasury bonds).

r_m = effective total return of the market portfolio (stock index for example the ASX200 (Australia) or S&P500 (US)).

This method of finding the cost of equity is also called the SML (Security Market Line) method.

This is because we are finding r_e on the SML using the stock's beta B_e.



Calculation Example: Cost of Equity

Question: Find the firm's cost of equity using:

(i) the DDM and

(ii) the CAPM or SML

with the information below:

The firm's stock price is $20,

Beta of equity is 1.5,

Market return is 10% p.a.,

Treasury bonds yield 5% p.a.,

The stock will pay its next annual dividend of $2.50 in one year, which grows at a rate of 2% p.a.. All rates are effective pa.

Answer:

(i) Using the Dividend Discount Model (DDM):

$$r_{e,DDM} = \frac{D_1}{P_0} + g$$

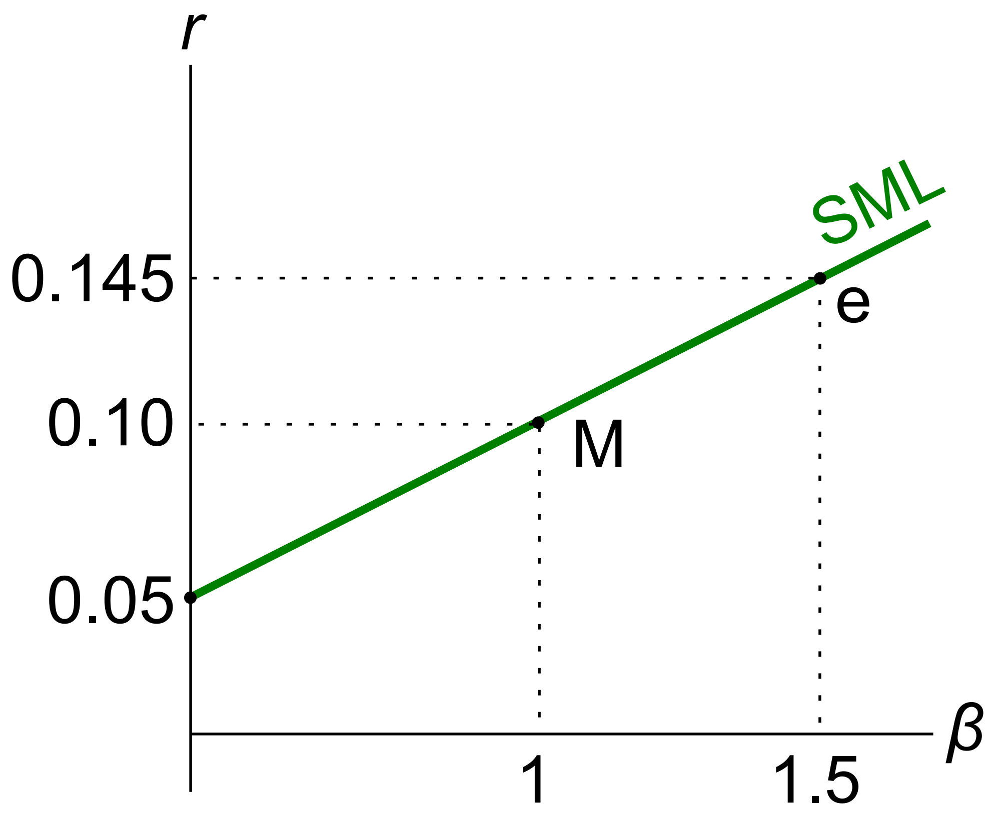
$$= \frac{2.50}{20} + 0.02 \quad = 0.145$$

(ii) Using the Capital Asset Pricing Model (CAPM):

$$r_{e,CAPM} = r_f + B_e(r_M - r_f)$$

$$= 0.05 + 1.5 \times (0.1 - 0.05)$$

$$= 0.125$$



In theory, they should both be the same. They are only different because our input numbers are inaccurate, and/or because the assumptions of the models are violated.

For example, the DDM assumes dividends grow forever at a constant rate which is obviously not going to happen in reality. The (static) CAPM assumes that the beta doesn't change which is also silly.

In practice, an arbitrary weighted average of the two might be used, weighted according to which one you think is more accurate and suitable for the project being valued.

The Cost of Debt (r_d)

The cost of debt is also known as the required return on debt, debt-holders' cost of capital, debt-holder's required return, or total return on debt.

The cost of debt (r_d) can also be found using two methods: discounted cash flows (DCF) or the CAPM.

But since the cash flows from debt are more predictable than shares, most practitioners prefer to use the DCF method. This is done using the fixed coupon bond-pricing equation.

$$Price_{\substack{fixed\\coupon\\bond}} = PV(annuity\ of\ coupons) + PV(principal)$$

$$= \frac{C_1}{r_{eff}}\left(1 - \frac{1}{\left(1 + r_{eff}\right)^T}\right) \quad + \quad \frac{Face_T}{\left(1 + r_{eff}\right)^T}$$

The bond price, coupon rate and face value are known so the yield (r) can be computed, but often the calculation requires trial and error or a financial calculator or spreadsheet with the solver function. The exception is the more simple zero-coupon bonds whose yields can easily be found using basic algebra and an ordinary calculator.

Note that when the promised coupons $(C_1, C_2, \ldots, C_T)$ and face value $(Face_T)$ are used in the above equation to find the bond yield (r_{eff}), this will actually give the 'promised yield' which is higher than the actual expected yield since the bond issuer may go bankrupt. This credit or default risk means they will not always pay back the coupon and principal payments they promise.