Indhold

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$$g = Retention\ rate \cdot return\ on\ new\ investment$$

$$\updownarrow$$

$$Return\ on\ new\ investment = \frac{g}{retention\ rate}$$

Hvor:

$$Change\ in\ earnings = New\ investment \cdot return\ on\ new\ investment$$

$$new\ investment = earnings \cdot retention\ rate$$

Hvor retention raten er den del af overskuddet der ikke bliver udloddet som udbytte.

BD. 318-319

Dividend-discount model with constant long-term growth

$$P_0 = \frac{Div_1}{r + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{1}{(1 + r_E)^N} \cdot \left(\frac{Div_{N+1}}{r_E - g}\right)$$

BD. 321

(9.16) Total payout model

$$P_0 = \frac{PV(Future\ total\ dividends\ and\ repurchases)}{Shares\ outstanding_0}$$

BD. 323

Discounted free cash flow model

$$V_0 = PV(Future\ free\ cash\ flow\ of\ the\ firm) \quad (9.21)$$

$$\updownarrow$$

$$V_0 = \frac{FCF_1}{1 + r_{wacc}} + \frac{FCF_2}{(1 + r_{wacc})^2} + \cdots + \left(\frac{1 + g_{FCF}}{r_{wacc} - g_{FCF}}\right) \cdot FCF_N$$

FCF_N = Free cash flow år N - sidste år inden *perpetuity*.

$r_{wacc} = Weighted\ average\ cost\ of\ capital$

g_{FCF} = Growth rate of free cash flow

V_0 = Enterprise value in year 0

$$P_0 = \frac{V_0 + Cash_0 - Debt_0}{Shares\ outstanding_0} \quad (9.22)$$

BD. 325

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Covariance

$Cov(r_D, r_E) = (E(r_D) - r_D) \cdot (E(r_E) - r_E)$

Eller:

$Cov(r_D, r_E) = \rho_{DE} \cdot \sigma_D \cdot \sigma_E$

Eller:

$Cov(r_D, r_E) = \beta_i \cdot \sigma_M^2$

Correlation

$$\rho_{DE} = \frac{Cov(D, E)}{\sigma_D \cdot \sigma_E}$$

Minimum variance

If $\rho = -1$ a perfectly hedged position can be obtained. Use the following formula below to find the weights that drive standard deviation to zero if $\rho = -1$. However, if $\rho > -1$ then the following formula will give the weights for the portfolio with minimum variance.

$$w_E^{min} = \frac{\sigma_D^2 - \sigma_{ED}}{\sigma_E^2 + \sigma_D^2 - 2\sigma_{ED}}$$

$$w_D^{min} = \frac{\sigma_E^2 - \sigma_{ED}}{\sigma_E^2 + \sigma_D^2 - 2\sigma_{ED}} = 1 - w_E$$

$\sigma_{ED} = Covariance\ mellem\ E\ og\ D$

Hvis korrelationen er -1 = hedget portefølje:

$$w_E = \frac{\sigma_D}{\sigma_D + \sigma_E}$$

$$w_D = 1 - w_E$$

HUSK formlerne for de særtilfælde hvor korrelationen er enten 1 eller -1. De står ovenfor.

Weights of the optimal risky portfolio, *P*

The objective is to find the weights w_D and w_E that result in the highest slope of the CAL. Thus, the highest risk-reward ratio. The problem can be formulated as:

$$Max\ Sharpe\ ratio = Max\ S_p = \frac{E(r_p) - r_f}{\sigma_p}$$

Which can be solved - for two risky assets - by the following formula

$$w_D = \frac{(E(r_D) - r_f) \cdot \sigma_E^2 - (E(r_E) - r_f) \cdot \rho_{DE}}{(E(r_D) - r_f) \cdot \sigma_E^2 + (E(r_E) - r_f) \cdot \sigma_D^2 - (E(r_D) - r_f + E(r_E) - r_f) \cdot \rho_{DE}}$$

$$w_E = 1 - w_D$$

Hvor:

D = debt

Til Toppen

Chapter 16 (BKM) - Managing Bond portfolios

Macaulay's duration (16.1)

To deal with the ambiguity of the "maturity" of a bond making many payments, we need a measure of the average maturity of the bond's promised cash flows. Macaulay's equation is a measure of the effective duration of the bond, commonly referred to as the duration.

$$D = \sum_{t=1}^{T} t \cdot w_t$$

Macaulay's duration equals the weighted average of the times to each coupon or principal payment, with weights related to the "importance" of that payment to the value of the bond.

Uses of duration:

1. It is a simple summary statistic of the effective average maturity of the portfolio
2. It is an essential tool in immunizing portfolios from interest rate risk.
3. Duration is a measure of interest rate sensitivity of a portfolio

Where:

$t = time\ until\ each\ of\ the\ bond's\ payment$

$w_t = weight\ (descriped\ blow)$

$T = total\ amount\ of\ periods\ of\ the\ bond$

Weight for Macaulay's duration

The weight applied to each payment time in the duration formula above, is the proportion of the total value of the bond accounted for by that payment. That is the present value of the payment divided by the bond price. The total of all the weights should equal 1 because the sum of the cash flows discounted at the yield to maturity equals the bond price.

$$w_t = \frac{\frac{CF_t}{(1+y)^t}}{Bond\ price}$$

Tælleren er nutidsværdien af pengestrømmen I tidspunkt t, udregnet ved hjælp af YTM.

Where:

$y = The\ bond's\ yield\ to\ maturity$

$\frac{CF_t}{(1+y)^t} = The\ present\ value\ of\ the\ cash\ flow\ in\ period\ t$

Modified duration

$$D^* = \frac{D}{(1+y)}$$

Hvor Y = YTM inden ændringen.

income are the same ($\tau_i = \tau_e$) this formula reduces to $\tau^* = t_c$. But when equity income is taxed less heavily ($\tau_i > \tau_e$), then τ^* is less than τ_c (and can even be negative).

Where:

$\tau_c = Corporate\ tax\ rate$

$\tau_e = Personal\ tax\ rate\ on\ equity$

$\tau_i = personal\ tax\ rate\ on\ interst\ income$

Effective tax disadvantage when interest exceeds limits for tax write-off

To receive the full tax benefits of leverage, a firm need not use 100% debt financing. A firm receives a tax benefit only if it is paying taxes in the first place. That is, the firm must have taxable earnings. In addition, in many countries there is a maximum limit on how much of their interest payments they can deduct from their taxes. Typically some % of EBIT or EBITDA.

Thus, no corporate tax benefit arises from incurring interest payments that regularly exceed the income limit. And, because interest payments constitute a tax disadvantage at the investor level, investors will pay higher personal taxes with excess leverage, making them worse off.

We can quantify the tax disadvantage for excess interest payments by setting $\tau_c = 0$ in the equation for τ^* (assuming there is no reduction in corporate tax for excess interest payments).

$$\tau_{ex}^* = 1 - \frac{(1-\tau_e)}{(1-\tau_i)} = \frac{\tau_e - \tau_i}{(1-\tau_i)} < 0$$

Where:

$\tau_c = Corporate\ tax\ rate$

$\tau_e = Personal\ tax\ rate\ on\ equity$

$\tau_i = personal\ tax\ rate\ on\ interst\ income$

Value of levered/unlevered firm with constant growth

$$V^L = \frac{FCF}{WACC - g}$$

$$V^U = \frac{FCF}{r^U - g}$$

Growth factor of value of levered/unlevered firm:

$$g = WACC - \frac{FCF}{V^L}$$

$$g = r^U - \frac{FCF}{V^U}$$