PDP-4. Foundations of Finance. Formula sheet.

This sheet may be used during tests and exams. The student is allowed to annotate the sheet.

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$PV = CF_t * (1 + r)^{-t}$; $FV_t = CF_0 * (1 + r)^t$

$R_{effective} = [1 + (\text{stated interest rate} / n)]^n - 1$

$R_{continuous} = e^r - 1$, r = stated annual interest rate.

PV of a normal annuity = $Ann * \left[\frac{1-(1+r)^{-n}}{r} \right]$

FV of a normal annuity = $Ann * \left[\frac{(1+r)^n - 1}{r} \right]$

PV and FV for begin-of-period annuities, multiply the normal with (1 + r).

PV of growing annuity = $Ann * (1+g) * \left[\frac{(1-(1+g)^n}{(r-g)} \right]$ if r > g.

PV of perpetuity = A / r ; PV of growing perpetuity = A / (r - g)

Chapter 3, Basics of risk.

Portfolio return: $r_p = W_a * r_a + W_b * r_b$

Portfolio variance: $\sigma^2_p = W^2_a * \sigma^2_a + W^2_b * \sigma^2_b + 2 * W_a * W_b * \sigma_a * \sigma_b * \rho_{a,b}$

Minimum variance portfolio weight: $W_a^{min} = [\sigma^2_b - cov_{a,b}] / [\sigma^2_a + \sigma^2_b - 2 * cov_{a,b}]$ **Where** $cov_{a,b} = \sigma_a * \sigma_b * \rho_{a,b}$

Expected return on asset: $E(R_{asset}) = R_f + [E(R_m) - R_f] * \beta_{asset}$

Beta of an asset: $\beta_a = \sigma_a * \sigma_m * \rho_{am} / \sigma_m^2 = Cov_{am} / \sigma_m^2$

Riskfree Portfolio: $W_a = \sigma_b / \sigma_a + \sigma_b$

Chapter 4. Risk and hurdle rates in practice.

Risk premium : $E(R_m) - R_f$

Jensen's alpha : $a - R_f * (1 - \beta)$

Stock period return : $(price_{end} - price_{begin} + dividends) / price_{begin}$

Degree of operating leverage: % change in operating profit / % change in sales $\Rightarrow$ FC⇑$\Rightarrow$β⇑

Debt/equity ratio : D / E

Levered β: $\beta_L = \beta_u * [1 + (1 - T) * D/E]$ if $\beta_D = 0$ anders $(-B_d(D/E))$

Weighted Average Cost of Capital (WACC): $k_e * E / V + k_d * D / V + k_{ps} * PS / V$ where V = E + D + PS

ROC = EBIT(1-t)/ Average bookvalue of total investment

Return on Equity (ROE)= $\frac{NetIncome}{AverageBookValueofEquityInvestment}$

EVA = (ROC-WACC) * capital invested ; **EVA to Equity** = (ROE-cost of equity) * equity invested

Profitability index = NPV / Initial Investment

IRR= rate at which NPV = 0 ; MIRR = cashflows are reïnvested at hurdle rate = $\sqrt[n]{\frac{FutureValue}{Investment}} - 1$

Chapter 7. Capital Structure

PV of tax savings from Debt = tax-rate*interest-rate*Debt/interest rate ofwel interest-rate * Debt
Value of Levered firm = Value unlevered + (Tax-rate * Debt)
After-tax cost of debt: k_d = interest rate * (1 - T)

Chapter 8. Capital Structure

K_{ps} = preferred dividend / preferred stock price

Cost of Equity:

1 Estimate equity beta and debt/equity ratio
2 Estimate unlevered beta (β in case of no debt) $\beta_u = \beta_{current} / [1+(1-t)D/E]$
3 Reestimate levered betas for different levels of debt $\beta_L = \beta_u * [1 + (1 - T) * D/E]$
4 Estimate costs of equity using levered beta $K_e = R_f + \beta_L [E(R_m)-R_f]$

Terminal Value = $\frac{FCFF}{WACC - Rate_{growth}} = TV_n = \frac{CFFirm_n(1+R_{gn})}{WACC_n - R_{gn}} = \Sigma[CF\ to\ firm_t / (1 + WACC)^t]$

Value (Levered) = Value (Unlevered) + Value (TaxBenefit) - Value (BankruptsyCosts)

Interest Coverage Ratio = EBIT / Interest Expense

Actual Debt Ratio < Optimal Debt ratio $\Rightarrow$ Underlevered $\Rightarrow$ takeover target $\Rightarrow$ increase leverage quickly
Actual Debt Ratio < Optimal Debt ratio $\Rightarrow$ Underlevered $\Rightarrow$ no takeover target $\Rightarrow$ Good projects $\Rightarrow$ Debt⇑

Actual Debt Ratio < Optimal Debt ratio ⇒ Underlevered ⇒ no takeover target ⇒ Poor projects ⇒ Dividend or Buyback
Actual Debt Ratio > Optimal Debt ratio ⇒ Overlevered ⇒ Bankruptcy ⇒ Debt ⇓ Assets ⇓
Actual Debt Ratio > Optimal Debt ratio ⇒ Overlevered ⇒ no Bankruptsy ⇒ Good projects ⇒ New Equity ⇑ or Retained earnings
Actual Debt Ratio > Optimal Debt ratio ⇒ Overlevered ⇒ no Bankruptsy ⇒ Poor projects ⇒ Debt, dividend ⇓

Chapter 9 Capital structure financing details

EBITDA = EBIT + depreciation

Chapter 10 Dividend Policy

Dividend Yield = Dividends Per Share / Price Per Share ⇒ Growth ⇑ Dyield ⇓

Expected return = Dividend Yield + price appreciation

Dividend Payout = Dividend / Earnings ; Retention Ratio (Reïnvested) = (1 - Payout ratio)

FCFE (residu after all needs) = NetIncome + Depr -CapEx - ΔWorkingCapital + Debtnet

Working Capital = Cash + invest + acc.receivable - acc. payable

FCFE payout = [Dividend + Repurchases] / FCFE

Spin off ⇒ new shares to existing stockholders

Split off ⇒ New shares in exchange of old shares from stockholders

FCFE < Dividends ⇒ ROC > WACC ⇒ cut dividends and reïnvest more
FCFE < Dividends ⇒ ROC > WACC ⇒ cut dicidends and analyse investment problem
FCFE > Dividends ⇒ ROC > WACC ⇒ let management decide about cash and dividends
FCFE > Dividends ⇒ ROC < WACC ⇒ hold cash or return to stockholders

Chapter 12 Discounted Cash Flow

Cash Flow	Discount Rate	Value
Dividends	K_e	Equity
FCFE	K_e	Equity
FCFF	WACC	EBIT

FCFF = EBIT (1-t) (1- Reïnvestmentrate) ; $FCFF_n = (EBIT_{n-1})(1+R_g)(1-t) - (EBIT_{n-1})(1+R_g)(1-t)(Reïnv._{rate})$

Growth = $Reïnvestment_{rate}$ x ROC

ROE = ROC +D/E * [ROC-i *(1-t)] ; **DDM=Div.PS/(required rate of return-growth rate)**

$$PriceEarningsRatio = \frac{Price}{EarningsPerShare} = \frac{PayoutRatio * (1+\mathbf{g_n})}{K_e \mathbf{- g_n}} \Rightarrow \text{Payout Ratio} = (1-t) * EPS$$

$$PriceBookvalueRatio = \frac{Price}{BookvaluePerShare} = \frac{\mathbf{ROE} * PayoutRatio * (1+g_n)}{(K_e - g_n)} = 1 \text{ in een competitive market} \Rightarrow ROE=(1-t)*[BVE-ROE]$$

$$PriceSalesRatio = \frac{Price}{RevenuPerShare} = \frac{\mathbf{ProfitMargin} * PayoutRatio * (1+g_n)}{Ke - g_n} \Rightarrow PM=(1-t)*[NetMargin*RevPS]$$

Price Earnings Ratio	Price Bookvalue Ratio	Category
High	High	Rising Star
Low	High	Falling Star
High	Low	Restructuring
Low	Low	Dog

EVA : more profit without capital; optimize capital structure; use less capital; invest capital in high return projects