Operating Cash Flow (OCF) = EBIT + depreciation – taxes

Cash Flow From Assets (CFFA) = OCF – net capital spending (NCS) – changes in NWC

## Straight-line depreciation

- D = (Initial cost – salvage) / number of years

$$\text{PV tax shield on CCA} = \frac{IdT_c}{d+k} \times \frac{1+0.5k}{1+k} - \frac{S_n d T_c}{d+k} \times \frac{1}{(1+k)^n}$$

- I = Total Capital Investment
- d = CCA tax rate
- Tc = Corporate Tax Rate
- k = discount rate
- $S_n$ = Salvage value in year n
- n = number of periods in the project

## Bottom-Up Approach

- Works only when there is no interest expense
- OCF = NI + depreciation

## Top-Down Approach

- OCF = Sales – Costs – Taxes
- Don't subtract non-cash deductions

## Tax Shield Approach

- OCF = (Sales – Costs)(1 – T) + Depreciation*T

Dividend Growth Model:

$D_1 = D_0(1+g)$
g = Retention ratio x ROE
Retention ratio= 1-payout ratio

$$R_i = R_f + \beta_i (R_m - R_f)$$

$R_i$ = Return on Asset $i$
$R_f$ = Return on Risk Free Asset
$\beta$ = Covariance of Asset and the Market Divided by Variance of the Market
$R_m$ = Return on the Market Portfolio

Market risk premium, (R M ) – R f
Cost of Preferred Stock:
RP = D / P 0
Weighted Average Cost of Capital:
E = market value of equity = # outstanding shares times price per share
D = market value of debt = # outstanding bonds times bond price
V = market value of the firm = D + E
w E = E/V = percent financed with equity
w D = D/V = percent financed with debt

After-tax cost of debt = $R_D(1-T_C)$
WACC = $w_E R_E + w_D R_D(1-T_C)$
What is the cost of equity?
$R_E$ = 5 + 1.15(9) = 15.35%
What is the cost of debt?
N = 30; PV = -1100; PMT = 45; FV = 1000; CPT
I/Y = 3.9268
$R_D$ = 3.927(2) = 7.854%
What is the after-tax cost of debt?
$R_D(1-T_C)$ = 7.854(1-.4) = 4.712%
What are the capital structure weights?
E = 50 million (80) = 4 billion
D = 1 billion (1.10) = 1.1 billion
V = 4 + 1.1 = 5.1 billion
$w_E$ = E/V = 4 / 5.1 = .7843
$w_D$ = D/V = 1.1 / 5.1 = .2157
What is the WACC?
WACC = .7843(15.35%) + .2157(4.712%) = 13.06%
Floatation cost: $F_A = (W_E)(F_E)+(W_D)(F_D)$
NPV w floatation = Investment/$(1-F_A)$
After-tax lease payment (outflow)
= Lease payment*(1 – T)
Lost depreciation tax shield (outflow)
= Depreciation * tax rate for each year
Initial cost of machine (inflow)
= Inflow because we save the cost of purchasing the asset now

**Suppose you invest $500 in a mutual fund today and $600 in one year. If the fund pays 9% annually, how much will you have in two years?**

List= 500,600,0 on the cah flow function.

**How much will you have in 5 years if you make no further deposits?**

List= 500,600,0,0,0,0

**You are offered an investment that will pay you $200 in one year, $400 the next year, $600 the year after, and $800 at the end of the following year.**

List: 0,200,400,600,800

List 1 = year 0 in the cal

**EAR:**

m is the number of times the interest is compounded in a year

**Bond:**

Bond Value = PV of coupons + PV of face

Bond Value = PV annuity + PV of lump sum

Suppose you have an 8% semiannual-pay bond with a face value of $1,000 that matures in 7 years. If the yield is 10%, what is the price of this bond? PMT = 40; N = 14; I/Y = 5; FV = 1000; CPT PV

**YTM has to be /or* by 2 depending on the compounding of the coupons**

Fisher effect: (1 + R) = (1 + r)(1 + h)

R = nominal rate, r = real rate, h = expected inflation rate

**$P_0$ = D / R**

**the capital gains yield = g**

**dividend yield = R-g**

buy

WACC = $R_A$ = (E/V)$R_E$ + (D/V)$R_D$

$R_E = R_A + (R_A - R_D)(D/E)$

$R_A$ is the "cost" of the firm's business risk, i.e., the required return on the firm's assets

$(R_A - R_D)(D/E)$ is the "cost" of the firm's financial risk, i.e., the additional return required by stockholders to compensate for the risk of leverage

CAPM: $R_A = R_f + {}_A(R_M - R_f)$

- Where $_A$ is the firm's asset beta and measures the systematic risk of the firm's assets

$R_E = R_f + {}_A(1+D/E)(R_M - R_f)$, can be simplified as $R_E = R_f + {}_E(R_M - R_f)$…

Therefore, $_E = {}_A(1 + D/E)$

**Present value of annual interest tax shield:**

PV = $D(R_D)(T_C) / R_D = DT_C$ = 6250(.34) = 2125

**Value of a levered firm = value of an unlevered firm + PV of interest tax shield**

**Value of equity = Value of the firm – Value of debt**

**$V_U$ = EBIT(1-T) / $R_U$**

**$V_L = V_U + DT_C$**

**$R_U$** is the cost of capital for an unlevered firm and equals $R_A$ for an unlevered firm.

**$V_U$** is just the PV of the expected future cash flow from assets for an unlevered firm.

**E = $V_L$-D**

WACC = (E/V)$R_E$ + (D/V)($R_D$)(1-$T_C$)

$R_E = R_U + (R_U - R_D)(D/E)(1-T_C)$

- Re, cost of capital, equity
- Rd, cost of debt
- Ru, cost of unleveraged

| Year | UCC | CCA | Tax Shields |
|---|---|---|---|
| 0 | $5,000 | $2,000 | $ 800 |
| 1 | 8,000 | 3,200 | 1,280 |
| 2 | 4,800 | 1,920 | 768 |
| 3 | 2,880 | 1,152 | 461 |
| 4 | 1,728 | 691 | 276 |
| 5 | 1,037 | | 415 |

| | Year | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 |
| Investment | $10,000 | | | | | |
| Lease payment | −2,500 | −$2,500 | −$2,500 | −$2,500 | $2,500 | |
| Payment shield | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | |
| Forgone tax shield | −800 | −1,280 | −768 | −461 | −276 | −$415 |
| Total cash flow | $ 7,700 | −$2,780 | −$2,268 | −$1,961 | −$1,776 | −$415 |

$$NPV = \$7{,}700 - \frac{\$2{,}780}{(1.066)} - \frac{\$2{,}268}{(1.066)^2} - \frac{\$1{,}961}{(1.066)^3} - \frac{\$1{,}776}{(1.066)^4} - \frac{\$415}{(1.066)^5} = -\$199$$

$$\text{Net salvage value} = S - (S - UCC) \times \left(\frac{d \cdot T_c}{d + k}\right),$$

where

$T_c$ = the corporate tax rate

$k$ = the discount rate (required return) for the project

$$PV(\text{CCA tax shield}) = \left(0.5 + \frac{0.5}{1+k}\right) \cdot \left(\frac{I \cdot d \cdot T_c}{d + k}\right) - \frac{1}{(1+k)^N} \cdot \left(\frac{S \cdot d \cdot T_c}{d + k}\right),$$

where: $I$ = Initial cost of the asset

$N$ = Number of years until salvage

$$\text{Depreciation} = d \cdot UCC,$$

where

$d$ = the CCA depreciation rate

$UCC$ = the undepreciated capital cost

Chapter 16 | IRR rule = reject if IRR < r, accept if IRR > r

Less levered = less debt
unlevered = no debt

MnM (without taxes) proposition 1: $V^L = E + D = V^U$

Pre-tax WACC ($= r_A$) $= r_E \frac{E}{E+D} + r_D \frac{D}{E+D} = r_U$

MnM proposition 2: $r_E = r_U + \frac{D}{E}(r_U - r_D)$ ($r_U = r_A$)

interest tax shield = corporate tax rate × interest payments

CF to investors with Leverage = CF to investors without Leverage + interest tax shield

MnM Prop 1 w/ taxes $= V^L = V^U + PV(\text{interest tax shield})$

Market value of debt $= D = PV(\text{future interest pay'ts})$

Value of interest tax shield of permanent debt $= T_C \times D$

WACC w/ taxes $= r_E \frac{E}{E+D} + r_D(1-T_C)\frac{D}{E+D}$

$r_{WACC} = \underbrace{r_E \frac{E}{E+D} + r_D \frac{D}{E+D}}_{\text{pre-tax WACC}} \underbrace{- r_D T_C \frac{D}{E+D}}_{\text{Reduction due to interest tax shield}}$

Debt and taxes = 1. forecast tax shield, find PV
2. use lower WACC to find PV of int pmt (after-tax)
↳ using pre-tax WACC and adding PV of interest tax shield

trade-off theory $= V^L = V^U + PV(\text{interest tax shield}) - PV(\text{Financial distress})$

$EPS = \frac{EBIT - int}{\#\ of\ shares}$, Crossover point $= EPS_{with\ debt} = EPS_{without\ debt}$

$\frac{EBIT}{400{,}000} = \frac{EBIT - (r_D D)}{200{,}000}$ (400,000)
= Find EBIT = 800,000

$RoE = \frac{NI}{E}$, $DFL = \frac{EBIT}{EBIT - int}$,
(DFL) Sensitivity of EPS to EBIT

$r_A = \frac{EBIT}{V_U}$ = rr on unlevered Equity = rr on firm's assets = $WACC_U$ [Value of unlevered]

$E_L = \frac{EBIT - r_D D}{r_E}$, $r_E = r_A + (r_A - r_D)\frac{D}{E_L}$ (MnM) II [value of levered]

1) $V^{old}$ = ...
$r_A$ = ...
(old) (New)

Geometric average return $= [(1 + R_1) \times (1 + R_2) \times \ldots \times (1 + R_T)]^{1/T} - 1$