Tutorial solutions for SU1 -3

1a. Initial investment = Cost of new asset
+ Installation costs
- A-T proceeds from sale of old asset
± ΔNWC

Old asset: Book value = Cost - Acc. Depreciation
= 60 000 - 2(12 000) ↘ $\frac{60\,000}{5}$
= 36 000

Tax = 0,3(SP - BV)
= 0,3(45 000 - 36000)
= 2700 liability (since SP > BV)

∴ Initial investment = 105 000 + 5000
- (45000 - 2700)
+ 12000*
= 79 700 ⟶

* ΔNWC = Δ(CA - CL)
= €30 000 + 40 000 - 58000
= 12000 (cash outflow since ΔNWC > 0)

b. $OCF_t = NOPAT_t + Depr_t$ (on an incremental basis)

$= EBIT_t(1-t) + Depr_t$

$OCF_{1-5} = 28000(1-0,3) + 22000$ ↘ $\frac{110\,000}{5}$

$= 41\,600$

c. Terminal cash flow = A-T proceeds from sale of new asset
- A-T proceeds from sale of old asset
$\pm \Delta NWC$

New asset : Book value = 0 (since fully depreciated)

Tax = $0,3(29\,000 - 0)$
$= 8700$ liability (since SP > BV)

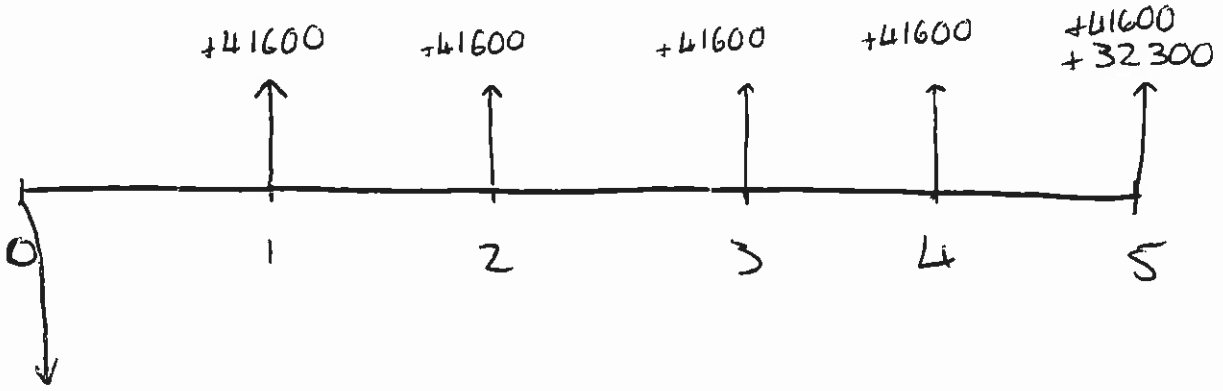
Old asset : Zero salvage value at t=5

$\Delta NWC = -12000$ (cash inflow since $\Delta NWC < 0$)

$\therefore TCF = (29000 - 8700) - (0) + 12000$

$= 32\,300$

d)



NPV : $CF_0 = -79700$

$CF_{1-4} = +41600$

$CF_5 = 41600 + 32300 = 73900$

$\hat{N} = 12\%$

$\therefore NPV = 88587 > 0 \Rightarrow$ Accept

IRR : $CF_0 = -79700$

$CF_{1-4} = +41600$

$CF_5 = +73900$

$\therefore IRR = 47,47\% > 12\%$ c.o.c. $\Rightarrow$ Accept

PI : $PI = \dfrac{PV(CF_{1-5})}{CF_0}$

$= \dfrac{168\,286}{79700}$

$= 2,11 > 1 \Rightarrow$ Accept

Payback period : $CF_0 = -79700$

$CF_1 + CF_2 = 83200$

$\therefore$ Payback period is just under 2 years (which is less than the maximum acceptable limit)

The project is clearly acceptable using each method; therefore, Thebes should invest in the machine

2a). $RADR_p = 0,10 + 1.5(0,04)$
$= 0,16$

$RADR_s = 0,10 + 0,9(0,04)$
$= 0,136$

b) Phalaborwa : $CF_0 = $ ~~150m~~ $-100m$
$CF_1 = +10m$
$CF_2 = +20m$
$CF_3 = +35m$
$CF_4 = +45m$
$CF_5 = +45m$
$CF_6 = +50m$
$i = 16\%$

$\therefore NPV_p = 12\ 707\ 264 > 0 \Rightarrow$ Acceptable

Sishen : $CF_0 = -100m$
$CF_1 = +15m$
$CF_2 = +25m$
$CF_3 = +30m$
$CF_4 = +30m$
$CF_5 = +40m$
$CF_6 = +45m$
$i = 13,6\%$

$\therefore NPV_s = 13\ 135\ 766 > 0 \Rightarrow$ Acceptable

c). Phalaborwa : $CF_0 = -100m$

$CF_1 = 0,9(10m) = +9m$

$CF_2 = 0,85(20m) = +17m$

$CF_3 = 0,8(35m) = +28m$

$CF_4 = 0,75(45m) = +33,75m$

$CF_5 = 0,7(45m) = +31,5m$

$CF_6 = 0,65(50m) = +32,5m$

$i = 10\%$

$\therefore NPV_p = 4\ 224\ 348 > 0 \Rightarrow$ Acceptable

Sishen : $CF_0 = -100m$

$CF_1 = 0,95(15m) = +14,25m$

$CF_2 = 0,9(25m) = +22,50m$

$CF_3 = 0,85(30m) = +25,50m$

$CF_4 = 0,8(30m) = +24m$

$CF_5 = 0,75(40m) = +30m$

$CF_6 = 0,7(45m) = +31,50m$

$i = 10\%$

$NPV_s = 3\ 509\ 006 > 0 \Rightarrow$ Acceptable

d). Phalaborwa: $CF_0 = -100m$
$CF_1 = +10m$
$CF_2 = +20m$
$CF_3 = +35m$
$CF_4 = +45m$
$CF_5 = +45m$
$CF_6 = +50m$

$\therefore IRR = 19,68\% > 16\%$ RADR $\Rightarrow$ Acceptable

Sishen: $CF_0 = -100m$
$CF_1 = +15m$
$CF_2 = +25m$
$CF_3 = +30m$
$CF_4 = +30m$
$CF_5 = +40m$
$CF_6 = +45m$

$\therefore IRR = 17,52\% > 13,6\%$ RADR $\Rightarrow$ Acceptable

e). Using each approach both projects appear acceptable. Since they are independent, Sibaya should invest in both.

3. EAA approach

- NPV_H : $CF_0 = -1.5m$
  $CF_{1-3} = +850\,000$
  $i = 11\%$
  $\therefore NPV_H = 577\,158$

$$EAA_H = \frac{NPV_H}{PVIFA_{3,11\%}}$$

$$= \frac{577\,158}{2,444}$$

$$= \underline{R236\,153} \rightarrow \text{a.k.a. Annualised NPV}$$

- NPV_A : $CF_0 = -3,5m$
  $CF_{1-6} = +1,1m$
  $i = 11\%$
  $\therefore NPV_A = 1\,153\,592$

$$EAA_A = \frac{NPV_A}{PVIFA_{6,11\%}}$$

$$= \frac{1\,153\,592}{4,231}$$

$$= \underline{R272\,652} \rightarrow \text{a.k.a Annualised NPV}$$

∴ Using the EAA approach, CCDU should invest in the Allianz processor since it has the higher annualised NPV

Replacement chain approach

- Both projects need to be looked at on a 6 year basis as their common life

Hitach:

$CF_0 = -1{,}5m$
$CF_1 = +850\,000$
$CF_2 = +850\,000$
$CF_3 = +850\,000 - 1{,}5m$
$= -650\,000$
$CF_4 = +850\,000$
$CF_5 = +850\,000$
$CF_6 = +850\,000$

$i = 11\%$

$\therefore$ Adjusted $NPV_H = 999\,170$

Allianz:

$CF_0 = -3{,}5m$
$CF_{1-6} = +1{,}1m$
$i = 11\%$

$\therefore NPV_A = 1\,153\,592$

$\therefore$ CCDU should invest in the Allianz processor since its 6-year adjusted NPV is higher

4a)

Project	NPV	CF_0
D	+220m	-1,8bn
G	+180m	-1 bn
B	+150m	-1,2bn
A	+120m	-800m
E	+110m	-750m
C	+100m	-750m
F	+50m	-1,4bn

b). Taking on G, B and A will offer the highest combined NPV (450m), for a total investment of R3bn

Tutorial solutions for SU4-7

1a). Cost of debt

$$r_d = \frac{I + \frac{1000 - N_d}{n}}{\frac{N_d + 1000}{2}}$$

$$= \frac{90 + \frac{1000 - 1034}{7}}{\frac{1034 + 1000}{2}}$$

$$= 8,37\% \text{ (before tax)}$$

Cost of preference shares

$$r_p = \frac{d_p}{N_p}$$

$$= \frac{0,11(100)}{100(1-0,04)}$$

$$= 11,46\%$$

Cost of retained earnings / 'old' equity

$$r_{re} = \frac{D_1}{P_0} + g$$

$$= \frac{D_0(1+g)}{P_0} + g$$

$$= \frac{3,50(1,06)}{75} + 0,06 = 10,95\%$$

Cost of new equity

$$r_E = \frac{D_1}{P_0 - N} + g$$

$$= \frac{3,50(1,06)}{75(1-0,05)} + 0,06$$

$$= 11,21\%$$

b) $WACC = w_D r_D (1-t) + w_P r_P + w_{re} r_{re} + w_e r_e$

$$= 0,4(0,0837)(1-0,35) + 0,1(0,1146) + 0,2(0,1095) + 0,3(0,1121)$$

$$= 8,875\%$$

c) Firm value $= \frac{EBIT(1-t)}{WACC}$

$$= \frac{108m(1-0,35)}{0,08875}$$

$$= R790\ 985\ 916$$

2a) Break-point = $\frac{\text{Level of Retained Earnings}}{\text{Weighting of retained earnings/equity}}$

$= \frac{40m}{0,4}$

$= R100m$ →

i.e. Should Ocean Holdings require financing of more than R100m, it will need to issue new shares

b) For financing < R100m:

$WACC = w_D r_D (1-t) + w_E r_E$

$r_E = \frac{D_1}{P_0} + g$ (Retained earnings (old equity)) $= \frac{8,19}{80} + 0,05$

$= 15,24\%$

$D_1 = E_1 \times 0,65$

~~$= (E_0)(1+g)$~~ $= E_0(1+g)(0,65)$

$= 12(1,05)(0,65)$

$= 8,19$

$\therefore WACC = 0,6(0,082) + 0,4(0,1524)$

$= 11,02\%$ →

For financing greater than R100m:

$$r_E = \frac{D_1}{P_0 - F} + g = \frac{8,19}{80 - 4,50} + 0,05$$

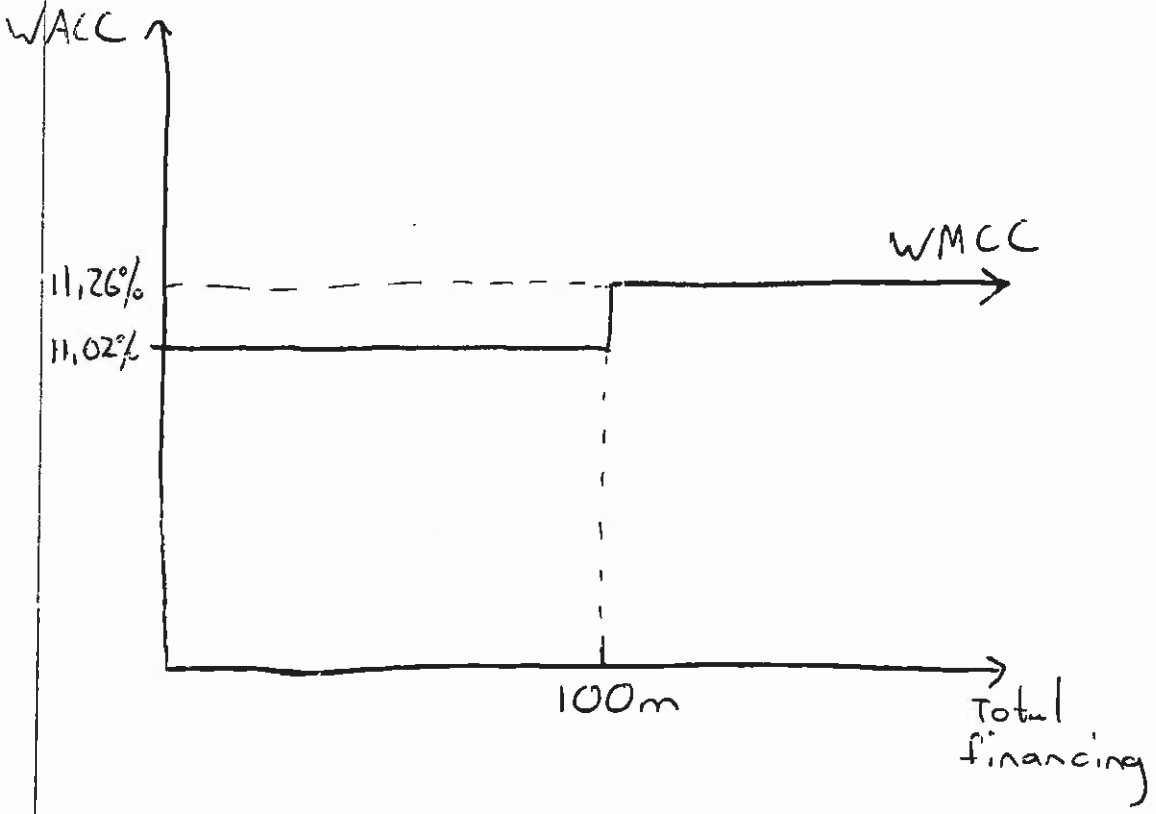
(r_E: cost of new equity)

$$= 15,85\%$$

$$\therefore WACC = w_D r_D (1-t) + w_E r_E$$

$$= 0,6(0,082) + 0,4(0,1585)$$

$$= 11,26\% \longrightarrow$$



3a) Op. BEP $= \frac{FC}{P-V}$

$= \frac{27m}{2350 - 850}$

$= 18\,000$ units

b) Overall ~~F~~. BEP $= \frac{FC + IC}{P-V}$

$IC = Int.\ exp. + \frac{PD}{1-t}$

$= 18m + \frac{7.5m}{(1-0,3)}$

$= R28\,714\,286$

$\therefore$ Overall BEP $= \frac{27m + 28\,714\,286}{2350 - 850}$

$= \underline{37143 \text{ units}} \rightarrow$

c) $OL = \frac{(P-V)X}{(P-V)X - FC}$

$= \frac{(2350 - 850)49\,000}{(2350 - 850)49000 - 27m}$

$= 1,58 > 1 \Rightarrow$ OL exists

d) $FL = \frac{(P-V)X - FC}{(P-V)X - FC - IC}$

$= \frac{(2350 - 850)49000 - 27m}{(2350 - 850)49000 - 27m - 28\,714\,286}$

$= 2,61 \quad > 1 \Rightarrow$ FL exists

e) $TL = OL \times FL$

$= 1,58 \times 2,61$

$= 4,12 \quad > 1 \Rightarrow$ TL exists

4. Option I

R50m in equity $\Rightarrow$ 500 000 new shares @ R100 per share

EBIT	R28 000 000
Int. exp.	0
EBT	28 000 000
Tax @ 35%	(9 800 000)
EAT	18 200 000
No. shares outstanding	(2m + 500') = 2,5m
EPS	R7,28

→

Option II

EBIT	28 000 000
Int. exp.	(4 500 000) *
EBT	23 500 000
Tax @ 35%	(8 225 000)
EAT	15 275 000
No. shares outstanding	2m
EPS	R7,64

* Int. exp. = R50m x 0,09
= R4 500 000

Option III

EBIT	28 000 000
Int. exp.	0
EBT	28 000 000
Tax @ 35%	(9 800 000)
EAT	18 200 000
Preferred dividend	(5 500 000) *
Earnings	12 700 000
No. shares outstanding	2m
EPS	R6,35

* Preferred dividend = R50m x 0,11
= R5 500 000

Option IV

EBIT	28 000 000
Int. exp.	(1 800 000)*
EBT	26 200 000
Tax @ 35%	(9 170 000)
EAT	17 030 000
No. shares outstanding	2,3m †
EPS	R7,40

* Int. exp. = R20m x0,09
= R1 800 000

† R30m ~~in~~ in new shares ⇒ 300 000 new shares issued at R100 per share, for 2.3m total shares outstanding

∴ Option II results in the highest EPS

5a) $WACC = w_D r_D(1-t) + w_E r_E$

$= 0,25(0,08)(1-0,3) + 0,75(0,13)$

$= 11,15\%$ →

EBIT	15 000 000
Int. exp.	(1600000)
EBT	13 400 000
Tax @ 30%	(4 020 000)
EAT	9 380 000
No. shares outstanding	1.5m
EPS	R6,25

→

b) $D/D+E = 0,5 = \frac{D}{A}$

$A = 80m \Rightarrow D = 0,5(80m)$

$= 40m \rightarrow$ Desired debt level

Debt is currently R20m. Therefore, MicroFin must issue/raise an additional R20m in debt to meet its target

c) Equity value was $0,75(80m) = R60m$

With 1,5 million shares outstanding, this implies a per share value of $60m/1,5m = R40$

With R20m in new debt, $20m/40 = 500\,000$ shares will be repurchased

d) $WACC = w_D r_D(1-t) + w_E r_E$

$= 0,5(0,085)(1-0,3) + 0,5(0,14)$

$= 9,98\%$

EBIT	15 000 000
Int. exp.	(3 400 000)
EBT	11 600 000
Tax @ 30%	(3 480 000)
EAT	8 120 000
No. shares outstanding	1m → 1,5m - 500'
EPS	R 8,12

40m x 0,085

e) WACC decreases after the restructuring, which would increase firm value. Therefore, the restructuring should be pursued

f) EPS is higher after the restructuring. Therefore, it should be pursued.

Tutorial solutions for SU 8 - 10

1a. Dividend = 0,45 x 21m
= R 9 450 000 →

b. Dividend = Prev. Div. x (1+g)
= 8.7m x (1,06)
= R 9 222 000 →

c. Investment = R8m

40% equity ⇒ 0,4 (8m)
= R 3,2m of the investment outlay comes from equity

∴ Dividend = 21m - 3,2m
= R17,8m →

2) Lease

$$A = \frac{\text{Amount of lease}}{1 + PVIFA_{i,n-1}}$$

$$= \frac{2m}{1 + PVIFA_{10\%,3}}$$

$$= \frac{2m}{1 + 2,487} = R573\,559$$

Year	A Lease Pmt	A.t Tax savings	Net cash flow
0	(573 559)		(573 559)
1	(573 559)	229 424	(344 135)
2	(573 559)	229 424	(344 135)
3	(573 559)	229 424	(344 135)
4		229 424	229 424

In Year 4, Palladium will purchase the drill for R700 000. Thus, Year 4's overall cash flow is $229\,424 - 700\,000 = (470\,576)$.

Thus: $PV(\text{cost of Lease}) = -573\,559 + \frac{-344\,135}{(1,08)} + \frac{-344\,135}{(1,08)^2} + \frac{-344\,135}{(1,08)^3} + \frac{-470\,576}{(1,08)^4}$

$= -R1\,806\,316$

Outright purchase

$$\text{Loan payment} = \frac{\text{Amount of loan}}{PVIFA_{4,9\%}}$$

$$= \frac{2m}{3,240}$$

$= R617\,284$

Calculate the explicit interest component of the loan payment by setting up a loan amortisation schedule:

Year	Loan Pmt	Beg. Principle	Interest @9%	Repmt of Principle
1	617 284	2 000 000	180 000	437 284
2	617 284	1562 716	140 644	476 640
3	617 284	1086 076	97 747	519 537
4	617 284	566 539	50 988	566 296
5	0	0	0	0

Slight differences in rounding may arise above

Thus:

① Year	② Loan Pmt	③ Ins. & maintenance	④ Depr.	⑤ Interest	⑥ =③+④+⑤ Total deduction	⑦ ⑥ * tax savings
1	617 284	150 000	500 000	180 000	830000	332 000
2	617 284	150 000	500 000	140 644	790 644	316 258
3	617 284	150 000	500 000	97 747	747 747	299 099
4	617 284	150 000	500 000	50 988	700 988	280 395

Leading to:

④ = ① + ② + ③

Year	① Loan Pmt	② Other cash costs	③ Tax savings	Net outflow
1	(617 284)	(150 000)	332 000	(435 284)
2	(617 284)	(150 000)	316 258	(451 026)
3	(617 284)	(150 000)	299 099	(468 185)
4	(617 284)	(150 000)	280 395	(486 889)

Thus : PV (cost of outright purchase)

$$= \frac{-435284}{(1,08)} + \frac{-451026}{(1,08)^2} + \frac{-468185}{(1,08)^3}$$

$$+ \frac{-486889}{(1,08)^4} = -R1519261$$

∴ Comparing the two alternatives, the outright purchase is cheaper (at R1519261) than the lease (R1806316)

3. Max price = Value (CenPharm) + Synergies

= R11bn + R2,25bn
= R13,25bn

∴ The offer should ~~be~~ lie between R11bn (the standalone value) and R13,25bn