

Solution Master David C. Drown 10/31/2007

Title : Adventure Airlines depreciation

Given : Baggage Crusher		part B)	
Original Cost	\$230,000		
Salvage Value	\$8,500	\$875	
expected life	11 years	13 years	
placed in service	2007	2020	sold for scrap
tax recovery period	7 years		
income tax rate	41.0%	3.5%	

Approach :

- a) MACRS Tax depreciation factors from Table 7-9 (page 313) 7-year period
 No salvage value in tax depreciation calculations
 First year gets 1/2 year convention = $2/7 / 2$ 0.1428571
 multiply original cost \$230,000 by yearly factor
 book value at end of year subtracts years depreciation from previous years book value
- b) After tax present worth of 2017 actual salvage value
 Taxes paid = scrap income * tax rate (unit is fully depreciated and has 0 book value)
 After tax cash income = scrap income - taxes paid
 discount after tax cash by dividing by $(1 + i)^{13}$ 1.5639561

Computations :	year	MACRS %	depreciation	book value	recovery year
a) Tax Depreciation	2007	14.29%	\$32,867	\$197,133	1
	2008	24.49%	\$56,327	\$140,806	2
	2009	17.49%	\$40,227	\$100,579	3
	2010	12.49%	\$28,727	\$71,852	4
	2011	8.93%	\$20,539	\$51,313	5
	2012	8.92%	\$20,516	\$30,797	6
	2013	8.93%	\$20,539	\$10,258	7
	2014	4.46%	\$10,258	\$0	8

A) Depreciation 2007 =	\$32,867
Depreciation 2008 =	\$56,327
Depreciation 2009 =	\$40,227
	\$100,580

b) Actual after tax salvage income	
scrap income	\$875
taxes paid	\$358.75 = $\$875 * 0.41$
after tax income	\$516.25 = $\$875 - \358.75
Present Worth	\$330.09 = $\$516.25 / (1.035)^{13}$

Title : I R A retirement fund

Given :

Annual deposits	\$3,000	per year
Years = working career	40	years
Nominal Rate of Return	8.30%	nominal
Years = life after retirement	30	years

Approach :

Calculate future worth of 40 year annuity = fund value at retirement

$$(a) F = A * [\{ (1+i)^n - 1 \} / i]$$

$$\$3,000 * [(1+0.083)^{40} - 1 / 0.083]$$

Calculate annual withdrawals to exhaust fund in 30 years using present worth of annuity

$$(b) P = A * [\{ (1+i)^n - 1 \} / \{ i * (1+i)^n \}] \quad P \text{ 40 years from now} = F \text{ from part (a)}$$

solved for $A = P * [\{ i * (1+i)^n \} / \{ (1+i)^n - 1 \}]$

$$\$841,223 * [0.083 * (1+0.083)^{30} / \{ (1+0.083)^{30} - 1 \}]$$

Computations :

Item	I R A	
Value at retirement	\$841,223	= D8*(((1+D10)^D9)-1)/D10
Annual withdrawals	\$76,848.69	= C30*((D10*(1+D10)^D11)/((1+D10)^D11-1))

Title : Vandal.Con alternatives = evaluate by Present Worth of cash flows at MARR

Given : Interest Rates : MARR current ave.
14.70% 13.35%

Year	Proposal A	Discounted A	Proposal B	Discounted B	Proposal C	Discounted C	Proposal D	Discounted D
0	\$ (73,000)	\$ (73,000)	\$ (89,000)	\$ (89,000)	\$ (78)	\$ (78)	\$ (93,000)	\$ (93,000)
1	\$ 17,000	\$ 14,821	\$ 19,700	\$ 17,175	\$ 210	\$ 183	\$ 17,000	\$ 14,821
2	\$ 17,000	\$ 12,922	\$ 19,700	\$ 14,974	\$ 230	\$ 175	\$ 36,700	\$ 27,896
3	\$ 17,000	\$ 11,266	\$ 19,700	\$ 13,055		\$ -	\$ 32,000	\$ 21,206
4	\$ 17,000	\$ 9,822	\$ 19,700	\$ 11,382		\$ -	\$ 44,000	\$ 25,421
5	\$ 17,000	\$ 8,563	\$ 19,700	\$ 9,923		\$ -		\$ -
6	\$ 17,000	\$ 7,466	\$ 19,700	\$ 8,651		\$ -		\$ -
7	\$ 17,000	\$ 6,509	\$ 19,700	\$ 7,543		\$ -		\$ -
8		\$ -	\$ 19,700	\$ 6,576		\$ -		\$ -

Approach : Discount each years cash flow at MARR and sum

- (a) recognize constant annual cash flows are an annuity & solve A & B with annuity formula
- (b) solve C & D by discounting each year and summing

Computations :

Present Worth =	= -I + sum[cash flow/(1+0.147)^n] = NPV(\$E\$8,B13:B19)+B12							
14.70%	(\$1,631.71)	(\$1,632)	\$279.21	\$279	\$279.91	\$280	(\$3,655.48)	(\$3,655)
	negative PW at MARR		accept B		accept C		negative PW at MARR	
	reject A		positive PW at MARR		very high ROI		reject D	
	DCFROI or IRR less than 14.7%		IRR greater than 14.7%		IRR greater than 14.7%		IRR less than 14.7%	
			but, better than current average ROI		but, small \$ profit PW at MARR			

Recognize constant cash flows = solve with annuity = -I + R*(((1+0.175)^n)-1)/((0.175)*((1+0.175)^n))

(\$1,631.71) **\$279.21** =D12+D13*(((1+\$E\$8)^\$A\$20)-1)/(((\$E\$8)*((1+\$E\$8)^\$A\$20)))

Present Worth at current average return interest rate:

13.35%	\$1,372.41	\$4,413.76	\$286.28	(\$810.89)
	accept A	accept B	accept C	negative PW at MARR
	positive PW at MARR	positive PW at MARR	very high ROI	reject D
	IRR greater than 13.35%	IRR greater than 13.35%	IRR greater than 13.35%	IRR less than 13.35%

Direct Cash	\$46,000.00	\$68,600.00	\$362.00	\$36,700.00
Internal Rate of Return =	=IRR(B12:B20)			
	13.96%	14.79%	252.8%	12.98%

Title : Extration Stages - Incremental Investment ROI

- Given :**
- \$ 0.85 Value / lb of metal
 - 1,000,000 Feed = lb. metal per year
 - 7 Years = Planned Useful Life
 - 20.0% MARR = Minimum Acceptable Rate of Return
 - 17.0% MARR = Current average Rate of Return

Approach :

- Determine annual income and operating costs, then Annual Profit
- (a) Income = Feed metal * % recovery * metal value
- (b) Annual Costs = Operating costs + depreciation capital recovery (Investment/Life)
- (c) Profit = Income - Total Annual Costs
- Return on Investment = Profit / Investment
- Incremental Investment = delta Profit / delta Investment

Computations :

Item	Number of Stages			
	2	3	4	5
Fixed Capital Investment	\$ 125,000	\$ 175,000	\$ 221,000	\$ 274,000
Recovery, %	76.0%	94.0%	97.5%	99.0%
Annual Operating Costs	\$ 31,000	\$ 41,000	\$ 55,130	\$ 59,000
Lb. Recovered	760,000	940,000	975,000	990,000
Income	\$ 646,000	\$ 799,000	\$ 828,750	\$ 841,500
Depreciation	\$ 17,857	\$ 25,000	\$ 31,571	\$ 39,143
Total Annual Cost	\$ 48,857	\$ 66,000	\$ 86,701	\$ 98,143
Profit	\$ 597,143	\$ 733,000	\$ 742,049	\$ 743,357
			Maximum	
ROI	478%	419%	336%	271%
	Maximum	compare 2 to 3	compare 3 to 4	compare 4 to 5
delta Profit		\$ 135,857	\$ 9,049	\$ 1,309
delta Investment		\$ 50,000	\$ 46,000	\$ 53,000
delta ROI		271.7%	19.671%	2%
		Accept 3		10.46%

Close = almost 20%, better than current 17%

ANSWER Negative = reject 5

Alternate Approach using 20% MARR as annual expense

Venture Profit	\$572,143	\$698,000	\$697,849	\$688,557
		Maximum		Close = only \$1591 less

Best at 17% MARR

Venture Profit at 17%	\$ 575,892.86	\$ 703,250.00	\$ 704,478.57	\$ 696,777.14
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Recommend 3 stages at 24% MARR, 4 stages is very close and better than current 17%

Alternate Approach using 20% MARR as annual expense

Venture Profit	\$572,143	\$698,000	\$698,009	\$688,557
		Close = only \$29 less	Maximum	

			Best at 17% MARR	
Venture Profit at 17%	\$ 575,892.86	\$ 703,250.00	\$ 704,638.57	\$ 696,777.14

Recommend 4 stages at 24% MARR, 4 stages is very close and better than current 17%

Install at least 2 stages = no brainer 478% is very good

Install at least 3 stages = 272% on additional \$50k is very good

4 stages is close = just barely over 20%, much better than current 17%