Pts

ENG 106 Homework Solution #6

IRR for non-simple flows or increments

15 7.48 Consider the following two mutually exclusive investment projects. Assume the MARR = 15%. *(Assume the flows are stated in constant $ and the MARR is inflation-free; B-A is non-simple, so you must check to see if it is pure or mixed.)*

n	Project A	Project B
0	-$100	-$200
1	60	$120
2	50	$150
3	50	
IRR	28.89%	21.65%

Which project would be selected under infinite planning horizon with project repeatability likely, based on the IRR criterion?

Given: Cash flows of 2 alternatives, MARR = 15%., infinite service period

Find: Which project is better, by IRR criterion

Solve: Use the LCM of lives of 6 years as the analysis period. Net flows and the incremental flows are:

EOY	Project A	Project B	B-A	PB(i*)_B-A
0	-100	-200	-100	-100
1	60	120	60	-55.9825
2	50	-50	-100	-164.93
3	-50	120	170	-21.2899
4	60	-50	-110	-134.693
5	50	120	70	-86.2199
6	50	150	100	0
i*			15.98%	

The incremental investment, B-A is non simple

Solving for i* using the IRR function (in cell D9: =IRR(D2:D8)) we get i* = 16%

Using i* to find project balances shown in the table above, e.g. in cell E3: =E2*(1+D$9)+D3

Since the project balance is never positive (-, -, -, -, -,0) we have a pure investment and i* = IRR

i* = IRR = 16% which is greater than MARR(15%) **so select B**

15 #2 **Given:** Consider the following two mutually exclusive investment projects. Assume the MARR = 15%.

n	**Project A**	**Project B**	**B – A**	**PB(i*=0%)$_{B-A}$**
0	-$300	-$800	**-$500**	**-500**
1	0	1150	**1,150**	**650**
2	690	40	**- 650**	**0**
i*	52%	46%	**0%, 30%**	

Find: Using the IRR criterion, which project would be selected?

Solve: (The last two columns above are part of the solution.)

Find an i* for B – A

Easiest to use the IRR function, but just to show there are two i* in this case:

NPW(B-A) = -500 + 1150(P/F, i*, 1) - 650(P/F, i*, 2) = 0

$-500 + 1150 / (1+i^*) - 650 / (1+ i^*)^2 = 0$

$500(1+i^*)^2 = 1150 + 1150i^* - 650$

$500 + 1000i^* + 500i^{*2} = 1150 + 1150i^* - 650$

$500i^{*2} - 150i^* = 0$

$i^*(500i^* - 150) = 0$

$i^* = 0,\ 0.30$ so 0 % and 30 %

From the project balance calculated above this project is mixed investment (- ,+, 0). We could explicitly find the IRR by applying an external rate of return (the MARR) to positive project balances and setting the final PB to zero as described in Ch. 7A. However, we'll default to using PW for the increment:

NPW(B-A) = -500 + 1150(P/F, 15%, 1) - 650(P/F, 15%, 2) = $8.5

Since NPW(B-A) > 0, accept the increment, i.e. choose B over A.

So project B is a better choice.

Depreciation

10 9.13b (Calculate the depreciation schedule over the full six years.)
The double-declining-balance method is to be used for an asset with a cost of $90,000, estimated salvage of $12,000, and estimated useful life of five years. If switching to the straight-line method is allowed, when is the optimal time to switch?

Double Declining Balance means alpha = 2/N = 2/5 = 0.4

N	Depr. Calc.	**Depreciation**	Balance
0			$90,000
1	0.4*$90,000	**$36,000**	$54,000
2	0.4*$54,000	**$21,600**	$32,400
3	0.4*$40,000	**$12,960**	$19,440
4	$19,440-SV	**$7,440**	$12,000
5	At SV	**0**	$12,000

The assumed salvage value is above that calculated by DDB, so must limit depreciation in year 4 so that book value does not drop below $12,000. One might view this as conversion in year 4.

10 9.25 The AG&M Cutting Tools Company purchased a new abrasive jet cutting machine in 2012 at a cost of $180,000. The company also paid $5,000 to have the equipment delivered and installed. The cutting

machine has an estimated useful life of 12 years, but it will have depreciated by MACRS over its seven year class life. What is the cost basis of the cutting equipment?

$180,000 + $5,000 = $185,000.

What will be the depreciation allowance in each year of the seven-year class life for the cutting machine?

With MACRS, depreciation in tax year n, D_n = Dep Rate $_n$ * Cost Basis

n	Dep Rate %	**Dn**	Bn
0			185,000
1	14.29	**26436.5**	158,564
2	24.49	**45306.5**	113,257
3	17.49	**32356.5**	80,901
4	12.49	**23106.5**	57,794
5	8.93	**16520.5**	41,274
6	8.92	**16502.0**	24,772
7	8.93	**16520.5**	8,251
8	4.46	**8251.0**	0

9.34a, b At the beginning of the fiscal year, G&J Company acquired new equipment at a cost of $100,000. The equipment has an estimated life of five years and an estimated salvage value of $10,000. (a) Determine the annual depreciation (for financial reporting) for each of the five years of estimated useful life of the equipment, the accumulated depreciation at the end of each year, and the book value of the equipment at the end of each year by (1) the straight-line method, and (2) the double-declining-method.

10 DSL_n = (100,000-10,000)/5 $DDB_n = (2/5)*B_{n-1}$

Straight Line Method			
n	**Dn**	**Sum of D**	**Bn**
0			**100,000**
1	**18000**	**18000**	**82,000**
2	**18000**	**36000**	**64,000**
3	**18000**	**54000**	**46,000**
4	**18000**	**72000**	**28,000**
5	**18000**	**90000**	**10,000**

Double Declining Balance Method			
n	**Dn**	**Sum of D**	**Bn**
0			**100,000**
1	**40,000**	**40,000**	**60,000**
2	**24,000**	**64,000**	**36,000**
3	**14,400**	**78,400**	**21,600**
4	**8,640**	**87,040**	**12,960**
5	**5,184**	**92,224**	**7,776**

5 (b) Determine the annual depreciation for tax purposes, assuming the equipment falls into the seven-year MACRS property class and is sold in the sixth tax year.

n	R	**Dn**	Bn
0			100,000
1	14.29	**14290**	85,710
2	24.49	**24490**	61,220
3	17.49	**17490**	43,730
4	12.49	**12490**	31,240
5	8.93	**8930**	22,310
6	8.92/2	**4460**	17,850

Tax Elements

9.38 ABC corporation will commence operations on January 1, 2013. The company projects the following financial performance during its first year of operation:
Sales revenues at $2,500,000.
Labor, material, and overhead costs at $800,000.
The company will purchase a warehouse worth $500,000 in February. To finance the warehouse, on January 1st, the company will issue a $500,000 long-term bond, which will carry interest of 10%. The first interest payment will occur on December 31.
For depreciation purposes, the purchase cost of the warehouse is divided into $100,000 for the land and $400,000 for the building. The building is classified into the 39 year MACRS real-property class and will be depreciated accordingly.
On January 5th, the company will purchase $200,000 of equipment that has a five-year MACRS class life.

(a) Determine the total depreciation expenses allowed in 2013

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Building Dep. = $400,000/39yrs * 10.5/12 (for February) = $8,974
Equipment Dep. = $200,000*20% = $40,000
Total = $48,974

(b) Determine ABC's tax liability in 2013.

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Taxable Income, TI = Revenue – Expenses – Bond Interest – Depreciation
= $2,500,000 - $800,000 – $50,000 - $48,974 = 1,601,026
This is in the $335,001 to $10,000,000 range, so use $113,900 + .34(delta)
Tax (Liability) [Table 9.11] $113,900 + .34(1,601,026-335,000) = $544,349

10 9.40b An electrical appliance company purchased an industrial robot costing $320,000 in year zero. The industrial robot, to be used for welding operations, is classified as a seven-year MACRS recovery property. If the robot is to be sold after five years, compute the amounts of gains (losses) for this salvage value, assuming that both capital gains and ordinary incomes are taxed at 35%: SV: $125,460. Also, find the Gains Tax.

Allowed Depreciation is $320,000 (14.29 + 24.49 + 17.49 + 12.49 + 8.93/2) = $234,320.
Book Value = $320,000 - $234,960 = $85,680.

Gains: S - BV = $125,460 - $85,680 = $39,780.
Gains Tax = $39,780 * 35% = $13,923.

10 10.9 Buffalo Environmental Service expects to generate a taxable income of $350,000 from its regular business in 2012. The company is also considering a new venture: cleaning up oil spills made by fishing boats in lakes. This new venture is expected to generate an additional taxable income of $180,000.

(a) Determine the firm's marginal tax rates before and after the venture.

From Table 9.11, TI with and without the project are both in the 34% marginal tax bracket

(b) Determine the firm's average tax rates before and after the venture.

	Without Project	With Project
Taxable Income	$350,000	350,000+180,000=$530,000
Income Taxes	$119,000	$180,200

[Income Taxes for both cases are calculated from Table 9.11] = $113,900 + .34(TI-335,000)

average tax rate before = 119,000/350,000 = 34%.
average tax rate after = 180,200/530,000 = 34%.

So in this problem the results are extremely boring: the marginal and average tax rates are all the same in both cases.

95 (Total pts)