ELEC 481

Assignment 7

Submitted to Prof. Jeff Carmichael

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Jian Gao

Problem 1 (2-23) (See the spreadsheet)

Direct costs:
- Cost of materials (inputs to production)
- Cost of storing the product before sale
- Product handling and shipping costs
- Machine operator wages (assuming more operators are needed for more units of products)
- Utility costs (assuming more utilities are needed for more units of products)
- Machine operator overtime expenses

Indirect costs:
- Cost of marketing the product
- Interest payments
- Machine depreciation (assuming the rate of depreciation is independent to the number of products produced each day)
- Insurance costs
- Engineering drawings
- Cost of tooling and fixtures (assuming the number of fixtures is fixed during a certain amount of time)
- Support (administrative) staff salaries (assuming no support staff is needed for additional products)

Problem 2 (2-27)
a)
Operating revenues and expenses
Operating revenues

Sales	35,000	
Total operating revenues	**35,000**	

Operating expenses

Administrative	3,750	
Subcontracted	19,000	
Development	1,900	
Selling	5,500	
Total operating revenues	**30,150**	

Total operating income	**4,850**

Non-operating revenues and expenses

Internet expenses	-1,200
Total Non-operating income	**-1,200**

Net income before taxes	**3,650**
Income taxes	912.5
Net profit/loss	**2,737.5**

b)
The net income before taxes is $3,650.

c)
The net profit after taxes is $2737.5.

Problem 3 (9-5)
a)

Effective annual rate of bonds = $1 - \left(1 + \frac{0.05}{2}\right)^2 = 0.050625 = 5.0625\%$

WACC before taxes = $\frac{40000*81*0.15 + 1800000*0.064 + 8500*1000*0.050625}{40000*81 + 1800000 + 8500*1000} = 7.6\%$

b)
New interest rate of loan = $6.4\% * (1 - 0.38) = 3.97\%$

New interest rate of bonds = $5.0625\% * (1 - 0.38) = 3.14\%$

WACC after taxes = $\frac{40000*81*0.15 + 1800000*0.03968 + 8500*1000*0.0313875}{40000*81 + 1800000 + 8500*1000} = 6.1\%$

Problem 4 (9-7)

Since a relatively large bank in Canada doesn't bankrupt easily in a short term, the gain of my investment should be definitely no less than the effective annual rate of a savings account. Meanwhile, I would like it to count for the inflation as well. By searching it online, I found a typical effective annual rate (for my Scotiabank account) to be 3.5%, and the rate of inflation to be 0.8% in BC.

My MARR = 1.035*1.008 – 1 = **4.3%** for 5 consecutive years

Latest Data

Inflation Rate	CPI	
Region	Monthly	Yearly
Canada	0.9%	0.4%
Quebec	1.1%	0.8%
Ontario	0.7%	0.4%
Alberta	0.7%	0.3%
B.C.	1.2%	0.8%

To gain at least 104.3% of the original amount in a year, here are three of my options with low/moderate risk:

1. Savings bonds [$1,000 (4.3%)]. *"The I bond (U.S. Department of the Treasury) is a good choice for protection against inflation as you get a fixed rate and an inflation added to that every six months."*

2. Index funds [$500 (6%)]. *"It provides diversification and is less risky, allowing people to invest in them with only a small amount of money."*

3. Gold [$500 (9.5%)], as the complementary to the first two options. *"The effect that an interest rate increase has on the precious metal, if any, is unknown since there is little solid correlation between interest rates and gold prices."*

Overall rate of return = [(9.5% + 6%)/2 + 4.3%]/2 = 6.03%

Problem 5 (11-35)

a)

Depreciation value in year 5 = $\$90{,}000 * 0.85 * 0.7^3 * 0.3 = \$7872$

b)

Depreciation value in year 5 = ($90,000 – $18,000)/7 = $10,286

c)

Depreciation value in year 5 = (7 – 5 + 1)/(1 + 2 + 3 + 4 + 5 + 6 + 7)*($90,000 – $18,000) = $7,714

d)

Annual depreciation rate = 150%/7 = 21.43%
Depreciation value in year 5 = $\$90{,}000 * 0.7857^4 * 0.2143 = \$7{,}350$

Problem 6 (11-44)

a)

Book value after 5 years = $200,000 – 5*($200,000 – $40,000)/8 = $100,000
The difference = $100,000 – $90,000 = $10,000

b)

Loss on Disposal occurred according to part a.

c)

The sale of the asset would decrease tax owed by the firm.

Problem 7 (11-54)

a)

Using a cost depletion method:
Annual depletion allowance = $2,400,000 / 15 = $160,000

b)

Using a percentage depletion method:
Annual depletion allowance = 100,000*$12.50*10% = $125,000

Using a taxable income limitation basis:
Annual depletion allowance = 100,000*$2.25*50% = $112,500

c)

The second percentage depletion option (taxable income limitation basis) should be allowed because it gives a smaller value of depletion allowance ($112,500).

Problem 8 (12-5)

a)

According to table 12-1, the tax rate is 15% for the first $45,282, 20.5% for the amount between $45,282 and $90,563, and 26% for the amount between $90,563 and $100,000.

Tax w/out exemption = $45,282*0.15 + ($90,563 – $45,282)*0.205 + ($100,000 – $90,563)*0.26 = $18,528.53

Tax credits = $11,474*0.15 = $1,721.1

Tax paid = $18,528.53 – $1,721.1 = $16,807.43

b)

Personal tax w/out exemption = $35,000*0.15 = $5,250

Tax credits = $11,474*0.15 = $1,721.1

Corporate tax = $65,000*0.15 = $9,750

Tax paid = $5,250 + $9,750 – $1,721.1 = $13,278.9

c)

Yes, she should incorporate. Her taxes will go down by $3,528.53.

Problem 9 (12-24)

a)

Payback period = $700,000/(10,000,000*$0.02) = 3.5 years

b)

Annual saving = 10,000,000*$0.02 = $200,000

Annual depreciation = $700,000/5 = $140,000

Taxable income = $200,000 – $140,000 = $60,000

Annual after-tax income = $200,000 – $60,000*0.4 = $176,000

Payback period = $700,000/$176,000= 3.98 years

Meanwhile, we have:

$700,000 = $176,000 (P/A, i, 5)

Using linear interpolation or calculator:

After-tax rate of return = i = 8.2%

Problem 10 (12-41) (See the spreadsheet)

Year	Before-Tax Cash Flow	CCA	Taxable Income	Income Taxes	After-Tax Cash Flow	PW
0	–$30,000	n/a	n/a	n/a	-$30,000	-$30,000
1	+$12,000	$8,250	$3,750	$1,500	$10,500	$9,375
2	+$12,000	$11,963	$37	$15	$11,985	$9,555
3	+$12,000	$5,383	$6,617	$2,647	$9,353	$6,657
	+$10,000		$5,596	$2,238	$7,762	$5,525
					NPW	$1,112

a)
Book value = $30,000 – $8,250 – $11,963 – $5,383 = $4,404

b)
Recaptured depreciation = $10,000 – $4,404 = $5,596
The amount of gain is $5,596.

c)
After-tax NPW = $1,112 > $0
Thus, it is a good decision to purchase the equipment.

Problem 11 (12-50) (See the spreadsheet)

Depreciation each year = $35,000/7 = $5,000
Assume the truck is used **A** days per year.
Thus, in the spreadsheet, annual income after year 0 can be represented by ($550 – $200)***A** – $2,500.

From the spreadsheet, when $A > 33.94$ days/year (or $A \geq 34$ days/year), the purchase can be made since NPW is greater than zero.

Problem 12 (13-9) (See the spreadsheet)

a)

Year	Capital value	(A/P, i, n)	EUAC of capital recovery costs	Maint	(A/G, i, n)	EUAC of Maint Costs	EUAC
0	$12,000						——
1		1.15	$13,800	0			$13,800
2		0.615	7,381	550	0.47	256	7,637
3		0.438	5,256	1,100	0.91	499	5,755
4		0.350	4,203	1,650	1.33	729	4,933
5		0.298	3,580	2,200	1.72	948	4,527
6		0.264	3,171	2,750	2.10	1,153	4,324
7		0.240	2,884	3,300	2.45	1,347	4,232
8		0.223	2,674	3,850	2.78	1,530	**4,204**
9		0.210	2,515	4,400	3.09	1,701	4,216
10		0.199	2,391	4,950	3.38	1,861	4,252

b)

The minimum EUAC occurs in year 8, which is $4,204.

c)

We don't know in which year the machine should be sold.
We need to compare the challenger's EUAC to the marginal cost of the current machine (defender) to know the result.

Problem 13

A business plan is needed since it outlines the strategy and operations of a purposed venture, including details about costs, products, services, sales and profits. With this, the audiences (the people hired, potential/current investors, customers) can be all convinced and understand the clear vision of the company.