Analysis of Investment Projects

Problem 1.

A toy company introduces a new gadget, expecting at the end of the first year of operations an EBITDA (earnings before taxes and depreciation) of €10 million. The total investment at the beginning of the first year is €24 million. The project will last three years. The EBITDA is expected to rise with an inflation rate of 5% annually. The tax rate of this company is 40%. The nominal cost of capital is 14%. The salvage value of the new gadget is expected to be zero and the firm uses a linear depreciation scheme. Compute the net present value of this project.

Answer:
Cash flow scheme: *in millions*

Time	**0**	**1**	**2**	**3**
Investment	**-24**			
EBITDA		**10**	**10.5**	**11.025**
Minus depreciation		**8**	**8**	**8**
EBIT		**2**	**2.5**	**3.025**
Minus taxes (40%)		**0.8**	**1**	**1.21**
Net income		**1.2**	**1.5**	**1.815**
Plus depreciation		**8**	**8**	**8**
Cash flow	**-24**	**9.2**	**9.5**	**9.815**
	*** 1**	*** 1.14^{-1}**	*** 1.14^{-2}**	*** 1.14^{-3}**
NPV	**-24**	**+8.07**	**+7.31**	**+6.62**

Answer:
The NPV is -2.0 million.

Problem 2.

Two investment proposals, both with a lifetime of **5 years**:

Project	Investment outlay	Yearly cash flows year (at the end of each year)
A	300	100
B	500	150

Project	Investment outlay	Yearly cash flows year (at the end of each year)				
		1	*2*	*3*	*4*	*5*
C	400	200	200	200	0	0
D	400	133.3	133.3	133.3	133.3	337

a. Compute the nominal pay back period of project A and B.

Answer:
Nominal pay back period:
A **300/100 = 3 years** **most attractive !?**
B **500/150 = 3.33 years**

b. Compute the nominal pay back period concerning the following investment proposals C and D:

Answer:
Nominal pay back period:
C **400/200 = 2 years** **most attractive !?**
D **400/133.3 = 3 years**

Problem 3. and problem 4.

Compute the net present value of project C (mentioned above). The cost of capital is 10% per year.

Compute the net present value of project C again, but now the cost of capital is 20% annually.

Answer:

Project	A	B	C	D
NPV @ 10 %	79	69	**97**	231
NPV @ 20 %	- 1	- 51	**21**	80

For example project C:
at 10%: $-400 + 200/1.10^1 + 200/1.10^2 + 200/1.10^3 = 97$

Problem 5.

Compute the net present value for project C. Assume that the cost of capital is 10% for year 1, 8% for year 2 and 6% for year 3.

Answer:
Project C at different annual interest rates:

NPV = - 400 + 200/1.1 + 200/ [1.1 * 1.08] + 200/ [1.1*1.08*1.06] = 109

Problem 6.

Two investment opportunities of G and H are compared. The data are:

Project	Investment outlay	cash flows at the end of year		
		1	*2*	*3*
G	100	20	20	120
H	100	70	40	24

Answer:
***IRR* of projects G and H is 20% per year.**

For example project G:
0 = -100 + 20/1.20^1 + 20/1.20^2 +120/1.20^3

Problem 7.

Which project is acceptable when the cost of capital is 10% per year?

NPV @ 10 %:	Project	G	H
	NPV	25	15

Answer:
Both are acceptable since both have a positive NPV.

Problem 8.

Which project is more attractive from a financial perspective?

Answer:
-) Both projects are *acceptable* (IRR > CC, and NPV is then positive).
-) Project G is the *most attractive* because the NPV of G is the highest.

Advanced exercises (9-11):

Problem 9.

A company has to make a choice between two alternative production systems: MECH and COMP. Both projects are expected to generate negative cash flows: an initial investment at the start of the project and the maintenance costs every year. The cash flow forecasts of these two systems are summarised below:

	MECH	COMP
initial investment	8 million	15 million
maintenance costs	2 million	1 million
salvage value	1 million	2 million
lifetime	6 years	8 years

The maintenance costs are paid at the end of each year. The cost of capital is 10% annually. From a financial perspective, which system is the better choice for the company (*hint*: apply the equivalent annual cost method).

Answer:
Since both projects are mutually exclusive and have different lives, you must choose the project with the lowest average annual costs.

Mech: $8 - 1*(1.1)^{-6} = A\,[\,1 - 1/(1.1)^{6}\,] / 0.1$
A = 1.707
Annual costs = 1.707 + 2 = 3.707

Comp: $15 - 2*(1.1)^{-8} = A\,[\,1 - 1/(1.1)^{8}\,] / 0.1$
A = 2.634
Annual costs = 2.634 + 1 = 3.634

Answer:
Choose COMP because this system has the lowest equivalent annual costs in comparison to Mech.

Problem 10.

Sell Bell Inc. hired two IT experts to investigate the possible improvement of their call centre sales system. After the company paid €150,000 in cash to these two IT experts, they come up with the following proposal.

An investment in an automated logistic system requires an outlay of €6 million at the beginning of the project (t_0, January 1). The lifetime of the system is estimated to be three years. With this system in place, expected *incremental* sales will amount to €4 million extra for each year during its lifetime. Moreover, the layoff resulting from labour redundancies will reduce the operating costs (excluding depreciation) from 85% of €40 million to 80% for each year during the lifetime of the system.

The system is linearly depreciated in three years until zero. The system is expected to be sold for €500,000 in cash at the end of the lifetime. Tax rate is 30%.

Another consequence of the implementation of this system is that at the beginning of the project (t_0, January 1), the net working capital will be immediately reduced from 10% to 6% of €40 million.

The cost of capital is 14%.

Assume all cash flows will occur at the end of the year (except if stated that cash flows occur at the start of the year).

Project a cash flow statement to evaluate this proposal.

Answer:

Amounts in €1,000

Item	Begin year 1	End year 1	End year 2	End year 3
Incremental sales		4,000	4,000	4,000
- operating costs 80%		-3,200	-3,200	-3,200
Incremental margin		800	800	800
Cost savings 5% of *40 mill. (extra each year!)**		2,000	2,000	2,000
- depreciation		- 2,000	- 2,000	-2,000
Incremental EBIT		800	800	800
- tax 30%		- 240	-240	-240
Incremental net income		560	560	560
Depreciation		2,000	2,000	2,000
Operating incr. cash flow		2,560	2,560	2,560
Change net working capital	+ 1,600			
Investment	- 6,000			350
Cash flow	- 4,400	2,560	2,560	2,910

Change net working capital:
old: 0.1 * 40 million = 4 million
new: 0.06 * 40 million = 2.40 million
Decrease (= cash in) 1.60 million

*** or operating costs 85% of €4 million and savings 5% of €44 million.**

Problem 11.

At the beginning of the year, Vin Company is considering to spend €130,000 purchasing a new logistic system. Furthermore, the installation of this new system requires an additional outlay of €30,000 right away. This outlay, however, can immediately be deducted fully for tax purposes. The new system will replace an old depreciated system, which has been sold for €20,000 in cash. The sale is also taxed immediately.

The new system has an expected useful life of 10 years and will be depreciated with the straight line depreciation method. The expected salvage value is zero. As a consequence of the installation of the new system, net working capital will immediately increase by €50,000. This increment is permanent. Revenue is expected to increase by €32,000 yearly and the operating costs will decrease by €2,000 per year. Both are measured at the end of each year.

The company's tax rate is 40%.

Assume all cash flows will occur at the end of the year (except if stated that cash flows occur immediately, at the start of the year).

Project a cash flow statement to evaluate this proposal.

Answer:

Amounts in €1,000

Net investment:	
Purchase of equipment	**130**
Outlay *after tax* 30*(1 - 0.4)	**18 +**
Salvage value after tax -20* (1 - 0.4)	**12 - (gain!)**
Increase net working capital	**50 +**
Net investment	**186**

Operating *incremental* cash flow:	
Revenues	**32**
Cost savings	**2 +**
Operating margin	**34**
Minus depreciation (130/10)	**13 -**
EBIT	**21**
Minus tax 40%	**8.4 -**
Net income	**12.6**
Plus depreciation	**13 +**
***Incremental* cash flow per year**	**25.6**