

HFIN 4210 Spring exam: Solutions manual

Grade F: 0-6 points [0% of students]

Grade E: 7-13 points [15% of students]

Grade D: 14-18 points [26% of students]

Grade C: 19-24 points [26% of students]

Grade B: 25-31 points [27 % of students]

Grade A: 32-43 points [7% of students]

1) About corporate finance

- a) Accepting capital from a venture capital firm in exchange for equity.
- b) Maximize their net value.
- c) Investing in projects with higher returns than the opportunity cost of capital increases shareholder value.

2) Net present value

- a) Amount entering Year 5: $(1000 \cdot 1.07^4)$.
The answer is $(1000 \cdot 1.07^4) \cdot 0.07 = \mathbf{91.8}$
- b) We are looking for a discount factor (X) that gives NPV = 10 000:
 $22\,456/X^{10} = 10\,000 \rightarrow$ Solve for X: $X = (22456/10000)^{(1/10)} \rightarrow X = 1.0842$, answer is **8%**
- c) Find the NPV of the amount: $34\,111/1.07^{10} = \mathbf{17\,340}$
- d) Use the perpetuity formula: $100\,000/0.04 = \mathbf{2\,500\,000}$
- e) $2\,500\,000 + 1\,000\,000 = \mathbf{2\,600\,000}$
- f) NPV of 1 000 000 is 415 520.7.
Create a 18-year annuity with this NPV: The annuity factor ("AF") is $(1/0.05 - 1/(0.05 \cdot 1.05^{18})) = 11.7$. Using the annuity formula: $PV = CF \cdot AF$, we get that CF must be $CF = 415\,520.7/11.7 = \mathbf{35546.2}$

3) Effective interest rates

- a) Use the formula for finding effective interest rate: $1.04^{12} - 1 = 0.60$, i.e. **60%**
- b) Use the same formula, now with the interest rate as the unknown: $X^4 - 1 = 0.20 \rightarrow X = 1.0466$, i.e. **4.7%**.

4) Net present value 2: applications

- a) The PV of 180 11 years from is: $180/1.08^{11} = 77.2$.
Need a 11-year annuity with NPV equal to the remaining amount: $120 - 77.2 = 42.8$;
 $AF = (1/0.08 - 1/(0.08 \cdot 1.08^{11})) = 7.14 \rightarrow$ Dividend payment must be: $42.8/7.14 = \mathbf{6}$
- b) The price is: $3 \cdot (1/0.05 - 1/(0.05 \cdot 1.05^5)) + 100/1.05^5 = \mathbf{91.34}$
- c) The answer from (b) is the denominator, let's find the nominator (see formula):
 $3/1.05 + 2 \cdot 3/1.05^2 + 3 \cdot 3/1.05^3 + 4 \cdot 3/1.05^4 + 5 \cdot 103/1.05^5 = 429.5$
The duration is $429.5/91.34 = \mathbf{4.7}$

5) Net present value applications: Bonds

- a) Decrease
- b) Generally, bonds with shorter duration are less sensitive to interest rate changes.

6) Investment criteria

- a) Need $NPV = 0$, so $-125 + 200/X^4 = 0 \rightarrow X = (200/125)^{(1/4)} - 1 = 0.1246$, i.e. **12.5%**
- b) **10%** is the correct answer, $NPV(B)$ is approximately 0.

7) Investment criteria 2

Two possible answers:

The IRR is higher than the opportunity cost of capital

IRR is the same as the opportunity cost of capital

Note: The last option was not programmed in Inspira as a possible answer, but was awarded points through a manual override.

8) Project analysis part 1

a)

Revenue: $2000 \times 1000 =$	2 000 000
Variable cost: $500 \times 1000 =$	500 000
Fixed cost:	500 000
Depreciation: $(3\,000\,000 - 1\,000\,000) \times (1/4)$	500 000
Net income:	500 000

b) As in (a), but without depreciation, i.e. **1 000 000**

c) Cash flow:

Year 0: - 3 000' (investment)

Year 1 to 4: 1000' (net income + depreciation)

Year 5 sale: 1000' (sale after project end)

$$NPV: -3000 + 1000 \times (1/0.08 - 1/0.08 \times 1.08^4) + 1000/1.08^5 = \mathbf{992\,710}$$

d) In year 1 nothing changes, since revenue is constant from year 1 to year 2, so as in (b), **1 000 000** (since capital had to be available at the start of the year – see d below)

e) In year 0: build working capital. Revenue is 2 000 000, so increase in WC is 200 000 (10%), so the CF in year 0 goes from - 3 000 000 to - **3 200 000**.

f) Opposite of year 0: Extra 200 000, so selling = + 1 000 000, and WC = + 200 000, i.e. **1 200 000**.

9) Project analysis part 2

a) There is a fixed cost of 1 000 000 every period (depreciation and fixed costs). For each unit sold, there is a $2000 - 500 = 1500$ income. So break even occurs when selling X units:

$$X \times (2000 - 500) - 500\,000 - 500\,000 = 0; \text{ i.e. } X = 667 \text{ units. A fall of } \mathbf{33\%} \text{ from 1000 units.}$$

b) There is a fixed cost of 500 000 every period (depreciation and fixed costs). For each unit sold, there is a $2000 - 500 = 1500$ income. So break even CF occurs when price is X:

$$1000 \times (X - 500) - 500\,000 = 0; \text{ i.e. } X = 1000. \text{ A fall of } \mathbf{50\%} \text{ from 2000 to 1000.}$$

10) Debt policy

a) Debt is reduced to 500 000, nothing about firm value has changed, so **50%**.

- b) Before the restructuring, according to proposition 2 of M&M, the return on assets must be given by $12\% = ROA + (ROA - 4\%) \cdot (750\,000 / 250\,000)$, so $ROA = 6\%$. Then after restructuring ROE must be: $6\% + (6\% - 3\%) \cdot 1 = 9\%$

11) Debt policy 2

- a) The return on equity normally increases in debt level.
The return on equity and return on assets are the same when debt level is zero.
When return on assets and cost of debt are the same, return on equity is the same as return on debt.
- b) Firms with more tangible assets have more debt.
Tax shields on interest rate payments increase firm value.

12) Leasing

- a) **-100**
- b) Have to add 25 due to saved tax on maintenance cost + $200 \cdot 25\%$ due to depreciation, hence: $-100 + 25 + 50 = -25$
- c) NPV of buying: $-2000 - 100 \cdot (1/0.06 - 1/(0.06 \cdot 1.06^{10})) = 2736$.
Corresponding to a yearly rate (leasing price, X) of: $X + X \cdot (1/0.06 - 1/(0.06 \cdot 1.06^9)) = 2736$;
 $(1/0.06 - 1/(0.06 \cdot 1.06^9)) = 6.8$, hence $X = 2736 / 6.8 = 350$.

13) Leasing 2

- a) The after-tax discount rate is: 4.5%
Buying has a NPV of: $-2000 - 25 \cdot (1/0.045 - 1/(0.045 \cdot 1.045^{10})) = -2198$, corresponding to a yearly leasing rate of $-2198 = X + X \cdot (1/0.045 - 1/(0.045 \cdot 1.045^9)) \rightarrow X = 266$.
But, this is after tax, pre-tax: $266 / 0.75 = 355$

14) Timing of investment

- a) Note: Goal is to find the equal annual amount for each of the two machines, i.e., have the same yearly annuity attached to them, due to different lifetimes.

Machine 1: $NPV = -1000 + 800 \cdot (1/0.06 - 1/(0.06 \cdot 1.06^8)) = 3968$.

This corresponds to a yearly annuity of $3968 / (1/0.06 - 1/(0.06 \cdot 1.06^8)) = 639$

Machine2: The yearly annuity of machine 2 should be the same, hence, corresponding to a NPV such that $NPV / (1/0.06 - 1/(0.06 \cdot 1.06^5)) = 639 \rightarrow NPV = 2690$

For this to hold, the yearly income must be such that:

$$-800 + X \cdot (1/0.06 - 1/(0.06 \cdot 1.06^5)) = 2690$$

Solving for X: $X = 829$.

15) Principal agency problems

- a) Shareholders activism.
- b) Compensation schemes that rewards company stock performance.