

**Discounting – problems for practice**

1. We can choose between 1000 € today and 3000 € in 30 years. We consider  $r = 4\%$ . Which option has higher value and by how much?  
(Solution: 1000 € vs. 924.96 €, first option by 75.04 €)
2. Which is more: 1000 € in  $t = 6$  with  $r = 5\%$  or 1500 € in  $t = 4$  with  $r = 20\%$ ? By how much?  
(Solution: 746.22 € vs. 723.38 €, first option by 22.84 €)
3. What is the value of 1000 € in 20 years with  $r = (1, 2, 3, 4, 5, 10, 20, 30, 50)\%$ ?  
(Solution: 819.54; 672.97; 553.68; 456.39; 376.89; 148.64; 26.08; 5.26; 0.30 €)

**Payback period – problems for practice**

1. We have project with costs 1000, net annual income of 220 and lifetime 7 years. What is simple and real payback period with  $r = 9\%$  is the project acceptable?  
(Solution:  $PB_s = 5$  years,  $PB_r = 7$  years, project is acceptable in both cases)
2. We have project with costs 400 and decreasing net incomes of 100, 90, 80, ..., 10. What is the simple and real PB with  $r = 8\%$  and is the project acceptable with lifetime of 10 years?  
(Solution:  $PB_s = 5$  years,  $PB_r = 9$  years, project is acceptable in both cases)
3. We have project with costs 300 and increasing net income 10, 20, 30, 40, .... What is simple and real payback period with  $r = 7\%$ ?  
(Solution:  $PB_s = 8$  years,  $PB_r = 10$  years)

**NPV – problems for practice**

1. Calculate NPV of project with investment costs of 500 and net income annual 200 for 5 year period with discount rate of 14%.  
(Solution: NPV = 186.62)
2. Choose preferable project according to the NPV criterion, all have initial investment of 200 and then: A) lifetime 2 years and CF (+150; +200); B) lifetime 3 years and CF (+100; +100; +250); C) lifetime 6 years and CF (+300; -200; +300; +100; +100; +100). Discount rate is 7%.  
\*hint: first adjust the project to the same lifetime and then calculate NPVs.  
(Solution: C = 364.8; B = 335.8; A = 302.8)
3. Compare projects based on NPV: A) lifetime 3 years and cash flow (-300; 0; +250; +500); B) lifetime 4 years and cash flow (-300; -200; +1000; 0; +100); C) lifetime 6 years and investment costs 300 and annual cash flow +210. Use discount rate 2%. Which project is the best?  
(Solution: C = 1654; B = 1548; A = 1509)

**Rentability index – problems for practice**

1. We have 2 projects: A) costs 50, incomes +100; +200; B) costs 500; incomes +900; +900. Discount rate is 1%. Which project would you choose based on  $R_i$ ? And which based on NPV?

(Solution:  $R_i$ : A = 4.901; B = 2.547; NPV: B = 1273; A = 245)

2. Municipality can choose between 3 projects, sort them according to the  $R_i$  with  $r = 19\%$ :

Period	0	1	2	3	4	5
Project A	-20	+16	+11	+6		
Project B	-30	+11	+22	+11	0	+6
Project C	-40	+10	+10	+10	+30	

(Solution: A = 0.239; B = 0.127; C = -0.091)

3. Choose the best project according to the Rentability index: A) lifetime 2 years and CF (-200; +150; +80); B) lifetime 3 years and CF (-400; +100; +100; +300); C) with lifetime 6 years and CF (-500; +300; -200; +300; +100; +100; +100). Discount rate is 0.07.

(Solution: C = 0.130; B = 0.064; A = 0.050)

**IRR – problems for practice**

1. Sort the projects based on their IRR:

Period	0	1	2	3	4	5
Project A	-20	+10	+10	+10		
Project B	-30	+10	+20	+5	+5	+15
Project C	-40	+10	+30	+20	+15	
Project D	-50	+10	+40	+10	+10	+10

(Solution: C = 29.72%; B = 25.55%; A = 23.38%; D = 20.74%)

2. We have project with costs 1000, net annual income 220 and lifetime 5 years. Calculate IRR of this project. Does the project pay off if the general discount rate is 5%?

(Solution: project does not pay off, IRR is 3.26%)

3. We have project with cash flow in individual years: -1500; +5400; -6465; +2574. Find all IRRs of this project.

(Solution: 10%; 20%; 30%)