Seminar finances

Break even point, investment evaluation

Task 10.4 A and B Evaluation of investment options - calculation comparing costs

The static cost method is based on a comparison of operating and one-time costs. It is based on the fact that one variant has higher operating costs, the other higher one-off costs, but they do not differ in their revenues.

Example: We have to decide between two investment variants of the same capacity. Variant A has one-time costs of CZK 250,000 and annual operating costs of CZK 160,000, variant B CZK 300,000 and CZK 140,000. The estimated lifetime of both variants is 4 years.

10.4 A: Compare the benefits of each alternative using absolute lifetime cost values.

10.4 B: assess the profitability of both investment variants by calculating the payback period of additional investment costs d_n.

Task 10.4 A Solution

- Compare the benefits of individual alternatives using absolute lifetime cost values.

Option A will incur lifetime costs:

250,000 + 4 * 160,000 = 890,000 CZK

Option B:

300,000 + 4 * 140,000 = 860,000 CZK

Task 10.4 B Solution

payback period d_n = $$\frac{N_J(B) - N_J(A)}{N_P(A) - N_P(B)}$$

where: NP is operating costs (think of their difference as "profit" - the difference between costs)

NJ is a one-time cost (think of it as an investment)

A, B - investment options

Calculation:

$$dn = \frac{300 - 250}{160 - 140} = 2{,}5$$

(50 thousand (300-250) will be paid in 2.5 years, while the investment will be in operation for another 1.5 years)

Again, option B is more advantageous, as the increased fixed costs of option B will pay off in just 2.5 years with the costs variants A thanks lower operational moods . So after 2.5 years they will start the total costs of variant A exceed the total costs of variant B

Task 10.5

- Example: We have to decide between two investment variants of the same capacity. Variant A has one-time costs of CZK 250,000 and annual operating costs of CZK 160,000, variant B CZK 300,000 and CZK 140,000. The estimated lifetime of both variants is 4 years.
- Compare the profitability of individual investment alternatives by discounting future costs. Based on the above example, the one-time cost was incurred in year 0 and the cost of capital is 14%.
- For the calculation, use the breakdown of the individual variants of the calculation tables:

Year	Costs	Disinheritor (14%)	Discounted costs
0		1.0000	
1		0.8772	
2		0.7695	
…	…	…	…

$$\frac{1}{(1+\mathrm{i})^t}$$

Task 10.5 Solution

Variant A

Year	Costs	Disinheritor	Discounted costs
0	250,000	1	250,000
1	160,000	0.8772	140,352
2	160,000	0.7695	123 120
3	160,000	0.675	108,000
4	160,000	0.5921	94,736
	890,000		716 208

Option B

Year	Costs	Disinheritor	Discounted costs
0	300,000	1	300,000
1	140,000	0.8772	122,808
2	140,000	0.7695	107,730
3	140,000	0.675	94,500
4	140000	0.5921	82,894
	860,000		707,932

Option B is again more advantageous (716208 for A versus 707932 for B). This procedure is especially advantageous if operating costs are different in individual years.

Task 10.6 Evaluation of investment options - financial and mathematical procedures

- Flows of cash expenses and cash income are assessed until the end of the economic life or a certain planning horizon.
- Example: There are two investment options (A and B) for which the same capital expenditure of CZK 1,000,000 is assumed, but a different distribution of annual net cash flows (see table). The cost of capital is 10%, the lifetime for both variants is the same (6 years). Compare the listed variants.

Task 10.6 A and B

Distribution of net income of investment options A and B

Year	Cash flow A	Monetary flow B	Executor (10%)
0	-1000	-1000	1,000
1	300	100	0.909
2	600	200	0.826
3	400	300	0.751
4	300	400	0.683
5	200	500	0.620
6	100	600	0.564

Assignment 10.6 A Compare the listed investment options using a simple cash flow analysis project.

Assignment 10.6 B Compare the listed investment options using discount rate , i.e. the changing time value of money.

Task 10.6 A Evaluation of investment options – simple cash flow

Distribution of net income of investment options A and B

Year	Cash flow A	Cash flow B
0	-1000	-1000
1	300	100
2	600	200
3	400	300
4	300	400
5	200	500
6	100	600
	900	1,100

Task 10.6 B Evaluation of investment options – discounted cash flow

K_A = -1000 + 300 * 0.909 + 600 * 0.826 + 400 * 0.751 + 300 * 0.683 + 200 * 0.620 + 100 * 0.564 = **454**

K_B = -1000 + 100 * 0.909 + 200 * 0.826 + 300 * 0.751 + 400 * 0.683 + 500 * 0.620 + 600 * 0.564 = **403**

Distribution of net income of investment options A and B

Year	Cash flow A	Cash flow B
0	-1000	-1000
1	300	100
2	600	200
3	400	300
4	300	400
5	200	500
6	100	600
	454	403

$$K = \sum_{t=o}^{n} \frac{(E_t - A_t)}{(1+i)^t}$$

Task 10.7

The cost function TC = 18,000 + 1.4 Q is given

Determine the break-even point in pieces if the price of 1 piece is 5 CZK

Task 10.7 Solution

- $Q_{BEP} = FC/(P-AVC)$
- $Q_{BEP} = 18000/(5-1.4)$
- $Q_{BEP} = 5000$

Task 10.8

- The cost function TC = 18,000 + 1.4 Q is given. Sell price is 5 CZK.
- What quantity of products must the company produce in order to make a profit of CZK 43,200

Task 10.8 Solution

- Q_{BEP} = (FC+Profit)/(P-AVC)
- Q_{BEP} = (18000+43200)/(5-1.4)
- Q_{BEP} = 17000

Task 10.9

The price of the product is CZK 5/pc. The required profit for the period is CZK 36,000. The company is able to produce 15,000 pieces of products during this period.

- What is the limit of fixed costs, if the variable costs per 1 piece are CZK 1.40?

Task 10.9 Solution

- Q_{BEP} = (FC+gain)/(P-AVC) --- FC = Q * (P-AVC) - gain
- FC = 15000 * (5-1.4) – 36000
- FC = 18000

Task 10.10

The company produces 2 types of products at the same time. More detailed information is given in the following table:

Product	*Production volume in tons*	*Var. cost per 1 ton*	*Fixed. costs*	*Price for 1 ton*
AND	600	20		50
B	200	40		60
in total	800		11,000	

Determine the break-even point of products A and B when producing both of them simultaneously.

Task 10.10 solution - equation

$P * Q = FC + AVC * Q$

$P_A * Q_A + P_B * Q_B = FC + Q_A * AVC_A + Q_B * AVC_{vB}$

$\mathbf{50\ Q_A + 60\ Q_B = 11{,}000 + 20\ Q_A + 40\ Q_B}$

$Q_A : Q_B = 600 : 200$

$\mathbf{QA = 3QB}$

$50 * 3\ Q_B + 60\ Q_B = 11{,}000 + 20 * 3\ Q_B + 40\ Q_B$

$Q_B = 100$ t

$Q_A = 300$ t

Task 10.10 solution - logic

Product	*Production volume in tons*	*Var. cost per 1 ton*	*Fixed. costs*	*Price for 1 ton*
A	600 3	20		50
B	200 1	40		60
in total	800		11,000	

$$Q = \frac{TFC}{\sum(P - VC)}$$

$$Q = \frac{11000}{110} = 100$$

110 = 3 * 30 + 1 * 20

pú $_A$ = 50 – 20 = 30

pú $_B$ = 60 – 40 = 20

Q_A = 100 * 3 = 300

Q_B = 100 * 1 = 100

Task 10.11

- Find out for which production volumes the individual technological procedures listed in the following overview will be suitable. The variants are technologically equivalent, they differ in their cost function.

Technological variant	Fixed costs	Variable cost per 1 piece
1	2000	300
2	10,000	200
3	50,000	100

Task 10.11 Solution

$TC_1 = 2000 + 300Q$

$TC_2 = 10{,}000 + 200Q$

$2000 + 300Q = 10000 + 200Q$

$Q = 80$ pcs

$TC_2 = 10{,}000 + 200Q$

$TC_3 = 50{,}000 + 100Q$

$10{,}000 + 200Q = 50{,}000 + 10Q$

$Q = 400$ pcs

With a production volume of up to 80 pieces, variant 1 is the most suitable, between 80 and 400 pieces, variant 2, and over 400 pieces, variant 3

Task 10.12

The company BOTAS, as is considering the production and sale of a new type of sports shoes. The estimated annual production volume is 60,000 units at a unit price of CZK 650. Annual fixed costs are budgeted at CZK 18,000,000.

a) Find out the maximum variable costs for 1 product.

b) By how many CZK would the unit variable costs have to be reduced if the company requires a pre-tax profit of CZK 1,500,000, taking into account the need to replenish the reserve fund, pay the required dividends for shareholders and resources for investments?

Task 10.12 Solution of a and b

- Q_{BEP} = (FC+profit)/(P-AVC) ➔ AVC = P – ((FC+profit)/Q_{BEP})
- AVC = 650 – ((18000000+0)/60000)
- **AVC = 350**

- Q_{BEP} = (FC+profit)/(P-AVC) ➔ AVC = P – ((FC+profit)/Q_{BEP})
- AVC = 650 – ((18000000 + 1500000)/60000)
- **AVC = 325**

350 - 325 = 25

- Thank you for your attention