

PRÍKLAD 1

$$A = (-1000, 1000, 500)$$

$$B = (-2000, 1400, 1000)$$

$$NPV_A(i) = -1000 + \frac{1000}{1+i} + \frac{500}{(1+i)^2}$$

$$IRR: \begin{cases} NPV(i^*) = 0 \\ IRR = i^* \cdot 100\% \end{cases}$$

$$-1000 + \frac{1000}{1+i} + \frac{500}{(1+i)^2} = 0$$

substitúcia $x = 1+i$ $i \in \langle 0, 1 \rangle \Rightarrow x \in \langle 1, 2 \rangle$

$$-1000 + \frac{1000}{x} + \frac{500}{x^2} = 0 \quad / \cdot \frac{x^2}{-500}$$

$$2x^2 - 2x - 1 = 0$$

$$D = b^2 - 4ac$$

$$D = (-2)^2 - 4 \cdot 2 \cdot (-1) = 12$$

$$\sqrt{D} = 3,464$$

$$x_{1/2} = \frac{-b \pm \sqrt{D}}{2a}$$

$$x_{1/2} = \frac{2 \pm 3,464}{2 \cdot 2} = \begin{cases} 1,366 \in \langle 1, 2 \rangle \\ -0,366 \notin \langle 1, 2 \rangle \end{cases}$$

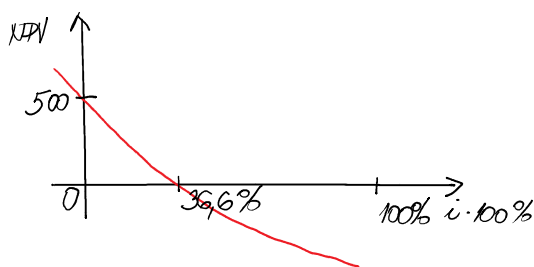
$$x = 1+i \Rightarrow i = x - 1$$

$$i = 1,366 - 1$$

$$i_A^* = 0,366$$

$$IRR_A = 0,366 \cdot 100\% = 36,6\%$$

$$NPV_A(0) = -1000 + 1000 + 500 = 500$$



$$NPV_B(i) = -2000 + \frac{1400}{1+i} + \frac{1000}{(1+i)^2}$$

$$NPV_B(i) = 0$$

$$-2000 + \frac{1400}{1+i} + \frac{1000}{(1+i)^2} = 0$$

substitúcia $x = 1+i$

$$-2000 + \frac{1400}{x} + \frac{1000}{x^2} = 0 \quad / \cdot \frac{x^2}{-100}$$

$$20x^2 - 14x - 10 = 0$$

$$20x^2 - 17x - 10 = 0$$

$$D = (-17)^2 - 4 \cdot 20 \cdot (-10) = 1089$$

$$\sqrt{D} = 33$$

$$x_{1/2} = \frac{17 \pm 33}{2 \cdot 20} = \begin{cases} \frac{50}{40} = 1,25 \in \langle 1,2 \rangle \\ -\frac{16}{40} \notin \langle 1,2 \rangle \end{cases}$$

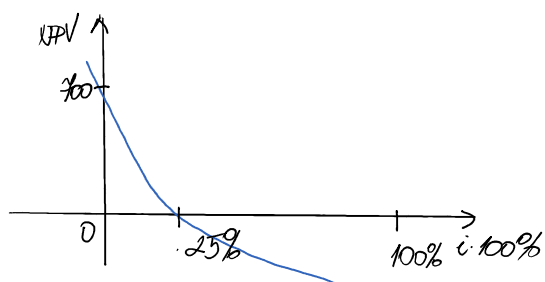
$$x = 1+i \Rightarrow i = x-1$$

$$i = 1,25 - 1$$

$$i^* = 0,25$$

$$IRR_B = 0,25 \cdot 100\% = 25\%$$

$$NPV_B(0) = -2000 + 1700 + 100 = 700$$



OTÁZKA: KEDY JE VÝNOS Z OBOCH PROJEKTŮ ROVNAKÝ?

$$NPV_A(i) = NPV_B(i)$$

$$-1000 + \frac{1000}{1+i} + \frac{500}{(1+i)^2} = -2000 + \frac{1700}{1+i} + \frac{1000}{(1+i)^2} \quad | +2000 - \frac{1700}{1+i} - \frac{1000}{(1+i)^2}$$

$$1000 - \frac{700}{1+i} - \frac{500}{(1+i)^2} = 0$$

$$\underbrace{1000 - \frac{700}{1+i} - \frac{500}{(1+i)^2}}_{NPV_{A-B}(i)} = 0$$

$$NPV_{A-B}(i) = 0$$

$$x = 1+i$$

$$1000 - \frac{700}{x} - \frac{500}{x^2} = 0 \quad | \cdot \frac{x^2}{100}$$

$$10x^2 - 7x - 5 = 0$$

$$D = (-7)^2 - 4 \cdot 10 \cdot (-5) = 249$$

$$\sqrt{D} = 15,78$$

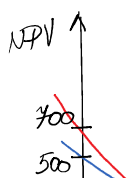
$$x_{1/2} = \frac{7 \pm 15,78}{2 \cdot 10} = \begin{cases} 1,139 \in \langle 1,2 \rangle \\ -0,439 \notin \langle 1,2 \rangle \end{cases}$$

$$x = 1+i \Rightarrow i = x-1$$

$$i = 1,139 - 1$$

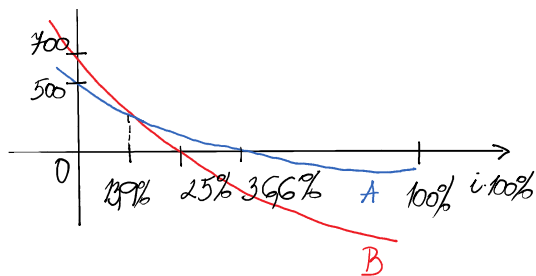
$$i^* = 0,139$$

$$IRR_{A-B} = 0,139 \cdot 100\% = 13,9\%$$



ZÁVĚR:

$i \cdot 100\% \in \langle 0; 13,9\% \rangle$ je výhodnější projekt B
 $i \cdot 100\% \in (13,9\%; 36,6\%)$ je výhodnější A



$i \cdot 100\% \in (0; 12.9\%)$ je zabavnejsi projekt
 $i \cdot 100\% \in (12.9\%; 36.6\%)$ je zabavnejsi A
 $i \cdot 100\% \in (25\%; 36.6\%)$ je prijatelny len A

PRÍKLAD 2

$$A = (300, -400, 600)$$

$$B = (-700, 1300, -100)$$

$$IRR: \begin{cases} NPV(i^*) = 0 \\ IRR = i^* \cdot 100\% \end{cases}$$

$$NPV_A(i) = 300 - \frac{400}{1+i} + \frac{600}{(1+i)^2}$$

$$NPV_A(i) = 0$$

$$300 - \frac{400}{1+i} + \frac{600}{(1+i)^2} = 0$$

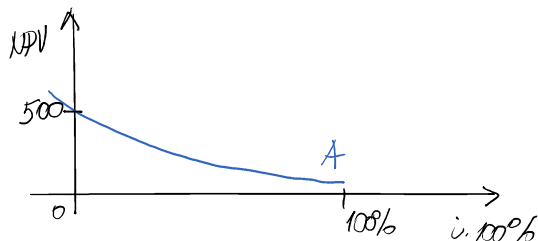
$$\text{substitúcia } X = 1+i \quad i \in \langle 0, 1 \rangle \Rightarrow X \in \langle 1, 2 \rangle$$

$$300 - \frac{400}{X} + \frac{600}{X^2} = 0 \quad / \cdot \frac{X^2}{100}$$

$$3X^2 - 4X + 6 = 0$$

$$D = (-4)^2 - 4 \cdot 3 \cdot 6 = -56 < 0 \Rightarrow \text{NEEXISTUJÚ REálne korene}$$

$$NPV(0) = 300 - 400 + 600 = 500$$



PROJEKT A JE VŽDY PRIJATELÝ

$$NPV_B(i) = -700 + \frac{1300}{1+i} - \frac{100}{(1+i)^2}$$

$$NPV_B(i) = 0$$

$$-700 + \frac{1300}{1+i} - \frac{100}{(1+i)^2} = 0$$

$$\text{substitúcia } X = 1+i$$

$$-700 + \frac{1300}{X} - \frac{100}{X^2} = 0 \quad / \cdot \frac{X^2}{-100}$$

$$7X^2 - 13X + 1 = 0$$

$$D = (-13)^2 - 4 \cdot 7 \cdot 1 = 141$$

$$\sqrt{D} = 11.874$$

$$X_{1,2} = \frac{13 \pm 11.874}{2 \cdot 7} = \begin{cases} 1.7767 \in \langle 1, 2 \rangle \\ 0.064 \notin \langle 1, 2 \rangle \end{cases}$$

$$\begin{aligned}
 X = 1+i &\Rightarrow i = X - 1 \\
 i &= 1.7767 - 1 \\
 i^* &= 0.7767 \\
 IRR_B &= 0.7767 \cdot 100\% = 77.67\%
 \end{aligned}$$

$$NPV_B(0) = -700 + 1000 - 100 = 500$$



$$NPV_A(i) = NPV_B(i)$$

$$NPV_{A-B}(i) = 0$$

$$1000 - \frac{1700}{1+i} + \frac{700}{(1+i)^2} = 0$$

substitucí $X = 1+i$

$$1000 - \frac{1700}{X} + \frac{700}{X^2} = 0 \quad / \cdot \frac{X^2}{100}$$

$$10X^2 - 17X + 7 = 0$$

$$D = (-17)^2 - 4 \cdot 10 \cdot 7 = 9$$

$$\sqrt{D} = 3$$

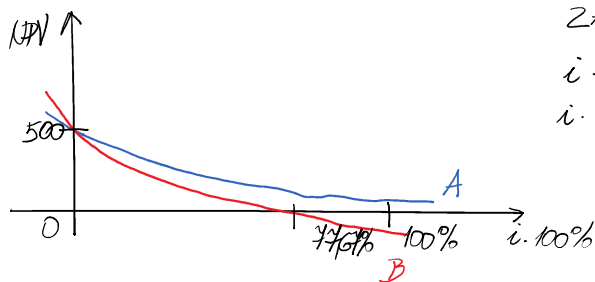
$$X_{1,2} = \frac{17 \pm 3}{2 \cdot 10} = \begin{cases} 1 \in \langle 1, 2 \rangle \\ 0.7 \notin \langle 1, 2 \rangle \end{cases}$$

$$X = 1+i \Rightarrow i = X - 1$$

$$i = 1 - 1$$

$$i^* = 0$$

$$IRR_{A-B} = 0 \cdot 100\% = 0\%$$



ZÁVĚR

$i \cdot 100\% \in \langle 0, 100\% \rangle$ JE VÝHODNĚJŠÍ A

$i \cdot 100\% \in \langle 77.67\%; 100\% \rangle$ JE PŘIJATEČNÝ LEN A