ZMIEŠANÉ ÚROKOVANIE

$$FV = \underbrace{PV(1+i)^n}_{PV'}(1+it)$$

$$PV \qquad FV_n = PV(1+i)^n = PV' \qquad FV = P(1+i)^n(1+it)$$
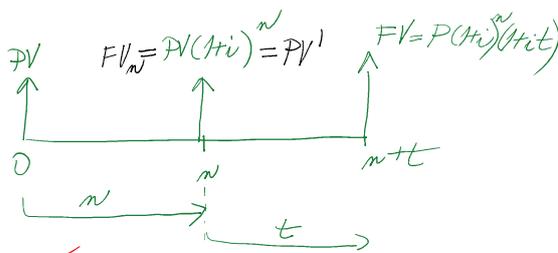
ÚROČENIE

PR1 $PV = 1500$

$i = 0{,}05$

$t = \dfrac{212}{360}$

$n = 6$

$\overline{FV = ?}$

$$FV = PV(1+it)(1+i)^n$$

$$FV = 1500\left(1+0{,}05\cdot\dfrac{212}{360}\right)(1+0{,}05)^6$$

$$FV = 2069{,}331$$

28.5.2005   31.12.2005   31.12.2011

$$t = \dfrac{30-28 + 7\cdot 30}{360} = \dfrac{2+210}{360} = \dfrac{212}{360}$$

$$n = 6 \; (= 2011 - 2005)$$

PR 2 $PV = 1500$

$i = 0{,}05$

$t_1 = \dfrac{212}{360}$

$n = 6$

$t_2 = \dfrac{10}{12}$

$\overline{FV = ?}$

$FV_1(PR1)$ $FV = ?$

28.5.2025 31.12.2005   31.12.2011 31.10.2012
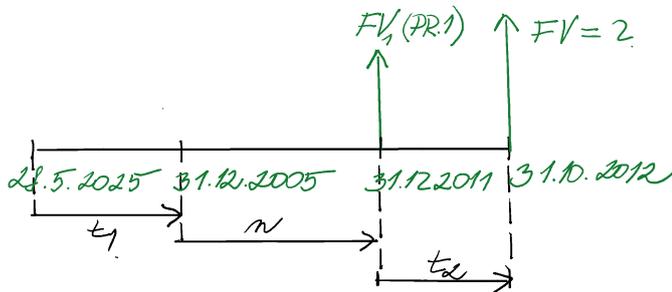
$$FV = PV(1+it_1)(1+i)^n(1+it_2)$$

$$FV = 1500\underbrace{\left(1+0{,}05\cdot\dfrac{212}{360}\right)(1+0{,}05)^6}_{2069{,}331 \;(PRÍKLAD\ 1)}\left(1+0{,}05\cdot\dfrac{10}{12}\right)$$

$$FV = 2\,155{,}553$$

$$FV = PV(1+it)(1+i)^n \Big/ \dfrac{1}{(1+it)(1+i)^n}$$

$$PV = \dfrac{FV}{(1+it)(1+i)^n}$$

ODÚROČENIE

PV FV
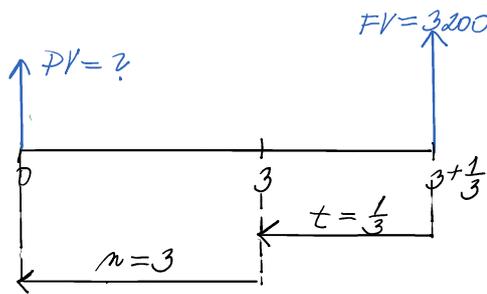
PR3
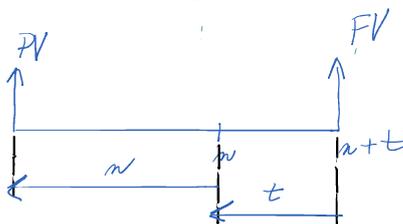
$FV = 3200$
$i = 0,04$
$n = 3$
$t = \dfrac{4}{12} = \dfrac{1}{3}$
_____
$PV = ?$

$PV = \dfrac{FV}{(1+i)^n (1+i \cdot t)}$

$PV = \dfrac{3\,200}{(1+0,04)^3 (1+0,04 \cdot \frac{1}{3})}$

$PV = 2\,807,357$

(Diagram: timeline with $PV = ?$ at 0, $FV = 3200$ at $3+\frac{1}{3}$, points 0, 3, $3+\frac{1}{3}$; $n = 3$, $t = \frac{1}{3}$)

SPOJITÉ ÚROKOVANIE

PLATÍ $\quad \lim\limits_{x \to \infty} \left(1 + \dfrac{1}{x}\right)^x = e \quad$ resp. $\quad \lim\limits_{x \to \infty} \left(1 + \dfrac{i}{x}\right)^x = e^{i}$

$(a^b)^c = a^{b \cdot c}$

$FV_n = PV \left(1 + \dfrac{j}{m}\right)^{m \cdot n} \qquad m \to \infty$

$FV_n = PV \cdot \lim\limits_{m \to \infty} \left(1 + \dfrac{j}{m}\right)^{m \cdot n} = PV \lim\limits_{m \to \infty} \left[\left(1 + \dfrac{j}{m}\right)^m\right]^n =$

$= PV \cdot \left[\lim\limits_{m \to \infty} \left(1 + \dfrac{j}{m}\right)^m\right]^n = PV \cdot \left[e^{j}\right]^n = PV \, e^{j \cdot n} =: t$

$\qquad\qquad\qquad\qquad \underbrace{}_{e^{j}}$

$FV_t = PV \, e^{j \cdot t}$

PR1

1) $j = 0,08$
$FV_n = 2PV$
$m = 12$
_____
$n = ?$

2) $j = 0,08$
$FV_t = 2PV$
$m \to \infty$
_____
$t = ?$

1.) $FV_n = PV \left(1 + \dfrac{j}{m}\right)^{m \cdot n}$

$2PV = PV \left(1 + \dfrac{0,08}{12}\right)^{12n} \quad \Big| \cdot \dfrac{1}{PV}$

$\left(1 + \dfrac{0,08}{12}\right)^{12n} = 2 \quad \Big| \ln(\ )$

$\ln\left(1 + \dfrac{0,08}{12}\right)^{12n} = \ln 2$

$12n \ln\left(1 + \dfrac{0,08}{12}\right) = \ln 2 \quad \Big| : \dfrac{1}{12 \ln\left(1 + \frac{0,08}{12}\right)}$

$n = \dfrac{\ln 2}{12 \ln\left(1 + \frac{0,08}{12}\right)}$

$n = 8,69 \text{ rokov}$

2.) $FV_t = PV \, e^{j \cdot t}$

$2PV = PV \, e^{0,08t} \quad \Big| \cdot \dfrac{1}{PV}$

$e^{0,08t} = 2 \quad \Big| \ln(\ )$

$\ln e^{0,08t} = \ln 2$

$0,08t \ln e^{1} = \ln 2$

$0,08t = \ln 2 \quad \Big| \cdot \dfrac{1}{0,08}$

$t = \dfrac{\ln 2}{0,08}$

$t = 8,66 \text{ rokov}$

PR2

$PV = 16\,000$
$FV_4 = 21\,597,74$
$t = 4$

$$m \to \infty$$

$$j = ?$$

$$FV_t = PV \cdot e^{jt}$$

$$21597{,}74 = 16\,000\, e^{j \cdot 4} \quad / : 16\,000$$

$$e^{4j} = \frac{21\,597{,}74}{16\,000} \quad / \ln(\ )$$

$$\ln e^{4j} = \ln \frac{21597{,}74}{16\,000}$$

$$4j \underbrace{\ln e}_{=1} = \ln \frac{21597{,}74}{16\,000}$$

$$j = \frac{\ln \frac{21597{,}74}{16\,000}}{4}$$

$$j = 0{,}075$$

$$j \cdot 100\% = 7{,}5\%$$

PR3

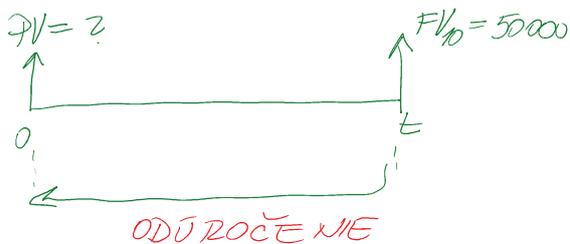$$FV_{10} = 50\,000$$

$$j = 0{,}05$$

$$t = 10$$

$$m \to \infty$$

$$PV = ?$$

$$FV_t = PV\, e^{jt}$$

$$PV = \frac{FV_t}{e^{jt}}$$

$$PV = \frac{50\,000}{e^{0{,}05 \cdot 10}}$$

$$PV = 30\,326{,}53$$

$$PV = ?$$

$$FV_{10} = 50\,000$$

0 .... t

ODÚROČENIE

OPTIMÁLNA DOBA VLASTNENIA

$v'(t) \leftarrow$ ZMENA   RELATÍVNA MIERA (ZMENY)

$$\frac{V'(t)}{V(t)} \leftarrow \text{RELATÍVNA MIERA (...)}$$

$$\nwarrow \text{PÔVODNÁ HODNOTA}$$

PR $\quad V(t) = 10\,000\, e^{\sqrt{t}} \quad \overset{g}{\nwarrow}$

$\quad\quad j = 0,05 \quad \uparrow f$

$\quad\quad \underline{m \to \infty}$

$\quad\quad t = ?$

$$\Big(f(g(x))\Big)' = f'(g(x)) \cdot g'(x)$$

DERIVÁCIA ZLOŽ FCIE

$$\big(\sqrt{t}\,\big)' = \big(t^{\frac{1}{2}}\big)' = \frac{1}{2} t^{-\frac{1}{2}}$$

$$\frac{V'(t)}{V(t)} = \frac{10\,000 \cdot e^{\sqrt{t}} \cdot \big(\sqrt{t}\,\big)'}{10\,000\, e^{\sqrt{t}}} = \frac{1}{2} t^{-\frac{1}{2}} = \frac{1}{2\sqrt{t}} \quad \big(\searrow \text{klesajúca}\big)$$

MIERA RASTU HODNOTY POZEMKU KLESÁ

$$\frac{1}{2\sqrt{t}} = 0,05 = j$$

$$\frac{1}{2\sqrt{t}} = \frac{5}{100} \quad\quad / \Big(\tfrac{1}{\;}\Big)$$

$$2\sqrt{t} = \frac{100}{5} = 20$$

$$\sqrt{t} = 10 \quad\quad /(\;)^2$$

$$t = 100$$

OPLATÍ SA PREDAŤ PO 100 ROKOCH