FINANCIJSKA MATEMATIKA

PITUP

– formule –

1. NIZOVI

Aritmetički niz

$$a_n = a_1 + (n-1)\cdot d\ , \qquad s_n = \frac{n}{2}\Big(2\cdot a_1 + (n-1)\cdot d\Big)\ , \qquad a_n = \frac{a_{n-1}+a_{n+1}}{2}$$

Geometrijski niz

$$a_n = a_1 \cdot q^{n-1}\ , \qquad s_n = a_1 \cdot \frac{q^n - 1}{q-1}\ , \qquad a_n = \sqrt{a_{n-1}\cdot a_{n+1}}$$

2. JEDNOSTAVNI *dekurzivni* KAMATNI RAČUN

$$I_n = C_0\ \frac{p\ n}{100}\ , \qquad C_n = C_0\Big(1 + \frac{p\ n}{100}\Big)$$

3. SLOŽENI *dekurzivni* KAMATNI RAČUN

$$I_n = C_{n-1}\frac{p}{100}\ , \qquad r = 1 + \frac{p}{100}\ , \qquad C_n = C_0 \cdot r^n$$

Ispodgodišnje ukamaćivanje

$$p_r = \frac{p}{m}\ , \qquad p' = 100\ \Big(\sqrt[m]{1+\frac{p}{100}} - 1\Big)\ , \qquad r' = \sqrt[m]{r}$$

Kontinuirano ukamaćivanje

$$C_n = C_0 \cdot e^{\frac{p\ n}{100}}$$

4. PERIODSKE UPLATE I ISPLATE

Konačna vrijednost periodskih uplata

$$S = R\ r\ \frac{r^n - 1}{r-1}\ , \qquad S' = R\ \frac{r^n - 1}{r-1}$$

$$n = \frac{\log\Big(\frac{S(r-1)}{Rr} + 1\Big)}{\log r}\ , \qquad n = \frac{\log\Big(\frac{S'(r-1)}{R} + 1\Big)}{\log r}$$

Sadašnja vrijednost periodskih isplata

$$A = \frac{S}{r^n} = R\ \frac{r^n - 1}{r^{n-1}(r-1)}\ , \qquad A' = \frac{S'}{r^n} = R\ \frac{r^n - 1}{r^n(r-1)}$$

$$n = \frac{\log\left(\frac{Rr}{Rr - A(r-1)}\right)}{\log r}\ , \qquad n = \frac{\log\left(\frac{R}{R - A'(r-1)}\right)}{\log r}$$

$$R' = \left(A - R\frac{r^n - 1}{r^{n-1}(r-1)}\right) \cdot r^n\ , \qquad R' = \left(A' - R\frac{r^n - 1}{r^n(r-1)}\right) \cdot r^{n+1}$$

Beskonačna renta

$$A_\infty = \frac{R}{r-1}$$

5. KREDIT

Otplata kredita jednakim anuitetima krajem razdoblja

$$K = a\frac{r^n - 1}{r^n(r-1)}\ , \qquad a = K\frac{r^n(r-1)}{r^n - 1}$$

$$I_k = \frac{O_{k-1}p'}{100}\ , \quad I_k = O_{k-1}(r-1)\ , \quad R_k = a - I_k\ , \quad O_k = O_{k-1} - R_k$$

$$O_k = a\frac{r^{n-k} - 1}{r^{n-k}(r-1)}\ , \quad R_k = R_1 r^{k-1}\ , \quad R_k = \frac{a}{r^{n-k+1}}$$

6. POKAZATELJI ISPLATIVOSTI ULAGANJA

Čista sadašnja vrijednost

$$NPV = F_0 + \frac{F_1}{r} + \frac{F_2}{r^2} + \cdots + \frac{F_n}{r^n}$$

Interna stopa rentabilnosti

$$F_0 + \frac{F_1}{r} + \frac{F_2}{r^2} + \cdots + \frac{F_n}{r^n} = 0$$

7. AMORTIZACIJA

Osnovna formula

$$D_k + B_k = C$$

Linearna metoda

$$R = \frac{C-S}{n}\ , \quad D_k = k \cdot R$$

Metoda konstantnog postotka

$$R_k = B_{k-1}\frac{d}{100}\ , \quad B_k = B_{k-1} - R_k\ , \quad S = C\big(1-\frac{d}{100}\big)^n$$

Metoda sume znamenaka

$$s = 1 + 2 + \cdots + n$$

$$R_1 = \frac{n}{s}(C-S)\ , \ldots,\ R_k = \frac{n-k+1}{s}(C-S)\ , \ldots,\ R_n = \frac{1}{s}(C-S)$$

Funkcionalna metoda

$$Q = p_1 + p_2 + \cdots + p_n\ , \quad a = \frac{C-S}{Q}\ , \quad R_i = p_i \cdot a$$

8. ANTICIPATIVAN OBRAČUN KAMATA

Jednostavni kamatni račun

$$I_n = C_0\frac{q\cdot n}{100}\ , \qquad C_n = C_0\left(\frac{100}{100-qn}\right)$$

Složeni kamatni račun

$$C_n = C_0\left(\frac{100}{100-q}\right)^n\ , \qquad \rho = \frac{100}{100-q}\ , \qquad C_n = C_0\cdot\rho^n$$

Ispodgodišnje ukamaćivanje

$$q_r = \frac{q}{m}\ , \qquad q' = 100\left(1-\sqrt[m]{1-\frac{q}{100}}\right)\ , \qquad \rho' = \sqrt[m]{\rho}$$

Otplata kredita jednakim anuitetima

$$K = a\frac{\rho^n-1}{\rho^{n-1}(\rho-1)}\ , \qquad a = K\frac{\rho^{n-1}(\rho-1)}{\rho^n-1}$$

$$I_0 = \frac{Kq}{100}\ , \quad R_k = (a-I_0)\rho^k\ , \quad I_k = a - R_k\ , \quad O_k = O_{k-1} - R_k$$

9. DERIVACIJA FUNKCIJE I PRIMJENE

Pravila deriviranja

$$(f \pm g)'(x) = f'(x) \pm g'(x)$$

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

$$\left(\frac{f}{g}\right)'(x) = \frac{f'(x) \cdot g(x) - f(x) \cdot g'(x)}{g(x)^2}$$

Elastičnost funkcije

$$E = \frac{\triangle Q}{\triangle P} \cdot \frac{P}{Q} \qquad E_{q,p} = \frac{p}{q} \cdot q'$$

$$E_{T,Q} = \frac{Q}{T} \cdot T' \qquad T_g = T' \qquad T_p = \frac{T}{Q}$$