INTERNAL RATE OF RETURN

martedì 28 febbraio 2023 08:31

$$CF = \{(x_0, x_1, x_2, \dots, x_m); (t_0, t_1, t_2, \dots, t_m)\}$$

i : interest rate

$$w(0) = x_0 (1+i)^{-t_0} + x_1 (1+i)^{-t_1} + \dots + x_m (1+i)^{-t_m}$$

IRR: it is that particular value of i such that $w(0) = 0$

$$x_0 (1+i)^{-t_0} + x_1 (1+i)^{-t_1} + \dots + x_m (1+i)^{-t_m} = 0$$

EX23: Determine the IRR of the following financial projects:

$$OF_A = \{(100, -120); (0, 5)\}$$

x_0 x_1 t_0 t_1

$$x_0 (1+i)^{-t_0} + x_1 (1+i)^{-t_1} = 0$$

$$100 (1+i)^{0} - 120 (1+i)^{-5} = 0$$

$$x := (1+i)^{-1}$$

$$100 - 120 x^5 = 0$$

$$120 x^5 = 100$$

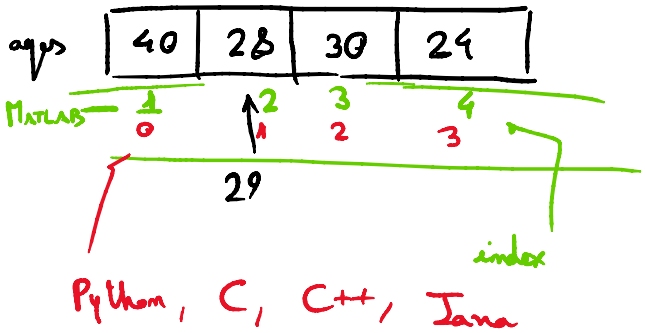
$$x^5 = \frac{100}{120} \qquad x = \sqrt[5]{\frac{100}{120}} = \left(\frac{100}{120}\right)^{\frac{1}{5}} \simeq 0.9642$$

$$x = (1+i)^{-1}$$

$$x = \frac{1}{1+i} \quad ; \quad 1+i = \frac{1}{x} \quad ;$$

$$i = \frac{1}{x} - 1 \simeq \frac{1}{0.9642} - 1 \simeq 0.0371$$

myAge | 40 |



$$\underline{x} = [1, \ 2, \ 3]$$ row vector

$$\underline{y} = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}$$ column vector

MATRIX:

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

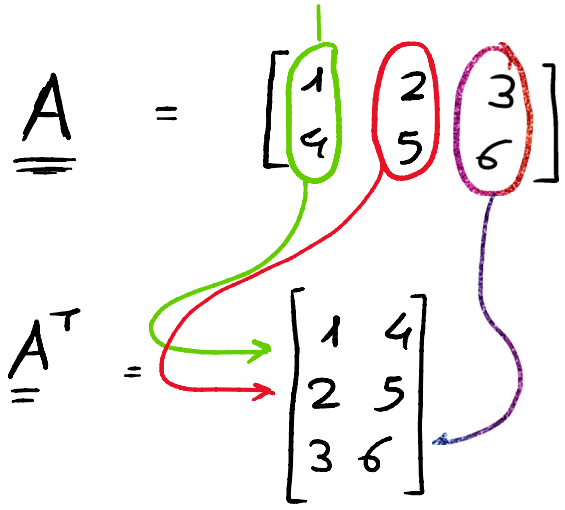
m rows and n columns

$$A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$ 2 x 2 mat...

$$\underline{\underline{A}} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \qquad 2 \times 3 \text{ matrix}$$

TRANSPOSE OF A MATRIX:

$\underline{\underline{A}}^T$: it is that matrix obtained from matrix $\underline{\underline{A}}$ where the j-th column becomes the j-th row.



$$\underline{x} = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$

it is a matrix with 1 row and 3 columns

$$\underline{x}^T = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

So the transposition of a row vector is a column vector and vice versa.

EX 24: You can use MatLab to calculate the IRR: Find the internal rate of return. The initial investment is 100000 and the following cash flows represent the yearly income from the investment. Year 1:10000, Year 2: 20000, Year 3:30000, Year 4: 40000, Year 5 : 50000.

$$CF = \{(-100000, 10000, 20000, 30000, 40000, 50000); (0, 1, 2, 3, 4, 5)\}$$

$$x := \frac{1}{1+i}$$

$$-100000 + 10000x + 20000x^2 + 30000x^3 + 40000x^4 + 50000x^5 = 0$$

x irr

lwis

EX 25: You can use MatLab to calculate the IRR for a non periodic cash flow: Find the internal rate of return. The project is as follows where the time is in terms of ~~months~~ years. OF={(-30,-20,28,32);(0,2,2.5,3)}

x irr (cf , dates)

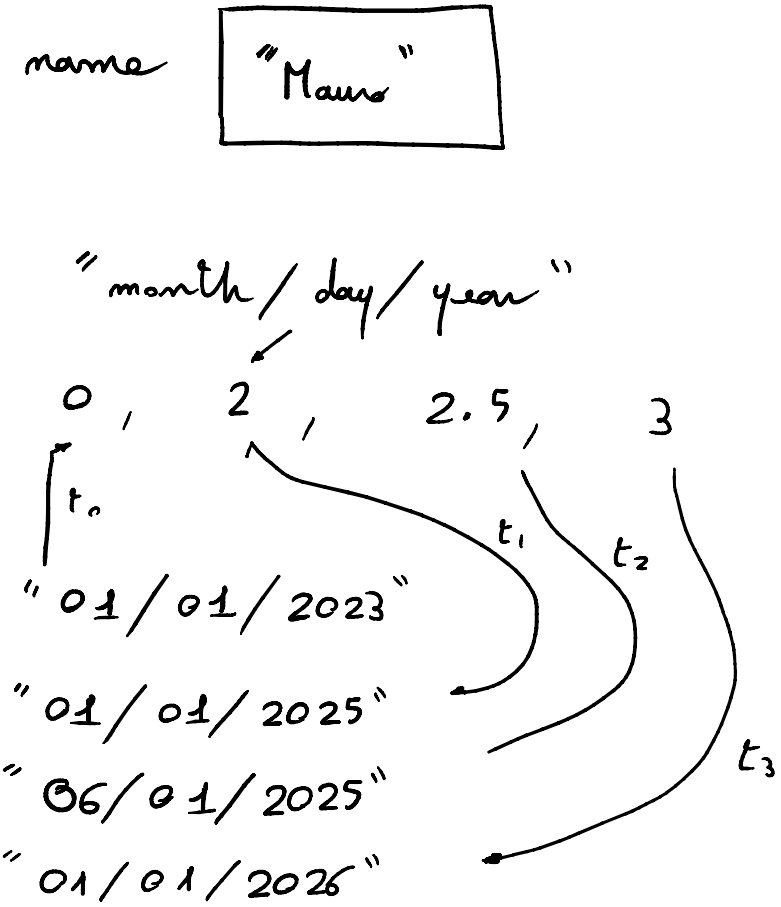
[-30, -20, 28, 32]

[t_0, t_1, t_2, t_3]

each of these dates must be a string of date

A string is a collection of characters

age 40



EX 25: You can use MatLab to calculate the IRR for a non periodic cash flow: Find the internal rate of return. The project is as follows where the time is in terms of months. OF={(-30,-20,28,32);(0,2,2.5,3)}

$t_0 = 0$ "01/01/2023"

$t_1 = 2$ "03/01/2023"

$t_2 = 2.5$ "03/15/2023"

$t_3 = 3$ "04/01/2023"