27-guia1_ejercicio_18

February 21, 2024

18- Para pagar una hipoteca de una casa durante n periodos de tiempo se usa la fórmula:

$$P = A\left(\frac{1-(1+i)^{-n}}{i}\right)$$

En esta ecuación, P es el valor presente de la casa, A es el valor del pago periódico de la deuda durante n periodos y la tasa de interés por periodo es i.

Suponga que la casa tiene un valor presente de 70000 dólares y deberá ser pagada mediante 1200 dólares mensuales por 25 años (300 meses). Utilice el método de la secante para encontrar el valor de la tasa de interés con una exactitud de 10−12. Emplee 15 decimales.

Despejamos la P para hacer la función de la forma f(x) = 0

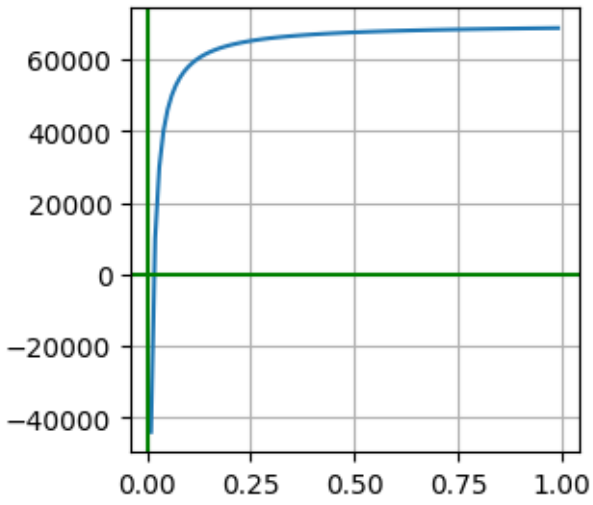
$$0 = P - A\left(\frac{1-(1+i)^{-n}}{i}\right)$$

Sustituimos por los valores:

$$0 = 70000 - 1200\left(\frac{1-(1+i)^{-300}}{i}\right)$$

[7]:
```
import numpy
from matplotlib import pyplot

from metodos_numericos import metodo_de_secante
from utils import imprimir_tabla

def hipoteca(i):
    """
    Retorna el valor de un interes en la hipoteca
    """
    return 70000 - 1200 * ((1 - (1+i)**(-300)) / i)

# graficamos la función para ver si nuestro rango es útil
# Y de ahí tomamos el intervalo.

eje_x = [x for x in numpy.arange(0.01, 1, 0.01)]
```

```
eje_y = [hipoteca(x) for x in eje_x]

plot_carga_en_tiempo = pyplot.figure(figsize=(3,3),)
pyplot.plot(eje_x, eje_y)
pyplot.grid(visible=True)
pyplot.axvline(0, color="g")
pyplot.axhline(0, color="g")
pyplot.show()

# Graficado vemos que el intervalo tiene sentido, pero podemos reducirlo
# entro 0.15 y 0.2 y probamos el método

resultado = metodo_de_secante(0.001, 0.05, hipoteca, tolerancia=10E-12,␣
 ↪resultado=[])
imprimir_tabla(resultado)
```



# de iteración	x0	x1	x2	␣ ↪error
1	0.001000000000000	0.050000000000000	0.042143188102602	0. ↪007856811897398
2	0.050000000000000	0.042143188102602	-0.030776423601630	0. ↪072919611704232
3	0.042143188102602	-0.030776423601630	0.042136619796134	0. ↪072913043397764
4	-0.030776423601630	0.042136619796134	0.042130052783223	0. ↪000006567012912

```
5                0.042136619796134   0.042130052783223   -0.019291273774818  0.
↪061421326558041
6                0.042130052783223   -0.019291273774818  0.042010771048054   0.
↪061302044822873
7                -0.019291273774818  0.042010771048054   0.041891952402085   0.
↪000118818645970
8                0.042010771048054   0.041891952402085   -0.018762579437374  0.
↪060654531839459
9                0.041891952402085   -0.018762579437374  0.041757712923480   0.
↪060520292360854
10               -0.018762579437374  0.041757712923480   0.041624068117259   0.
↪000133644806221
11               0.041757712923480   0.041624068117259   -0.018012797415301  0.
↪059636865532559
12               0.041624068117259   -0.018012797415301  0.041465241140364   0.
↪059478038555664
13               -0.018012797415301  0.041465241140364   0.041307260870138   0.
↪000157980270225
14               0.041465241140364   0.041307260870138   -0.017145890493897  0.
↪058453151364036
15               0.041307260870138   -0.017145890493897  0.041114864451903   0.
↪058260754945800
16               -0.017145890493897  0.041114864451903   0.040923735769436   0.
↪000191128682466
17               0.041114864451903   0.040923735769436   -0.016116017305940  0.
↪057039753075376
18               0.040923735769436   -0.016116017305940  0.040683064622498   0.
↪056799081928437
19               -0.016116017305940  0.040683064622498   0.040444426580933   0.
↪000238638041564
20               0.040683064622498   0.040444426580933   -0.014859274210184  0.
↪055303700791117
21               0.040444426580933   -0.014859274210184  0.040130096504761   0.
↪054989370714945
22               -0.014859274210184  0.040130096504761   0.039819343684156   0.
↪000310752820605
23               0.040130096504761   0.039819343684156   -0.013270081518708  0.
↪053089425202864
24               0.039819343684156   -0.013270081518708  0.039383404928868   0.
↪052653486447576
25               -0.013270081518708  0.039383404928868   0.038954633934301   0.
↪000428770994567
26               0.039383404928868   0.038954633934301   -0.011161488408148  0.
↪050116122342449
27               0.038954633934301   -0.011161488408148  0.038295352333115   0.
↪049456840741264
```

```
28                -0.011161488408148   0.038295352333115    0.037653431207378    0.
↪000641921125737
29                0.038295352333115    0.037653431207378    -0.008173293067472   0.
↪045826724274850
30                0.037653431207378    -0.008173293067472   0.036521215194696    0.
↪044694508262168
31                -0.008173293067472   0.036521215194696    0.035444889293294    0.
↪001076325901402
32                0.036521215194696    0.035444889293294    -0.003557988109165   0.
↪039002877402459
33                0.035444889293294    -0.003557988109165   0.033139273517023    0.
↪036697261626187
34                -0.003557988109165   0.033139273517023    0.031103413319842    0.
↪002035860197180
35                0.033139273517023    0.031103413319842    0.004090944378006    0.
↪027012468941837
36                0.031103413319842    0.004090944378006    0.026067944355437    0.
↪021976999977431
37                0.004090944378006    0.026067944355437    0.022796313110097    0.
↪003271631245340
38                0.026067944355437    0.022796313110097    0.014116177245701    0.
↪008680135864396
39                0.022796313110097    0.014116177245701    0.017943702077710    0.
↪003827524832009
40                0.014116177245701    0.017943702077710    0.017176203436927    0.
↪000767498640783
41                0.017943702077710    0.017176203436927    0.017027937868345    0.
↪000148265568582
42                0.017176203436927    0.017027937868345    0.017034933600354    0.
↪000006995732009
43                0.017027937868345    0.017034933600354    0.017034880769322    0.
↪000000052831032
44                0.017034933600354    0.017034880769322    0.017034880749569    0.
↪000000000019753
45                0.017034880769322    0.017034880749569    0.017034880749569
↪<-- solución
```