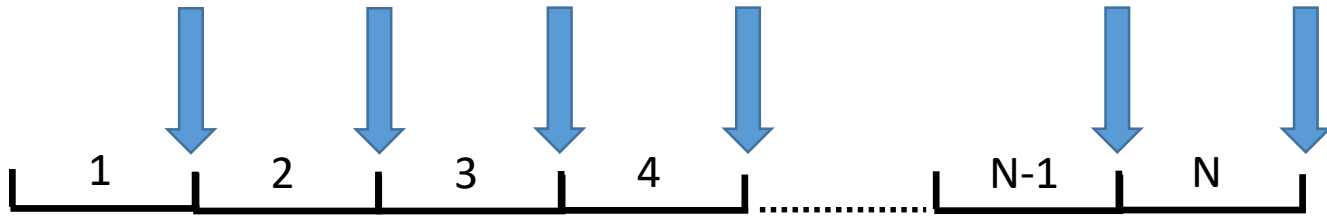# Série uniforme
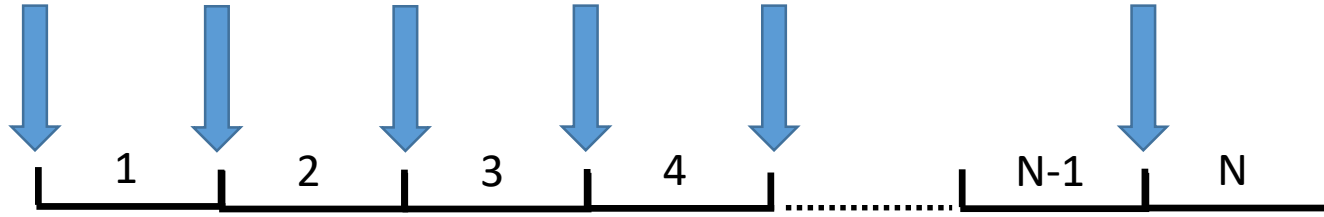
$$VP = \frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} + \frac{P}{(1+i)^3} + \frac{P}{(1+i)^4} \cdots \frac{P}{(1+i)^{N-1}} + \frac{P}{(1+i)^N}$$

$$VP = \left(\frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} \cdots \frac{P}{(1+i)^N} \right) \left(\frac{1-(1+i)}{1-(1+i)} \right)$$

$$VP = \left(\frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} \cdots \frac{P}{(1+i)^N} - P - \frac{P}{(1+i)^1} \cdots \frac{P}{(1+i)^{N-1}} \right) \left(\frac{1}{-i} \right) = \left(\frac{P}{(1+i)^N} - P \right) \left(\frac{1}{-i} \right)$$

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

$$VF = VP(1+i)^N = \frac{P}{i} \left(1 - \frac{1}{(1+i)^N} \right)(1+i)^N \rightarrow VF = \frac{P}{i} \left((1+i)^N - 1 \right)$$

$$VP = P + \frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} + \frac{P}{(1+i)^3} + \frac{P}{(1+i)^4} \cdots \frac{P}{(1+i)^{N-1}}$$

$$VP = \left(P + \frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} \cdots \frac{P}{(1+i)^{N-1}}\right)\left(\frac{1-(1+i)}{1-(1+i)}\right)$$

$$VP = \left(P + \frac{P}{(1+i)^1} + \frac{P}{(1+i)^2} \cdots \frac{P}{(1+i)^{N-1}} - P(1+i) - P - \frac{P}{(1+i)^1} \cdots \frac{P}{(1+i)^{N-2}}\right)\left(\frac{1}{-i}\right)$$

$$VP = \left(\frac{P}{(1+i)^{N-1}} - P(1+i)\right)\left(\frac{1}{-i}\right) = \frac{P}{i}\left((1+i) - \frac{1}{(1+i)^{N-1}}\right) \rightarrow VP = \frac{P}{i}\left(\frac{(1+i)^N - 1}{(1+i)^{N-1}}\right)$$

$$VF = VP(1+i)^N = \frac{P}{i}\left(\frac{(1+i)^N - 1}{(1+i)^{N-1}}\right)(1+i)^N \rightarrow VF = \frac{P(1+i)}{i}\left((1+i)^N - 1\right)$$