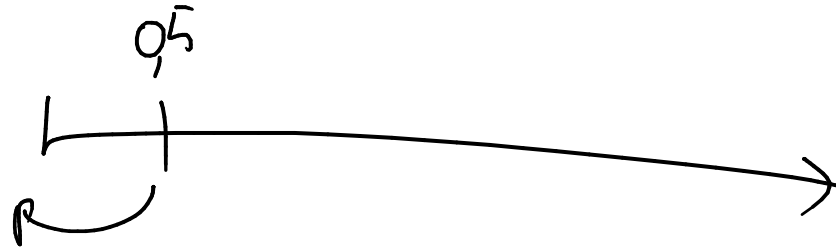


$$(1+i_A) = (1+i_2)^2 \quad \boxed{i_2 = 0,0364}$$



$$\underline{NPV} (i_2; \text{[Diagram]}) = \text{price}$$

$$D = \sum_{k=1}^m t_k \cdot p_k \Rightarrow \frac{e_k (1+i)^{-k}}{\text{PRICE}}$$

$$D = 0.5 \frac{70(1+0.07)^{0.5}}{P} + 1 \frac{70(1+0.07)^1}{P} + \dots$$

$$\dots + 5 \frac{1070(1+0.07)^5}{P} =$$

$$\underbrace{f(x) - f(x_0)}_{\Delta P} = f'(x_0) \frac{(x-x_0)}{\Delta r} + \frac{1}{2} f''(x_0) \frac{(x-x_0)^2}{\Delta r^2}$$

$$f'(x_0) =$$

$$P = \sum C_k (1+r)^{-k}$$

$$\frac{\partial P}{\partial r} = \sum -k (1+r)^{-k-1} \cdot C_k = \frac{\sum (-k (1+r)^{-k} C_k) P}{(1+r)}$$

$$= -\frac{D}{1+r} \cdot P$$

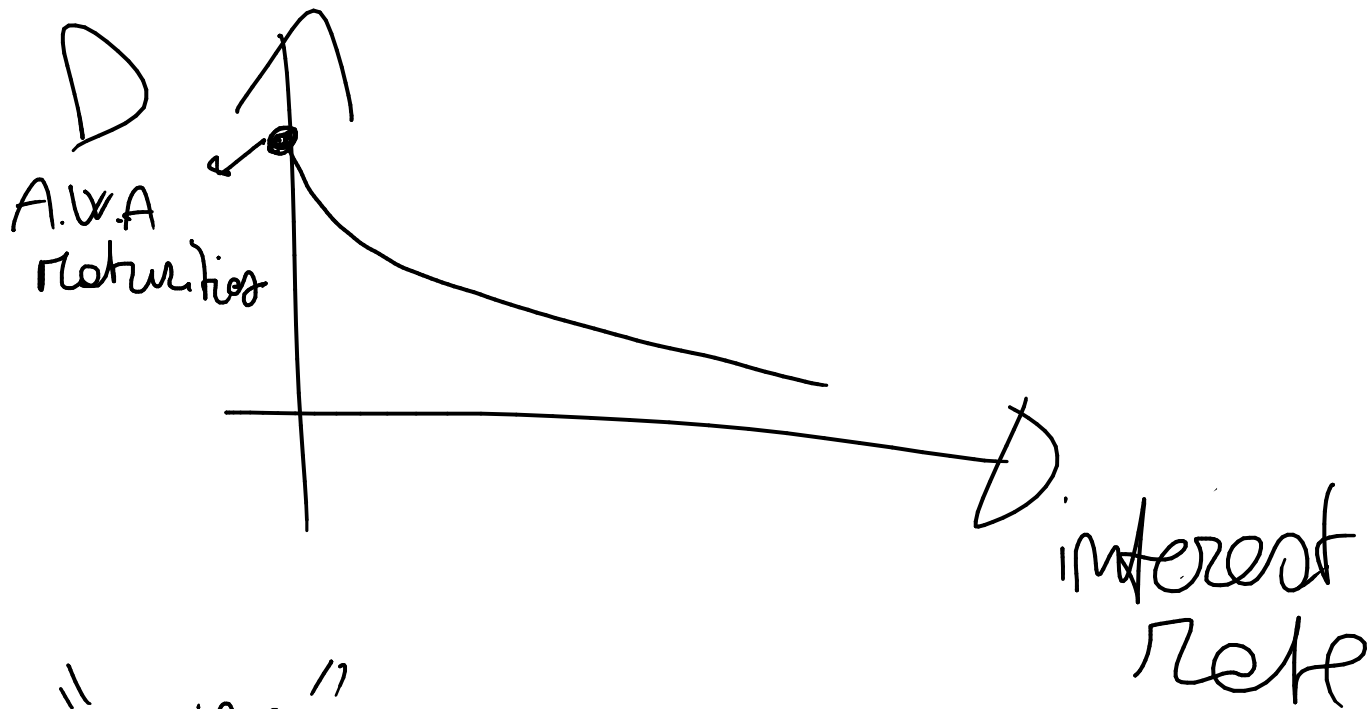
$$f(x) - f(x_0) = f'(x_0) (x - x_0)$$

$$\underbrace{\Delta P}_{\text{}} = \underbrace{-\frac{D}{1+r}}_{\text{}} \cdot \underbrace{P}_{\text{}} \cdot \underbrace{\Delta r}_{\text{}}$$

1<sup>st</sup> order approximation

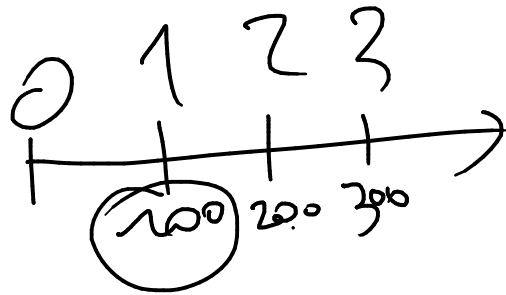
$$\frac{\Delta P}{P} = -\frac{D}{1+r} \cdot \Delta r$$

$$-6.311\% = -\frac{DM}{6.311} \cdot \Delta r$$



"SMA" = A.W.A.

$$= 1 \cdot \frac{100}{600} + 2 \cdot \frac{200}{600} + 3 \cdot \frac{300}{600} =$$



$$\begin{aligned}
 f''(x_0) &= \left[ \sum -k c_k (1+r)^{-k-1} \right]^1 \\
 &= \sum (-k)(-k-1) \cdot c_k (1+r)^{-k-2} \\
 &= \frac{\sum k(k+1) \cdot c_k (1+r)^{-k}}{(1+r)^2} \cdot \frac{P}{P} = \frac{D}{P}
 \end{aligned}$$

$$D = \sum k \cdot p_k \quad \frac{D}{P} = \sum k(k+1) \cdot p_k$$

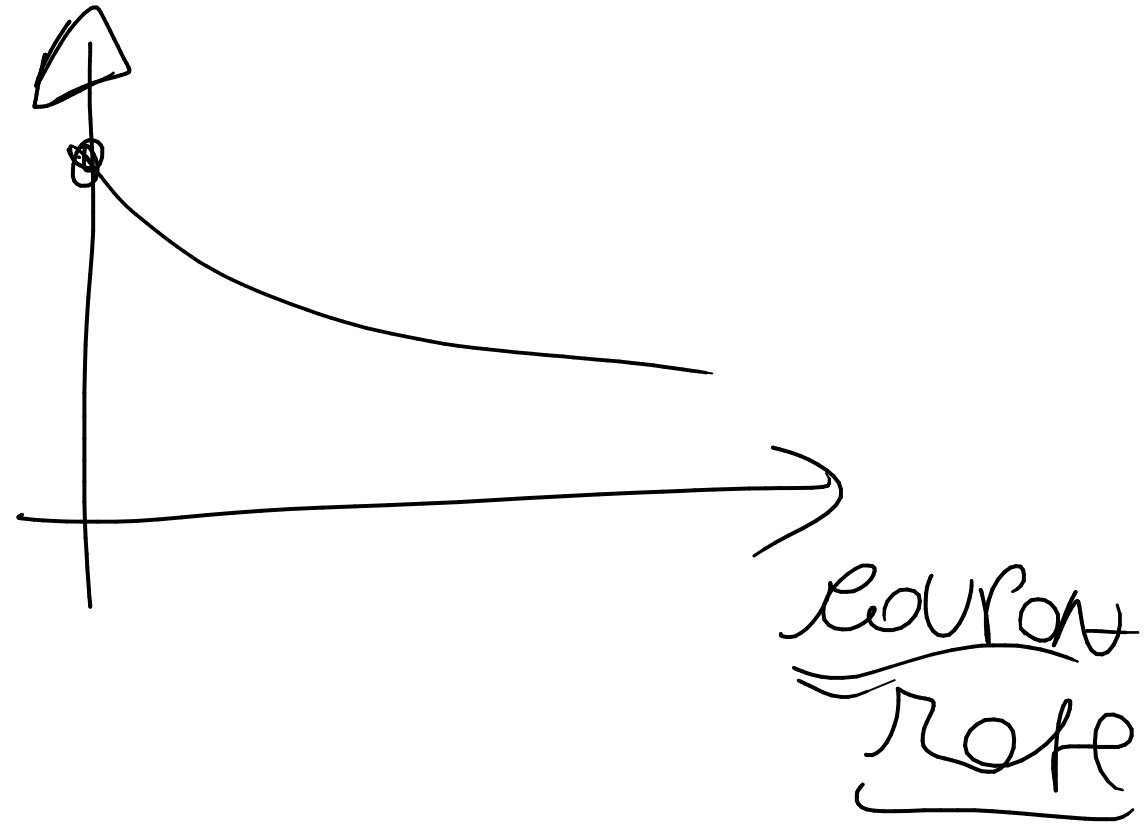
$$f(x) - f(x_0) = f'(x_0)(x - x_0) + \frac{1}{2} f''(x_0)(x - x_0)^2$$

$$\Delta P = \left[ -\frac{D \cdot P}{1+r} \right] \Delta r + \frac{1}{2} \left[ \frac{C \cdot P}{(1+r)^2} \right] \Delta r^2$$

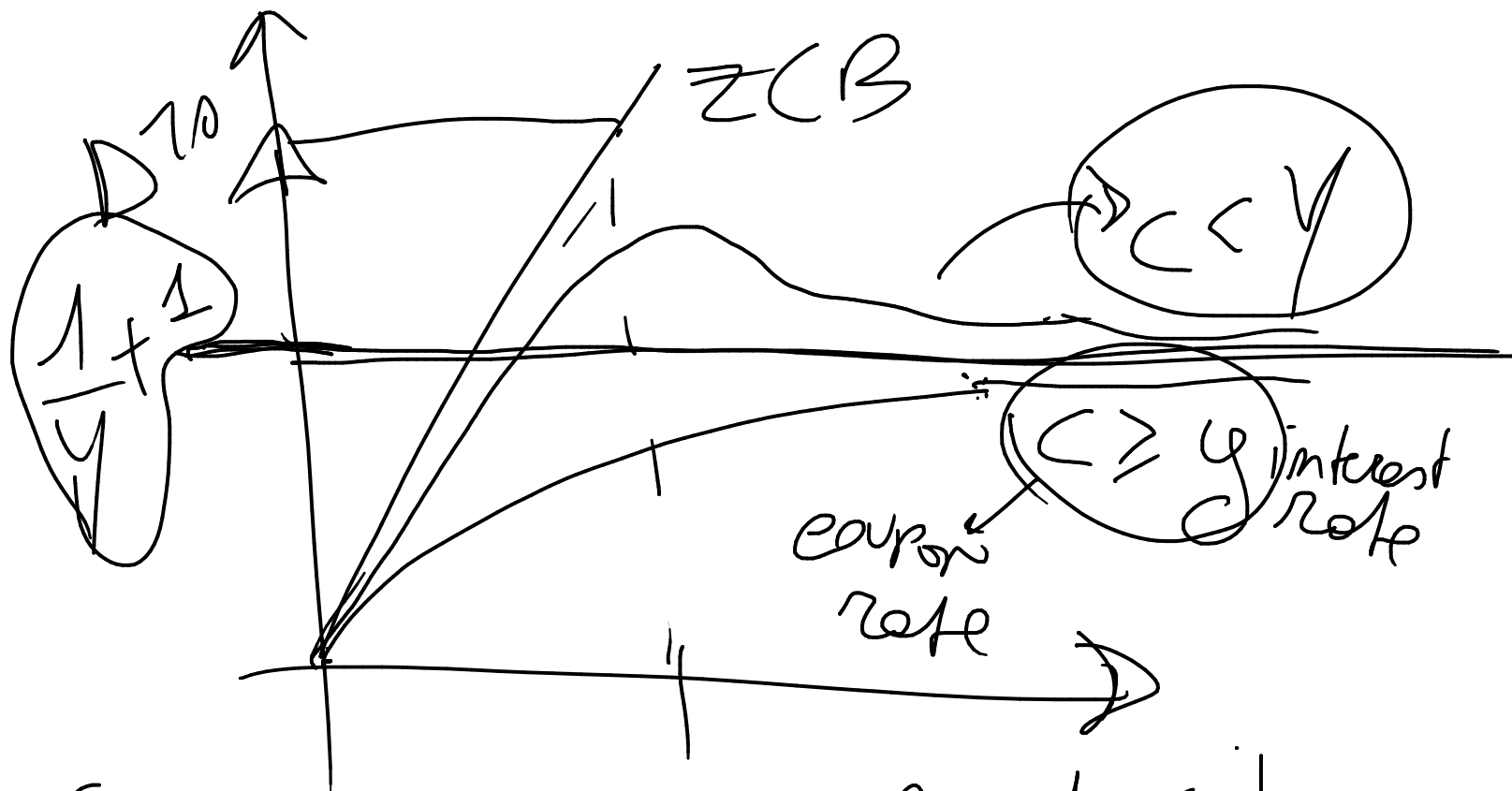
$\frac{D}{1+r} = \boxed{DM} = \text{modified DURATION}$   
 $\text{DURATION } (j; j; j)$

$$\frac{\Delta P}{P} = -DM \cdot \Delta r$$

D







1 effect  $D \uparrow$  if maturity  $\uparrow \rightarrow$  ZCB  
 2 effect  $PV \downarrow$