

Answer:

a. Duration of Assets ( $D_A$ ) =  $(50/500) \times 0 + (200/500) \times 1.25 + (250/500) \times 7 = 4$  years

Duration of Liabilities ( $D_L$ ) =  $(300/450) \times 1 + (150/450) \times 5 = 2.333$  years

$$D_A - \frac{L}{A} D_L = 4 - 0.9 \times 2.333 = 1.9 \text{ years}$$

b. Change in equity:

$$\Delta E = -\left(D_A - \frac{L}{A} D_L\right) \cdot A \cdot \frac{\Delta r}{1+r} = -1.9 \times 500,000,000 \times \frac{0.002}{1.08} = -\$1.759 \text{ million}$$

c.  $\Delta P_F = -D \cdot P_F \cdot \frac{\Delta r}{1+r} = -6 \times 102,000 \times 0.002 = -\$1224$

d.  $N_F = \frac{\left(D_A - \frac{L}{A} D_L\right) A}{D_F P_F} = \frac{1.9 \times 500,000,000}{6 \times 102,000} = 1552 \text{ contracts}$