1

Søk 2005 Retake Fall 2023

a) $E[r_p] = w\mu + (1-w) r_f.$

$$\sigma_p^2 = var(wr + (1-w)r_f) = var(wr)$$
$$= w^2\sigma^2$$
$$\hookrightarrow \sigma_p = w\sigma.$$

b) The investor maximizes expected utility wrt w:

$$\max_w U = \max_w \left(w\mu + (1-w)r_f\right) - \frac{1}{2}Aw^2\sigma^2$$

FOC:

$$\frac{dU}{dw} = \mu - r_f - Aw\sigma^2 = 0 \Leftrightarrow w^* = \frac{\mu - r_f}{A\sigma^2}.$$

c) $w^* = \dfrac{0.1 - 0.03}{2.5 \cdot 0.2^2} = \underline{0.7}$

$$E[r_p] = 0.7 \cdot 0.1 + (1-0.7) \cdot 0.03 = \underline{0.079}$$

$$\sigma_p = (0.7 \cdot 0.2)^{*} = 0.14 \Rightarrow \sigma_p^2 = \underline{0.0196}$$

$$EU = 0.079 - \frac{1}{2} \cdot 2.5 \cdot 0.0196 = \underline{\underline{0.0545}}$$

d)

i $E_u = 0.03$

ii $E_u = 0.1 - \frac{1}{2} \cdot 2.5 \cdot 0.2^2 = 0.05$

2 a) The par value is 450.

PGS can sell these bonds for $450 \cdot 0.98 = \underline{\underline{441}}$

b) The annual interest rate is 13.5%.

This interest rate translates to $\frac{13.5\%}{2} = 6.75\%$ per six months.

Semi-annual coupon payments are: $450 \cdot 0.0675 = \underline{\underline{30.375}}$

c) We calculate the bond value, given the analysts' yield. Per six months, we get

$$\sqrt{1.1467} = 1.07084$$

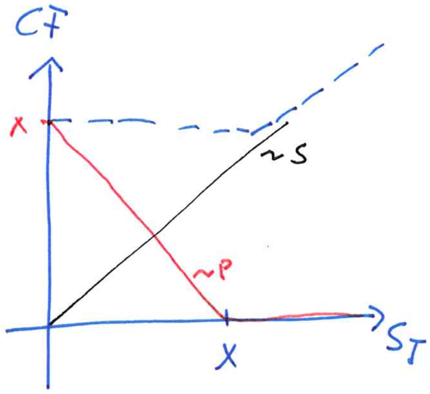
$$P_0 = \sum_{t=1}^{8} \frac{30.375}{(1.07084)^t} + \frac{450}{(1.07084)^8}$$

$$= \frac{(1.07084)^8 - 1}{0.07084 \cdot (1.07084)^8} \cdot 30.375 + \frac{450}{(1.07084)^8} = 441$$

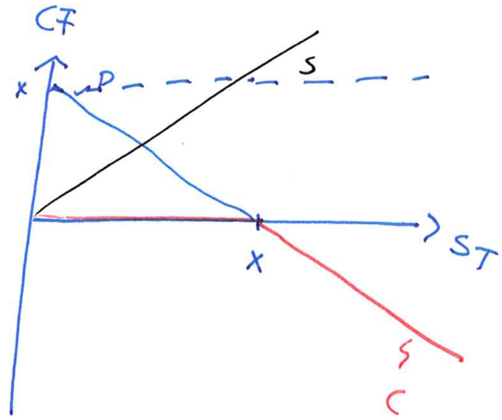
): Tm yield is $\underline{\underline{14.67\%}}$

3)

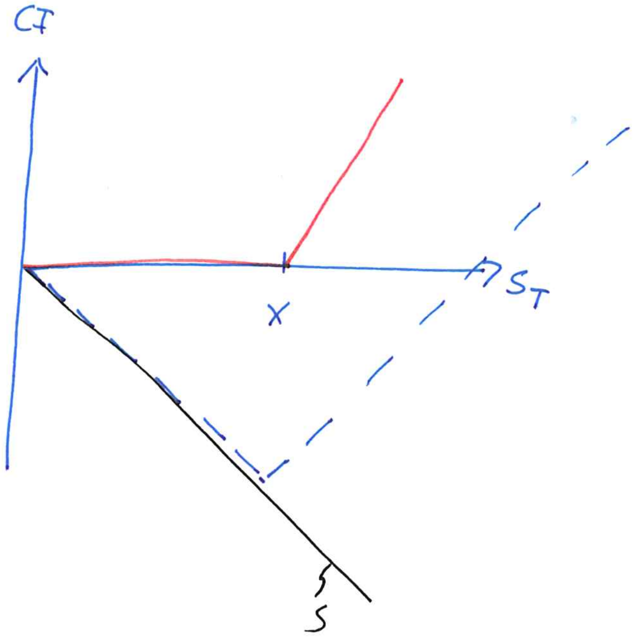
a)



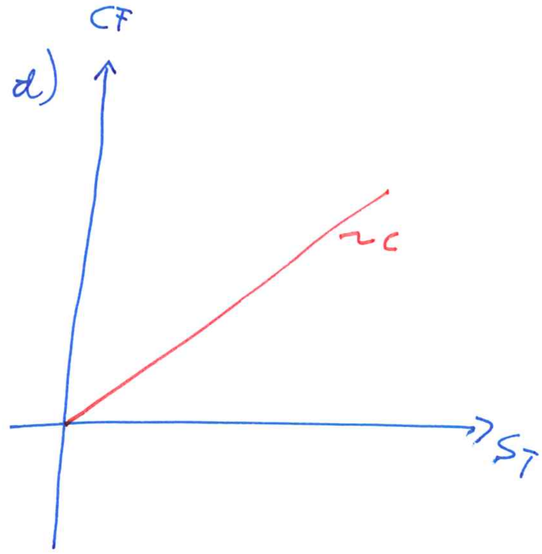
b)



c)



d)



e) The strategy has the same payoff as a risk-free asset. Value = PV(x).

f) Gives positive payoff when the two calls are in-the-money: $-S_T + 2(S_T - x) > 0 \Leftrightarrow$

$$-S_T + 2S_T - 2x > 0 \Leftrightarrow \underline{\underline{S_T > 2x}}$$

g) It has the same payoff as a long stock $\hookrightarrow$ $C_0 = S_0$. This also follows from the put-call parity. The put has price $= 0$ when $x = 0$: $P_T = \max(0 - S_T, 0) = 0$. Thus

$$C_0 + \underbrace{PV(x)}_{0} = S_0 + \underbrace{P_0}_{0} \Rightarrow \underline{\underline{C_0 = S_0}}$$

4) a) $k = E[r_A] = r_f + (E[r_M - r_f])\beta_A$

$= 0.04 + (0.1 - 0.04)\cdot 1.2 = 0.112$): $\underline{\underline{11.2\%}}$

b) $P_0^A = \sum_{t=1}^{\infty} \frac{11.2}{(1.112)^t} = \frac{11.2}{0.112} = \underline{\underline{100}}$

c) $g = b \cdot ROE = 0.5 \cdot 0.168 = 0.084$): $\underline{\underline{8.4\%}}$

d) $P_0^A = \frac{11.2 \cdot (1-0.5)}{0.112 - 0.084} = \underline{\underline{200}}$