Løsningsforslag i SØK 2005 (V15)

#1

a) $E[r_P] = E[a r_A + (1-a) r_B] = \underline{\underline{a E[r_A] + (1-a) E[r_B]}}$

b) $\sigma_P^2 = E\left[\left(a r_A - a E[r_A] + (1-a) r_B - (1-a) E[r_B]\right)^2\right]$

$$= \underline{\underline{a^2 \sigma_A^2 + 2\rho_{AB}\, a(1-a)\sigma_A \sigma_B + (1-a)^2 \sigma_B^2}}$$

c) Siden $E[r_A] = E[r_B]$, vil alle portefølje-sammensetninger ha lik forventet avkastning. Velger den a som gir lavest varians σ_P^2.

$$\frac{d\sigma_P^2}{da} = 2a\sigma_A^2 + 2\rho_{AB}\sigma_A\sigma_B - 4a\rho_{AB}\sigma_A\sigma_B - 2(1-a)\sigma_B^2 = 0$$

$$\Longleftrightarrow$$

$$2a(\sigma_A^2 - 2\rho_{AB}\sigma_A\sigma_B + \sigma_B^2) = 2(\sigma_B^2 - \rho_{AB}\sigma_A\sigma_B)$$

$$\Longleftrightarrow$$

$$\underline{\underline{a^* = \frac{\sigma_B^2 - \rho_{AB}\sigma_A\sigma_B}{\sigma_A^2 - 2\rho_{AB}\sigma_A\sigma_B + \sigma_B^2}}}$$

d) Det er fordi $E[r_P] = E[r_A]$ samtidig som vi kan ha at $\sigma_P^2 < \sigma_A^2$, noe som avhenger av størrelsen på ρ_{AB}.

e) $a^* = \dfrac{0{,}3^2 - 0{,}25 \cdot 0{,}2 \cdot 0{,}3}{0{,}2^2 - 2 \cdot 0{,}25 \cdot 0{,}2 \cdot 0{,}3 + 0{,}3^2} = \underline{\underline{0{,}75}}$

f) Å shorte B betyr at $a^* > 1$:

$$\frac{\sigma_B^2 - \rho_{AB}\sigma_A\sigma_B}{\underbrace{\sigma_A^2 - 2\rho_{AB}\sigma_A\sigma_B + \sigma_B^2}_{>0 \text{ (fra hint)}}} > 1 \Longleftrightarrow$$

$$\sigma_B^2 - \rho_{AB}\sigma_A\sigma_B > \sigma_A^2 - 2\rho_{AB}\sigma_A\sigma_B + \sigma_B^2 \Longleftrightarrow$$

$$\rho_{AB}\sigma_A\sigma_B > \sigma_A^2 \Longleftrightarrow \underline{\underline{\rho_{AB} > \frac{\sigma_A}{\sigma_B}}} \quad \left(= \frac{2}{3}\right)$$

#2

a) $P_A = \dfrac{1000}{(1{,}05)^5} = \underline{\underline{783{,}53}}$

b) $P_B = \dfrac{1000 \cdot (1-0{,}2) + 0 \cdot 0{,}2}{(1{,}05)^5} = \dfrac{800}{(1{,}05)^5} = \underline{\underline{626{,}82}}$

c) $P_C = \dfrac{1000 \cdot (1-0{,}4) + 1000 \cdot 0{,}5 \cdot 0{,}4}{(1{,}05)^5} = \dfrac{800}{(1{,}05)^5} = \underline{\underline{626{,}82}}$

d) 1. $HPR_A = \dfrac{1000 - 783{,}53}{783{,}53} = 0{,}276 \text{): } \underline{\underline{27{,}6\%}}$

$HPR_B = \dfrac{1000 - 626{,}82}{626{,}82} = 0{,}595 \text{): } \underline{\underline{59{,}5\%}}$

$HPR_C = HPR_B = \underline{\underline{59{,}5\%}}$

2. HPR_A blir som i 1. : $\underline{\underline{27{,}6\%}}$

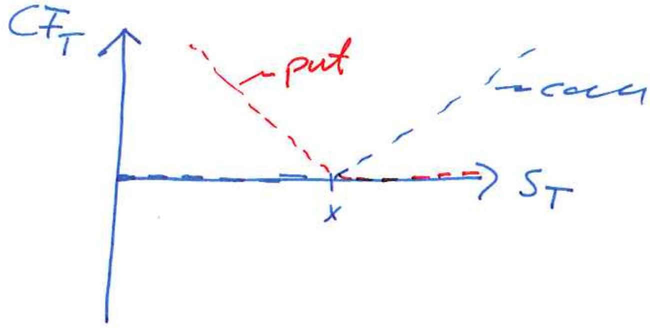
$HPR_B = \dfrac{0 - 626{,}82}{626{,}82} = -1 \text{): } \underline{\underline{-100\%}}$

$HPR_C = \dfrac{1000 \cdot 0{,}5 - 626{,}82}{626{,}82} = -0{,}202 \text{): } \underline{\underline{-20{,}2\%}}$

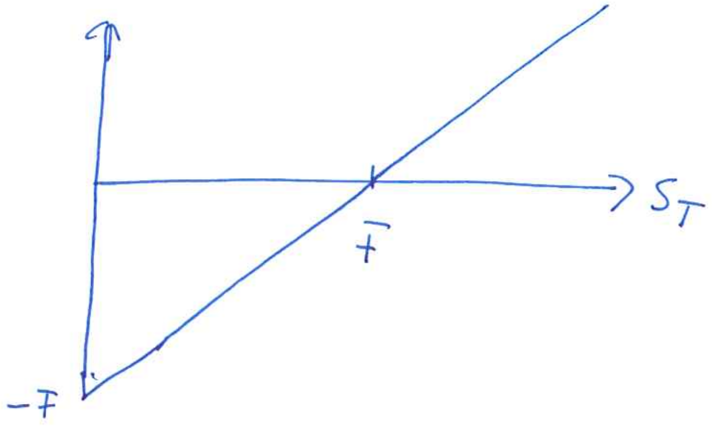
e) Ingen av obligasjonene har utbetalinger før om fem år. Dermed har alle tre obligasjonene durasjon på fem år.

#3

a)



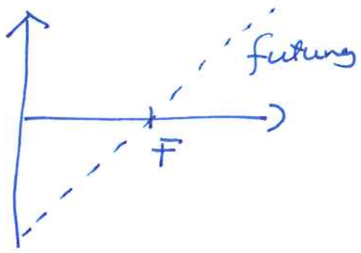
b)

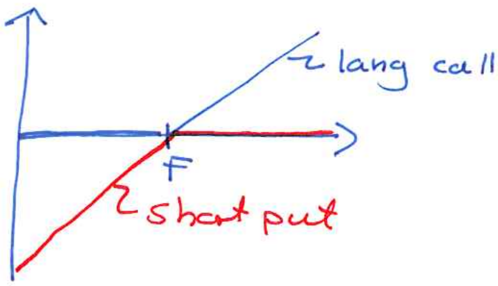


c) Vi har at $F = S \cdot (1+r)^T$.

$$105 = 100 \cdot (1+r) \Leftrightarrow r = \frac{105}{100} - 1 = 0{,}05 \text{): } \underline{\underline{5\%}}$$

d) Når $X = F$, får vi:





Det er gratis å inngå futures. Lang call og kort put med $X = F$ gir samme kontantstrøm som futures.

Da må $C_0 - P_0 = 0 \Leftrightarrow C_0 = P_0 \underline{\underline{= 10.}}$

e) Fra put-call pariteten har vi at

$$P_0 = C_0 + PV(X) - S_0$$

Strategi: Selg put, kjøp call, plasser $PV(X)$ i banken og short aksjen:

#4

a) Vi har at $P/E = 14{,}9 \iff E = \frac{P}{14{,}9} = \frac{94{,}5}{14{,}9}$

$$= \underline{\underline{6{,}3}}$$

b) $k = r_f + (E(r_M) - r_f)\beta$

$$= 0{,}0212 + 0{,}04 \cdot 0{,}47 = 0{,}04 \text{):} \underline{\underline{4\%}}$$

c) Vi har at

$$P_0 = \frac{D}{k-g} \iff 94{,}5 = \frac{3}{0{,}04-g} \iff$$

$$94{,}5(0{,}04-g) = 3 \iff g = 0{,}04 - \frac{3}{94{,}5} = 0{,}008$$

$$\text{):} \underline{\underline{0{,}8\%}}$$

d) $b = \frac{E-D}{E} = \frac{6{,}3-3}{6{,}3} = 0{,}524 \text{):} \underline{\underline{52{,}4\%}}$

e) $g = b \cdot ROE \iff ROE = \frac{g}{b} = \frac{0{,}008}{0{,}524} = 0{,}015$

$$\text{):} \underline{\underline{1{,}5\%}}$$

f) Vi har at

$$P_0 = \frac{E(1-b)}{k-g} = \frac{E}{k} + PVGO \iff PVGO = P_0 - \frac{E}{k}$$

(På forelesning har vi kalt dette D)

$$= 94{,}5 - \frac{6{,}3}{0{,}04} = 94{,}5 - 157{,}5$$

$$= \underline{\underline{-63}}$$