1a

ALLE 1-PERIODE DELMODELLER HAR FORMEN

$$S_t < \begin{matrix} S_t u \\ S_t d \end{matrix} \quad m/ \quad u = 1{,}06 \text{ OG } D = 0{,}97$$

SÅ DE HAR ALLE DEN SAMME ENTYDIGE MG-SSH (' ''

$q = (R-d)/(u-d) = (1{,}01-0{,}97)/(1{,}06-0{,}97) = \boxed{4/9}$

DA $q \in]0;1[$ ER ALLE 1-PER DELMODELLER ARB'FRIE OG KOMPLETTE — SÅ HELE MODELLEN ER DET

VI TRÆVLER OS BAGLÆNS TIL PRISEN PÅ DIGITALOPTIONEN

$$\frac{1}{1{,}01}\left\{\frac{4}{9}\times 1 + \frac{5}{9}\times 1\right\} = 0.99_{00}$$

$$\frac{1}{1{,}01}\left\{\frac{4}{9}\times 1 + \frac{5}{9}\times 0\right\} = 0.44_{00}$$

$$\boxed{0{,}6777}$$

m/ $PRIS(t) = E_t^q\left((PRIS(t+1) + DIV(t+1))/R\right)$ SELVFØLGELIG

1b

BARRIEREVERS ER STIAF, SÅ VI PRISER I "UDFOLDET TRÆ"

$$\frac{1}{1{,}01} = 0.9900$$

$$0$$

$$\frac{1}{1{,}01}\left\{\frac{4}{9}\times 0.99_{00} + \frac{5}{9}\times 0\right\} = \boxed{0{,}4357}$$

FOR AT REP. m/ a aktier og b ACM. DIGITAL SKAL VI LØSE

$$\begin{aligned} a\,530 + b\,0.99_{00} &= 0.99_{00} \\ a\,485 + b\,0.44_{00} &= 0. \end{aligned} \quad \rightsquigarrow \quad \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} -0.001761 \\ 1{,}944 \end{pmatrix}$$

ALTSÅ KØBE KNAP 2 DIGITAL OG SÆLGE EN "[illegible] AKTIE"

2a

$$\mathrm{KORR}(r_1, r_2) = \frac{0.01}{\sqrt{0.01}\,\sqrt{0.04}} = \boxed{0.5}$$

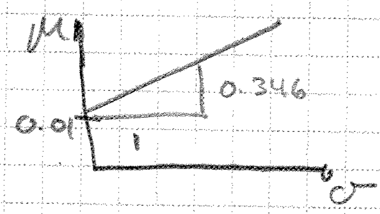
IFØLG (9.16) ER CML GITT VED

$$\sigma_p^2 = \frac{(\mu_p - r_0)^2}{(\mu - r_0)^T \Sigma^{-1} (\mu - r_0)}$$

DVS DA $(\mu - r_0)\Sigma^{-1}(\mu - r_0) = \begin{pmatrix} 0.03 \\ 0.06 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} = 0.12$

FÅR VI

$$\boxed{\mu_p = \underbrace{\sqrt{0.12}}_{0.346}\,\sigma_p + 0.01}$$



VI FÅR OGSÅ UTREGNET DÅ TG-PF VHA øverst p141

$$\mu_{TG} - r_0 = \frac{(\mu - r_0)^T \Sigma^{-1} (\mu - r_0)}{1\,\Sigma^{-1}\,(\mu - r_0)} = \frac{0.12}{0.03} = 0.04$$

OG SÅ (9.15)

$$x_{TG} = \frac{0.04 \begin{pmatrix} 2 \\ 1 \end{pmatrix}}{0.12} = \boxed{\begin{pmatrix} 2/3 \\ 1/3 \end{pmatrix}}$$

2b

$x = (1/3, 1/3, 1/3)$ SÅ $\mu_x = \frac{1}{3}(0.01 + 0.04 + 0.07) = 0.04$

og $\sigma_x^2 = x^T \Sigma x = 1^T \Sigma 1 / 9 = 0.07/9 = 0.00\overline{7}$

SÅ SHARPERATIO $SR_x = \dfrac{\mu_x - r_0}{\sigma_x} = \dfrac{0.03}{0.0882} = \boxed{0.3402}$

SR-DÅ TG-PF ER $\sqrt{0.12} = 0.3464$ = CML-helning

DA $SR_x < SR_{TG}$ ER x IKKE EFFISIENT

$$\beta_x = \frac{\mathrm{COV}(r_x, r_{TG})}{\sigma_{TG}^2} = \frac{(1/3, 1/3)\Sigma \begin{pmatrix} 2/3 \\ 1/3 \end{pmatrix}}{(2/3, 1/3)\Sigma \begin{pmatrix} 2/3 \\ 1/3 \end{pmatrix}} = \frac{0.01}{1/75} = \boxed{0.75}$$

CAPM $\underbrace{\mu_x - r_0}_{0.03} = \underbrace{\beta_x}_{0.75} \underbrace{(\mu_{TG} - r_0)}_{0.04}$ ✓ DET PASSER —

MEN DET SKAL DET DA REF. PF X_{TG} ER MV-EFF. (PROP. 33)

3a

$$E(Z(X-E_t(X))) \overset{\text{IT. FORV. (5.3)}}{=} E(E_t(Z(X-E_t(X))))$$

$\mathcal{F}_t$-mb ; (5.2)

$$= E(Z\{E_t(X)-E_t(X)\}) = E(Z\cdot 0) = 0$$

$E((X-Z)^2)$ (MINIMER)

$$= \underbrace{E((X-E_t)^2)}_{a} + \underbrace{2E((E_t(X)-Z)(X-E_t(X)))}_{b} + \underbrace{E((E_t(X)-Z)^2)}_{c}$$

DA $(E_t(X)-Z)$ ER $\mathcal{F}_t$ målelig i 1 del at $(b)=0$
a afhænger ikke af valget af Z
$c \geq 0$ OG FOR DET TILFÆLDE ($E_t(X)$ ER $\mathcal{F}_t$ målelig)
VÆLG $Z=E_t(X)$ ER DET 0. SÅ $Z=E_t(X)$
MINIMERER $E((X-Z)^2)$ OVER $\mathcal{F}_t$-mb Z'ER

4a H.S. i (2) $= S(0)E^{q'}\left(\frac{Call(1)}{S(1)}\right)$

$$= S(0)\left\{\frac{q'}{S(0)u}C^u + \frac{(1-q')}{S(0)d}C^d\right\} \quad (C^{u,d} = (S(0)u,d-K)^+)$$

$$= \frac{q'}{u}C^u + \frac{(1-q')}{d}C^d \quad (*)$$

VISER $(*2)$ = H.S. i (1)

$$(*) = \frac{1}{R}\left\{q\,C^u + \underbrace{\frac{1}{d}(R-uq)}_{(a)}C^d\right\} \quad \left(\text{def. af } q' \text{ IFT } q\right)$$

DA $q=\frac{R-d}{u-d}$ SÅ ER

$$a = \frac{1}{d}\left(\frac{R(u-d)}{u-d} - \frac{u(R-d)}{u-d}\right) = \frac{1}{d}\left(\frac{-dR+du}{u-d}\right) = \frac{u-R}{u-d} = 1-q$$

OG DERFOR

$$(*) = \frac{1}{R}\left(q\, C^u + (1-q)\, C^d \right)$$

$= $ H.S. i (1) $=$ ARB' FRI MODO-PRIS

4b VINDET

$$\frac{C^u}{u} = \frac{(u S(0) - K)^+}{u} = \left(S(0) - \frac{K}{u} \right)^+$$

$$\overset{(d \leq u)}{\geq} \left(S(0) - \frac{K}{d} \right)^+ = C^d$$

OG DA

$$Call(0) = q' \underbrace{\left(\frac{C_u}{u} - \frac{C_d}{d} \right)}_{\geq 0} + \frac{C^d}{d}$$

SÅ HOLDER UDSAGNET HVIS $\partial q' / \partial R \geq 0$

MEN

$$q' = \frac{u}{R}\, q = \frac{u}{R}\, \frac{R-d}{u-d} = u \cdot \frac{1 - d/R}{u-d}$$

SÅ

$$\frac{\partial q'}{\partial R} = \underbrace{\frac{u}{u-d}}_{>0} \times \frac{d}{R^2} > 0.$$

"AND WE'RE DONE"