5) $X = 20$

$r = 5\%$

$t = 0$ $\quad$ $t = 1$

$S = £20 \xrightarrow{?\ \to 62.5\%} S_u = S \times u = 24$ $\quad$ $u \to (1 + 20\%)$

$S = £20 \xrightarrow{?\ \to 37.5\%} S_d = S \times d = 16$ $\quad$ $d \to (1 - 20\%)$

→ if σ (volatility of the security) was given

$\Rightarrow u = e^{\sigma \cdot \sqrt{h}}$ $\quad$ $h \to$ i.e. 5 months → 5/12

$\Rightarrow d = 1/u$ $\quad$ → fractioned time of the year

→ you don't know the probabilities!

$\Rightarrow \pi \cdot S_u + (1 - \pi) \cdot S_d = S \cdot (1 + r)$

$\Rightarrow \pi \cdot 24 + (1 - \pi) \cdot 16 = 20 \cdot (1 + 5\%)$

$\Rightarrow 8\pi = 5$

$\Rightarrow \pi = 5/8 = 62.50\%$ → probability of increase

⇒ decrease → 37.5%

→ $V_u = £4$ → value of that option

→ $V_d = £0$

$$\Rightarrow \frac{62.50\% \times 4 + 37.5\% \times 0}{(1 + 5\%)} = £\,2.38$$

↳ discount it for year zero

6) $\sigma = 20\%$

$S = 600$

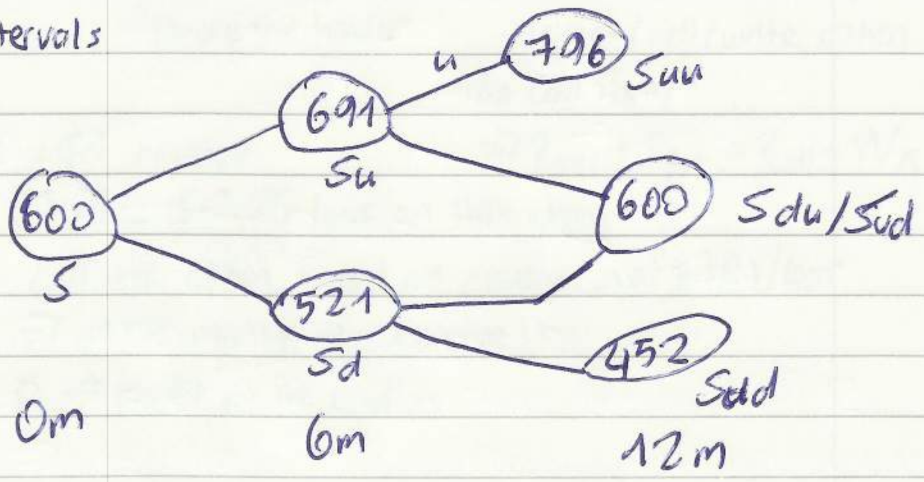
a) 6 month intervals

$u = e^{0.2\sqrt{6/12}}$

$u = 1.152$

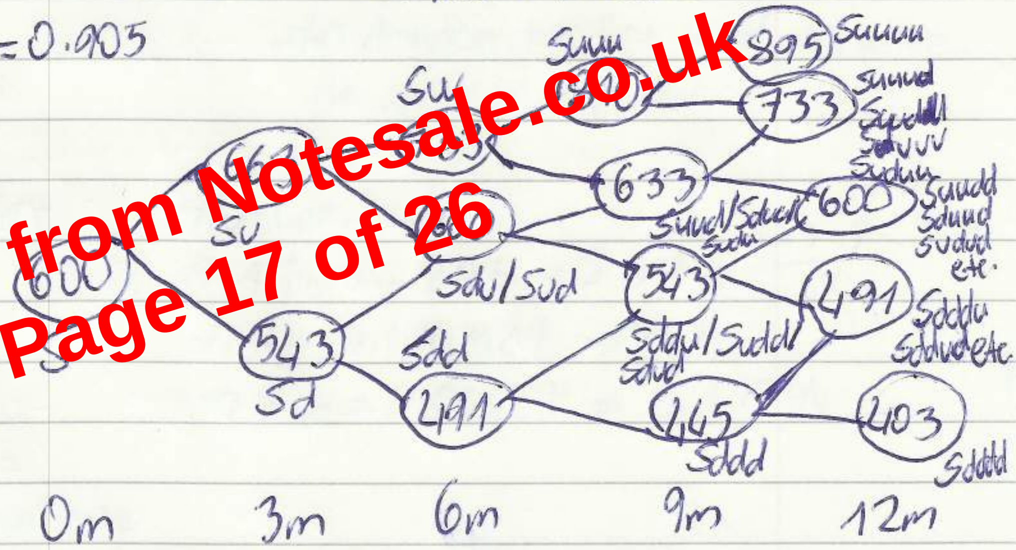
$d = 1/u$

$= 0.868$



b) $u = e^{0.2\sqrt{0.25}} = 1.105$ $\Rightarrow$ 3 month intervals

$d = 1/u = 0.905$



2) $S = 1.65$, $X = 1.85$, $t = 3m$, $R = 6\%$ annual, $\sigma = 0.46$

$\Rightarrow u = e^{\sigma\sqrt{h}} \rightarrow h = 3/12 = 1/4 \quad \Rightarrow e^{0.4\sqrt{3/12}} = 1.26$

$\Rightarrow d = 1/u \quad \Rightarrow 1/1.26 = 0.79$

$\Rightarrow$

$S = 1.65$ — $S_u = 1.65 \times 1.26 = 2.08 \Rightarrow V_u = 2.08 - 1.85 = 0.23$

$S = 1.65$ — $S_d = 1.65 \times 0.79 = 1.31 \Rightarrow V_d = 0$

$\Rightarrow \pi S_u + (1-\pi) S_d = (1+r) S$

$\Rightarrow 2.08\pi + (1-\pi)1.31 = 1.65(1 + 1.5\%)$

$\Rightarrow \pi = 0.474$

$$\Rightarrow \frac{V_u \times \pi + V_d \times (1-\pi)}{(1+r)}$$

$$\Rightarrow \frac{0.23 \times 0.474 + 0 \times 0.526}{(1+1.5\%)} = 0.1074$$

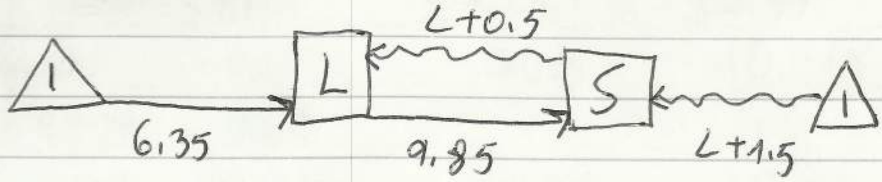
$\Rightarrow$ this value is only for one contract

$\Rightarrow V_{contract} = 5M \times 0.1074 = €537,044.34$

3)

	Fixed	Floating
L	6.35	L+0.5
S	9.85	L+1.5

L = LIBOR



a) $\Rightarrow 9.85 - 6.35 = 3.5\%$

$\Rightarrow (L+0.5) - (L+1.5) = -1\%$

$\Rightarrow$ spread differential if swap happens

$\Rightarrow 3.5 - 1 = 2.5\%$ $\Rightarrow$ this is the interval

$\Rightarrow$ no intermediary

$\Rightarrow$ in reality

$\Rightarrow$ S would not agree to this swap

b) assume L gets 1.5% and S gets 1% $\rightarrow$ from the interval

$9.8 - 1.5 = 8.35$

L $\rightarrow$ borrows at 6.35% from the bank and lends to S at 8.35%

S $\Rightarrow$ borrows at LIBOR + 1.5% and lends to L at 1%

$\Rightarrow$ L gains $= ((8.35) - 6.35) + (0.5 - 1) = 1.5\%$

$\Rightarrow$ S gains $= (1 - 1.5) + (9.85 - 8.35) = 1\%$