# Lab 5: Revision Week 16 – Week 21

**Question 1**:

Companies A and B face the following interest rates (adjusted for the differential impact of taxes):

| | US dollars (floating rate) | Canadian dollars (fixed rate) |
|---|---|---|
| Company A | LIBOR $+ 0.5\%$ | $5.0\%$ |
| Company B | LIBOR $+ 1.0\%$ | $6.5\%$ |

Assume that A wants to borrow U.S. dollars at a floating rate of interest and B wants to borrow Canadian dollars at a fixed rate of interest. A financial institution is planning to arrange a swap and requires a $50$-basis-point spread. If the swap is equally attractive to A and B, what rates of interest will A and B end up paying? Show your calculations and draw the scheme that represents the cash flows.

**Question 2**:

Demonstrate your calculations for the price of a 1-year European option to give up $100$ ounces of silver in exchange for $1$ ounce of gold. The current prices of gold and silver are $\$1{,}520$ and $\$16$, respectively; the risk-free interest rate is $10\%$ per annum; the volatilities $\sigma_1, \sigma_2$ for both commodity prices are $20\%$; and the correlation between the two prices is $\rho_{12} = 0.7$. Ignore storage costs. (You are given that $\sigma = \sqrt{\sigma_1^2 + \sigma_2^2 - 2\rho_{12}\sigma_1\sigma_2}$.)

**Question 3**:

Show by substituting for the various terms $(\Theta, \Delta, \Gamma, \Pi)$ in

$$\Theta + r \cdot S \cdot \Delta + \frac{1}{2} \cdot \sigma^2 \cdot S^2 \cdot \Gamma = r \cdot \Pi$$

that the equation is true for:

a) a single European call option on a non-dividend-paying stock,
b) a single European put option on a non-dividend-paying stock,
c) any portfolio of European put and call options on a non-dividend-paying stock.

**Question 4**:

The spread between the yield on a 3-year corporate bond and the yield on a similar risk-free bond is $50$ basis points. The recovery rate is $30\%$. Estimate the average hazard rate per year over the 3-year period.

**Question 5**:

Suppose that in Question 4, the spread between the yield on a 5-year bond issued by the same company and the yield on a similar risk-free bond is $60$ basis points. Assume the same recovery rate of $30\%$. Estimate the average hazard rate per year over the 5-year period. What do your results indicate about the average hazard rate in years 4 and 5?