MFE5130 – Financial Derivatives
Class Activity (11-October-2018) (Solution)

Important Notes:

1. This class activity is counted toward to your class participation score. **Fail** to hand in this class activity worksheet in the class will receive **0 score** for that class.

2. **0 mark** will be received if you leave the solution blank.

Name:	Student No.:

Problem 1

Consider a 3-year swap contract for oil, the notional amount of the contract is 100,000 barrels. The forward price for deliver in 1 year, 2 years and 3 years are $108, $115 and $120 per barrel respectively. The continuously compounded yield of 1-year, 2-year and 3-year zero-coupon bonds are 4%, 5% and 6% respectively. The fixed swap payment will be made at the end of each year.

a. Find the fixed swap price per barrel of oil in the swap.

b. **One year later**, suppose that the forward price for delivery in 1 year and 2 years become $105 and $110 respectively. The continuously compounded yield of 1-year and 2-year zero-coupon bonds change to 2% and 3% respectively. Find the market value of the swap in the perspective of long party.

Solution

(a)

Let R be the fixed swap price per barrel of oil

$$
\begin{aligned}
R &= \frac{P(0,1)108 + P(0,2)115 + P(0,3)120}{P(0,1) + P(0,2) + P(0,3)} \\
&= \frac{e^{-(4\%)(1)}108 + e^{-(5\%)(2)}115 + e^{-(6\%)(3)}120}{e^{-(4\%)(1)} + e^{-(5\%)(2)} + e^{-(6\%)(3)}} \\
&= 114.0562.
\end{aligned}
$$

(b)

Let R_{new} be the new fixed swap price per barrel of oil in the swap after 1 year.

$$
\begin{aligned}
R_{\text{new}} &= \frac{P(0,1)105 + P(0,2)110}{P(0,1) + P(0,2)} \\
&= \frac{e^{-(2\%)(1)}105 + e^{-(3\%)(2)}110}{e^{-(2\%)(1)} + e^{-(3\%)(2)}} \\
&= 107.45.
\end{aligned}
$$

The market value of the swap in the perspective of the long party

$$= 100,000(107.45 - 114.0562)[P(0,1) + P(0,2)]$$

$$= 100,000(107.45 - 114.0562)[e^{-(2\%)(1)} + e^{-(3\%)(2)}]$$

$$= -1,269,687.3337.$$