

# **FINM2002 Derivatives/FINM6041 Applied Derivatives**

## Tutorial 3 Question

### **Question 1**

Suppose the term structure of zero rates with continuous compounding is as follows

Maturity(years)	Rate (% p.a.)
1	8.0
2	7.5
3	7.2
4	7.0
5	6.9

Calculate forward interest rates for the second, third, fourth and fifth years.

### **Question 2**

This is a past exam question.

After the Evergrande was downgraded, the market expects that the Chinese central bank is very likely to reduce its interest rates to stabilize the real estate market. If that indeed happens, the term structure of the risk free rate will change accordingly to the following table (all rates are p.a., continuously compounded). Suppose you want to borrow ¥5,000 in 1 year for a period of 36 months, what is the forward rate for the required loan?

1 year	2 year	3 year	4 year	5 year
3%	2.5%	2%	1.5%	1%

## Question 3

Companies X and Y have been offered the following rates per annum on a \$5 million 10-year investment.

	Fixed	Floating
Company X	8.0%	BBSW
Company Y	8.8%	BBSW

Company X requires a fixed-rate investment; company Y requires a floating-rate investment. Design a swap where the swap bank will charge a commission of 0.2% per annum and the net gain will be equally shared between X and Y.

## Question 4

This is a past exam question.

The LIBOR rate is going to phase out starting from the end of 2021. As a replacement, the Secured Overnight Financing Rates (SOFR) has been selected by the U.S. Federal Reserve Bank to serve as a benchmark floating rate. However, unlike the LIBOR rates which by construction have incorporated the credit risk of the big banks, the SOFR rates are constructed based on risk-free treasury bonds and do not incorporate the credit risk of big banks. This difference indicates that the SOFR rates may not fully reflect the funding cost for the big banks, and hence not fully reflect the rates at which the banks should lend to their customers. As a solution, the SOFR administration suggests to use a dynamic credit risk premium add-on to SOFR rate. One such add-on that is widely recognized is called the Across-the-Curve Credit Spread Index (AXI). In practice, it is recommended that the big banks use SOFR plus AXI as a replacement of the LIBOR rate. Interest rate swaps contracts are among the applications of this new benchmark floating rate. Based on the above information, assume the following

Companies X and Y have been offered the following rates per annum on a \$5 million 10-year loan by the bank who has adopted the new benchmark floating rate.

	Fixed rate	Floating rate
Company X	4%	SOFR+AXI+1%
Company Y	7.5%	SOFR+AXI+2%

Company X requires a loan with floating rate borrowing cost.

Company Y requires a loan with fixed-rate borrowing cost.

Design a swap that the dealer bank can receive a commission fee of 0.5% p.a., and both companies X and Y will receive 50% of the net gain. Please answer the following questions:

- (1) Identify the comparative advantages for each of the two companies.
- (2) Compute the net gains from the swap, and how much each company will receive.
- (3) What are the final borrowing costs for each company? (You are not required to discuss the detail swap steps)

## Question 5

Under the terms of an interest rate swap, a financial institution has agreed to pay 10% per annum and to receive three-month BBSW in return on a notional principal of \$100 million with payments being exchanged every three months. The swap has a remaining life of 14 months.

The next interest payment is in two months. The term structure of zero rates is a constant for all maturities at 12% per annum, continuously compounded. The three-month BBSW rate one month ago was 11.8% per annum, compounded every 3 months. What is the value of the swap?