EXAMPLE 10.1: FRM EXAM 2002—QUESTION 27

A long position in a 2 × 5 FRA is equivalent to the following positions in the spot market:

a. Borrowing in two months to finance a five-month investment
b. Borrowing in five months to finance a two-month investment
c. Borrowing half a loan amount at two months and the remainder at five months
d. Borrowing in two months to finance a three-month investment

EXAMPLE 10.2: FRM EXAM 2005—QUESTION 57

ABC, Inc., entered a forward rate agreement (FRA) to receive a rate of 3.75% with continuous compounding on a principal of USD 1 million between the end of year 1 and the end of year 2. The zero rates are 3.25% and 3.50% for one and two years. What is the value of the FRA when the deal is just entered?

a. USD 35,629
b. USD 34,965
c. USD 664
d. USD 0

EXAMPLE 10.3: FRM EXAM 2001—QUESTION 70

Consider the buyer of a 6 × 9 FRA. The contract rate is 6.35% on a notional amount of $10 million. Calculate the settlement amount of the *seller* if the settlement rate is 6.85%. Assume a 30/360-day count basis.

a. −12,500
b. −12,290
c. +12,500
d. +12,290

EXAMPLE 10.4: FRM EXAM 2009—QUESTION 3-11

The yield curve is upward sloping. You have a short T-bond futures position. The following bonds are eligible for delivery:

Bond	A	B	C
Spot price	102-14/32	106-19/32	98-12/32
Coupon	4%	5%	3%
Conversion factor	0.98	1.03	0.952

The futures price is 103-17/32 and the maturity date of the contract is September 1. The bonds pay their coupon semiannually on June 30 and December 31. The cheapest to deliver bond is:

a. Bond A
b. Bond B
c. Bond C
d. Insufficient information

EXAMPLE 10.5: FRM EXAM 2009—QUESTION 3-23

Which of the following statements related to forward and futures prices is *true*?

a. If the forward price does not equal the futures price, arbitragers will exploit this arbitrage opportunity.
b. The level of interest rates determines whether the forward price is higher or lower than the futures price.
c. The volatility of interest rates determines whether the forward price is higher or lower than the futures price.
d. Whether the forward price will be higher or lower than the futures price depends on correlation between interest rate and futures price.

EXAMPLE 10.6: FRM EXAM 2007—QUESTION 80

Consider a forward rate agreement (FRA) with the same maturity and compounding frequency as a Eurodollar futures contract. The FRA has a LIBOR underlying. Which of the following statements is *true* about the relationship between the forward rate and the futures rate?

a. The forward rate is normally higher than the futures rate.
b. They have no fixed relationship.
c. The forward rate is normally lower than the futures rate.
d. They should be exactly the same.

EXAMPLE 10.7: FRM EXAM 2005—QUESTION 51

Consider the following information about an interest rate swap: two-year term, semiannual payment, fixed rate = 6%, floating rate = LIBOR + 50 basis points, notional USD 10 million. Calculate the net coupon exchange for the first period if LIBOR is 5% at the beginning of the period and 5.5% at the end of the period.

a. Fixed-rate payer pays USD 0.
b. Fixed-rate payer pays USD 25,000.
c. Fixed-rate payer pays USD 50,000.
d. Fixed-rate payer receives USD 25,000.

EXAMPLE 10.8: FRM EXAM 2000—QUESTION 55

Bank XYZ enters into a five-year swap contract with ABC Co. to pay LIBOR in return for a fixed 8% rate on a principal of $100 million. Two years from now, the market rate on three-year swaps at LIBOR is 7%. At this time ABC Co. declares bankruptcy and defaults on its swap obligation. Assume that the net payment is made only at the end of each year for the swap contract period. What is the market value of the loss incurred by Bank XYZ as a result of the default?

a. $1.927 million
b. $2.245 million
c. $2.624 million
d. $3.011 million

EXAMPLE 10.9: FRM EXAM 2009—QUESTION 3-4

A bank entered into a three-year interest rate swap for a notional amount of USD 250 million, paying a fixed rate of 7.5% and receiving LIBOR annually. Just after the payment was made at the end of the first year, the continuously compounded spot one-year and two-year LIBOR rates are 8% and 8.5%, respectively. The value of the swap at that time is closest to

- **a.** USD 14 million
- **b.** USD −6 million
- **c.** USD −14 million
- **d.** USD 6 million

EXAMPLE 10.10: FRM EXAM 2002—QUESTION 22

An interest rate cap runs for 12 months based on three-month LIBOR with a strike price of 4%. Which of the following is generally *true*?

- **a.** The cap consists of three caplet options with maturities of three months, the first one starting today based on three-month LIBOR set in advance and paid in arrears.
- **b.** The cap consists of four caplets starting today, based on LIBOR set in advance and paid in arrears.
- **c.** The implied volatility of each caplet will be identical no matter how the yield curve moves.
- **d.** Rate caps have only a single option based on the maturity of the structure.

EXAMPLE 10.11: FRM EXAM 2004—QUESTION 10

The payoff to a swap where the investor receives fixed and pays floating can be replicated by all of the following *except*

- **a.** A short position in a portfolio of FRAs
- **b.** A long position in a fixed-rate bond and a short position in a floating-rate bond
- **c.** A short position in an interest rate cap and a long position in a floor
- **d.** A long position in a floating-rate note and a short position in a floor

EXAMPLE 10.12: FRM EXAM 2003—QUESTION 27

A portfolio management firm manages the fixed-rate corporate bond portfolio owned by a defined-benefit pension fund. The duration of the bond portfolio is five years; the duration of the pension fund's liabilities is seven years. Assume that the fund sponsor strongly believes that rates will decline over the next six months and is concerned about the duration mismatch between portfolio assets and pension liabilities. Which of the following strategies would be the best way to eliminate the duration mismatch?

    a. Enter into a swap transaction in which the firm pays fixed and receives floating.
    b. Enter into a swap transaction in which the firm receives fixed and pays floating.
    c. Purchase an interest rate cap expiring in six months.
    d. Sell Eurodollar futures contracts.

EXAMPLE 10.13: FRM EXAM 2003—QUESTION 56

As your company's risk manager, you are looking for protection against adverse interest rate changes in five years. Using Black's model for options on futures to price a European swap option (swaption) that gives the option holder the right to cancel a seven-year swap after five years, which of the following would you use in the model?

    a. The two-year forward par swap rate starting in five years' time
    b. The five-year forward par swap rate starting in two years' time
    c. The two-year par swap rate
    d. The five-year par swap rate

EXAMPLE 10.14: FRM EXAM 2007—QUESTION 95

To hedge against future, unanticipated, and significant increases in borrowing rates, which of the following alternatives offers the greatest flexibility for the borrower?

a. Interest rate collar
b. Fixed for floating swap
c. Call swaption
d. Interest rate floor

EXAMPLE 10.15: FRM EXAM 2009—QUESTION 2-24

The yield curve is upward sloping and a portfolio manager has a long position in 10-year Treasury notes funded through overnight repurchase agreements. The risk manager is concerned with the risk that market rates may increase further and reduce the market value of the position. What hedge could be put on to reduce the position's exposure to rising rates?

a. Enter into a 10-year pay-fixed and receive-floating interest rate swap.
b. Enter into a 10-year receive-fixed and pay-floating interest rate swap.
c. Establish a long position in 10-year Treasury note futures.
d. Buy a call option on 10-year Treasury note futures.

10.6 ANSWERS TO CHAPTER EXAMPLES

Example 10.1: FRM Exam 2002—Question 27

b. An FRA defined as $t_1 \times t_2$ involves a forward rate starting at time t_1 and ending at time t_2. The buyer of this FRA locks in a borrowing rate for months 3 to 5. This is equivalent to borrowing for five months and reinvesting the funds for the first two months.

Example 10.2: FRM Exam 2005—Question 57

d. The market-implied forward rate is given by $\exp(-R_2 \times 2) = \exp(-R_1 \times 1 - F_{1,2} \times 1)$, or $F_{1,2} = 2 \times 3.50 - 1 \times 3.25 = 3.75\%$. Given that this is exactly equal to the quoted rate, the value must be zero. If instead this rate was 3.50%, for example, the value would be $V = \$1,000,000 \times (3.75\% - 3.50\%) \times (2 - 1) \exp(-3.50\% \times 2) = 2,331$.

Example 10.3: FRM Exam 2001—Question 70

b. The seller of an FRA agrees to receive fixed. Since rates are now higher than the contract rate, this contract must show a loss for the seller. The loss is $\$10,000,000 \times (6.85\% - 6.35\%) \times (90/360) = \$12,500$ when paid in arrears (i.e., in nine months). On the settlement date (i.e., brought forward by three months), the loss is $\$12,500/(1 + 6.85\% \times 0.25) = \$12,290$.

Example 10.4: FRM Exam 2009—Question 3-11

b. The cost of delivering each bond is the price divided by the conversion factor. This gives, respectively, $(102 + 14/32)/0.98 = 104.53$, 103.49, and 103.55. Hence the CTD is bond B. All other information is superfluous.

Example 10.5: FRM Exam 2009—Question 3-23

d. Forward rates may not equal futures rates due to the correlation between the interest rate, or reinvestment rate, and the futures contract profit. As seen in Equation (10.4), the volatility determines the size of the bias but not the direction.

Example 10.6: FRM Exam 2007—Question 80

c. Equation (10.4) shows that the futures rate exceeds the forward rate.

Example 10.7: FRM Exam 2005—Question 51

b. The floating leg uses LIBOR at the beginning of the period, plus 50bp, or 5.5%. The payment is given by $\$10,000,000 \times (0.06 - 0.055) \times 0.5 = 25,000$.

Example 10.8: FRM Exam 2000—Question 55

c. Using Equation (10.9) for three remaining periods, we have the discounted value of the net interest payment, or $(8\% - 7\%)\$100m = \$1m$, discounted at 7%, which is $\$934,579 + \$873,439 + \$816,298 = \$2,624,316$.

Example 10.9: FRM Exam 2009—Question 3-4

d. This question differs from the previous one, which gave the swap rate. Here, we have the spot rates for maturities of one and two years. The coupon is 7.5. The net present value (NPV) of the payments is then $V = \$18.75\exp(-1 \times 8\%) + (\$250 + \$18.75)\exp(-2 \times 8.5\%) = \$244$ million. Right after the reset, the value of the FRN is $250 million, leading to a gain of $6 million. This is a gain because the bank must pay a fixed rate but current rates are higher.

Example 10.10: FRM Exam 2002—Question 22

a. Interest rate caps involve multiple options, or caplets. The first one has terms that are set in three months. It locks in $Max[R(t + 3) - 4\%, 0]$. Payment occurs in arrears in six months. The second one is a function of $Max[R(t + 6) - 4\%, 0]$. The third is a function of $Max[R(t + 9) - 4\%, 0]$ and is paid at $t + 12$. The sequence then stops because the cap has a term of 12 months only. This means there are three caplets.

Example 10.11: FRM Exam 2004—Question 10

d. A receive-fixed swap position is equivalent to being long a fixed-rate bond, or being short a portfolio of FRAs (which gain if rates go down), or selling a cap and buying a floor with the same strike price (which gains if rates go up). A short position in a floor does not generate a gain if rates drop. It is asymmetric anyway.

Example 10.12: FRM Exam 2003—Question 27

b. The manager should increase the duration of assets, or buy coupon-paying bonds. This can be achieved by entering a receive-fixed swap, so b. is correct and a. is wrong. Buying a cap will not provide protection if rates drop. Selling Eurodollar futures will lose money if rates drop.

Example 10.13: FRM Exam 2003—Question 56

a. The forward rate should start at the beginning of the option in five years, with a maturity equal to the duration of the option, or two years.

Example 10.14: FRM Exam 2007—Question 95

c. A swaption gives the borrower the flexibility to lock in a low rate. A regular swap does not offer flexibility as an option. A collar fixes a range of rates, but not much flexibility. A floor involves protection if rates go down, not up. (Note that buying a cap would have been another good choice.)

Example 10.15: FRM Exam 2009—Question 2-24

a. The bond position has positive duration. Entering a pay-fixed swap gains if rates go up; this negative duration can provide a hedge against the original position. Answer b. is thus incorrect. Answer c. is the same as the original position and is not a hedge. In answer d., a call on futures would not create a profit if rates go up, in which case the futures would go down. Buying a put would be a correct answer.