2019 FRM Part I

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金融市场与产品

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3. Financial Market and Products

3.1. Key Point: Spot Rate and Forward Rate

3.1.1. 重要知识点

- Forward rates are interest rates implied by the spot curve for a specified future period. The forward rate between T1 and T2 can be calculated as:

$$(1+Z_1)^{T_1}(1+F_{1,2})^{(T_2-T_1)} = (1+Z_2)^{T_2}$$

$$e^{Z_1T_1} \times e^{F_{1,2}(T_2-T_1)} = e^{Z_2T_2} \Rightarrow F_{1,2} = \frac{Z_2T_2 - Z_1T_1}{T_2 - T_1}$$

3.1.2. 基础题

Q-1. The zero rate of three years is 4.6%, the zero rate of four years is 5.0%. Please calculate the 1-year forward rate three years from today (continuous compuanding).

A. 6.2%

B. 6.0%

C. 5.5%

D. 4.8%

Q-2. The interest rate for a 1-year period is 5% and the rate for a 2-year period is 6%. Assuming continuous compounding, what is the forward rate for the period from the end of the first year to the second year?

A. 6.9991%

B. 7.0000%

C. 7.0009%

D. 8.0000%

Q-3. Given the following bonds and forward rates:

Maturity	YTM	Coupon	Price
1 year	4.5%	0%	95.694
2 years	7%	0%	87.344
3 years	9%	0%	77.218

- 1-year forward rate one year from today = 9.56%
- 1-year forward rate two years from today = 10.77%
- 2-year forward rate one year from today = 11.32%

Which of the following statements about the forward rates, based on the bond prices, is true?

A. The 1-year forward rate one year from today is too low.

B. The 2-year forward rate one year from today is too high.

C. The 1-year forward rate two years from today is too low.

D. The forward rates and bond prices provide no opportunities for arbitrage.

Q-4. Below is a table of term structure of swap rates:

Maturity in Years	Swap Rate
1	2.50%
2	3.00%
3	3.50%
4	4.00%
5	4.50%

The 2-year forward swap rate starting in three years is closest to:

A. 3.50%

B. 4,50%

C. 5.51%

D. 6.02%

3.2. Key Point: Bond Pricing

3.2.1. 重要知识点

3.2.1.1. Bond Pricing

$$P = \frac{C_1}{1+y} + \frac{C_2}{(1+y)^2} + \cdots + \frac{C_T}{(1+y)^T} = \sum_{t=1}^{T} \frac{C_t}{(1+y)^t}$$

3.2.1.2. Perpetual Bond

$$P = \frac{cF}{1+y} + \frac{cF}{(1+y)^2} + \cdots = \sum_{t=1}^{+\infty} \frac{cF}{(1+y)^t} = \frac{cF}{y}$$

3.2.1.3. Clean Price & Dirty Price

- Dirty price = clean price + accrued price

3.2.2. 基础题

Q-5. Given a one-year and a three-year zero coupon bonds price of 95.18 and 83.75 respectively, what should be the price of a two year zero coupon bond using linear interpolation on zero rates (semiannual compounding)?

A. 95.18

B. 89.47

C. 89.72

D. 83.75

Q-6. A two-year zero-coupon bond issued by corporate XYZ is currently rated A. One year from

now XYZ is expected to remain at A with 85% probability, upgraded to AA with 5% probability, and downgraded to BBB with 10% probability. The risk free rate is flat at 4%. The credit spreads are flat at 40, 80, and 150 basis points for AA, A, and BBB rated issuers, respectively. All rates are compounded annually. Estimate the expected value of the zero-coupon bond one year from now (for USD 100 face amount).

A. USD 92.59
B. USD 95.33
C. USD 95.37
D. USD 95.42

Q-7. A $1,000 par corporate bond carries a coupon rate of 6%, pays coupons semiannually, and has ten coupon payments remaining to maturity. Market rates are currently 5%. There are 90 days between settlement and the next coupon payment. The dirty and clean prices of the bond, respectively, are closest to:

A. $1,043.76, $1,013.76
B. $1,043.76, $1,028.76
C. $1,056.73, $1,041.73
D. $1,069.70, $1,054.70

3.3. Key Point: Corporate Bonds

3.3.1. 基础题

Q-8. As it relates to the bond indenture, the corporate trustee acts in a fiduciary capacity for:

I. bond investors
II. bond issuers
III. bond underwriters
IV. regulators

A. I only
B. II only
C. I and IV
D. II and III

Q-9. TRSC, a trust company specializing in corporate investments, is brought in as a corporate trustee for a recent bond issue made by Banko, a small investment bank. Which of the following statements about TRSC and its role as a third party to the indenture is correct?

A. TRSC must monitor Banko's financial situation to foresee any covenant breaches.
B. When deemed necessary, TRSC should take action beyond the terms of the indenture in

order to protect bondholders.

C. TRSC must take action according to the terms of the indenture whenever it is requested by bondholders.

D. TRSC is paid by Banko to represent the interests of the bondholders.

Q-10. Relative to coupon-bearing bonds of same maturity, zero-coupon bonds are NOT subject to which type of risk?

A. Interest rate risk

B. Credit risk

C. Reinvestment risk

D. Liquidity risk

Q-11. Which of the following statements regarding the trustee named in a corporate bond indenture is correct?

A. The trustee has the authority to declare a default if the issuer misses a payment.

B. The trustee may take action beyond the indenture to protect bondholders.

C. The trustee must act at the request of a sufficient number of bondholders.

D. The trustee is paid by the bondholders or their representatives.

3.4. Key Point: Exchange VS. Over the Counter Market

3.4.1. 基础题

Q-12. Which of the following statements is an advantage of an exchange trading system? On an exchange system:

A. Terms are not specified.

B. Trades are made in such a way as to reduce credit risk.

C. Participants have flexibility to negotiate.

D. In the event of a misunderstanding, calls are recorded between parties.

3.5. Key Point: Forward Rate Agreement (FRA)

3.5.1. 重要知识点

- A long FRA position benefits from an increase in rates. A short FRA positions similar to a long position in a bond.

3.5.2. 基础题

Q-13. A long position in a FRA 2 × 5 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.

Q-14. 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

3.6. Key Point: Margin

3.6.1. 重要知识点

3.6.1.1. Initial Margin

- Must be deposited when contract is initiated

3.6.1.2. Marking to Market

- At the end of each trading day, margin account is adjusted to reflect gains or losses.

3.6.1.3. Maintenance Margin

- Investor can withdraw funds in the margin account in excess of the initial margin. A maintenance margin guarantees that the balance in the margin account never gets negative (the maintenance margin is lower than the initial margin).

3.6.1.4. Margin Call

- When the balance in the margin account falls below the maintenance margin, broker executes a margin call. The next day, the investor needs to "top up" the margin account back to the initial margin level.

3.6.1.5. Variation margin

- Extra funds deposited by the investor after receiving a margin call.
- Variation margin = initial margin – margin account balance

3.6.2. 基础题

Q-15. To utilize the cash position of assets under management, a portfolio manager enters into a long futures position on the S&P 500 index with a multiplier of 250. The cash position is $15 million with the current futures value of 1000, which requires the manager to long

60 contracts. If the current initial margin is $12500 per contract, and the current maintenance margin is $10000 per contract, what variation margin does the portfolio manager have to advance if the futures contract value falls to $995 at the end of the first day of the position being placed?

A. $30,000
B. $0
C. $300,000
D. $75,000

Q-16. In late June, John purchased two December gold futures contracts. Each contract size is 5,000 ounces of silver and the futures price on the date of purchase was USD 18.62 per ounce. The required initial margin is USD 6,000 and a maintenance margin of USD 4,500. You are given the following price history for the December silver futures:

Day	Futures Price	Daily Gain
June 29	18.62	0
June 30	18.69	700
July 1	18.03	-6600
July 2	17.72	-3100
July 6	18.00	2800
July 7	17.70	-3000
July 8	17.60	-1000

On which days did John receive a margin call?

A. July 1 only
B. July 1 and July 2 only
C. July 1, July 2 and July 7 only
D. July 1, July 2 and July 8 only

Q-17. Assume you enter into 5 long futures contracts to buy July gold for $1,400 per ounce. A gold futures contract size is 100 troy ounces. The initial margin is $14,000 per contract and the maintenance margin is 75% of the initial margin. What change in the futures price of gold will lead to a margin call?

A. $35 drop
B. $70 drop
C. $175 drop
D. $350 drop

3.7. Key Point: Order Terms

3.7.1. 重要知识点

3.7.1.1. Market Order

- The market order is a simple (the simplest) request to execute the trade immediately at the best available price.

3.7.1.2. Limit Order

- A limit order specifies a particular price. The order can be executed only at this price or at one more favorable to the investor.

3.7.1.3. Stop Loss

- The order is executed at the best available price once a bid or offer is made at that particular price or a less-favorable price.

3.7.1.4. Stop-Limit

- The order becomes a limit order as soon as a bid or offer is made at a price equal to or less favorable than the stop price.

3.7.1.5. Market-if-Touched

- A market-if-touched (MIT) order is executed at the best available price after a trade occurs at a specified price or at a price more favorable than the specified price.

3.7.1.6. Discretionary

- A market order except that execution may be delayed at the broker's discretion in an attempt to get a better price.

3.7.2. 基础题

Q-18. Assume you have a long position in a stock with a current market price of $35. You have two goals. First, to retain ownership as long as the stock continues to go up. Second, to exit the position completely if the stock drops below $30. Which order best meets your dual objectives?

A. Sell market order
B. Sell limit order at $37
C. Stop-loss sell order at $30
D. Stop-and-limit sell order at $30

Q-19. An investor with a long position in a futures contract wants to issue instructions to close out the position. A market-if-touched order would be used if the investor wants to:

A. Execute at the best available price once a trade occurs at the specified or better price.
B. Execute at the best available price once a bid/offer occurs at the specified or worse price.

C. Allow a broker to delay execution of the order to get a better price.

D. Execute the order immediately or not at all.

3.8. Key Point: T-bond futures, CTD bond

3.8.1. 重要知识点

- In a T-bond futures contract, any government bond with more than 15 years to maturity on the first of the delivery month (and not callable within 15 years) is deliverable on the contract.
- The procedure to determine which bond is the cheapest-to-deliver (CTD) is as follows:
- Cash received by the short = (QFP × CF) + AI
- Cost to purchase bond = QBP + AI
- Where:
- QFP = quoted futures price
- CF = conversion factor
- QBP = quoted bond price
- The CTD is the bond that minimizes the following: QBP – (QFP × CF). This formula calculates the cost of delivering the bond.

3.8.2. 基础题

Q-20. 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

Q-21. A German housing corporation needs to hedge against rising interest rates. It has chosen to use futures on 10-year German government bonds. Which position in the futures

should the corporation take, and why?

A. Take a long position in the futures because rising interest rates lead to rising futures prices.
B. Take a short position in the futures because rising interest rates lead to rising futures prices.
C. Take a short position in the futures because rising interest rates lead to declining futures prices.
D. Take a long position in the futures because rising interest rates lead to declining futures prices.

3.9. Key Point: Eurodollar Futures

3.9.1. 重要知识点

- This contract settles in cash and the minimum price change is one "tick", which is a price change of one basis point, or $25 per $1 million contract.
- The interest rate underlying this contract is essentially the 3-month (90-day) forward LIBOR. If Z is the quoted price for a Eurodollar futures contract, the contract price is:
- Eurodollar futures price = $10,000[100 – (0.25)(100 – Z)] = 10,000[100 – 0.25F_t]
- Convexity adjustment: The daily marking to market aspect of the futures contract can result in differences between actual forward rates and those implied by futures contracts.
- Forward rate = Futures rate – $0.5 \times \sigma^2 \times T_1 \times T_2$

3.9.2. 基础题

Q-22. Consider an FRA (forward rate agreement) with the same maturity and compounding frequency as a Eurodollar futures contract. The FRA has labor underlying. Which of the following statements are 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.

Q-23. The four-year Eurodollar futures quote is 97.00. The volatility of the short-term interest rate (LIBOR) is 1.0%, expressed with continuous compounding. What is the equivalent forward rate, adjusted for convexity, given in ACT/360 day count with continuous

compounding (i.e., the Eurodollar futures contract gives LIBOR in quarterly compounding ACT/360, so convert to continuous but a day count conversion is not needed)?

A. 2.90%

B. 2.95%

C. 2.99%

D. 3.00%

3.10. Key Point: Cost-of-Carry Model

3.10.1. 重要知识点

- Reflection of market sentiment;
- Forward price when underlying asset does not have cash flows: $F_0 = S_0e^{rT}$
- Forward price when underlying asset has cash flows: $F_0 = (S_0 – I)e^{rT}$
- Forward price with continuous dividend yield (q): $F_0 = S_0e^{(r-q)T}$
- Forward price with storage costs: $F_0 = (S_0 + U)e^{rT}$ or $F_0 = S_0e^{(r+u)T}$
- Forward price with convenience yield: $F_0 = S_0e^{(r-c)T}$
- Arbitrage: Remember to buy low, sell high.
- If $F_0 > S_0e^{rT}$, borrow, buy spot, sell forward today; deliver asset, repay loan at end.
- If $F_0 < S_0e^{rT}$, short spot, invest, buy forward today; collect loan, buy asset under futures contract, deliver to cover short sale.
- Interest Rate Parity
- $F_0 = S_0e^{(r-r_f)T}$

3.10.2. 基础题

Q-24. A stock index is valued at USD 750 and pays a continuous dividend at the rate of 2% per annum. The 6-month futures contract on that index is trading at USD 757. The risk free rate is 3.50% continuously compounded. There are no transaction costs or taxes. Is the futures contract priced so that there is an arbitrage opportunity? If yes, which of the following numbers comes closest to the arbitrage profit you could realize by taking a position in one futures contract?

A. 4.18

B. 1.35

C. 12.60

D. There is no arbitrage opportunity.

Q-25. A trader in the arbitrage unit of a multinational bank finds that an asset is trading at USD 1,000, the price of a 1-year futures contract on that asset is USD 1,010, and the price of

a 2-year futures contract is USD 1,025. Assume that there are no cash flows from the asset for 2 years. If the term structure of interest rates is flat at 1% per year, which of the following is an appropriate arbitrage strategy?

A. Short 2-year futures and long 1-year futures
B. Short 1-year futures and long 2-year futures
C. Short 2-year futures and long the underlying asset funded by borrowing for 2 years
D. Short 1-year futures and long the underlying asset funded by borrowing for 1 year

Q-26. A risk manager is deciding between buying a futures contract on an exchange and buying a forward contract directly from a counterparty on the same underlying asset. Both contracts would have the same maturity and delivery specifications. The manager finds that the futures price is less than the forward price. Assuming no arbitrage opportunity exists, what single factor acting alone would be a realistic explanation for this price difference?

A. The futures contract is more liquid and easier to trade.
B. The forward contract counterparty is more likely to default.
C. The asset is strongly negatively correlated with interest rates.
D. The transaction costs on the futures contract are less than on the forward contract.

Q-27. A 15-month futures contract on an equity index is currently trading at USD 3,767.52. The underlying index is currently valued at USD 3,625 and has a continuously-compounded dividend yield of 2% per year. The continuously compounded risk-free rate is 5% per year. Assuming no transactions costs, what is the potential arbitrage profit per contract and the appropriate strategy?

A. USD 189, buy the futures contract and sell the underlying.
B. USD 4, buy the futures contract and sell the underlying.
C. USD 189, sell the futures contract and buy the underlying.
D. USD 4, sell the futures contract and buy the underlying.

Q-28. A risk analyst at a commodities trading firm is examining the supply and demand conditions for various commodities and is concerned about the volatility of the forward prices for silver in the medium term. Currently, silver is trading at a spot price of USD 20.35 per troy ounce and the six-month forward price is quoted at USD 20.50 per troy ounce. Assuming that after six months the lease rate rises above the continuously compounded interest rate, which of the following statements is correct about the shape of the silver forward curve after six months?

A. The forward curve will be downward sloping.

B. The forward curve will be upward sloping.

C. The forward curve will be flat.

D. The forward curve will be humped.

Q-29. Current spot CHF/USD rate: 1.3680 (1.3680CHF = 1USD)

3-month USD interest rates: 1.05%

3-month Swiss interest rates: 0.35%

(Assume continuous compounding)

A currency trader notices that the 3-month future price is USD 0.7350. In order to arbitrage, the trader should investment:

A. Borrow CHF, buy USD spot, go long CHF futures

B. Borrow CHF, sell CHF spot, go short CHF futures

C. Borrow USD, buy CHF spot, go short CHF futures

D. Borrow USD, sell USD spot, go long CHF futures

Q-30. You are examining the exchange rate between the U.S. dollar and the Euro and have the following information:

- Current USD/EUR exchange rate is 1.25.
- Current USD-denominated 1-year risk-free interest rate is 4% per year.
- Current EUR-denominated 1-year risk-free interest rate is 7% per year.

According to the interest rate parity theorem, what is the 1-year forward USD/EUR exchange rate?

A. 0.78

B. 0.82

C. 1.21

D. 1.29

3.11. Key Point: Contango and Backwardation

3.11.1. 重要知识点

3.11.1.1. Backwardation

- Refers to a situation where the futures price is below the spot price. For this to occur, there must be a significant benefit to holding the asset.

3.11.1.2. Contango

- Refers to a situation where the futures price is above the spot price. If there are no benefits to holding the asset (e.g., dividends, coupons, or convenience yield),

contango will occur because the futures price will be greater than the spot price.

3.11.2. 基础题

Q-31. The current price of Commodity X in the spot market is $42.47. Forward contracts for delivery of Commodity X in one year are trading at a price of $43.11. If the current continuously compounded annual risk-free interest rate is 7.0%, calculate the implicit lease rate for Commodity X. Holding the calculated implicit lease rate constant, would the forward market for Commodity X be in backwardation or contango if the continuously compounded annual risk-free rate immediately fell to 5.0%?

A. The implicit lease rate is 1.49%. Holding this rate constant, the forward market would be in contango if the continuously compounded annual risk-free rate immediately fell to 5.0%.

B. The implicit lease rate is 5.50%. Holding this rate constant, the forward market would be in backwardation if the continuously compounded annual risk-free rate immediately fell to 5.0%.

C. The implicit lease rate is 1.49%. Holding this rate constant, the forward market would be in backwardation if the continuously compounded annual risk-free rate immediately fell to 5.0%.

D. The implicit lease rate is 5.50%. Holding this rate constant, the forward market would be in contango if the continuously compounded annual risk-free rate immediately fell to 5.0%.

Q-32. In commodity markets, the complex relationships between spot and forward prices are embodied in the commodity price curve. Which of the following statements is true?

A. In a backwardation market, the discount in forward prices relative to the spot price represents a positive yield for the commodity supplier.

B. In a backwardation market, the discount in forward prices relative to the spot price represents a positive yield for the commodity consumer.

C. In a contango market, the discount in forward prices relative to the spot price represents a positive yield for the commodity supplier.

D. In a contango market, the discount in forward prices relative to the spot price represents a positive yield for the commodity consumer.

Q-33. A commodities trader observes quotes for futures contracts as follow:

Spot Price	321
July, 2014	312

October, 2014	310
December, 2014	309

This commodity is trading:

A. As a normal futures market since the futures prices are consistent with the commodity's seasonality.

B. As an inverted futures market since more distant delivery contracts are trading at lower prices than nearer-term ones.

C. As a normal futures market because it is typical for more distant delivery contracts to trade lower than nearer-term delivery contracts.

D. Consistently with convergence as futures prices will rise when the delivery period nears.

3.12. Key Point: Forward Contract Value

3.12.1. 基础题

Q-34. Three months ago a company entered in a one-year forward contract to buy 100 ounces of gold. At the time, the one-year forward price was USD 1,000 per ounce. The nine-month forward price of gold is now USD 1,050 per ounce. The continuously-compounded risk-free rate is 4% per year for all maturities and there are no storage costs. Which of the following is closest to the value of the contract?

A. USD5,000

B. USD 4,852

C. USD 7,955

D. USD1,897

Q-35. A French bank enters into a 6-month forward contract with an importer to sell GBP 40 million in 6 months at a rate of EUR 0.80 per GBP. If in 6 months the exchange rate is EUR 0.85 per GBP, what is the payoff for the bank from the forward contract?

A. EUR -2,941,176

B. EUR -2,000,000

C. EUR 2,000,000

D. EUR 2,941,176

Q-36. Company XYZ operates in the U.S. On April 1, 2009, it has a net trade receivable of EUR 5,000,000 from an export contract to Germany. The company expects to receive this amount on Oct. 1, 2009. The CFO of XYZ wants to protect the value of this receivable. On April 1, 2009, the EUR spot rate is 1.34, and the 6-month EUR forward rate is 1.33. The CFO can lock in an exchange rate by taking a position in the forward contract.

Alternatively, he can sell a 6-month EUR 5,000,000 call option with strike price of 1.34. The CFO thinks that selling an option is better than taking a forward position because if the EUR goes up, XYZ can take delivery of the USD at 1.34, which is better than the outright forward rate of 1.33. If the EUR goes down, the contract will not be exercised. So, XYZ will pocket the premium obtained from selling the call option.

What can be concluded about the CFO's analysis?

A. CFO's analysis is correct. The company is better off whichever way the EUR rate goes.

B. CFO's analysis is not correct. The company will suffer if the EUR goes up sharply.

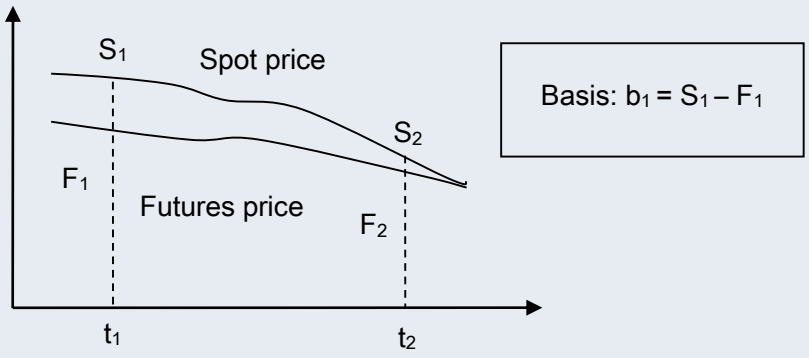
C. CFO's analysis is not correct. The company will suffer if the EUR moves within a narrow range.

D. CFO's analysis is not correct. The company will suffer if the EUR goes down sharply.

3.13. Key Point: Basis and Basis Risk

3.13.1. 重要知识点

- Define the basis and the various sources of basis risk, and explain how basis risks arise when hedging with futures.



- The profit on the futures position is $F_1 - F_2$.
- The effective price that is obtained for the asset with hedging is therefore: $S_2 + F_1 - F_2 = F_1 + b_2$; The value of F_1 is known at time t_1. If b_2 were also known at this time, a perfect hedge would result. The hedging risk is the uncertainty associated with b_2 and is known as basis risk.

3.13.2. 基础题

Q-37. Which of the following statements are true with respect to basis risk?

I. Basis risk arises in cross-hedging strategies but there is no basis risk when the underlying asset and hedge asset are identical.

II. Short hedge position benefits from unexpected strengthening of basis.

III. Long hedge position benefits from unexpected strengthening of basis.

A. I and II

B. I and III

C. II only

D. III only

Q-38. A buffalo farmer is concerned that the price he can get for his buffalo herd will be less than he has forecasted. To protect himself from price declines in the herd, the farmer has decided to hedge with live cattle futures. Specifically, he has entered into the appropriate number of cattle future position for September delivery that he believes will help offset any buffalo price declines during the winter slaughter season. The appropriate position and the likely sources of basis risk in the hedge are, respectively:

A. Short; choice of futures delivery date.

B. Short; choice of futures asset.

C. Short; choice of futures delivery date and asset.

D. Long; choice of futures delivery date and asset.

Q-39. You wish to hedge an investment in Zirconium using futures. Unfortunately, there are no futures that are based on this asset. To determine the best futures contract for you to hedge with, you run a regression of daily changes in the price of Zirconium against daily changes in the prices of similar assets which do have futures contracts associated with them. Based on your results, futures tied to which asset would likely introduce the least basis risk into your hedging position?

Change in price of Zirconium = α+ β (Change in price of Asset)			
Asset	**α**	**β**	**R^2**
A	1.25	1.03	0.62
B	0.67	1.57	0.81
C	0.01	0.86	0.35
D	4.56	2.30	0.45

A. Asset A

B. Asset B

C. Asset C

D. Asset D

Q-40. Imagine a stack-and-roll hedge of monthly commodity deliveries that you continue for the next five years. Assume the hedge ratio is adjusted to take into effect the mistiming of cash flows but is not adjusted for the basis risk of the hedge. In which of the following

situations is your calendar basis risk likely to be greatest?

A. Stack and roll in the front month in oil futures.
B. Stack and roll in the 12-month contract in natural gas futures.
C. Stack and roll in the 3-year contract in gold futures.
D. All four situations will have the same basis risk.

Q-41. Pear, Inc. is a manufacturer that is heavily dependent on plastic parts shipped from Malaysia. Pear wants to hedge its exposure to plastic price shocks over the next 7 ½ months. Futures contracts, however, are not readily available for plastic. After some research, Pear identifies futures contracts on other commodities whose prices are closely correlated to plastic prices. Futures on Commodity A have a correlation of 0.85 with the price of plastic, and futures on Commodity B have a correlation of 0.92 with the price of plastic. Futures on both Commodity A and Commodity B are available with 6-month and 9-month expirations. Ignoring liquidity considerations, which contract would be the best to minimize basis risk?

A. Futures on Commodity A with 6 months to expiration
B. Futures on Commodity A with 9 months to expiration
C. Futures on Commodity B with 6 months to expiration
D. Futures on Commodity B with 9 months to expiration

3.14. Key Point: Hedging Strategy

3.14.1. 重要知识点

3.14.1.1. Optimal Hedge Ratio

$$h^* = \rho \frac{\sigma_S}{\sigma_F}$$

3.14.1.2. Hedge Effectiveness

$$R^2 = h^{*2} \frac{\sigma_F^2}{\sigma_S^2}$$

3.14.1.3. Optimal Number of Futures Contracts

$$N^* = \frac{h^* N_A}{Q_F}$$

3.14.1.4. Hedging with Stock Index Futures

$$N^* = \beta \times \frac{P}{A}$$

3.14.1.5. Adjusting Portfolio Beta

- $\#\text{ of contracts} = (\text{target beta - portfolio beta}) \times \frac{\text{portfolio value}}{\text{underlying asset}}$

3.14.1.6. Duration-Based Hedge Ratio

- $$\#\ \text{of contracts} = -\frac{\text{portfolio value} \times \text{duration}_{\text{p}}}{\text{futures value} \times \text{duration}_{\text{F}}}$$

3.14.2. 基础题

Q-42. The hedge ratio is the ratio of derivatives to a spot position (or vice versa that achieves an objective such as minimizing or eliminating risk. Suppose that the standard deviation of quarterly changes in the price of a commodity is 0.57, the standard deviation of quarterly changes in the price of a futures contract on the commodity is 0.85, and the correlation between the two changes is 0.3876. What is the optimal hedge ratio for a 3-month contract?

A. 0.1893

B. 0.2135

C. 0.2381

D. 0.2599

Q-43. On Nov 1, Jimmy Walton, a fund manager of a USD 60 million US medium-to-large cap equity portfolio, considers locking up the profit from the recent rally. The S&P 500 index and its futures with the multiplier of 250 are trading at 900 and 910, respectively. Instead of selling off his holdings, he would rather hedge two-thirds of his market exposure over the remaining 2 months. Given that the correlation between Jimmy's portfolio and the S&P 500 index futures is 0.89 and the volatilities of the equity fund and the futures are 0.51 and 0.48 per year respectively, what position should he take to achieve his objective?

A. Sell 250 futures contracts of S&P 500

B. Sell 169 futures contracts of S&P 500

C. Sell 167 futures contracts of S&P 500

D. Sell 148 futures contracts of S&P 500

Q-44. The current value of the S&P 500 index futures is 1457, and each S&P futures contract is for delivery of 250 times the index. A long-only equity portfolio with market value of USD 300,100,000 has beta of 1.1. To reduce the portfolio beta to 0.75, how many S&P futures contract should you sell?

A. 288 contracts

B. 618 contracts

C. 906 contracts

D. 574 contracts

Q-45. A trader executes a $420 million 5-year pay fixed swap (duration 4.433) with one client and a $385 million 10 year receive fixed swap (duration 7.581) with another client shortly afterwards. Assuming that the 5-year rate is 4.15% and 10-year rate is 5.38% and that all contracts are transacted at par, how can the trader hedge his position?

A. Buy 4,227 Eurodollar contracts

B. Sell 4,227 Eurodollar contracts

C. Buy 7,185 Eurodollar contracts

D. Sell 7,185 Eurodollar contracts

Q-46. A bronze producer will sell 1,000 mt (metric tons) of bronze in three months at the prevailing market price at that time. The standard deviation of the change in the price of bronze over a 3-month period is 2.6%. The company decided to use 3-month futures on copper to hedge the exposure. The copper futures contract is for 25mt of copper. The standard deviation of the futures price is 3.2%. The correlation between 3-month changes in the futures price and the price of bronze is 0.77. To hedge its price exposure, how many futures contracts should the company buy/sell?

A. Sell 38 futures

B. Buy 25 futures

C. Buy 63 futures

D. Sell 25 futures

3.15. Strip Hedge and Stack Hedge

3.15.1. 基础题

Q-47. An oil producer has an obligation under an agreement to supply 75,000 barrels of oil every month for one year at a fixed price. He wishes to hedge his liability to address the event of an upward surge in oil prices. The producer has opted for a stack and roll hedge rather than a strip hedge. Which of the following two statements are correct?

I. A strip hedge increases transaction costs owing to active trading each month.

II. A strip hedge tends to have wider bid-ask spreads as compared to a stack & roll hedge.

A. I only

B. II only

C. I and II

D. Neither

3.16. Swaps

3.16.1. 重要知识点

3.16.1.1. Interest Rate Swap

- Plain vanilla interest rate swap: exchanges fixed for floating-rate payments over the life of the swap.
- At inception, the value of the swap is zero.
- After inception, the value of the swap is the difference between the present value of the remaining fixed-and floating-rate payments:

$$V_{\text{swap to pay fixed}} = B_{\text{float}} - B_{\text{fix}}$$

$$V_{\text{swap to receive fixed}} = B_{\text{fix}} - B_{\text{float}}$$

$$B_{\text{fixed}} = (PMT_{\text{fixed},t_1} \times e^{-rt_1}) + (PMT_{\text{fixed},t_2} \times e^{-rt_2}) + \ldots + [(\text{notional} + PMT_{\text{fixed},t_n}) \times e^{-rt_n}]$$

$$B_{\text{floating}} = [\text{notional} + (\text{notional} \times r_{\text{float}})] \times e^{-rt_1}]$$

3.16.1.2. Currency Swaps

$$V_{\text{swap}}(DC) = B_{DC} - (S_0 \times B_{FC})$$

3.16.1.3. Swaptions

- OTC options that give the buyer the right to enter a swap at a fixed point in time at specified terms.

3.16.2. 基础题

Q-48. Consider a $1 million notional swap that pays a floating rate based on 6-month LIBOR and receives a 6% fixed rate semiannually. The swap has a remaining life of 15 months with pay dates at 3, 9 and 15 months. Spot LIBOR rates are as following: 3 months at 5.4%; 9 months at 5.6%; and 15 months at 5.8%. The LIBOR at the last payment date was 5.0%. Calculate the value of the swap to the fixed-rate receiver using the bond methodology.

A. $6,077

B. -$6,077

C. -$5,077

D. $5,077

Q-49. Two companies, C and D, have the borrowing rates shown in the following table.

Borrowing Rates for C and D		
Company	Fixed Borrowing	Floating Borrowing

C	10%	LIBOR+ 50bps
D	12%	LIBOR+ 100bps

According to the comparative advantage argument, what is the total potential savings for C and D if they enter into an interest rate swap?

A. 0.5%

B. 1.0%

C. 1.5%

D. 2.0%

Q-50. An oil driller recently issued USD 250 million of fixed-rate debt at 4.0% per annum to help fund a new project. It now wants to convert this debt to a floating-rate obligation using a swap. A swap desk analyst for a large investment bank that is a market maker in swaps has identified four firms interested in swapping their debt from floating-rate to fixed-rate. The following table quotes available loan rates for the oil driller and each firm:

Firm	Fixed-rate (in %)	Floating-rate (in %)
Oil driller	4.0	6-month LIBOR + 1.5
Firm A	3.5	6-month LIBOR + 1.0
Firm B	6.0	6-month LIBOR + 3.0
Firm C	5.5	6-month LIBOR + 2.0
Firm D	4.5	6-month LIBOR + 2.5

A swap between the oil driller and which firm offers the greatest possible combined benefit compared with the driller directly issues a floating debt and the counterparty financed with a fixed rate?

A. Firm A

B. Firm B

C. Firm C

D. Firm D

Q-51. Savers Bancorp entered into a swap agreement over a 2-year period on August 9, 2008, with which it received a 4.00% fixed rate and paid LIBOR plus 1.20% on a notional amount of USD 6.5 million. Payments were to be made every 6 months. The table below displays the actual annual 6-month LIBOR rates over the 2-year period.

Date	6-month LIBOR
Aug 9	3.11%
Feb 9	1.76%
Aug 9	0.84%

Feb 9	0.39%
Aug 9	0.58%

Assuming no default, how much did Savers Bancorp receive on August 9, 2010?

A. USD 72,150

B. USD 78,325

C. USD 117,325

D. USD 156,650

Q-52. Your company is expecting a major export order from a London-Based client. The receivables under the contract are to be billed in GBP, while your reporting currency is USD. Since the order is a large sum, your company does not want to bear the exchange risk and wishes to hedge it using derivatives. To minimize the cost of hedging, which of the following is the most suitable contract?

A. A chooser option for GBP/USD pair

B. A currency swap where you pay fixed in USD and receive floating in GBP

C. A barrier put option to sell GBP against USD

D. An Asian call option on GBP against USD

Q-53. Consider the following 3-year currency swap, which involves exchanging annual interest of 2.75% on 10 million US dollars for 3.75% on 15 million Canadian dollars. The CAD/USD spot rate is 1.52. The term structure is flat in both countries. Calculate the value of the swap in USD if interest rates in Canada are 5% and in the United States are 4%. Assume continuous compounding. Round to the nearest dollar.

A. $152,000

B. $145,693

C. $131,968

D. $127,818

Q-54. As an asset manager, Sarah Peck wishes to reduce her exposure to fixed-income securities and increase her exposure to large-cap stocks. She enters into an equity swap with a dealer on the terms that she will pay the dealer a fixed rate of 5% and receive from him the return on the large-cap stock index. Assume that payments are made annually and that the notional principal is EUR 50 million. If the large-cap stock index had a value of 10,320 at the beginning of the year and a value of 11,219 at the end of the year, what is the net payment made at the end of the year and which party makes the net payment?

	Net payment made	Party making net payment
A.	EUR 1.86 million	Asset manager
B.	EUR 2.50 million	Dealer
C.	EUR 1.86 million	Dealer
D.	EUR 2.50 million	Asset manager

Q-55. 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.

3.17. Foreign Currency Risk

3.17.1. 重要知识点

A net long (short) currency position means a bank faces the risk that the FX rate will fall (rise) versus the domestic currency.

net currency exposure = (assets – liabilities) + (bought – sold)

3.17.2. 基础题

Q-56. Samantha Fore, FRM, is examining foreign asset-liability positions that are mismatched in individual currencies at regional financial institutions. Fore is specifically looking at the overall currency exposure of the western region consisting of three banks: Mountain West、 First Interstate, and Glacier Bank. Given the uncertainty in non-U.S. markets, Fore is concerned about a euro collapse.

	Mountain West	**First Interstate**	**Glacier Bank**
EUR Assets	1,350,000	500,000	875,000
EUR Liabilities	2,000,000	400,000	1,550,000
EUR Bought	275,000	150,000	2,450,000
EUR Sold	650,000	375,000	1,875,000

On an aggregate basis, how would this region’s euro exposure be characterized?

A. The aggregate euro exposure faces the risk that the euro will rise in value against the domestic currency.

B. The aggregate euro exposure faces the risk that the euro will fall in value against the domestic currency.

C. The banks, collectively, are net long euros.

D. The banks, collectively, are close to evenly matched and face little euro exposure.

3.18. Basic Characteristics of Option

3.18.1. 重要知识点

3.18.1.1.

- **Option Factors & Pricing Bounds**

Factor	European Call	European Put	American Call	American Put
S	+	-	+	-
X	-	+	-	+
T	?	?	+	+
σ	+	+	+	+
r	+	-	+	-
D	-	+	-	+

Option	Proxy	Min Value	Max value
European call	c	$\max(0, S_0 - Xe^{-rT})$	S_0
American call	C	$\max(0, S_0 - Xe^{-rT})$	S_0
European put	p	$\max(0, Xe^{-rT} - S_0)$	Xe^{-rT}
American put	P	$\max(0, X - S_0)$	X

3.18.1.2. Rules for Exercising American

- It is never optimal to exercise an American call on a non-dividend-paying stock before its expiration date
- American puts can be optimally exercised early if they are sufficiently in-the-money.
- An American call on a dividend-paying stock may be exercised early if the dividend exceeds the amount of forgone interest.

3.18.1.3. Put-call Parity

European option: $p + S = c + Xe^{-rT}$

American option: $S - X \le C - P \le S - Xe^{-rT}$

3.18.2. 基础题

Q-57. An American investor holds a portfolio of French stocks. The market value of the portfolio is €10 million, with a beta of 1.35 relative to the CAC index. In November, the spot value of the CAC index is 4,750. The exchange rate is USD 1.25/€. The dividend yield, euro interest rates, and dollar interest rates are all equal to 4%. Which of the following option strategies would be most appropriate to protect the portfolio against a decline of the euro that week? March Euro options (all prices in US dollars per €)

Strike	Call Euro	Put Euro
1.25	0.018	0.022

A. Buy calls with a premium of USD 180,000
B. Buy puts with a premium of USD 220,000
C. Sell calls with a premium of USD 180,000
D. Sell puts with a premium of USD 220,000

Q-58. The current stock price of a share is USD 100 and the continuously compounding risk-free rate is 12% per year. The maximum possible prices for a 3-month European call option, American call option, European put option, and American put option, all with strike price oust 90, are:

A. 100,100,87.34, 90
B. 100,100,90, 90
C. 97.04,100, 90, 90
D. 97.04, 97.04, 87.34, 87.34

Q-59. Consider an American call option and an American put option, each with 3 months to maturity, written on a non-dividend-paying stock currently priced at USD 40. The strike price for both options is USD 35 and the risk-free rate is 1.5%. What are the lower and upper bounds on the difference between the prices of the call and put options?

Scenario	Lower Bound (USD)	Upper Bound (USD)
A	5.13	40.00
B	5.00	5.13
C	34.87	40.00
D	0.13	34.87

A. Scenario A
B. Scenario B

C. Scenario C

D. Scenario D

Q-60. Jeff is an arbitrage trader, and he wants to calculate the implied dividend yield on a stock while looking at the over-the-counter price of a 5-year put and call (both European-style) on that same stock. He has the following data:

- Initial stock price = USD 85
- Strike price = USD 90
- Continuous risk-free rate = 5%
- Underlying stock volatility = unknown
- Call price = USD 10
- Put price = USD 15

What is the continuous implied dividend yield of that stock?

A. 2.48%

B. 4.69%

C. 5.34%

D. 7.71%

Q-61. Stock UGT is trading at USD 100. A 1-year European call option on UGT with a strike price of USD 80 is trading at USD 30. No dividends are being paid in the following year. What should be the lower bound for an American put option on UGT with a strike price of USD 80, in order to not have arbitrage opportunities? Assume a continuously-compounded risk-free rate of 4% per year.

A. 6.1

B. 7.7

C. 5.7

D. 6.9

Q-62. The price of a six-month, USD 25 strike price, European call option on a stock is USD 3. The stock price is USD 24. A dividend of USD 1 is expected in three months. The continuously compounded risk-free rate for all maturities is 5% per year. Which of the following is closest to the value of a put option on the same underlying stock with a strike price of USD 25 and a time to maturity of six months?

A. USD 3.60

B. USD 2.40

C. USD 4.37

D. USD 1.63

3.19. Trading Strategies Involving Options

3.19.1. 基础题

Q-63. Consider the following bearish option strategy of buying one at-the-money put with a strike price of $43 for $6, selling two puts with a strike price of $37 for $4 each and buying one put with a strike price of $32 for $1. If the stock price plummets to $19 at expiration, calculate the net profit/loss per share of the strategy.

A. -2.00 per share
B. Zero – no profit or loss
C. 1.00 per share
D. 2.00 per share

Q-64. An investor owns a stock and is bullish over the short term. Which of the following strategies will be the most appropriate one for this investor if the primary concern is to make a bet on the volatility of the stock?

A. A covered call
B. A protective put
C. An at-the-money strip
D. An at-the-money strap

Q-65. Which option combination most closely simulates the economics of a short position in a futures contract?

A. Payoff of a long call plus a short put
B. Profit of a long call plus a short put
C. Payoff of a long put plus short call
D. Profit of long put plus short call

Q-66. A butterfly spread involves positions in options with three difference strike prices. It can be created by buying a call option with a low strike of X1; buying a call option with a high strike X3; and selling two call options with a strike X2 halfway between X1 and X3. What can be said about the upside and downside of the strategy?

A. Both the upside and downside is unlimited.
B. Both the upside and downside is limited.
C. The upside is unlimited but the downside is limited.
D. The upside is limited but the downside is unlimited.

Q-67. The payoff on a calendar spread is most similar to which of the following option strategies?

A. Bull spread
B. Bear spread
C. Long straddle
D. Butterfly spread

Q-68. A stock is trading at USD 100. A box spread with 1 year to expiration and strikes at USD 120 and USD150 is trading at USD 20. The price of 1-year European call option with strike USD 120 is USD 5 and the price of a European put option with same strike and expiration is USD 25. What strategy exploits an arbitrage opportunity, if any?

A. Short one put, short one unit of spot, buy one call, and buy six units box spread.
B. Buy one put, short one unit of spot, short one call, and buy four units of box spread.
C. Buy one put, buy one unit of spot, short one call, and short six units of box spread.
D. There are no arbitrage opportunities.

Q-69. An investor sells a January 2014 call on the stock of XYZ Limited with a strike price of USD 50 for USD 10, and buys a January 2014 call on the same underlying stock with a strike price of USD 60 for USD 2. What is the name of this strategy, and what is the maximum profit and loss the investor could incur at expiration?

	Strategy	Maximum Profit	Maximum Loss
A.	Bear spread	USD 8	USD 2
B.	Bull spread	USD 8	Unlimited
C.	Bear spread	Unlimited	USD 2
D.	Bull spread	USD 8	USD 2

3.20. Exotic Options

3.20.1. 重要知识点

3.20.1.1.

- **Compound option: option on another option.**

  Call on a call: right to buy a call option at a set price for a set period of time.

  Call on a put: right to buy a put option at a set price for a set period of time.

  Put on a call: right to sell a call option at a set price for a set period of time.

  Put on a put: right to sell a put option at a set price for a set period of time.

3.20.1.2.

- **Chooser option:** owner chooses whether option is call or put after initiation.

3.20.1.3.

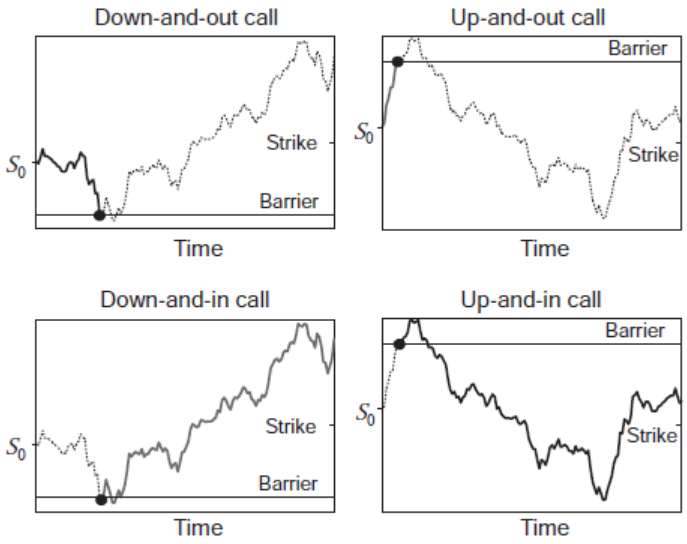
- **Barrier option:** payoff and existence depend on price reaching a certain barrier level.

  Down-and-out call (put): ceases to exist if the underlying asset price hits the barrier level, which is set below the current stock value.

  Down-and-in call (put): only comes into existence if the underlying asset price hits the barrier level, which is set below the current stock value.

  Up-and-out call (put): ceases to exist if the underlying asset price hits a barrier level, which is set above the current stock value.

  Up-and-in call (put): only comes into existence if the underlying asset price hits the above – current stock – price barrier level.



Paths for Knock-Out and Knock-In Call Options

3.20.1.4.

- **Binary option:** pay either nothing or a fixed amount.
- **Cash-or-nothing call:** a fixed amount, Q, is paid if the asset ends up above the strike price. $N(d_2)$ is the probability of the asset price being above the strike price, the value of a cash-or-nothing call is equal to

$$Qe^{-rT}N(d_2)$$

- **Asset-or-nothing call:** pays the value of the stock when the contract is initiated if the stock price ends up above the strike price at expiration. The corresponding value for this option is

$$S_0e^{-qT}N(d_1)$$

3.20.1.5.

- **Lookback option:** payoff depends on the maximum (call) or minimum (put) value of the underlying asset over the life of the option. Can be fixed or floating depending on the specification of a strike price.

- **Lookback option:** payoff depends on the maximum (call) or minimum (put) value of the underlying asset over the life of the option. Can be fixed or floating depending on the specification of a strike price.
- **Shout option:** owner receives intrinsic value of option at shout date or expiration, whichever is greater.
- **Asian option:** payoff depends on average of the underlying asset price over the life of the option; less volatile than standard option.
- **Basket options:** options to purchase or sell baskets of securities. These baskets may be defined specifically for the individual investor and may be composed of specific stocks, indices, or currencies. Any exotic options that involve several different assets are more generally referred to as rainbow options. (One example is the bond futures contract traded on the CBOT (described in Level I). The party with the short position is allowed to choose between a large numbers of different bonds when making delivery.)

3.20.2. 基础题

Q-70. A cash-or-nothing call (also known as a digital call) pays a fixed amount to the buyer if the asset finishes above the strike price. Assume that at the end of a 1-year investment horizon, the stock is equal to $50, the fixed payment amount is equal to $45, and $N(d_1)$ and $N(d_2)$ from the Black-Scholes-Merton model are equal to 0.9767 and 0.9732, respectively. The value of this cash-or-nothing call when the risk-free rate equals 3% is closest to:

A. $5
B. $42
C. $44
D. $47

Q-71. A trader writes the following 1-year European-style barrier options as protection against large movements in a non-dividend paying stock that is currently trading at EUR 40.96.

Option	Price (EUR)
Up-and-in barrier call, with barrier at EUR 45	3.52
Up-and-out barrier call, with barrier at EUR 45	1.24
Down-and-in barrier put, with barrier at EUR 35	2.00
Down-and-out barrier put, with barrier at EUR 35	1.01

All of the options have the same strike price. Assuming the risk-free rate is 2% per annum, what is the common strike price of these options?

A. EUR 39.00

B. EUR 40.00

C. EUR 41.00

D. EUR 42.00

Q-72. A 1-year forward contract on a stock with a forward price of USD 100 is available for USD 1.50. The table below lists the prices of some barrier options on the same stock with a maturity of 1 year and strike of USD 100. Assuming a continuously compounded risk-free rate of 5% per year what is the price of a European put option on the stock with a strike of USD 100.

Option	Price
Up-and-in barrier call, barrier USD 95	USD 5.21
Up-and-out barrier call, barrier USD 95	USD 1.40
Down-and-in barrier put, barrier USD 80	USD 3.5

A. USD 2.00

B. USD 4.90

C. USD 5.11

D. USD 6.61

Q-73. You are an institutional portfolio manager. One of your clients is very interested in the flexibility of options but expresses great concern about the high cost of some of them. In general, which of the following options would be the least costly to purchase?

A. Shout options

B. American options

C. Lookback options

D. Bermudan options

Q-74. You believe that a stock will increase in price and would like to buy a call option. You would like to choose the date during the option's term when the option payoff is determined. However, if the option payoff is greater at the option's maturity, you want to be paid this value. What type of option should you buy?

A. Chooser option

B. Compound option

C. Shout option

D. Asian option

Q-75. Looking at a risk report. Mr. Woo finds that the options book of Ms. Yu has only long

positions and yet has a negative delta. He asks you to explain how that is possible. What is a possible explanation?

A. The book has a long position in up-and-in call options.
B. The book has a long position in binary options.
C. The book has a long position in up-and-out call options.
D. The book has a long position in down-and-out call options.

Q-76. Of the following options, which one does not benefit from an increase in the stock price when the current stock price is $100 and the barrier has not yet been crossed:

A. A down-and-out call with out barrier at $90 and strike at $110
B. A down-and-in call with in barrier at $90 and strike at $110
C. An up-and-in put with barrier at $110 and strike at $100
D. An up-and-in call with barrier at $110 and strike at $100

Q-77. Vega is the sensitivity of an option's price to changes in volatility. Increases in an underlying instrument's volatility will usual increase the value of options since increases in volatility produce a greater probability that an option will find its way into the money. Of the four options listed below, which investment has the potential to produce a negative Vega measure?

A. Shout option
B. Call option
C. Put option
D. Barrier option

3.21. Mortgage and MBS

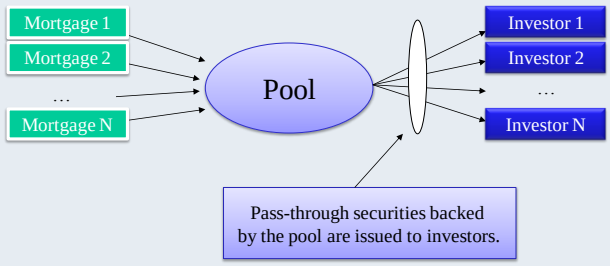
3.21.1. 重要知识点

3.21.1.1.

- **Fixed Rate Mortgage Payments**

$$X\sum_{n=1}^{12T}\frac{1}{\left(1+\frac{y}{12}\right)^{n}}=B(0);\ X\frac{12}{y}\left[1-\frac{1}{\left(1+\frac{y}{12}\right)^{12T}}\right]=B(0)$$

- **Mortgage Pass-through Securities**



- **Prepayment of Mortgage Loans**

$$\mathrm{CPR_n} = 1 - (1 - \mathrm{SMM_n})^{12}$$

- **Dollar Rolls**

Consider an investor who has just purchased a mortgage pool but wants to finance that purchase over the next month. One alternative is an MBS repo. The investor could sell the repo, i.e., sell the pool today while simultaneously agreeing to repurchase it after a month.

An alternative for financing mortgages is the dollar roll. The buyer of the roll sells a TBA for one settlement month and buys the same TBA for the following settlement month. Two differences: 1) The buyer of the roll may not get back in the later month the same pool delivered in the earlier month. 2) The buyer of the roll does not receive any interest or principal payments from the pool over the roll.

3.21.2. 基础题

Q-78. If a pool of mortgage loans begins the month with a balance of $10,500,000, has a scheduled principal payment of $54,800, and ends the month with a balance of $9,800,000, what is the CPR for this mouth?

A. 6.18%

B. 42.24%

C. 53.47%

D. 66.67%

Q-79. How would you describe the typical price behavior of a low premium mortgage pass-through security?

A. It is similar to a U.S. Treasury bond.

B. It is similar to a plain-vanilla corporate bond.

C. When interest rates fall, its price increase would exceed that of a comparable duration U.S. Treasury bond.

D. When interest rates fall, its price increase would lag that of a comparable duration U.S. Treasury bond.

Q-80. Bennett Bank extends a 5% APR (annual percentage rate) USD 100,000 30-year mortgage requiring monthly payments. If the mortgage is structured so that it requires interest-only payments for the first 5 years, after which point it becomes a self-amortizing mortgage, what would be the portion of the monthly payment applied to the principal in the 61st month?

A. USD 167.92
B. USD 174.60
C. USD 584.59
D. USD 591.27

Q-81. A fixed-income portfolio manager purchases a seasoned 5.5% agency mortgage-Backed security with a weighted average loan age of 60 months. The current balance on the loans is USD 20 million, and the conditional prepayment rate is assumed to be constant at 0.4% per year. Which of the following is closest to the expected principal prepayment this month?

A. USD 1,000
B. USD 7,000
C. USD 10,000
D. USD 70,000

Q-82. Consider an investor who wants to finance the purchase of a mortgage pool over a one month period. One alternative is to sell an MBS repo, in which case the investor could sell the pool today while simultaneously agreeing to repurchase it after a month. This trade has the same economics as a secured loan: the investor effectively borrows cash today by posting the pool as collateral, and upon paying back the loan with interest after a month, retrieves the collateral. An alternative is the “dollar roll”. In the dollar roll, the buyer of the roll sells a TBA for one settlement month (the “earlier month”) and buys the same TBA for the following settlement month (the “later month”).

For example, the investor who just purchased a 30-year 4% FNMA pool might sell the FNMA 30-year 4% January TBA and buy the FNMA 30-year 4% February TBA. Delivering the pool just purchased through the sale of the January TBA, which raises cash, and purchasing a pool through the February TBA, which returns cash, is very close to the economics of a secured loan.

But there are two important differences between dollar roll and repo financing:

I. The buyer of the roll may not get back in the later month the same pool delivered in the earlier month. The buyer of the roll delivers a particular pool, for example, in January but

will have to accept whatever eligible pool is delivered in the next February. By contrast, an MBS repo seller is always returned the same pool that was originally posted as collateral.

II. The buyer of the roll does not receive any interest or principal payments from the pool over the roll. For example, the buyer of the Jan/Feb roll, who delivers the pool in January, does not receive the January payments of interest and principal. By contrast, a repo seller receives any payments of interest and principal over the life of the repo. While the prices of TBA contracts reflect the timing of payments, so that the buyer of a roll does not, in any sense, lose a month of payments relative to a repo seller, the risks of the two transactions are different. The buyer of a roll does not have any exposure to prepayments over the month being higher or lower than what had been implied by TBA prices while the repo seller does.

Which of these two differences is (are) correct?

A. Neither is correct.

B. I is true but II is incorrect.

C. I is incorrect but II is true.

D. Both are correct.

Q-83. Mortgage-Backed securities (MBS) are a class of securities where the underlying is a pool of mortgages. Assume that the mortgages are insured, so that they do not have default risk. The mortgages have prepayment risk because the borrower has the option to repay the loan early (at any time) usually due to favorable interest rate changes. From an investor's point of view, a mortgage-backed security is equivalent to holding a long position in a non-prepayable mortgage pool and which of the following?

A. A long American call option on the underlying pool of mortgages.

B. A short American call option on the underlying pool of mortgages.

C. A short European put option on the underlying pool of mortgages.

D. A long American put option on the underlying pool of mortgages.

Q-84. Jack recently completed a Monte Carlo simulation analysis of a CMO tranche. Jack's analysis includes six equally weighted paths, with the present value of each calculated using four different discount rates, which are shown in the following table. If the actual market price of the CMO tranche being valued is 70.17, what is the tranche's option-adjusted spared (OAS)?

Representative Path	PV if Spread is 50 bps	PV if Spread is 60 bps	PV if Spread is 70 bps	PV if Spread is 75 bps

1	70	68	66	65
2	73	70	68	66
3	68	66	64	63
4	71	69	68	67
5	77	75	73	71
6	75	73	71	70

A. 50 basis points

B. 60 basis points

C. 70 basis points

D. 75 basis points

Q-85. In regard to the prepayment option embedded in a mortgage, the borrower (the homeowner) is most similar to:

A. Corporate issuer of a bond with a put option

B. Corporate issuer of a bond with a call option

C. Corporate issuer of a bond with an interest rate cap

D. Corporate issuer of a bond with an interest rate floor

Q-86. A homeowner has a 30-year, 5% fixed-rate mortgage with a current balance of USD 250,000. Mortgage rates have been decreasing. If the existing mortgage was refinanced into a new 30-years, 4% fixed rate mortgage, which of the following is closest to the amount that the homeowner would save in monthly mortgage payments?

A. USD 145

B. USD 150

C. USD 155

D. USD 160

3.22. CCPs

3.22.1. 重要知识点

- **Central Counterparties (CCPs):**
  When trades are centrally cleared, a CCP becomes the seller to a buyer and the buyer to a seller.
- **Advantages of CCPs:**
  Transparency, offsetting, loss mutualization, legal and operational efficiency, liquidity, and default management.
- **Disadvantages of CCPs:**

Moral hazard, adverse selection, separation of cleared and non-cleared products, and margin procyclicality.

- **Risks faced by CCPs:**

  Default risk, model risk, liquidity risk, operational risk, and legal risk.

Default of a clearing member and its flow through effects is the most significant risk for a CCP

3.22.2. 基础题

Q-87. Which of the following statements least likely describe a problem with bilaterally cleared over-the-counter (OTC) derivatives trades?

A. The defaults of individual counterparties could lead to systemic problems.
B. Bilateral OTC derivatives are often non-standard with exotic features.
C. Closing out trades may be difficult.
D. Loss mutualization may not spread all the losses among participants.

Q-88. Which of the following functions is least likely performed by an exchange?

A. Derivatives contract design and specifying contract terms.
B. Price negotiation through a bilateral process.
C. Limiting access to approved firms and individuals.
D. Reporting transaction prices to trading participants and data vendors.

Q-89. Alex Dell, a derivatives trader, has some reservations about the central clearing of OTC derivatives with a central counterparty (CCP). Specifically, he is worried that clearing members' willingness to monitor credit risk may decline since the CCP assumes most of the risks, and that CCPs may increase margin requirements during a period of market stress. Which of the following concepts best describe Dell's reservations?

	Decline in Willingness	Higher Margin Requirements
A.	Moral hazard	Procyclicality
B.	Adverse selection	Offsetting
C.	Moral hazard	Offsetting
D.	Adverse selection	Procyclicality

Q-90. XYZ, a clearinghouse member, has recently contributed funds with its clearinghouse. The funds are designed to give the clearinghouse the ability to meet the financial obligations of any defaulting members. The funds may not be withdrawn by XYZ as long as it remains a member of the clearinghouse. Which of the following amounts best describe XYZ's contribution?

A. Variation margin
B. Original margin
C. Membership dues
D. Guaranty deposit

Q-91. ABC, a clearinghouse member, has not managed its debts very well. As a result, it is unable to meet its open contract obligations. Which of the following statements represents one of the first actions of the clearinghouse?

A. Exchange membership is sold.
B. Under-margined customer positions are transferred to a solvent clearinghouse member.
C. Guaranty fund is used.
D. Fully margined positions are transferred to a solvent clearinghouse member.

Q-92. Jack Johnson is going to receive a physical commodity from a settling long futures trade. Which of the following statements best describe the role of Johnson and the clearinghouse in this process?

A. The clearinghouse will coordinate Johnson's settlement with any eligible settling shorts.
B. Johnson will have to contact the clearinghouse to coordinate with any eligible settling short.
C. Johnson will have to close his position with the original counterparty.
D. The clearinghouse will coordinate Johnson's settlement with the original counterparty only.

3.23. Financial Institutions

3.23.1. 重要知识点

3.23.1.1.

- **Bank:**

  Originate-to-Distribute Model

  Involves the bank originating but not keeping loans. Portfolios of loans are packaged into tranches which are then sold to investors.

  Also termed securitization.

- **Benefits**

  By securitizing the loans it gets them off the balance sheet and frees up funds to enable it to make more loans.

  It also frees up capital that can be used to cover risks being take elsewhere in the bank. This is particularly attractive if the bank feels that the capital required by regulators for a loan is

too high.

A bank can earn a further fee if it services the loan after it has been sold.

- **Drawbacks**

  Banks may relax their mortgage lending standards and the credit quality of the instruments being originated may decline sharply.

- **Insurance Companies**

  Insurance is usually classified as life insurance and nonlife insurance, with health insurance often being considered to be a separate category. Nonlife insurance is also referred to as property-casualty insurance.

  A life insurance contract typically lasts a long time and provides payments to the policyholder's beneficiaries that depend on when the policyholder dies.

  A property-casualty insurance contract typically lasts one year (although it may be renewed) and provides compensation for losses from accidents, fire, theft, and so on.

Loss Ratio : Payouts/Premiums	Expense Ratio : Expenses/Premiums
Combined Ratio : Loss Ratio + Expense Ratio	Combined Ratio after Dividends: Combined Ratio + Dividend Yield
Operating Ratio : Combined Ratio after Dividend – Investment Income	

A pension plan is a form of insurance arranged by a company for its employees. It is designed to provide the employees with income for the rest of their lives once they have retired.

- **Hedge Funds vs. Mutual Funds**

  Mutual funds, which are called "unit trusts" in some countries, serve the needs of relatively small investors, while hedge funds seek to attract funds from wealthy individuals and large investors such as pension funds.

  Hedge funds are subject to much less regulation than mutual funds because they accept funds only from financially sophisticated individuals and organizations. This gives them a great deal of freedom to develop sophisticated, unconventional, and proprietary investment strategies. Hedge funds are sometimes referred to as alternative investments.

  Hedge funds are free to use a wider range of trading strategies than mutual funds and are usually more secretive about what they do. Mutual funds are required to explain their investment policies in a prospectus that is available to potential investors.

3.23.2. 基础题

Q-93. The minimum level of capital a bank needs to maintain, according to its own estimates, models, and risk assessments, is best described as its:

A. Equity capital.

B. Financial capital.
C. Economic capital.
D. Regulatory capital.

Q-94. Which of the following actions in the banking system is most likely intended to address the problem of moral hazard?

A. Deposit insurers charge risk-based premiums.
B. Banks increase loans to higher-risk borrowers.
C. Governments implement deposit insurance programs.
D. Banks increase the interest rates they offer to depositors.

Q-95. An investment bank is most likely to earn a trading profit from buying and selling securities if it arranges a:

A. Dutch auction.
B. Private placement.
C. Best efforts offering.
D. Firm commitment offering.

Q-96. The purpose of a "Chinese wall" in banking is to:

A. Prevent a bank failure from endangering other banks.
B. Prevent a bank's departments from sharing information.
C. Restrict companies from offering both banking and securities services.
D. Restrict companies from engaging in both commercial and investment banking.

Q-97. A drawback of the originate-to-distribute banking model is that it has led to:

A. Too little liquidity in certain sectors.
B. Too much liquidity in certain sectors.
C. Looser credit standards in certain sectors.
D. Tighter credit standards in certain sectors

Q-98. The relevant interest rate for insurance contracts is 2% per annum (semiannual compounding applies) and all premiums are paid annually at the beginning of the year. A $2,000,000 term insurance contract is being proposed for a 40-year-old male in average health. Assume that payouts occur halfway throughout the year. Using the mortality rates estimated by the U.S. Social Security Administration (in Figure 1), which of the following amounts is closest to the insurance company's breakeven premium for a two-year term?

Age (Years)	Male		
	Probability of Death within 1 Year	Survival Probability	Life Expectancy
0	0.006519	1.00000	76.28
1	0.000462	0.99348	75.78
2	0.000291	0.99302	74.82
3	0.000209	0.99273	73.84
...	...	...	...
30	0.001467	0.97519	47.82
31	0.001505	0.97376	46.89
32	0.001541	0.97230	45.96
33	0.001573	0.97080	45.03
...	...	...	...
40	0.002092	0.95908	38.53
41	0.002240	0.95708	37.61
42	0.002418	0.95493	36.70
43	0.002629	0.95262	35.78

A. $4,246.

B. $4,287.

C. $4,332.

D. $8,482.

Q-99. The following information pertains to a property and casualty (P&C) insurance company:

- Investment income 5%
- Dividends 2%
- Loss ratio 74%
- Expense ratio 23%

Based on the information provided, what is this company's operating ratio?

A. 90%

B. 94%

C. 97%

D. 99%

Q-100. Which of the following problems would most likely be a concern for life insurance companies that are worried about differentiating between good risks and bad risks?

A. Adverse selection.

B. Catastrophic risk.

C. Longevity risk.

D. Moral hazard.

Q-101. Which of the following statements regarding the capital requirements and regulation of

insurance companies is correct?

A. Insurance companies are regulated at both the state and federal level.
B. The guaranty system for insurance companies consists of a permanent fund created from premiums paid by insurers.
C. Unearned premiums can be found on the balance sheets of both life insurance and property and casualty insurance companies.
D. The amount of equity on the balance sheet of a life insurance company is typically lower than that of a property and casualty insurance company.

Q-102. Which of the follow characteristics is a key differentiator between mutual funds and hedge funds?

A. Professional asset management.
B. Immediate access to withdrawals from the fund.
C. Charging a fee for providing investment services.
D. Easy diversification for an investor.

Q-103. What is the expected fee to a hedge fund if the fund uses a standard 2 and 20 incentive fee structure with an investment that has a 35% probability of making 55% and a 65% probability of losing 45%?

A. 5.71%
B. 6.12%
C. 3.78%
D. 5.28%