2020 年 06 月 CFA 一级百题预测

1. **ETHICS AND PROFESSIONAL STANDARDS**
2. **QUANTITATIVE METHODS**
3. **ECONOMICS**
4. **FINANCIAL REPORTING AND ANALYSIS**
5. **CORPORATE FINANCE**
6. **EQUITY**
7. **FIXED INCOME**
8. **DERIVATIVES**
9. **ALTERNATIVE INVESTMENT**
10. **PORTFOLIO MANAGEMENT**

8. Derivatives

8.1. Derivatives Market and Instruments

8.1.1. 重要知识点

8.1.1.1. 衍生品的定义: A derivative is a financial instrument (contract) that derives its performance from the performance of an underlying asset.

8.1.1.2. 衍生品分类方法

- **根据合约特点分类：forward commitment & contingent claim**
  - Forward commitment: is an agreement between two parties in which one party, the buyer, agrees to buy from the other party, the seller, an underlying asset at a future date at a price established at the start → forward, futures and swap contracts
  - Contingent claim: is derivative in which the payoffs occur if a specific event happens → option contracts
    - Credit default swaps (CDS) is essentially an insurance contract for the reference, the reference obligation is the fixed income security on which the swap is written-usually a bond but potentially also a loan.
    - The protection buyer pays the seller a premium. The default swap premium is also referred to as the **CDS spread**.
    - Protection buyer receives a payment from the protection seller if default occurs on the reference entity.
- **根据交易场所分类： exchange-traded & over-the-counter traded**
  - Exchange-traded: 在一个固定的交易所交易。多空双方不直接见面，与清算所交易。(A—>Clearinghouse—>B)
  - OTC traded: 没有固定交易场所，多空双方直接交易。(A—>B)

Exchange-traded	Over-the-counter
Standardized —> Liquid	Customized/Specific needs
Backed by a clearinghouse	Trade with counterparty (default risk)
Trade in the a physical exchange	Not trade in organized markets
Regulated	Unregulated

  - Market makers: buy at one price (the bid), sell at a higher price (the ask).

8.1.2. 基础题

Q-1. Which of the following derivatives is least likely to be classified as a contingent claim?

A. A futures contract

B. A call option contract

C. A credit default swap

Q-2. Which of the following statements is true about contingent claims?

A. Either party can default to the other

B. The payoffs are linearly related to the performance of the underlying

C. The most the long can lose is the amount paid for the contingent claim

Q-3. In contrast to over-the-counter options, futures contracts most likely:

A. are not exposed to default risk.

B. represent a right rather than a commitment.

C. are private, customized transactions

Q-4. Which of the following is least likely to be an example of a derivative?

A. An exchange-traded fund

B. A contract to sell Alphabet Inc.'s shares at a fixed price

C. A contract to buy Australian dollars at a predetermined exchange rate

8.2. Advantages & Disadvantages of Derivatives

8.2.1. 重要知识点

8.2.1.1. Advantages & disadvantages of derivatives

- **Advantage**
  - Price discovery
  - Risk management: hedge and speculation
  - Lowering transaction costs
  - Low capital requirement
  - Greater liquidity
  - Ease of going short

- Enhance market efficiency

➢ **Disadvantage**

- Too risky and High leverage
- Complex instruments
- Sometimes likened to gambling

8.2.2. 基础题

Q-5. Which of the following is not an advantage of derivative markets?

A. They are less volatile than spot markets
B. They facilitate the allocation of risk in the market
C. They incur lower transaction costs than spot markets

Q-6. Which of the following is least likely one of the main benefits of derivative markets? Derivative markets

A. exhibit lower volatility compared with the spot market.
B. enable companies to more easily practice risk management.
C. reveal prices and volatility of the underlying assets.

8.3. Forward Contract

8.3.1. 重要知识点

8.3.1.1. Classification of forward contract

➢ Commodity forward contract
➢ Financial forward contract

8.3.1.2. Characteristics forward contracts

➢ Each party are exposed to default risk (or counterparty risk)
➢ Zero-sum game

8.3.2. 基础题

Q-7. The usefulness of a forward contract is limited by some problems. Which of the following is most likely one of those problems?

A. Once you have entered into a forward contract, it is difficult to exit from the contract
B. Entering into a forward contract requires the long party to deposit an initial amount with the

short party

C. If the price of the underlying asset moves adversely from the perspective of the long party, periodic payments must be made to the short party

Q-8. Two counterparties sign a forward contract on a stock, the underlying stock price goes up afterward, which counterparty/counterparty suffer from credit default risk?

A. The long position only

B. The short position only

C. Both long and short position

8.4. Forward Rate Agreements(FRA)

8.4.1. 重要知识点

8.4.1.1. 概念

- **Definition:** viewed as a forward contract for the long to get a loan from the short at a specific future date at a fixed rate in the contract.
- A forward rate agreement (FRA) is a forward contract on an interest rate (**LIBOR**).
- **Quotation:** A 60-day FRA on 90-day LIBOR（2×5 FRA）means：Settlement or expiration is 60 days from now and the payment at settlement is based on 90-day LIBOR 60 days from now.

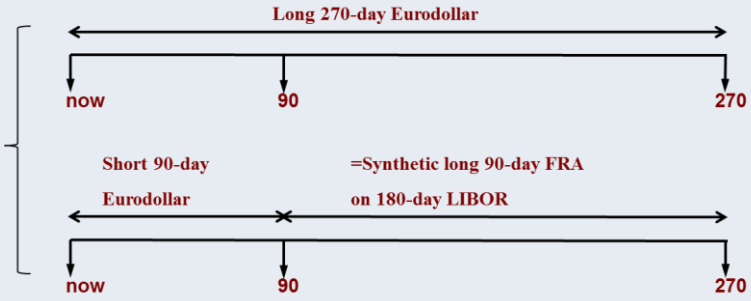
8.4.1.2. LIBOR and Euribor

- **LIBOR**
  - USD interest rates.
  - Quoted as an annualized rates based on a 360-day a year
  - Add-on rate
  - Single interest
- Euribor is a similar rate for borrowing and lending in Euros.

8.4.1.3. Settlement

- Settle in cash, but no actual loan is made at the settlement date.
- Payoff
  - If the reference rate at the expiration date is above the specified contract rate, the long will receive cash payment from the short;
  - If the reference rate at the expiration date is below the contract rate, the short will receive cash payment from the long

8.4.1.4. Synthetic FRA:



8.4.2. 基础题

Q-9. A 30-day FRA on 90-day LIBOR is quoted as:

A. 1×4 FRA

B. 1×3 FRA

C. 3×1 FRA

Q-10. Forward rate agreements are most likely used to hedge an exposure in the:

A. foreign exchange market.

B. money market.

C. equity market.

Q-11. Conceptually, a FRA most likely allows a company that wants to invest money in the future to lock in a rate by making a:

A. variable payment and receiving a fixed payment.

B. fixed payment and receiving a different fixed payment.

C. fixed payment and receiving a variable payment.

8.5. Futures Contract

8.5.1. 重要知识点

8.5.1.1. Futures contract 风险控制方法

- **Margin**
  - Initial margin: the first deposit is called the initial margin. Initial margin must be posted before any trading takes place;

- Maintenance margin: is the amount of money that each participant must maintain in the account after the trade is initiated. If the margin balance is **lower than the maintenance margin**, the trader will get a margin call;
- Variation margin: used to bring the margin balance back up to the initial margin level.

➢ **Daily price limit:** price limits are exchanged-imposed limits on how much the contract price can change from the previous day's settlement price.

➢ **Marking to market:** the margin requirement of a futures contract is low because at the end of every day there is a daily settlement process called marking to market.

➢ **Difference between forward and futures**

Forwards	Futures
Private contracts	Exchange-traded
Unique customized contracts	Standardized contracts
Little or no regulation	Regulated
Default risk is present	Guaranteed by clearinghouse
Settlement at maturity	Daily settlement(mark to market)
No margin deposit required	Margin required and adjusted

8.5.1.2. 掌握股票与期货保证金的区别：

	期货 margin	股票 margin
目的	作抵押减少违约风险	借钱给你买股票，举杠杆
现金流方向	现金流出	现金流入
支付利息	不用支付利息	相当于贷款给你，要付利息
补交 margin 数额	回到 initial margin	回到 maintenance margin

➢ **Clearinghouse**

- Each exchange has a clearing house which is a third participant guaranteeing to each party that it ensures against the other party defaulting.
- A clearinghouse acts as the counterparty to each participant. The clearinghouse is the buyer to the seller and the seller to the buyer by crediting gains to the winners and charging losses to the losers.
- There is no need to worry about the counterparty default risk.
- Each participants are allowed by the clearinghouse to reverse their positions in the future.

8.5.2. 基础题

Q-12. Tony Harris is planning to start trading in commodities. He has heard about the use of futures contracts on commodities and is learning more about them. Which of the following is Harris least likely to find associated with a futures contract?

A. Existence of counterparty risk
B. Standardized contractual terms
C. Payment of an initial margin to enter into a contract

Q-13. When receive a margin call, an investor must deposit more money to meet the in the futures market, whereas to meet the in the stock market:

A. Initial margin Initial margin
B. Maintenance margin Maintenance margin
C. Initial margin Maintenance margin

Q-14. In futures markets, contract performance is most likely guaranteed by:

A. Clearing houses.
B. The futures exchanges.
C. Regulatory agencies

Q-15. A futures trader takes a long position of 8 contracts. The initial margin requirement is $12 per contract, and the maintenance margin requirement is $8.4 per contract. She deposits the required initial margin on the trade date. On Day 5, her margin account balance is $48. On Day 6, variation margin is closest to:

A. $38.
B. $48.
C. $78.

8.6. Swap Contract

8.6.1. 重要知识点

8.6.1.1. 定义

- **Swap contract:** A swap contract obligates two parties to exchange a series of cash flows on periodic settlement dates over a certain time period
- Three kinds of swaps
  - Interest rate swaps
    - Interest rate swap in which one party pays a fixed rate and the other pays a floating rate.
  - Currency swaps
    - 双方互换不同国家货币
    - Notional principle will be changed in a currency swap.
  - Equity swaps
    - Permit investors to pay the return on one stock index and receive the return on another index or a fixed rate.

8.6.1.2. 与 forward 相似点

- No payment required by either party at initiation except the principal values exchanged in currency swaps.
- Custom instruments.
- Not traded in any organized secondary market.
- Largely unregulated.
- Default risk is a critical aspect of the contracts.
- Institutions dominate.

8.6.1.3. Plain vanilla interest rate swap: involves trading fixed interest rate payments for floating-rate payment (paying fixed and receiving floating).

- **Counterparties:** The parties involved in any swap agreement are called the counterparties
- **Pay-fixed side:** The counterparty that makes fixed-rate interest payment in exchange for variable interest rate**.**
- **Pay-floating side:** The counterparty that makes variable-rate interest payment in exchange for fixed payment.

8.6.2. 基础题

Q-16. In a currency swap, the underlying principal amount is exchanged:

A. only at the start of the swap.

B. only at the end of the swap.

C. both at the start and at the end of the swap.

Q-17. A corporation issues five-year fixed-rate bonds. Its treasurer expects interest rates to decline for all maturities for at least the next year. She enters into a one-year agreement with a bank to receive quarterly fixed-rate payments and to make payments based on floating rates benchmarked on three-month LIBOR. This agreement is best described as a:

A. forward contracts.

B. swap.

C. futures contract.

8.7. Basic Concept of Options

8.7.1. 重要知识点

8.7.1.1. Basic characteristics of options (4 positions of options)

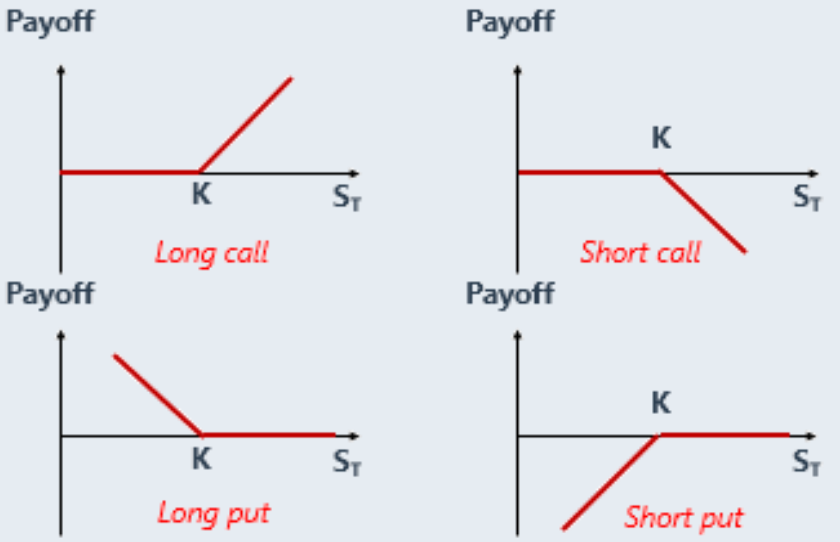
- Definition of option
  - A derivative contract in which one party, the buyer, pays a sum of money to the other party, the seller or writer, and receives the right to either buy or sell an underlying asset at a fixed price either on a specific expiration date or at any time prior to the expiration date.
- 分类
  - Call option 看涨期权：long call and short call
  - Put option 看跌期权：long put and short put
- 价格
  - 期权费 option premium: paid by the buyer of option
  - 行权价格 exercise price: represent the exercise price specified in the contract.
- An option to buy an asset at a particular price is termed a call option

Buyer of a call	Right to buy	
Seller of a call		Obligation to sell

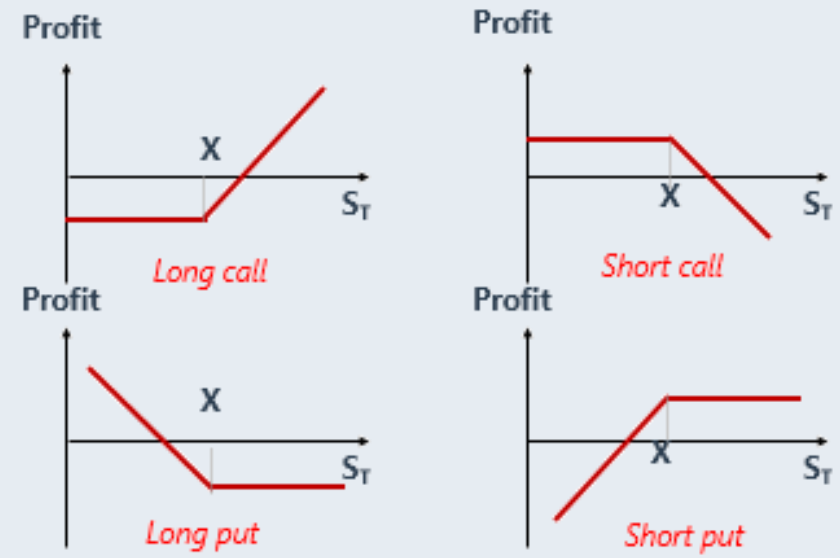
- An option to sell an asset at a particular price is termed a put option

Buyer of a put	Right to sell	
Seller of a put		Obligation to buy

- Payoff



- Gain or loss



8.7.2. 基础题

Q-18. Which of the following is most similar to a short position in the underlying asset?

A. Buying a put

B. Writing a put

C. Buying a call

8.8. Risk Neutrality

8.8.1. 重要知识点

8.8.1.1. **Risk-neutral investors** are willing to buy risky investments for which they expect to earn only the risk-free rate. They do not expect to earn a premium for bearing risk.

8.8.1.2. **The expected payoff of the derivative can be discounted at the risk-free rate.** And should yield the risk-free rate of return, if it generates certain payoffs.

8.8.2. 基础题

Q-19. An investor who requires no premium to compensate for the assumption of risk is said to be which of the following?

A. Risk seeking

B. Risk averse

C. Risk neutral

8.9. Moneyness, Intrinsic Value, Time Value

8.9.1. 重要知识点

8.9.1.1. Option 的主要种类

- Financial option
  - Equity options
  - Interest options
  - Foreign currency options
  - Bond options
  - Index options
- Commodity option

8.9.1.2. Moneyness（价值状态）：定性看 long 是否赚钱

- **In the money:** immediate exercise would generate a **positive payoff.**
- **At the money**: immediate exercise would generate no payoff.
- **Out of the money:** immediate exercise would generate a **negative payoff.**

Moneyness	Call option	Put option
In-the-money	S > X	S < X
At-the-money	S = X	S = X
Out-of-the-money	S < X	S > X

8.9.1.3. Intrinsic Value and Time Value

- The **intrinsic value** of an option is the amount that it is in the money, and zero otherwise.
  - Intrinsic value of call option: C=max[0, S-X]
  - Intrinsic value of put option: P=max[0, X-S]
- **Time value**
  - The difference between the price of an option (called its premium) and its intrinsic value is due to its time value.
  - 欧式看跌期权：time value can be larger than, smaller than or equal to zero.
  - For others, time value is not less than zero.
- **Option value=intrinsic value + time value**
  - Before expiration: option value>intrinsic value
  - At expiration: option value=intrinsic value

8.9.1.4. Replication

- Long call + short put=long forward/long asset

8.9.2. 基础题

Q-20. At expiration, an option that is in the money will most likely have:

A. time value, but no exercise value.
B. exercise value, but no time value.
C. both time value and exercise value.

Q-21. Which of the following statements most closely relates to the concept of moneyness?

A. The sum of money the option buyer pays the seller is called the premium
B. Both call and put option prices decline as the time to expiration becomes shorter
C. One would never exercise a call option if the price of the underlying is below the strike price

Q-22. The recent price per share of Win Big, Inc. is €50 per share. Verna Hillsborough buys 100 shares at €50. To protect against a falling price, Hillsborough buys one put, covering 100 shares of Win Big, with a strike price of €40. The put premium is €1 per share. If Win Big closes at €45 per share at the expiration of the put and Hillsborough sells her shares at €45, Hillsborough's profit from the stay/put is closest to:

A. - €1,100.

B. - €600.

C. €900.

Q-23. For a call option, if the underlying asset's value is less than the option's exercise price, the option is said to be:

A. At the money.

B. Out of the money.

C. In the money.

8.10. Option Sensitivity

8.10.1. 重要知识点

8.10.1.1. 影响 option 价格的因素：

Factor	European call	European put	American call	American put
Underlying asset price	+	-	+	-
Strike price	-	+	-	+
Time	+	**?**	+	+
Risk-free rate	+	-	+	-
Volatility	+	+	+	+
Payments on the underlying	-	+	-	+
Carrying cost	+	-	+	-

- There is an exception to the general rule that European put option thetas are negative. The put value may increases as the option approaches maturity if the option is deep in-the-money and close to maturity. The higher the risk-free rate, the stronger the negative relationship.

8.10.2. 基础题

Q-24. Which statement best describes the early exercise of non-dividend paying American options? Early exercise may be advantageous for:

A. deep-in-the-money calls.
B. both deep-in-the-money calls and deep-in-the-money puts.
C. deep-in-the-money puts.

Q-25. Which of the following statements about put and call options is least accurate?

A. The price of the option is less volatile than the price of the underlying stock.
B. Option prices are generally higher the longer the time until the option expires.
C. For put options, the higher the strike price relative to the stock's underlying price, the more the put is worth.

Q-26. If there are two call options for two different underlying assets, and related information is shown in the table below.

	Option 1	Option 2
Payments on the underlying	Positive	Zero
Carrying cost	Zero	Positive

Based on the table, which of the option is most likely to have higher value?

A. Option 1
B. Option 2
C. The same

Q-27. The value of a call option can be positively correlated to the:

A. exercise price & risk-free rate
B. risk-free rate & volatility
C. exercise price & volatility

8.11. Put-Call Parity

8.11.1. 重要知识点

8.11.1.1. Put-call parity

- **Put call parity**
  - $c+ X/(1+R_f)^T = S + p$

- **Put-call parity 的作用**
  - 为 option 定价
  - 合成 option
  - 无风险套利。在无风险套利中，遵循 long 小边，short 大边原则
    - 如：$C+\frac{X}{(1+RFR)^T}>S+P$，套利方法是：long security, long put, short call, short bonds.
- **Replication (熟练掌握 put-call parity 公式的各种变形):**
  - $S=C-P+X/(1+RFR)^T$
  - $P=C-S+X/(1+RFR)^T$
  - $C=S+P-X/(1+RFR)^T$
  - $X/(1+RFR)^T=S+P-C$
    - Note that the options much be European-style and the puts and calls mush have the same exercise price for these relations to hold.
    - Fiduciary call: buy riskless bond that pays X at maturity and a call with exercise price X.
    - Protective put: buy security and long put.
- Put-call-forward parity can be written as
  - p-c=[X-F (T)]/(1+r)^T
  - This means that the difference between the price of a put and the price of a call is equal to the difference between exercise price and forward price discounted at the risk-free rate.

8.11.2. 基础题

Q-28. A description that will least likely be used to explain put-call parity is:

A. The (exercise) prices of calls and puts on an underlying asset must be consistent with each other to remove arbitrage opportunities.

B. A fiduciary call option strategy and a protective put option strategy for an underlying asset

are equal in value.

C. A put is equivalent to long a call, a long position in the underlying asset, and a long position in the risk-free asset.

Q-29. A stock is selling at $40, a 3-month put at $50 is selling for $11, a 3-month call at $50 is selling for $1, and the risk-free rate is 6%. How much, if anything, can be made on an arbitrage?

A. $0 (no arbitrage)

B. $0.28

C. $0.72

Q-30. According to put–call parity, if a fiduciary call expires in the money, the payoff is most likely equal to the:

A. difference between the market value of the asset and the face value of the risk-free bond.

B. market value of the asset.

C. face value of the risk-free bond.

Q-31. Based on put–call parity for European options, a synthetic put is most likely equivalent to a:

A. short call, long underlying asset, short bond.

B. long call, short underlying asset, long bond.

C. long call, long underlying asset, short bond.

Q-32. According to put–call–forward parity, the difference between the price of a put and the price of a call is most likely equal to the difference between:

A. forward price and spot price discounted at the risk-free rate.

B. spot price and exercise price discounted at the risk-free rate.

C. exercise price and forward price discounted at the risk-free rate.

Q-33. Instead of entering into a short position in risk free bond, the investors can also replicate the risk free bond by:

A. combining short stock, a short positions in a put option, and a long position in call option.

B. combining long stock, a long positions in a put option, and a short position in call option.

C. combining short stock, a short positions in a put option, and a short position in call option.

8.12. Arbitrage and No-Arbitrage Principle

8.12.1. 重要知识点

8.12.1.1. Risk-free arbitrage and no-arbitrage rule

- **Arbitrage** involves earning over the risk-free rate with no risk or earning an immediate gain with no future liabilities.
  - Arbitrage opportunities: arbitrage occurs when equivalent assets or combinations of assets sell for two different prices.
- **Law of one price:** the condition in a financial market in which two equivalent financial instruments or combinations of financial instruments can sell for only one price. Equivalent to the principle that no arbitrage opportunities are possible.
- The role of arbitrage is to eliminate mispricing and lead to the market efficiency. That is why arbitrage also plays a role in pricing.

8.12.2. 基础题

Q-34. The law of one price is best described as:

A. the true fundamental value of an asset.
B. earning a risk-free profit without committing any capital.
C. two assets that will produce the same cash flows in the future must sell for equivalent prices.

Q-35. Which of the following best describes an arbitrage opportunity? It is an opportunity to:

A. Earn a risk premium in the short run.
B. Buy an asset at less than its fundamental value.
C. Make a profit at no risk with no capital invested.

8.13. Forward Pricing and Valuation

8.13.1. 重要知识点

8.13.1.1. Forward pricing and valuation

- Pricing a forward contract is the process of determining the no-arbitrage price that will make the value of the contract be zero to both sides at the initiation of the contract
  - General Equation: $FP=(S_0-PVB_0+PVC_0) \times (1+R_f)^T$
    - Monetary benefits: dividends, coupons, interest, etc.
    - Non-monetary benefits: convenience yield.
    - **Convenience yield** are primarily associated with commodities and generally exist as a result of difficulty in either shorting the commodity or unusually tight supplies.
- Valuation of a forward contract means determining the value of the contract to the long (or the short) at some time during the life of the contract.

Time	Forward Contract Valuation
t=0	Zero, because the contract is priced to prevent arbitrage
t=t	$V_{long} = S_t - \frac{FP}{(1+R_f)^{T-t}}$ $V_{short} = -V_{long} = \frac{FP}{(1+R_f)^{T-t}} - S_t$
t=T	$S_T - FP$

- T-bill (zero-coupon bond) forwards
  - $FP=S_0 \times (1+R_f)^T$
- Forward contracts on a dividend-paying stock
  - $FP=(S_0-PVD_0) \times (1+R_f)^T$
  - $V_{long}=(S_t-PVD_t) - FP/(1+R_f)^{T-t}$

8.13.2. 基础题

Q-36. Over time, a forward contract most likely has variable:

A. value and constant price.

B. price and constant value.

C. value and variable price.

Q-37. Which of the following statements best describes changes in the value of a long forward position during its life?

A. As the time to maturity goes down, the value of the position goes up.

B. As the price of the underlying goes up, the value of the position goes up.

C. As interest rates go down, the value of the position goes up.

Q-38. Stocks BWQ and ZER are each currently priced at $100 per share. Over the next year, stock BWQ is expected to generate significant benefits whereas stock ZER is not expected to generate any benefits. There are no carrying costs associated with holding either stock over the next year. Compared with ZER, the one-year forward price of BWQ is most likely:

A. lower.

B. the same.

C. higher.

Q-39. A high convenience yield is most likely associated with holding:

A. commodities.

B. equities.

C. bonds.

Q-40. During its life, the value of a forward contract is most likely equal to the price of the underlying minus the price of the:

A. forward, discounted over the remaining term of the contract.

B. forward.

C. forward, discounted over the original term of the contract.

Q-41. Which of the following statements best describes changes in the value of a long forward position during its life?

A. As interest rates go down, the value of the position goes up.

B. As the price of the underlying goes up, the value of the position goes up.

C. As the time to maturity goes down, the value of the position goes up.

Q-42. There are two forward contracts, contract 1 and contract 2, on the same underlying. The underlying makes no cash payments, does not yield any nonfinancial benefits, and does not incur any storage costs. Contract 1 expires in one year while contract 2 expires in two years. It is most likely that the price of contract 1:

A. is less than the price of contract 2.

B. is equal to the price of contract 2.

C. exceeds the price of contract 2.

8.14. Futures Pricing and Valuation

8.14.1. 重要知识点

8.14.1.1. Futures pricing and valuation: futures price and forward price

If the correlation between the underlying asset value and interest rate is…	Investors will…
Positive	Prefer to go long in a futures contract, and the futures price will be greater than the price of an otherwise comparable forward contract.
Zero	Have no preference
Negative	Prefer to go long in a forward contract, and the forward price will be greater than the price of an otherwise comparable futures contract.

8.14.2. 基础题

Q-43. To the holder of a long position, it is more desirable to own a forward contract than a futures contract when interest rates and futures prices are:

A. negatively correlated.

B. uncorrelated.

C. positively correlated.

Q-44. Which of the following statements is least accurate concerning differences in the pricing of forwards and futures?

A. Interest rate volatility can explain pricing differences.

B. Pricing differences can arise if futures prices and interest rates are uncorrelated.

C. Differences in the pattern of cash flows of forwards and futures can explain pricing differences.

8.15. Swap Pricing and Valuation

8.15.1. 重要知识点

8.15.1.1. Swap pricing and valuation

- **Equivalence of swaps to bonds:** An interest rate swap is identical to issuing a fixed-rate bond and using the proceeds to buy a floating-rate bond.
- **Equivalence of swaps to forward contracts (FRA):** A forward contract is an agreement to exchange future cash flows once, so a swap can be viewed as a series of forward contracts.

8.15.2. 基础题

Q-45. The price of an interest rate swap that involves the exchange of a fixed payment for a floating payment is most likely?

A. equal to its value at expiration.

B. set at initiation and constant over time.

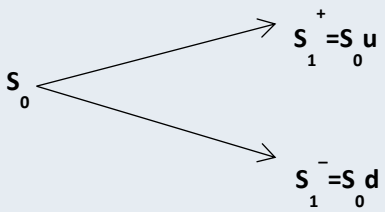
C. affected by changes in the floating payment

8.16. Option Pricing and Valuation

8.16.1. 重要知识点

8.16.1.1. Option pricing and valuation

- **Binomial model**
  - A binomial model is for pricing options in which the underlying price can move to only one of two possible new prices.
  - We start off by having only one binomial period, which means that the underlying price moves to two new prices at option expiration. We let S_0 be the price of the underlying stock now. One period later, the stock price can move up to S_1^+ or down to S_1^-. We then identify a factor, u, as the up move on the stock and d as the down move. Thus, $S_1^+ = S_0u$ and $S_1^- = S_0d$. We further assume that u = 1/d.



  - Risk-neutral probability of an up move is π_u ; Risk-neutral probability of an

down move is $\pi_d=1-\pi_u$

- $\pi_u = \dfrac{1+R_f-d}{u-d}$

- We should notice that:
  - On the first point, if volatility increases, the difference between S_1^+ and S_1^- increases, which widens the range between c_1^+ and c_1^-, leading to a higher option value. The upper payoff, c_1^+, will be larger and the lower payoff, c_1^-, will be lower.
  - On the second point, the actual probabilities of the up and down moves do not matter. This result is because of our ability to construct a hedge and the rule of arbitrage.
- On the third point, the irrelevance of the actual probabilities is replaced by the relevance of a set of synthetic or pseudo probabilities, π and 1-π, which are called risk-neutral probabilities.

8.16.1.2. Early Exercise of American Options

- **American call options**
  - When the underlying makes no cash payments (dividends and coupon interest), no reason to exercise the call early, $C_0 = c_0$.
  - When the underlying makes cash payments (dividends and coupon interest) during the life of the option, early exercise can happen, $C_0 >= c_0$.
- **American put options**
  - $P_0 > p_0$, nearly always true, as long as there is a possibility of bankruptcy, P_0 always > p_0, (consider an American put on a bankrupt company, stock →0, cannot go any lower, then put option holder may exercise it).

8.16.2. 基础题

Q-46. The most correct statement about the binomial option pricing formula is that:

A. The discount rate to calculate the option price is the risk-free rate

B. The discount rate to calculate the option price is the risk-free rate plus a risk premium

C. The spot price is compounded at the risk-free rate to get the expected payoff

Q-47. If the implied volatility for options on a broad-based equity market index goes up, then it is most likely that:

A. The broad-based equity market index has gone up in value.

B. Market interest rates have gone up.

C. The general level of market uncertainty has gone up.

Q-48. Which of the following statements best describes a feature of an American option? Early exercise of an American:

A. put option is optimal only if the underlying is dividend paying.

B. call option is never optimal if the underlying is dividend paying.

C. put option that is deep in the money may be optimal.

Q-49. With respect to American calls, which of the following statements is most accurate?

A. American calls should be exercised early if the underlying has reached its expected maximum price

B. American calls should be exercised early if the underlying has a lower expected return than the risk-free rate

C. American calls should be exercised early only if there is a dividend or other cash payment on the underlying

Q-50. A 1-year put option on the stock with the strike price of $20, and the price of the stock is $20 now, and the size of an up-move is 1.25. The risk-free rate is 7%. The value of the put option is closest to:

A. 1.5.

B. 2.8.

C. 1.25.

8.17. 进阶题

Q-1. A derivative is best described as a financial instrument that derives its performance by:

A. passing through the returns of the underlying.

B. replicating the performance of the underlying.

C. transforming the performance of the underlying.

Q-2. Keven, a hedge fund manager, observes that the spot gold price is negatively correlated with interest rate. He intends to get profit from the short-term price movement. Which instrument is most suitable to him to long?

A. forward

B. future

C. swap

Q-3. A credit derivative is a derivative contract in which the:

A. clearinghouse provides a credit guarantee to both the buyer and the seller.

B. seller provides protection to the buyer against the credit risk of a third party.

C. the buyer and seller provide a performance bond at initiation of the contract.

Q-4. By nature, margin in futures contracts can be most likely regarded as a:

A. Loan granted by brokers.

B. Advance payment to carry out the ultimate settlement.

C. Deposit of commission for brokers.

Q-5. Compare an American call with a strike of 50 which expires in 90 days to an American call on the same underlying asset which has a strike of 60 and expires in 120 days. The underlying asset is selling at 55. Consider the following statements:

Statement1: "The 50 strike call is in-the-money and the 60 strike call is out-of-the-money."

Statement 2: "The time value of the 60 strike call, as a proportion of the 60 strike call's premium, exceeds the time value of the 50 strike call as a proportion of the 50 strike call's premium."

Are the statements most likely correct or incorrect?

A. Both statements are correct
B. Statement 1 is incorrect, but Statement 2 is correct
C. Statement 1 is correct, but Statement 2 is incorrect

Q-6. The greater of either zero or the present value of the exercise price minus the underlying price is most likely the lower bound on the price of a(n): （扩展知识）

A. European put option.
B. American put option.
C. American call option.

Q-7. With respect to American calls, which of the following statements is most accurate?

A. American calls should be exercised early if the underlying has reached its expected maximum price.
B. American calls should be exercised early if the underlying has a lower expected return than the risk-free rate
C. American calls should be exercised early only if there is a dividend or other cash payment on the underlying

Q-8. Assume the probability of bankruptcy for the underlying asset is high. Compared to the price of an American put option on the same underlying asset, the price of an equivalent European put option will most likely be:

A. lower.
B. higher.
C. the same because the probability of bankruptcy does not affect pricing.

Q-9. Assume an asset pays no dividends or interest, and also assume that the asset does not yield any non-financial benefits or incur any carrying cost. At initiation, the price of a forward contract on that asset is:

A. lower than the value of the contract.
B. equal to the value of the contract.
C. greater than the value of the contract.

Q-10. Which of the following conditions will not make futures and forward prices equivalent?

A. Interest rates are known
B. Futures prices are uncorrelated with interest rates
C. The volatility of the forward price is different from the volatility of the futures price

Q-11. With respect to the value of a futures contract, which of the following statements is most accurate? The value is the:

A. futures price minus the spot price.
B. present value of the expected payoff at expiration.
C. accumulated gain since the previous settlement, which resets to zero upon settlement.

Solutions

Time the study pain is temporary, has not learned the pain is life-long.

学习的痛苦是一时的，而没有学习的痛苦是一辈子的。

8. Derivatives

8.1. 基础题

Q-1. Solution: A.

A futures contract is classified as a forward commitment in which the buyer undertakes to purchase the underlying asset from the seller at a later date and at a price agreed on by the two parties when the contract is initiated. A call option contract is a contingent claim in which the buyer of the option has a right to purchase the underlying asset at a fixed price on or before a pre-specified expiration date. A credit default swap is a contingent claim in which the credit protection seller provides protection to the credit protection buyer against the credit risk of a third party.

Q-2. Solution: C.

The maximum loss to the long is the premium. The payoffs of contingent claims are not linearly related to the underlying, and only one party, the short, can default.

Q-3. Solution: A

Over-the-counter options are exposed to default risk, but futures contracts are standardized transactions that take place on futures exchanges and are not exposed to default risk.

Q-4. Solution: A.

A is correct. Although an exchange-traded fund derives its value from the underlying assets it holds, it does not transform the performance of those assets and so is not a derivative.

B is incorrect. A contract to sell Alphabet Inc.'s shares transforms the performance of the underlying shares of Alphabet Inc and is an example of an option derivative.

C is incorrect. A contract to buy Australian dollars transforms the performance of the underlying currency and is an example of a currency derivative.

Q-5. Solution: A.

Derivative markets are not by nature more or less volatile than spot markets. They facilitate risk allocation by making it easier and less costly to transfer risk, and their transaction costs are lower than those of spot markets.

Q-6. Solution: A.

A is correct. Derivative markets are not necessarily more or less volatile than spot markets. Derivative markets reveal prices and volatilities of the underlying assets and facilitate risk management.

B is incorrect. One of the main purposes of derivative markets is risk management

C is incorrect. One of the main purposes of derivative markets is price discovery.

Q-7. Solution: A.

As opposed to a futures contract, trading out of a forward contract is quite difficult. There is no exchange of cash at the origination of a forward contract. There is no exchange on a forward contract until the maturity of the contract.

Q-8. Solution: A.

Since long position gains positive profit when underlying price goes up, then long position may suffer from the credit default of the short position. So the long position only suffers from credit default risk when the underlying stock price goes up.

Q-9. Solution: A.

1×4 FRA is a forward rate agreement whose expiration date is 30 days from now and the payment at settlement is based on 90-day LIBOR 30 days from now.

Q-10. Solution: B.

Forward rate agreements are used to hedge interest rate exposure present in the money market.

Q-11. Solution: A.

FRAs are forward contracts that conceptually allow lenders to lock in a fixed payment on a future investment by receiving a known payment and making an unknown payment which offsets the unknown future interest payment.

Q-12. Solution: A.

Harris is *least likely* to find counterparty risk associated with a futures contract. There is limited counterparty risk in a futures contract because the clearinghouse is on the other side of every contract

Q-13. Solution: C.

In stock market, additional margin must be deposited to bring the ending balance up to the Maintenance margin requirement; however, in futures market, additional margin must be deposited to bring the ending balance up to the initial margin requirement.

Q-14. Solution: A.

Clearing houses arrange for financial settlement of trades. In futures markets, they guarantee contract performance.

Q-15. Solution: B.

On any day when the balance in the margin account falls below the maintenance margin, the trader must deposit sufficient funds to bring the balance back up to the initial margin requirement. This additional amount is called the "variation margin." Therefore, $96 – $48 = $48 variation margin.

Q-16. Solution: C.

C is correct. In a currency swap, the underlying principal is denominated in different currencies and is typically exchanged at the start and end of the swap.

A is incorrect. In a currency swap, the underlying principal is denominated in different currencies and would typically be exchanged not only at the start of the swap but also at the end of the swap.

B is incorrect. In a currency swap, the underlying principal is denominated in different currencies and would typically be exchanged not just at the end of the swap but at the start of the swap as well.

Q-17. Solution: B.

A swap is a series of forward payments. Specifically, a swap is an agreement between two parties to exchange a series of future cash flows. The corporation receives fixed interest rate payments and makes variable interest rate payments. Given that the contract is for one year and the floating rate is based on three-month LIBOR, at least four payments will be made during the year.

Q-18. Solution: A.

Buying a put is most similar to a short position in the underlying asset because the put increase the value if the underlying asset value decreases. The writer of a put and the holder of call have a long exposure to the underlying asset because their positions increase in value if the underlying asset value increase.

Q-19. Solution: C.

Risk-seeking investors give away a risk premium because they enjoy taking risk. Risk-averse investors expect a risk premium to compensate for the risk. Risk-neutral investors neither give nor receive a risk premium because they have no feelings about risk.

Q-20. Solution: B.

At expiration, options have no time value; if they are in the money, they have exercise value

Q-21. Solution: C.

Only an in-the-money option would be exercised. Moneyness describes the relationship between the price of the underlying and an option's exercise price.

Q-22. Solution: B.

The loss on her stock is (€45-€50) X 100 = - €500. She also paid €100 for the put. The put expires worthless, making her total loss €600.

Q-23. Solution: B.

If the underlying asset's value is less than the option's exercise price, the call option is not worth exercising and is said to be out of the money.

Q-24. Solution: C.

Only deep-in-the-money put options may be exercised early. The price cannot fall below zero and thus the additional upside of such an option is limited.

Q-25. Solution: A.

Option prices are more volatile than the price of the underlying stock. The other statements are true. Options have time value, which means prices are higher the longer the time until the option expires, and a higher strike price increase the value of a put option.

Q-26. Solution: B.

A call option's value is negatively correlated to the payments on the underlying, and positively related to the carrying cost, so the option 2 would have higher value.

Q-27. Solution: B.

B is correct. A call option's value is negatively correlated to the exercise price. The call option's value increases as the risk-free rate increases. And the volatility is positively related to both call and put options.

Q-28. Solution: C.

For $P=C+X / (1+r_f)^T - S$

A put is equivalent to long a call, a short position in the underlying asset, and a long position in the risk free asset.

Q-29. Solution: C.

A synthetic stock is S=C-P+X/ $[(1+RFR)^{T}]$ =\$1-\$11+50/ $[(1.06)^{0.25}]$ =39.28. Since the stock is selling for \$40, you can short a share of stock for \$40 and buy the synthetic for an immediate arbitrage profit of \$0.72.

Q-30. Solution: B.

A fiduciary call, defined as a long position in a call and in a risk-free bond, generates a payoff that is equal to the market value of the asset if it expires in the money.

Q-31. Solution: B.

A synthetic put is equivalent to a Long call + Short underlying + Long bond.

Q-32. Solution: C.

C is correct. Put-call-forward parity can be written as:

$P_0 - C_0 = [X - F_0(T)]/(1 + r)^{T}$

This means that the difference between the price of a put and the price of a call is equal to the difference between exercise price and forward price discounted at the risk-free rate.

A is incorrect. Neither put–call parity nor put–call–forward parity support this interpretation.

B is incorrect. Neither put–call parity nor put–call–forward parity support this interpretation.

Q-33. Solution: A.

Put-call parity is $P_0+S_0 =C_0+X/(1+r)^{T}$

Solving for the risk free bond is, $\frac{\boldsymbol{X}}{(\boldsymbol{1+RFR})^{\boldsymbol{T}}} = \boldsymbol{S} + \boldsymbol{P} - \boldsymbol{C}$

Therefore, the synthetic long assets are a combination of long the call, short stock, and short the put option.

Q-34. Solution: C.

The law of one price occurs when market participants engage in arbitrage activities so that identical assets sell for the same price in different markets.

A is incorrect because the law of one price refers to identical assets. B is incorrect because it refer to arbitrage not the law of one price.

Q-35. Solution: C.

C is correct because it is the only answer that is based on the notion of when an arbitrage opportunity exists: when two identical assets or portfolios sell for different prices. A risk premium earned in the short run can easily have occurred through luck. Buying an asset at less than fair value might not even produce a profit.

Q-36. Solution: A.

The price of a forward contract remains constant throughout its life. It is set as part of the contract specifications. The value varies with changes in the price of the underlying.

Q-37. Solution: B.

Given the formula for the value of a forward contract:

$Vt(T) = St - F0(T)(1 + r)^{-(T-t)}$ it follows that the value of the contract goes up as the price of the underlying goes up.

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Q-38. Solution: A.

The forward price of each stock is found by compounding the spot price by the risk-free rate for the period and then subtracting the future value of any benefits and adding the future value of any costs. In the absence of any benefits or costs, the one-year forward prices of BWQ and ZER should be equal.

After subtracting the benefits related to BWQ, the one-year forward price of BWQ is lower than the one-year forward price of ZER.

Q-39. Solution: A.

Convenience yield is primarily associated with commodities and generally exists as a result of difficulty in shorting the commodity or unusually tight supplies.

Q-40. Solution: A.

The value of a forward contract is the spot price of the underlying minus the present value of the forward contract. Calculating the present value requires adjusting the time period to account for the remaining term of the contract.

Q-41. Solution: B.

Given the formula for the value of a forward contract:

$$V_t(T) = S_t - F_0(T)(1 + r)^{-(T-t)}$$

it follows that the value of the contract goes up as the price of the underlying goes up.

Q-42. Solution: A.

The forward price is the spot price compounded at the risk-free rate over the life of the contract. Since Contract 2 has the longer life, compounding will lead to a larger value.

Q-43. Solution: A.

If futures prices and interest rates are negatively correlated, forwards are more desirable to holders of long positions than are futures. This is because rising prices lead to futures profits that are reinvested in periods of falling interest rates. It is better to receive all of the cash at expiration under such conditions. If futures prices and interest rates are uncorrelated, forward and futures prices will be the same. If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards.

Q-44. Solution: B.

If futures prices and interest rates are uncorrelated, the prices of forwards and futures will be identical.

Q-45. Solution: B.

Swaps have both a price and a value. Price in the context of a swap is a reference to the fixed-rate payment on the swap, which is constant over time. The value of a swap is zero at initiation but can change over the life of the swap as market interest rates change.

Q-46. Solution: A.

Risk-neutral probabilities are used, and discounting is at the risk-free rate. There is no risk premium incorporated into option pricing because of the use of arbitrage.

Q-47. Solution: C.

One benefit of derivatives markets is information discovery. Implied volatility reveals information about the risk of the underlying. Increases in implied volatility are an implication of increased market uncertainty.

Q-48. Solution: C.

C is correct. For a deep-in-the-money put option, early exercise may be optimal because the additional upside is limited.

A is incorrect. The fact that the underlying is dividend paying does not justify early exercise in the case of a put option.

B is incorrect. Early exercise of a call option may be beneficial if a sufficiently high dividend can be captured.

Q-49. Solution: C.

Cash payments on the underlying are the only reason to exercise American calls early. Interest rates, the expected return on the underlying, and any notion of a maximum price is irrelevant. But note that a dividend does not mean that early exercise should automatically be conducted. A dividend is only a necessary condition to justify early exercise for calls.

Q-50. Solution: A.

u=1.25; d=1/u=0.8

Su=20×1.25=25

Sd=20×0.8=16

p_+ = Max (0, 20-25) = 0

p_- = Max (0, 20-16) = 0

π_u = (1+0.07−0.8)/(1.25−0.8) = 0.6

π_d =1− π_u = 0.4

P = (0.6×0 + 0.4×4)/1.07 = 1.6/1.07 = 1.50

8.2. 进阶题

Q-1. Solution: C.

A derivative is a financial instrument that transforms the performance of the underlying. The transformation of performance function of derivatives is what distinguishes it from mutual funds and exchange traded funds that pass through the returns of the underlying.

A is incorrect because derivatives, in contrast to mutual funds and exchange traded funds, do not simply pass through the returns of the underlying at payout. B is incorrect because a derivative transforms rather than replicates the performance of the underlying.

Q-2. Solution: A.

If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards. A negative correlation between futures prices and interest rates leads to the opposite interpretation, with forwards being more desirable than futures to the long position.

If futures prices and interest rates are uncorrelated, forwards and futures prices will be the same.

If futures prices are positively correlated with interest rates, futures contracts are more desirable to holders of long positions than are forwards.

A negative correlation between futures prices and interest rates leads to the opposite interpretation, with forwards being more desirable than futures to the long position.

The more desirable contract will tend to have the higher price.

Q-3. Solution: B.

A credit derivative is a derivative contract in which the credit protection seller provides protection to the credit protection buyer against the credit risk of a third party.

A is incorrect because the clearinghouse provides a credit guarantee to both the buyer and the seller of a futures contract, whereas a credit derivative is between two parties, in which the credit protection seller provides a credit guarantee to the credit protection buyer. C is incorrect because futures contracts require that both the buyer and the seller of the futures contract provide a cash deposit for a portion of the futures transaction into a margin account, often referred to as a performance bond or good faith deposit.

Q-4. Solution: B.

A margin deposit in futures contract is in fact a guarantee of delivery of the underlying assets. The change in the amount of margin is a current gain or loss of counterparties of futures contracts. If a participant has a margin greater than his maintenance margin, he/she can withdraw the part above the maintenance level to realize the gain.

The loan granted by brokers is used in a purchase in margin of stocks. Commissions are a fee charged by brokers. It is a transaction cost and has no direct relation with margin.

Q-5. Solution: A.

A call is in-the-money when the underlying asset price exceeds the strike price. The entire premium of the 60 strike call reflects time value; only a part of the 50 strike call's premium is time value, the rest will be intrinsic value.

Q-6. Solution: A.

For a European put, the exercise price must be adjusted to the present value because the option can only be exercised on expiration.

Option	Min Value	Max Value
European call	$\text{Max}[0 , S_t - X/(1+RFR)^{T-t}]$	S_t
American call	$\text{Max}[0 , S_t - X/(1+RFR)^{T-t}]$	S_t
European put	$\text{Max}[0 , X/(1+RFR)^{T-t} - S_t]$	$X/(1+RFR)^{T-t}$
American put	$P_t \geq \text{Max}[0 , X - S_t]$	X

Q-7. Solution: C.

Cash payments on the underlying are the only reason to exercise American calls early. Interest rates, the expected return on the underlying, and any notion of a maximum price is irrelevant. But note that a dividend does not mean that early exercise should automatically be conducted. A dividend is only a necessary condition to justify early exercise for calls.

Q-8. Solution: A.

In bankruptcy, the price of the bankrupt company's stock falls. In the limit it falls to zero. At a price of zero, the price cannot go any lower, and it would be advantageous to exercise the American put at that point in time rather than be forced to wait until the expiration date. Therefore, the American-style put is likely to have a higher price than an equivalent European-style put.

Q-9. Solution: C.

The price of a forward contract is a contractually fixed price, established at initiation, at which the underlying will be purchased (or sold) at expiration. The value of a forward contract at initiation is

zero; therefore, the forward price is greater than the value of the forward contract at initiation.

Q-10. Solution: C.

Known interest rates and the condition that futures prices are uncorrelated with forward prices will make forward and futures prices equivalent. The volatility of forward and futures prices has no relationship to any difference.

Q-11. Solution: C.

Value accumulates from the previous settlement and goes to zero when distributed.