金程教育
GOLDEN FUTURE
可信赖的财经培训专家

CFA一级培训项目

Derivative Investments

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CFA一级课程框架

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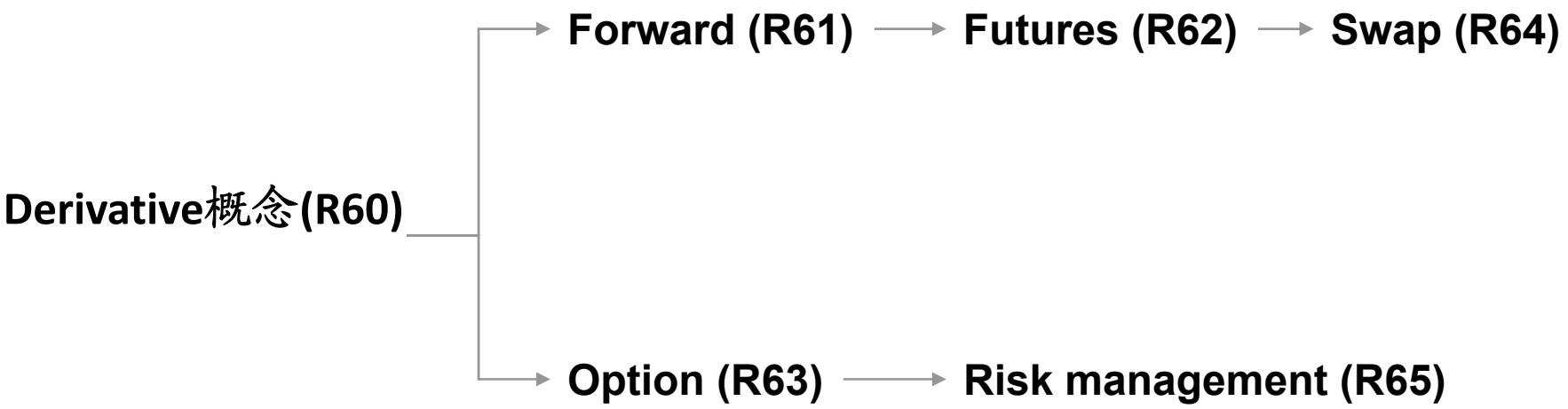
Derivative框架结构



Framework

R60：Derivative markets and instruments

1. Derivative的定义
2. 分类
   - Exchange-traded & Over-the-counter的区别 ★
   - Forward commitment & Contingent claim的区别 ★
3. Derivatives的作用和对它的批评
4. 什么是arbitrage？arbitrage的作用

R.60 Derivative Markets and Instruments

- **Definition:** A **derivative** is a financial instrument (**contract**) that offers a return based on the return of some other underlying asset.
  - ✓ **Buy or Sell Something:**
    - Buy or Sell **now**;
    - Buy or Sell sometime **in the future**.
  - ✓ **Example**:
    - 3个月后→3￥/瓶价格→买果汁;
    - 3个月后→15￥/股价格→买股票;
    - 3个月后→4%利息→借￥1million;
    - 3个月后→6.5CNY/USD→换CNY.
- 关键词:
  - 合约
  - 规避风险Hedge vs. 赚钱 Speculate
  - 合约收益取决于约定的资产价格变化

R.60 Derivative Markets and Instruments

Forward contract | **Futures contract** | **Swap contract** | **Option contract**

➢ Forward contract:

- A **forward contract** is an private agreement that obligates one party to buy and the other party to sell a specific quantity of an underlying asset, at a set price, at a future date
- 约定未来特定时间以约定价格买卖标的物的合约.
- If the future price of the underlying assets increase, the buyer has a gain, and the seller has a loss.

R.60 Derivative Markets and Instruments

Forward contract | **Futures contract** | **Swap contract** | **Option contract**

- **A Futures contract** is a forward contract that is standardized and exchange-traded.
  - A forward contract
  - Are regulated
  - Backed by a clearinghouse
  - Require a daily settlement of gains and losses.

R.60 Derivative Markets and Instruments

Forward contract | **Futures contract** | **Swap contract** | **Option contract**

- **A Swap contract** is a series of forward contracts .
  - forward contracts
  - Exchange cash flows on period settlement dates

R.60 Derivative Markets and Instruments

Forward contract | Futures contract | Swap contract | **Option contract**

➢ **An option contract:**

- The owner has the right, but not the obligation the conduct a transaction
- **四种contract中只有option权利义务不对等要交期权费**

➢ Basic characteristics of options

1. 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

2. 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

R.60 Derivative Markets and Instruments

➢ 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

R.60 Derivative Markets and Instruments

➢ 衍生品分类方法

- 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**）
- 两种交易区别：

Exchange-traded	Over-the-counter
standardized→ liquid	customized
backed by a clearinghouse	trade with counterparty (default risk)
trade in the a physical exchange	not trade in a central location
regulated	unregulated

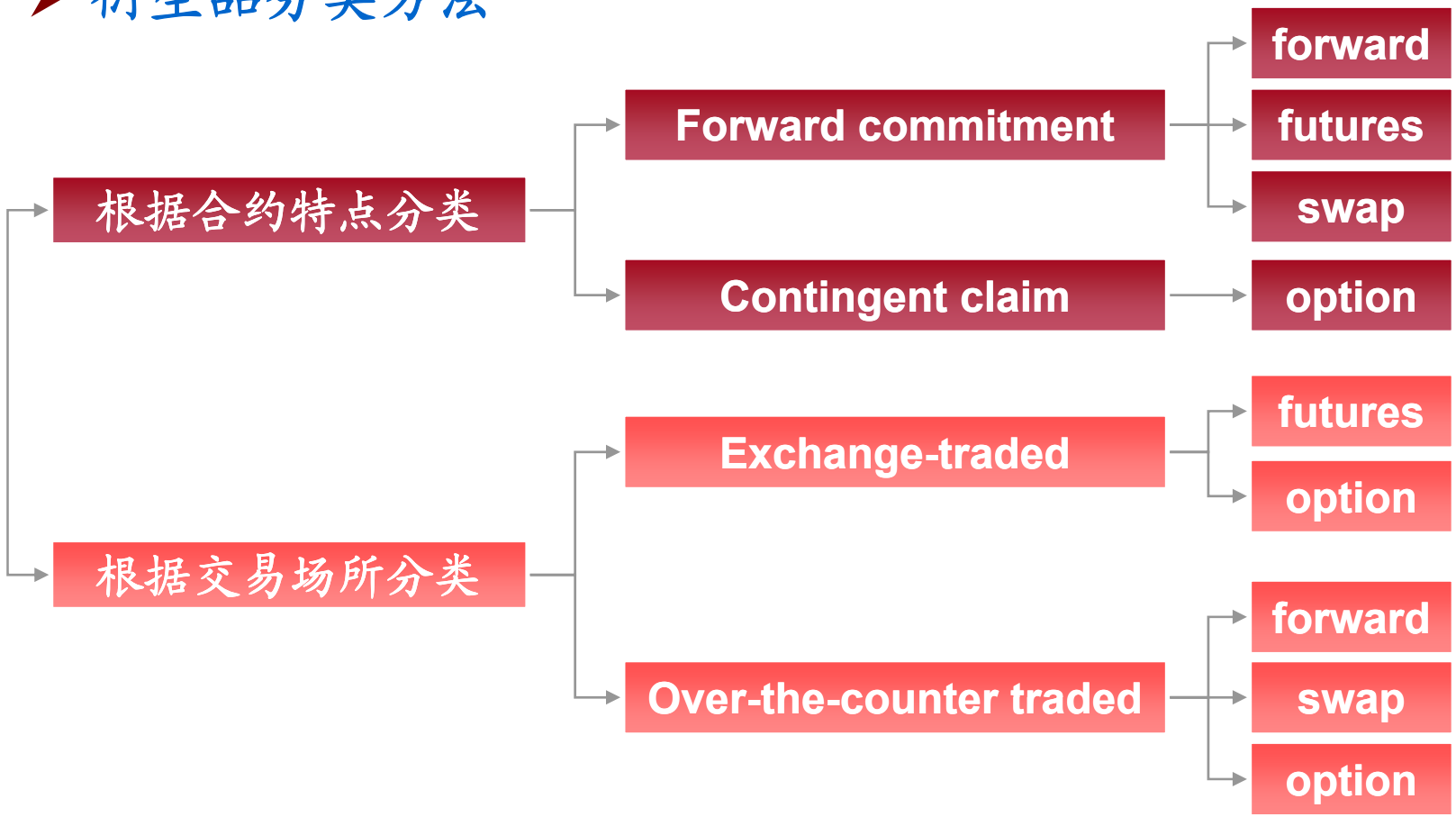
R.60 Derivative Markets and Instruments

➢ 主要术语:

- **Forward commitment**
  - ✓ ***Long***: 指买标的物
  - ✓ ***Short***: 指卖标的物
- **Contingent claim**
  - ✓ ***Long***: 指获得一个权利
  - ✓ ***Short***: 指卖出一个权利
  - ✓ ***Call***: 指买入标的物的权利
  - ✓ ***Put***: 指卖出标的物的权利

R.60 Derivative Markets and Instruments

➢ 衍生品分类方法



Bond options

Example

1. The buyer of a call option has the:
   A. right to buy the underlying asset in the future under certain conditions
   B. obligation to sell the underlying asset in the future under certain conditions
   C. right to sell the underlying asset in the future under certain conditions

➢ Correct answer: A

2. A private agreement between two parties to exchange a series of future cash flows with at least one of the two series of cash flows determined by a later outcome, is best characterized as a(n):
   A. Swap
   B. Futures contract
   C. Exchange-traded contingent claim

➢ Correct answer: A

R.60 Derivative Markets and Instruments

➢ Advantage:

- Price discovery
- Risk management: hedge and speculation
- Lowering transaction costs

➢ Disadvantage:

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

➢ 考点:

- *Always increase risk? →No.*

R.60 Derivative Markets and Instruments

➢ 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***: two securities or portfolios that have identical cash flows in the future, regardless of future events, should have the same price

➢ Risk-free arbitrage and no-arbitrage rule (Cont.):

- The way of arbitrage: **sell high, buy low**
- If a portfolio consisting of A and B has a certain payoff, the portfolio should yield the risk-free risk
- The role of arbitrage is to eliminate mispricing and lead to the market efficiency. That is why arbitrage also plays a role in **pricing**.

Example

- Whether these two rules below can restrict the price discover function of the market?

	Restrict sell short system	limit the amount of arbitrage
A.	yes	yes
B.	yes	no
C.	no	yes

- Correct answer: A
- Solution
  - Sell short和arbitrage可以促进市场有效定价，加以限制将影响市场功能.

Review

➢ R60：Derivative markets and instruments

100% Contribution Breeds Professionalism

Framework

R61：Forward

1. Definition and features
2. 到期delivery的方法 & 到期前termination的方法 ★
3. dealer和end user的区别
4. 各种forward的特点
   - Equity/zero-coupon bond/coupon bond
   - Eurodollar time deposit → 定义LIBOR和Euribor
   - **FRA** → 特点、payoff、解释“3×6 FRA” ★★
   - Currency forward

R.61 Forward Markets and Contracts

- **Definition:** A **forward contract** is a bilateral contract that obligates one party to buy and the other party to sell a specific quantity of an underlying asset, at a set price, on a specific date in the future

- **Long and short forward position**
  - ***Long***: buy underlying
  - ***Short***: sell underlying
  - No payments will be made at the inception of a forward contract. So both parties of a forward contract is exposed to potential default risk

R.61 Forward Markets and Contracts

➢ Forward contracts分类:

- *Commodity forward contract*：商品远期合约
- *Financial forward contract*：金融远期合约

➢ Purposes of trading forward contracts:

- *Hedge risk*：套期保值，锁定未来交易成本，但不保证一定比不实施套期保值赚钱。存在default risk。
- *Speculation*：投机，赌未来价格的变化方向。

➢ Characteristics of Forward contracts :

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

R.61 Forward Markets and Contracts

➢ forward contracts使用者:

- ***End users（风险回避）***:
  - ✓ An end user is generally a party with a risk management problem that is searching for a dealer to provide it with a financial transaction to solve that problem.
  - ✓ 公司，政府机构，非赢利组织.
- ***Dealers（Bid-ask spread）***:
  - ✓ Market maker that provides market liquidity. The bid-ask price spread is the dealer's compensation for administrative costs as well as bearing default risk and any un-hedged positions.
  - ✓ Ideally, dealers will balance their overall positions. For forward contract risk management, dealer often use offsetting and spot transaction.
  - ✓ banks and nonbank 金融机构.

R.61 Forward Markets and Contracts

➢ Settling a forward contract *at expiration*

- ***Physical settlement***: deliver an actual asset，存在储存成本，多用于商品远期
- ***Cash settlement***: the party that has a position with negative value is obligated to pay that amount to the other party，多用在金融远期

➢ Settling a forward contract *prior to expiration*

- ***Entering into an opposite forward contract***: with an expiration date equal to the time remaining on the original contract
  - ✓ Offsetting with a ***different*** party: some credit risk remains
  - ✓ Offsetting with the ***original*** party: can avoid credit risk

Example

1. Which is the most common way to terminate a forward contract prior to expiration?
   A. Cash settlement
   B. Enter into an opposite contract
   C. Delivers the actual instruments

➢ Correct answer: B

2. How to eliminate the risk on a forward contract: terminate
   A. enter a opposite trade with same counterparty at same price
   B. enter a opposite trade with different counterparty for any price
   C. enter a opposite trade with same counterparty for any price

➢ Correct answer: A

R.61 Forward Markets and Contracts

Forward contract 分类

- Equity forward contract
- Equity index forward contract
- Bond forward contract
- FRAs
- Currency forward contract

R.61 Forward Markets and Contracts

➢ Equity forward

- 定义: An equity forward contract is a forward contract on a stock, a stock portfolio, or an equity index .
- 交割方式:
  - ✓ *Equity forwards*: ***physical or cash settlement*** (based on the value of a stock, a specific portfolio of stocks).

Equity index forward

- 交割方式:
  - ✓ *Stock index forward*: ***cash settlement***.
- 股利处理: Dividends are usually **not** included in equity forward contracts, as the uncertainty about dividend amounts and payment dates is small compared to the uncertainty about future equity prices.
- Since forward contracts are custom instruments, the parties could specify a **total return value** (including dividends) rather than simply the index value. This would effectively remove return uncertainty.

Example（Equity index forward contracts）

- A portfolio manager desires to generate $10 million 100 days from now from a portfolio that is quite similar in composition to the S&P 100 index.
- She took a short position in a 100-day index forward contract with a notional amount of $10 million and gets a quote of 525.2.
- If the index level at the settlement date is 535.7, calculate the amount the manager will pay or receive to settle the contract.

R.61 Forward Markets and Contracts

Bond forward contracts

- 定义：Forward contracts on short-term, zero-coupon bonds (T-bills in the U.S.) and coupon interest-paying bonds are quite similar to those on equities.
- 与**Equity Forward**区别：Equities do not have a maturity date, bonds do, and the forward contract must settle before the bond matures.
- 报价方法:
  - ✓ T-bill prices are often quoted as 100-annualized discount in percent on the T-bill.
  - ✓ Coupon bonds are often quoted as a YTM

Example

- A forward contract for T-bills with a face value of $200 million has 80 days to maturity at contract settlement and is priced at a 3 percent discount. The amount the long must pay for the T-bills at settlement is *closest* to:
  - A. $198,666,667.
  - B. $194,000,000.
  - C. $198,684,932.
- Correct answer: A
- **Solution**
  - The annualized discount must be converted to an 80-day discount:
  - 0.03 (80/360) = 0.006666667
  - The settlement price is:
  - $200 million (1-0.006666667) = $198,666,667

R.61 Forward Markets and Contracts

➢ LIBOR, Euribor, and FRAs

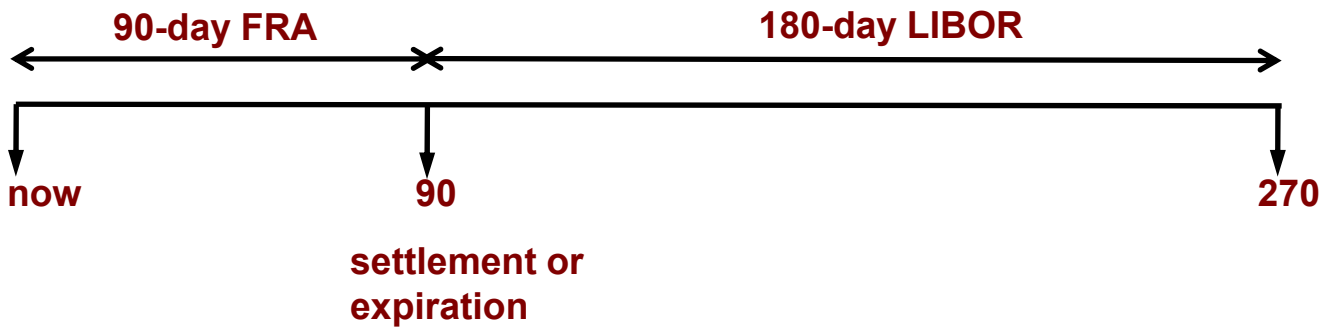
- Eurodollar time deposit.
- London Interbank Offer Rate (LIBOR).
  - ✓ USD interest rates.
  - ✓ Quoted as an annualized rates based on a 360-day a year
  - ✓ Add-on rate
  - ✓ Single interest

  Example：英国借本金1million的美元，借30天，30天的LIBOR是6%，那30天到期之后我应该还多少钱?
- Euribor is a similar rate for borrowing and lending in Euros
- A forward rate agreement (FRA) is a forward contract on an interest rate (LIBOR)

R.61 Forward Markets and Contracts

➢ LIBOR, Euribor, and FRAs（续）

- **FRA定义**： An FRA can be viewed as a forward contract to borrow/lend money at a certain rate at some future date.
  - ✓ **The long position**: is the party that would **borrow** the money
  - ✓ **The short position**: is the party that would **lend** the money
- **FRA期限.**
  - ✓ 常见期限：30、60、90、120天Libor
  - ✓ Off-the-run FRA： 非标准周期如45天Libor
- **报价**： Example 3×9FRA



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➢ LIBOR, Euribor, and FRAs（续）

交割: settle in cash, but no actual loan is made at the settlement date

- **Payoff定性分析**:
  - ✓ 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
- **Payoff定量分析**

$$(\text{notional principal})\left[\frac{(\text{floating rate at settlement} - \text{forward rate})\left[\frac{\text{days}}{360}\right]}{1+\text{floating rate at settlement}\left[\frac{\text{days}}{360}\right]}\right]$$

R.61 Forward Markets and Contracts

➢ LIBOR, Euribor, and FRAs（续）

- **Payoff计算注意事项**:

1. 给出的利率为annualized年利率，需要月度化
2. The difference in rates is multiplied by the notional amount of the contract.
3. The payment at settlement is the present value of the interest difference, discounted at the rate prevailing at settlement.

Example

1. A forward rate agreement (FRA) has the following characteristics:
   - Expires/settles in 60 days
   - Is based on a notional principal of $500,000
   - Is based on 180 day LIBOR
   - Specifies a forward rate of 4%
   - The actual 180 day LIBOR 60 days from now is 3%

➢ What is the payoff at expiration of the FRA and which party will owe or make a payment to the other party?

Payoff at Expiration	Payment to Party
A. -$2,463.05	Long owes the short
B. $2,450.98	Long owes the short
C. -$837.44	Short owes the long

➢ Correct answer: A

Example

2. The term (maturity) of a forward rate agreement is 90 days and the underlying rate is 180-day LIBOR. If 180-day LIBOR increases over the term (life) of the contract, which of the following best describes the descriptive notation for the contract and the party receiving payment at expiration, respectively?

	Descriptive notation	Party receiving payment at expiration
A.	3-6	Long
B.	3-6	Short
C.	3-9	Long

- Correct answer: C

3. The underlying asset of FRA is

   A. Bond

   B. Stock

   C. Interest rate

- Correct answer: C

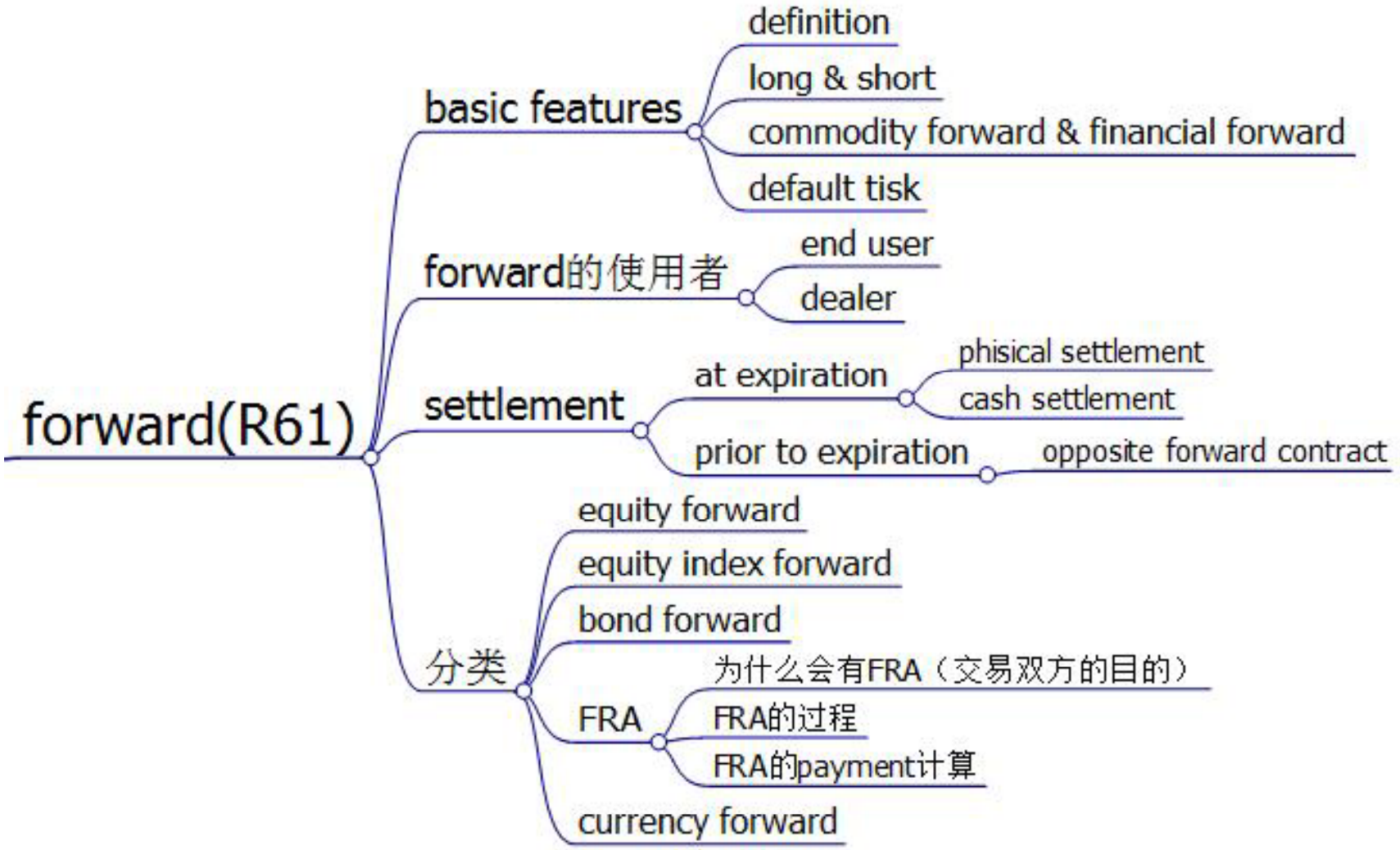
R.61 Forward Markets and Contracts

Currency Forward

- 定义：Currency forwards are widely used to hedge exchange rate risk and require delivery of a specified amount of a particular currency with a contract price in another currency or settled in cash.
- 交割方式：Cash or deliverable

Review

➢ R61：Forward



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Framework

➢ R62：Futures

1. Futures和forward的对比 ★
2. Margin ★★
   - 证券市场和期货市场上margin的区别
   - 几个定义: initial/maintenance/variation margin, settle price, price limit, mark-to-market
   - **计算margin balance**
3. 控制风险的其他方法：marking-to-market/price limit
4. Terminate的方法
5. 各种futures的特点：Eurodollar★/Treasury bond★/Stock index/Currency

R.62 Futures Markets and Contracts

➢ 定义:

- A **futures contract** is an agreement that obligates one party to buy and the other party to sell a specific quantity of an underlying asset, at a set price, at a future date.

➢ 与forward contract相似点:

- Can be either deliverable or cash settlement contracts;
- Are priced to have zero value at the time an investor enters into the contract.

R.62 Futures Markets and Contracts

➢ 与forward区别：

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

R.62 Futures Markets and Contracts

➢ Standardization:

- Futures contracts specify the **quality and quantity** of goods that can be delivered, the **delivery time and the manner** of delivery.

➢ clearinghouse

- **Each exchange has a clearing house** that guarantees that traders in the futures market will honor their obligations.
- A clearinghouse acts as the **counterparty** to each participant. The clearinghouse is the buyer to every seller and the seller to every buyer.
- There is no need to worry about the **counterparty default risk**.
- Clearinghouse allows either side of the trade to **reverse positions** at a future date.

R.62 Futures Markets and Contracts

Futures contract风险控制方法

- **Margin;**
- **Daily Price Limit;**
- **Marking to market.**

R.62 Futures Markets and Contracts

➢ Futures contract风险控制方法

- **方法一：Margin:**
  - ✓ ***Initial margin***: The first deposit is called the initial margin. Initial margin must be posted before any trading takes place;
  - ✓ ***Maintenance margin***: If the margin balance in the trader's account falls below 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.***

R.62 Futures Markets and Contracts

➢ 例题、

Initial margin=$5/contract, maintenance margin=$2/contract, long 20 contract

Day	Beginning balance	Funds deposited	Futures price	Price change	Gain/Loss	Ending Balance
0	0	100	82			100
1	100	0	84	2	40	140
2	140	0	78	-6	-120	20
3	20	80	73	-5	-100	0
4	0	100	79	6	120	220
5	220	0	82	3	60	280
6	280	0	84	2	40	320

Futures contract风险控制方法（续）

- **Margin**（续）:与股票市场Margin的比较

	期货margin	股票margin
目的	做抵押减少违约风险	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

Example

1. Do “margin” in the stock market and “margin” in the futures market, respectively, mean that an investor has received a loan that reduces the amount of his own money required to complete the transaction?

	“Margin” in the stock market	“Margin” in the future market
A	No	No
B	No	Yes
C	Yes	No

➢ Correct answer: C

2. A futures trader must keep the money in the margin account above the:

   A. initial margin requirement

   B. variation margin requirement

   C. maintenance margin requirement

➢ Correct answer: C

Example

3. The following information relates to a futures market contract:

Initial futures price on Day 0	$100
Initial margin requirement	$5
Maintenance margin requirement	$3
Settlement price on Day 1	$103
Settlement price on Day 2	$96
Settlement price on Day 3	$98

- If no funds are withdrawn and margin calls are met at the beginning of the next day, the ending balance on Day 3 for an investor with a short position of 10 contracts is closest to:

  A. $50

  B. $70.

  C. $100.

- Correct answer: C

R.62 Futures Markets and Contracts

➢ Futures contract风险控制方法（续）

- **方法二：Daily Price Limit涨跌停机制:**

  - ✓ Price limits are exchanged-imposed limits on how much the contract price can change from the previous day's settlement price;
  - ✓ ***Limit move***: If traders wish to trade at prices outside these limit---no trades will take place.---the settlement price will be reported upper or lower price limits
  - ✓ ***Locked limit:*** if trades cannot take place because of a limit move, either up or down, the price is said to be locked limit, since no trades can take place and traders are "locked" into their existing positions.

R.62 Futures Markets and Contracts

➢ Futures contract风险控制方法（续）

- ***方法三：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

Example

- Which of the following statements about futures contracts is **FALSE**?
  - A. The futures clearinghouse allows traders to reverse their positions without having to contract the other side of the initial trade.
  - B. To safeguard the clearinghouse, the exchange requires traders to post margin and settle their accounts on a weekly basis.
  - C. Offsetting trades rather than exchanges for physicals are used to close most futures contracts.
- Correct answer: B
- **Solution**
  - Marking to market is the process of adjusting the margin balance in a futures account each day, not on a weekly basis.

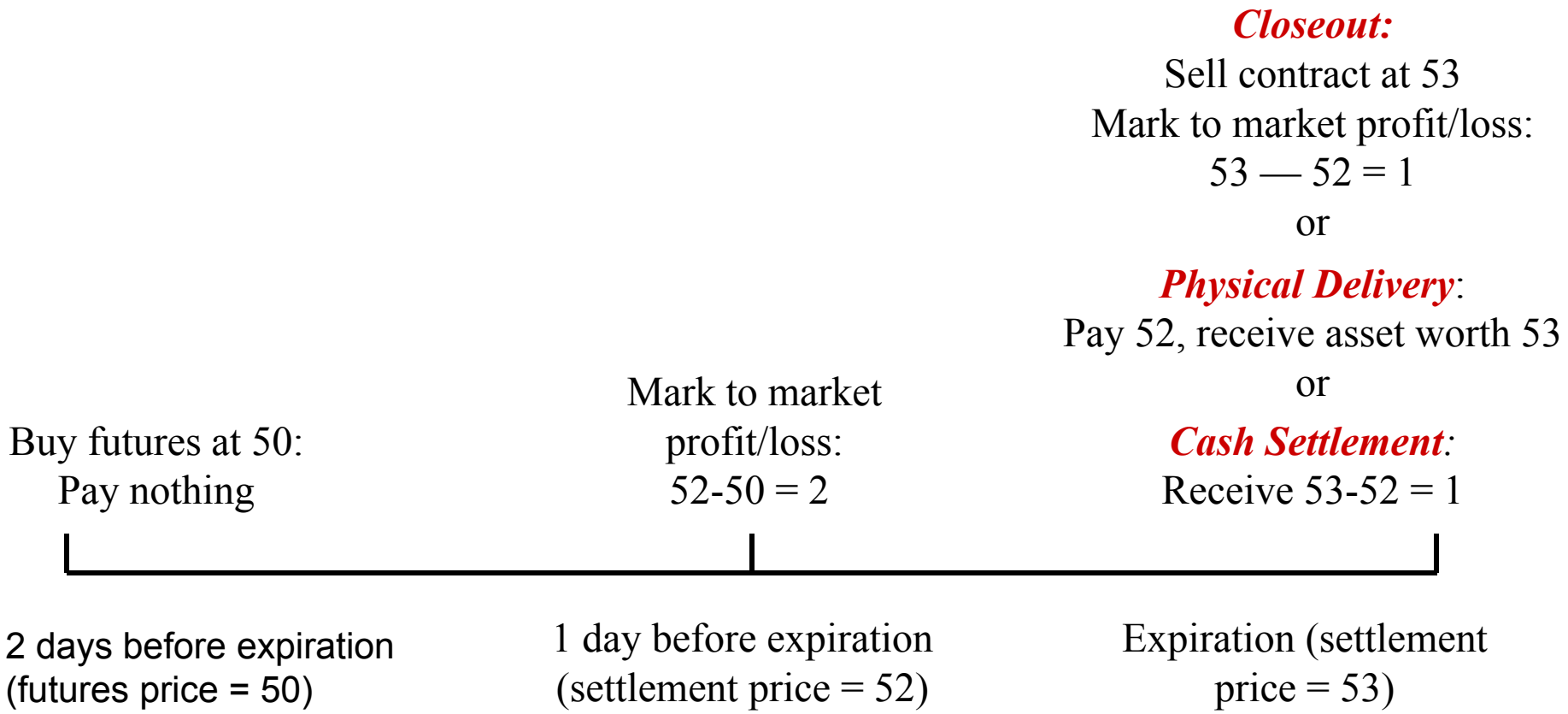
R.62 Futures Markets and Contracts

➢ Four ways to terminate a futures contract

- 到期日交割：
  - ✓ ***Delivery of the asset specified in the contract***: a **short** can initiate the delivery process, a long by accepting delivery and paying the contract price to the short.
  - ✓ ***Cash payment at expiration***
- 提前交割：
  - ✓ ***Close out or offsetting trade***
  - ✓ ***An exchange for physicals***: off the floor of the exchange (called an ex-pit transaction)

R.62 Futures Markets and Contracts

➢ 例题（原版书）



Example

- Which is the most common method of closing a futures contract?
  - A. Physical delivery.
  - B. Exchange of physicals.
  - C. Reversing or offsetting trade.
- Correct answer: C

R.62 Futures Markets and Contracts

- **Five types of futures contracts**
  - ***Treasury bill futures contracts***
    - ✓ based on a $1 million face value 90-day T-bill and settle in cash.---the price quotes are 100 minus the annualized discount in the percent on the T-bills.
  - ***Eurodollar futures***
    - ✓ based on 90-day LIBOR, which is an add-on yield---quoted as 100 minus annualized 90-day LIBOR, and settle in cash
    - ✓ The minimum price change is one tick, representing $25 per $1 million contract.
  - ***Treasury bond futures contracts*** :
    - ✓ Are traded for treasury bonds with maturities greater than 15 years.
    - ✓ Are a deliverable contract: a delivery option to the short
    - ✓ Have a face value of $100,000
    - ✓ Are quoted as a percent and fractions of one percent of face value
  - ***Stock index futures***
  - ***Currency futures***

R.62 Futures Markets and Contracts

➢ Five types of futures contracts- *T-bill futures contracts*

- 标的物:
  - ✓ $1 million face value 90-day T-bill
- 交割方式:
  - ✓ Cash payment at expiration
- 报价:
  - ✓ ***Discount yield***: 100-the annualized discount in the percent on the T-bills
  - ✓ ***Actual futures price***: **100-[1-(quoted price)/100(90/360)]**
  - ✓ Minimum price change (0.01,or one ***tick***) representing $25 per $1 million contract.

R.62 Futures Markets and Contracts

➢ Five types of futures contracts- *Eurodollar futures*

- 标的物：
  - ✓ $1 million face value 90-day LIBOR
- 交割方式:
  - ✓ Cash payment at expiration
- 报价:
  - ✓ 100-annualized 90-day LIBOR
- **Payoff**:
  - ✓ Long the contract is lending money and short the contract short is borrowing money.
  - ✓ Minimum price change (0.01,or one ***tick***) representing $25 per $1 million contract, similar to T-bill future contract

R.62 Futures Markets and Contracts

➢ Five types of futures contracts- *Treasury bond futures*

- **Underlying asset:**
  - ✓ **A hypothetical 30 year bond with 6% coupon rate (>=15y)**
- **Bond can be deliverable:**
  - ✓ Treasury bonds with maturities ***greater*** than 15 years, with a face value of $100,000
- 交割方式:
  - ✓ ***Deliverable***: a delivery option to the short so that the ***cheapest-to-deliver bond*** is delivered
  - ✓ ***Conversion factor***: used to adjust the long's payment at delivery so that more valuable bonds receive a higher payment. The factors are multipliers for the futures price at settlement.
- 报价:
  - ✓ A percent and fractions of one percent (measured in 1/32nds) of face value

➢ Five types of futures contracts- *Stock index futures*

- 标的物:
  - ✓ The most popular stock index is the S&P 500 index futures
- 交割方式:
  - ✓ Cash payment at expiration
- 报价:
  - ✓ Based on a multiplier of 250

R.62 Futures Markets and Contracts

➢ Five types of futures contracts- *Currency futures*

- 标的物:
  - ✓ Exchange rate to change foreign currency with domestic currency
- 交割方式:
  - ✓ Cash or deliverable at expiration.
- 报价:
  - ✓ Price is stated in USD/unit.

R.62 Futures Markets and Contracts

➢ Futures & Forward 总结

	标的物	交割方式	报价
Equity forward	Stock	Cash or deliverable	Stock price
Equity index forward	Equity index	Cash	Euqity index
Bond Forward	T-bills		100-annualized discount in percent
FRA	Libor	Cash	Example1 × 4FRA
Currency Forward	Exchange rate	Cash or deliverable	Exchange rate
T-bill futures	$1 million 90-day T-bill	Cash	100-annualized discount rate
Eurodollar futures	$1 million 90-day LIBOR	Cash	100-annualized 90-day LIBOR
Treasury bond futures	$100,000, **hypothetical 30 year bond with 6% coupon rate**	Deliverable	A percent and fractions of one percent
Stock index futures	Stock index	Cash	Based on a multiplier of 250
Currency futures	Exchange rate	Cash or deliverable	Price is stated in USD/unit

Review

➢ R62：Futures

100% Contribution Breeds Professionalism

Framework

- **R64：Swaps**
  1. Swap的定义和特征
  2. Terminate的方法
  3. 几种swap：currency/plain vanilla interest rate/equity → 特点/计算 **payments** ★★

R.64 Swap Markets and Contracts

➢ Characteristics of Swap Contracts

- ***Swap contract*** **:** A swap contract obligates two parties to change a series of cash flows on periodic settlement dates over a certain time period.
- ***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

R.64 Swap Markets and Contracts

➢ Methods of Terminating a Swap

- **Mutual termination**
- **Offsetting swap contract**
- **Resale to a third party *(unusual)***
- **Exercising a swaption**
  - ✓ **Swaption**: An option to enter into an offsetting swap

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Interest Rate Swaps

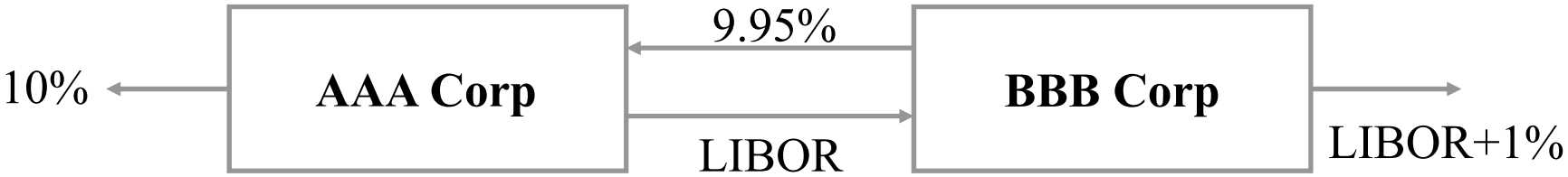
- The **plain vanilla interest rate swap** involves trading fixed interest rate payments for floating-rate payment (paying fixed and receiving floating).
  - ✓ ***Counterparties***: The parties involved in any swap agreement are called the counterparties
  - ✓ ***Pay-fixed side***: The counterparty that wants variable-rate interest agrees to pay fixed-rate interest.
  - ✓ ***Pay-floating side***: The counterparty that receives the fixed payment and agrees to pay variable-rate interest .

R.64 Swap Markets and Contracts

Three types of swap contracts- Interest Rate Swaps

- The Comparative Advantage Argument
  - ✓ **AAA Corp**: wants to borrow floating
  - ✓ **BBB Corp**: wants to borrow fixed.

	Fixed	*Floating*
AAA Corp	10.00%	6-month LIBOR + 0.30%
BBB Corp	11.20%	6-month LIBOR + 1.00%



- ✓ AAA Corp: LIBOR+0.05%，节省0.25%
- ✓ BBB Corp: 10.95%，节省0.25%

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Interest Rate Swaps

- Cash flow of an IRS
  - ✓ There is no need to actually exchange the cash at the initiation of the swap
  - ✓ Net interest is paid by the party who owes it
    - Fixed payment =fixed rate*(number of days/360)*principal
    - Float payment =Libor *(number of days/360)*principal
    - Net fixed rate payment= Fixed payment- Float payment
  - ✓ At the conclusion of the swap, only the final net payment is made, since the notional principal was not swapped
- In a swap, the floating-rate payment is made based on what the floating rate was at the beginning of the settlement period.
- Default risk is greater in the middle of the swap

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Interest Rate Swaps

Example of IRS

✓ An agreement by Microsoft to receive 6-month LIBOR & pay a fixed rate of 5% per annum every 6 months for 3 years on a notional principal of $100 million

		---------Millions of Dollars---------		
Date	LIBOR Rate	*FLOATING* Cash Flow	*FIXED* Cash Flow	Net Cash Flow
Mar.5, 2001 (0)	4.2%			
Sept. 5, 2001 (0.5)	4.8%	+2.10	–2.50	–0.40
Mar.5, 2002 (1)	5.3%	+2.40	–2.50	–0.10
Sept. 5, 2002 (1.5)	5.5%	+2.65	–2.50	+0.15
Mar.5, 2003 (2)	5.6%	+2.75	–2.50	+0.25
Sept. 5, 2003 (2.5)	5.9%	+2.80	–2.50	+0.30
Mar.5, 2004 (3)	6.4%	+2.95	–2.50	+0.45

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Interest Rate Swaps

- Cash flow of an IRS
  - ✓ The basic formula for the net fixed-rate payment in an interest rate swap is:

$$\begin{pmatrix}\text{net fixed rate}\\ \text{payment}\end{pmatrix}_t = \begin{pmatrix}\text{swap fixed}\\ \text{rate} - \text{LIBOR}_{t-1}\end{pmatrix}\left(\frac{\text{number of days}}{360}\right)\begin{pmatrix}\text{notional}\\ \text{principal}\end{pmatrix}$$

  - ✓ If this number is positive, the fixed-rate payer owes a net payment to the floating-rate party.
  - ✓ If this number is negative, then the fixed-rate payer receives a net payment from the floating-rate party.

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Currency swaps

- In a currency swap, one party makes payments denominated in one currency, while the payments from the counterparty are made in a second currency. Typically, the notional amounts of the contract, expressed in both currencies, are exchanged at contract initiation and returned at the contract termination date ***in the same amounts.***
- The cash flows that would occur in a currency swap are as follows:
  - ✓ Unlike an interest-rate swap, the notional principal actually changes hands at the beginning of the swap.
  - ✓ Interest payments are made without netting.
  - ✓ At the termination of the swap agreement (maturity), the counterparties return the notional amounts. Notional principal is swapped again at the termination of the agreement
  - ✓ The termination date has the greatest default risk

R.64 Swap Markets and Contracts

➢ Three types of swap contracts- Equity Swaps

- In an equity swap, the return on a stock, a portfolio, or a stock index is paid each period by one party in return for a fixed or a floating payment. The return can be the capital appreciation or the total return including dividends on the stock or portfolio. The payment is calculated as the percentage return on the equity over the period times the notional amount of the swap.
- In an equity swap, the first payment (and the others) are unknown and the fixed rate payer may actually pay more than the fixed rate if the equity return is negative over the period.
- It may help to remember that the party that pays equity returns would receive a fixed return on the equity portfolio combined with the swap, regardless of the equity portfolio performance.

Example

1. Two parties enter into a three-year, plain-vanilla interest rate swap agreement now to exchange the LIBOR rate for a 10 percent fixed rate annually on $10 million. LIBOR is 11 percent now, 12 percent at the end of the first year, and 9 percent at the end of the second year. If payments are in arrears, which of the following best characterizes the net cash flow to be received by the fixed-rate payer?

   A. $100,000 at the end of year 2.

   B. $100,000 at the end of year 3.

   C. $200,000 at the end of year 2.

- Correct answer: C
- **Solution**
  - The payment at the end of year two is based on the difference between the interest rate at the end of year one and the fixed rate:

    $10,000,000 × 0.02 = $200,000.

Example

3. An asset manager wants to increase his portfolio's exposure to large-capitalization and has entered into the following swap with a dealer:

Frequency of payments	Semiannually
Fixed rate (annual rate)	3.0%
Notional principal	$50 million
Value of the large-capitalization stock index at swap initiation	863.20
Value of the large-capitalization stock index six month after swap initiation	885.50

- If the swap involves netting of payments and the dealer agrees to pay the return on the stock index while the asset manager pays fixed, the party making the payment after six months and the approximate amount of the payment, respectively, are:

Party making the payment	Approximate amount of the payment
A. Dealer	$105,000
B. Dealer	$540,000
C. Asset manager	$105,000

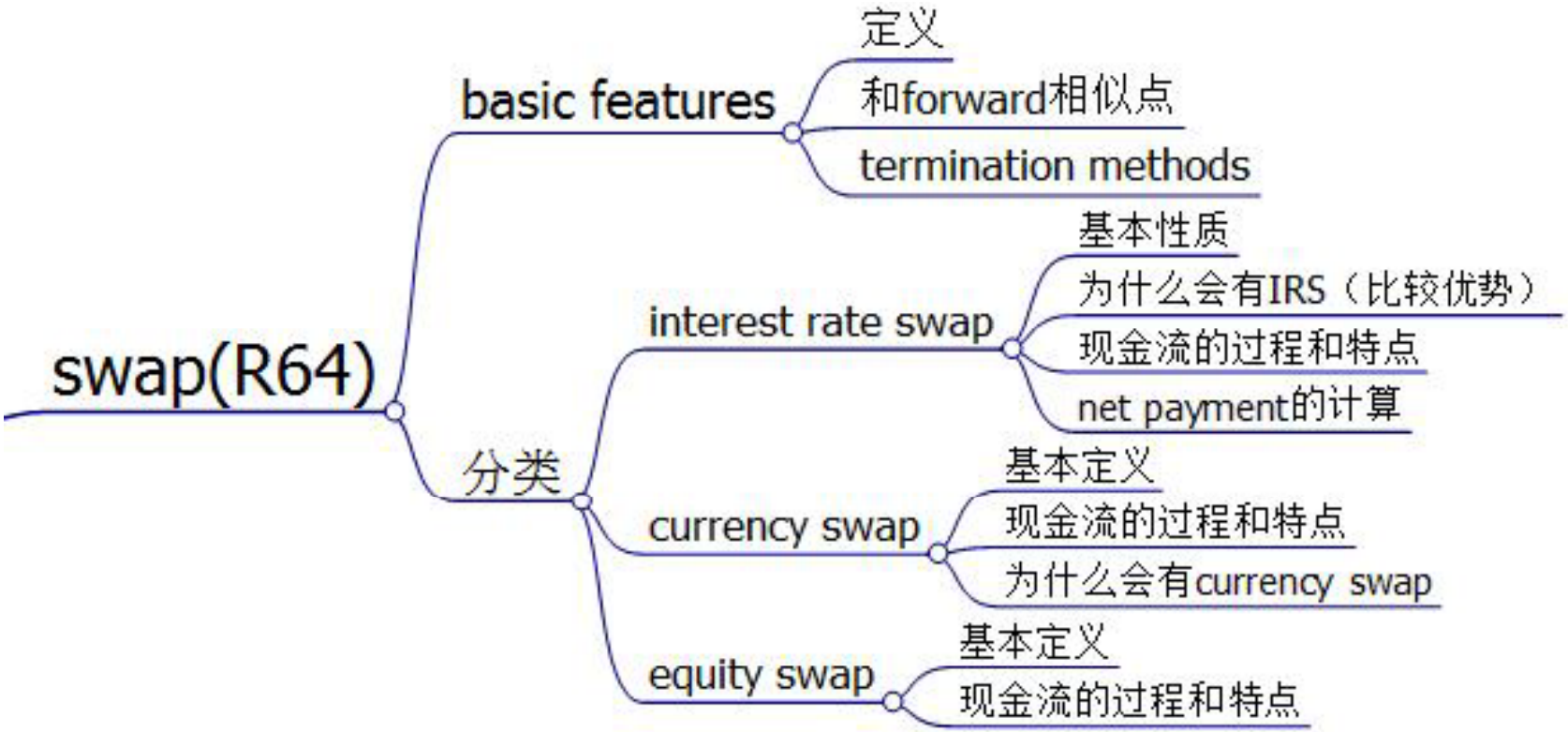
- Correct answer: B

R64. Swap Markets and Contracts

	Interest Rate Swaps	Currency Swaps	Equity Swaps
At the initiation and the termination of the swap	No need to exchange principal	Notional principal is swapped	No need to exchange principal
During the periods	Net interest is paid by the party who owes it	Interest payments are made without netting	The return is paid each period by one party in return for a fixed payment
	The netting payment is known at the beginning of a period	----------	The netting payment is known at the end of a period
	May not pay more than the fixed-rate interest	----------	The fixed rate payer may pay more than the fixed rate if the equity return is negative over the period

Review

➢ R64：Swaps



Framework

- **R63：Options**
  1. Basic concepts
     - Call & Put
     - Option premium & Strike price
     - moneyness /Time value/intrinsic value ★★
     - Option四个position的损益图(long call/short call/long put/short put)★★
  2. Option的分类
     - European & American
     - Exchange-traded & Over-the-counter
     - 以基础资产来分类
     - 常见option: interest rate option/cap/floor ★★
  3. 有关Valuation的基本概念 ★★
     - Put call parity
     - Option价格的相关概念:上下限
     - 影响option价格的因素分析

R.63 Option Markets and Contracts

Basic Concepts

- **Option定义：** An option gives its owner the right, but not the obligation, to buy or sell an underlying asset on or before a future date (the expiration date) at a predetermined price (the exercise price or strike price)
  - ✓ **Call option**: Long call & Short call
  - ✓ **Put option**: Long put & short put
  - ✓ The seller or short position in an options contract is sometimes referred to as the **writer of the option**
- 价格:
  - ✓ 期权价格: option premium paid by the buyer of option;
  - ✓ 执行价格: Strike price (X) represents the exercise price specified in the contract.

R.63 Option Markets and Contracts

➢ Moneyness（价值状态）:定性看long是否赚钱

- **Moneyness:**
  - ✓ **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 no payoff
- The following table summarizes the moneyness of options based on the stock's current price, S, and the option's exercise strike price, X.

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

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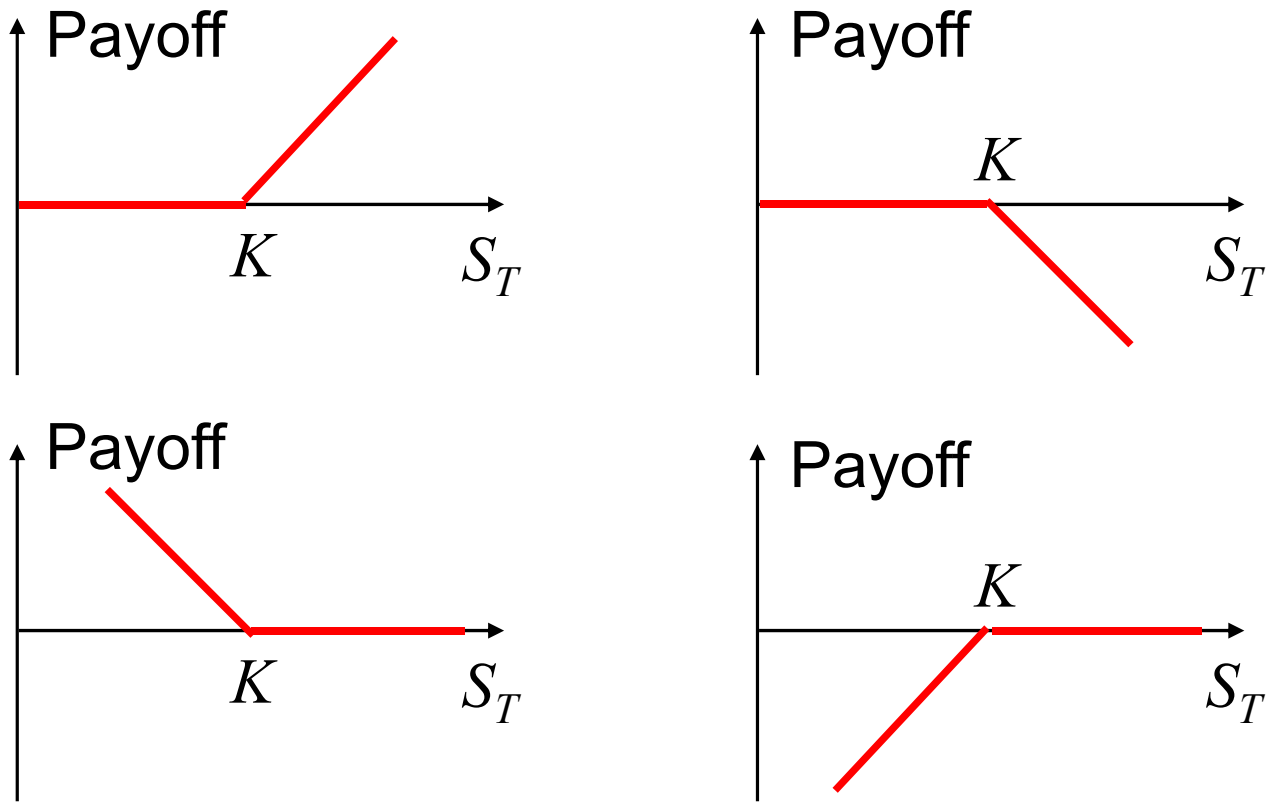
R.63 Option Markets and Contracts

- **Intrinsic Value（内在价值）:定量看long赚多少钱**



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R.63 Option Markets and Contracts

➢ Intrinsic Value（内在价值）:定量看long赚多少钱

- **Intrinsic Value:** 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
  - ✓ **Option value=intrinsic value + time value**
    - 到期日之前：option value>intrinsic value
    - 到期日：option value=intrinsic value
    - Price of the option is **more volatile** than prices of underlying stock

Example

1. Which of the following statements about call options at expiration is **TRUE?**

   A. The profit potential to the buyer of the option is unlimited.

   B. The call buyer's maximum loss is the call option's premium.

   C. All of the answers are correct.

➢ Correct answer: C

2. Which of the below positions is the most risky, in the sense of having the largest potential losses?

   A. A long position in call options.

   B. A short position in put options.

   C. A short (written) position in call options.

➢ Correct answer: C

Example

3. Consider a put option on Deter, Inc., with an exercise price of $45. The current stock price of Deter is $52. What is the intrinsic value of the put option, and is the put option at-the-money or out-of-the-money?

	Intrinsic Value	Moneyness
A.	$7	At-the-money
B.	$0	Out-of-the-money
C.	$0	At-the-money

➢ Correct answer: B

4. Which statement about option valuation is **FALSE**?

A. Prior to maturity, out-of-the-money options have no value.

B. The value of an option is its time value plus its intrinsic value.

C. The buyer of a call option contract can never lose more than the initial premium.

➢ Correct answer: A

R.63 Option Markets and Contracts

Option分类

- 分类方法一：按交割时间分：
  - ✓ **American option美式期权**: allow the owner to exercise the option at any time before or at expiration
  - ✓ **European options欧式期权**: can only be exercised at expiration.
  - ✓ 美式期权价格>=欧式期权价格 due to more ***flexibility***.
- 分类方法二：按交易场所分：
  - ✓ **Exchanged-traded**: regulated, standardized, liquid;
  - ✓ **OTC options**: customized, primarily for ***institutional*** buyers.

R.63 Option Markets and Contracts

➢ Option分类(续)

- 分类方法三： 按标的物类型分

✓ ***Financial options***: include equity options and other options based on stock indexes, Treasury bonds, interest rates, and currencies.

- ***Bond Options:*** most are OTC options that can be deliverable or settle in cash.
- ***Interest rate options***
- ***Index Options***: settle in cash, nothing is delivered.
- ***Options on futures***: sometimes called futures options, give the holder the right to buy or sell a specified futures contract on or before a given date at a given futures price, the strike price.

✓ ***Commodity options***: give the holder the right to either buy or sell a fixed quantity of some physical asset at a fixed (strike) price.

R.63 Option Markets and Contracts

➢ 常见Option

- **Stock option contracts**:
  - ✓ listed stock option contracts traded on exchanges and are normally for 100 shares of stock.
  - ✓ Stock option contracts are adjusted for **stock splits** but not cash dividends.
  - ✓ They can either be exchange-traded or OTC.
- **Index options**
  - can only be settled in cash。

R.63 Option Markets and Contracts

➢ 常见Option(续)

- **Interest rate options :**
  - ✓ Options that the exercise price is an interest rate and the underlying asset is a reference rate such as LIBOR.
  - ✓ **An interest rate call**: is an option that grants the holder the right to make a known interest payment and receive an unknown interest payment.
  - ✓ **An interest rate put**: is an option that grants the holder the right to make an unknown interest payment and receive a known interest payment..

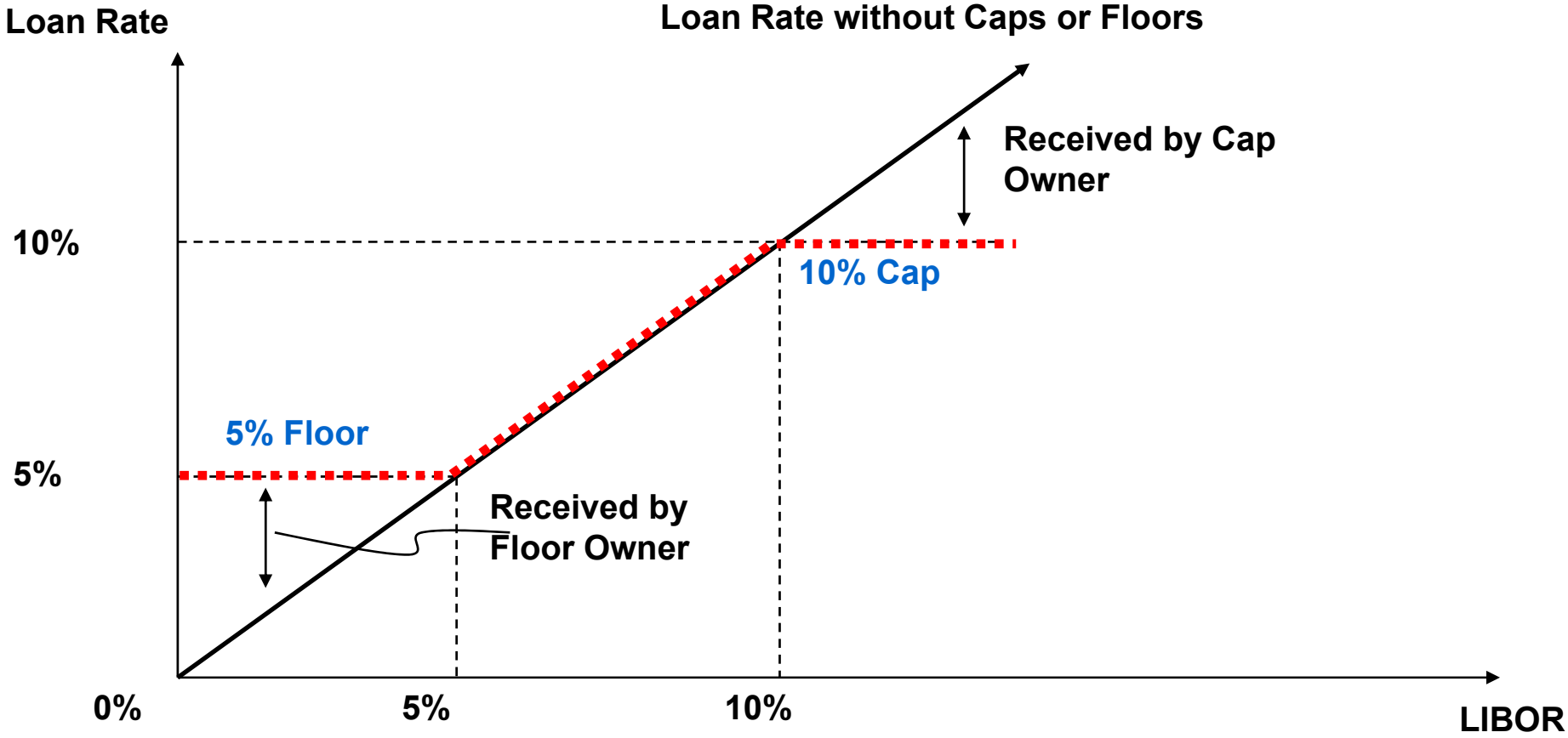
R.63 Option Markets and Contracts

➢ Caps and Floors

- ***An interest rate cap*** is a series of interest rate call options (each call option is called a **caplet**), having expiration dates that correspond to the reset dates on a floating rate loan. Caps are often used to protect a floating rate borrower from an increase in interest rates.
  - ✓ Caps place a maximum (upper limit) on the interest payments on a floating rate loan.
- ***An interest rate floor*** is a series of interest rate put options, (each call option is called a **floorlet**) having expiration dates that correspond to the reset dates on a floating rate loan. Floors are often used to protect a floating rate lender from a decline in interest rates.
  - ✓ Floors place a minimum (lower limit) on the interest payments that are received from a floating rate loan.

Caps and Floors

- *An interest rate collar* is the combination of a cap and a floor is called an interest rate collar.



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R.63 Option Markets and Contracts

➢ Caps and Floors

- **Long interest rate call + short interest rate put = FRA.**
- **Long Caps + Short Floors = interest Rate Swap**

	Interest Rate Options	FRAs
Similarity	There is no deliverable asset	
	They are settled in cash, in an amount based on a notional amount and the spread between the strike rate and the reference rate.	
Differences	Can choose exercise or not	Must exercise
	Payoffs are made at the end of the loan period	Payoffs are made at the beginning of the loan period
	Payoffs need not to discount	Payoffs need to discount

Example

1. If the interest rate of a put option is 5%, 180 day LIBOR, expired date is 90 days later, what is the likely benefit that the option holder will have at the expired day?
   A. The interest rate will be less than 5%, and the settlement payment will from dealer immediately.
   B. The interest rate will be less than 5%, and the settlement payment will from dealer 180 days later.
   C. The interest rate will be more than 5%, and the settlement payment will from dealer immediately.

➢ Correct answer: B

2. An interest rate floor on a floating rate loan is best described as a series of interest rate:
   A. Put options expiring on the same date but having different exercise rates
   B. Put options expiring on different date but having the same exercise rate
   C. Call option expiring on the same date but having different exercise rates

➢ Correct answer: B

R.63 Option Markets and Contracts

Put call parity

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

  或$c + K/\left(1+R_f\right)^T = S + p$

- *Positions replicating*
  - *Condition A* $-s = -c + p - X/\left(1+R_f\right)^T$
  - *Condition B* $p = c + X/\left(1+R_f\right)^T - S$
  - *Condition C* $c = p + S - X/\left(1+R_f\right)^T$
  - *Condition D* $-p = -c + S - X/\left(1+R_f\right)^T$
  - *Condition E* $-c = -p + X/\left(1+R_f\right)^T - S$

Put call parity

- Arbitrage opportunity
  - **Condition 1**

$$c - p > S - Ke^{-r\tau} \Rightarrow -p > -c + S - Ke^{-r\tau}$$

    - How can make the arbitrage profit ?
    - Long call + short stock + investing + short put
  - **Condition 2**

$$c - p < S - Ke^{-r\tau} \Rightarrow -c > -p - S + Ke^{-r\tau}$$

    - How can make the arbitrage profit ?
    - Long put + long stock + borrowing + short call

Example

- A description that will least likely be used to explain put-call parity is:
  - A. the 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 a short call, a short position in the underlying asset, and a long position in the risk-free asset
- Correct answer: C
- **Solution**
  - The put requires a short position in the underlying rather than a long position.

R.63 Option Markets and Contracts

➢ Minimum and Maximum Option Values（文字描述）

- ***Lower bound***. Theoretically, no option will sell for less than its intrinsic value and no option can take on a negative value.
- ***Upper bound for call options***. The maximum value of either an American or a European call option at any time t is the time-t share price of the underlying stock.
- ***Upper bound for put options***.
  - ✓ The price for an American put option cannot be more than its strike price.
  - ✓ The maximum value is the present value of the exercise price discounted at the risk-free rate.

R.63 Option Markets and Contracts

➢ Minimum and Maximum Option Values（公式）

Min value and Max value of options without dividend

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

R.63 Option Markets and Contracts

- Early Exercise of American Options
  - American call options
    - when the underlying makes no cash payments, no reason to exercise the call early, $C_0 = c_0$,
    - when the underlying makes cash payments 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 $\rightarrow$0, cannot go any lower, then put option holder may exercise it)

Example

- A European stock index call option has a strike price of $1160 and a time to expiration of 0.25 years. Given a risk-free rate of 4%, if the underlying index is trading at $1,200 and has a multiplier of 1, then the lower bound for the option price is closest to:
  - A. $ 0.00.
  - B. $28.29.
  - C. $51.32.
- Correct answer: C
- **Solution**
  - The lower bound on a European call is either zero or the underlying price minus the present value of the exercise price, whichever is greater. $1200 - ($1160 / 1.04^0.25) = $51.32.

R.63 Option Markets and Contracts

➢ Price Sensitivity

Factor	European call	European put	American call	American put
Underlying asset price	+	-	+	-
Strike price	-	+	-	+
Time	+	?	+	+
Risk-less rate	+	-	+	-
volatility	+	+	+	+

Example

- The effects on the price of a call option from an increase in volatility and an increase in interest rates are:

	Increase in Volatility	Increase in Interest Rates
A.	Decrease	Increase
B.	Increase	Decrease
C	Increase	Increase

- Correct answer: C

Framework

- **R65： Risk management applications of option strategies（R63的延伸）** ★★

  Call/put/covered call/ protective put → value/profit/shape等

R.65 Risk management applications of option strategies

➢ Basic Concepts

- The key here is your ability to interpret option payoff diagrams and calculate profit/loss diagrams
- Option positions
  - ✓ Buyer of a call option – long position.
  - ✓ Writer (seller) of a call option – short position.
  - ✓ Buyer of a put option – long position.
  - ✓ Writer (seller) of a put option – short position.

R.65 Risk management applications of option strategies

➢ Call /Put Option Payoff Diagrams

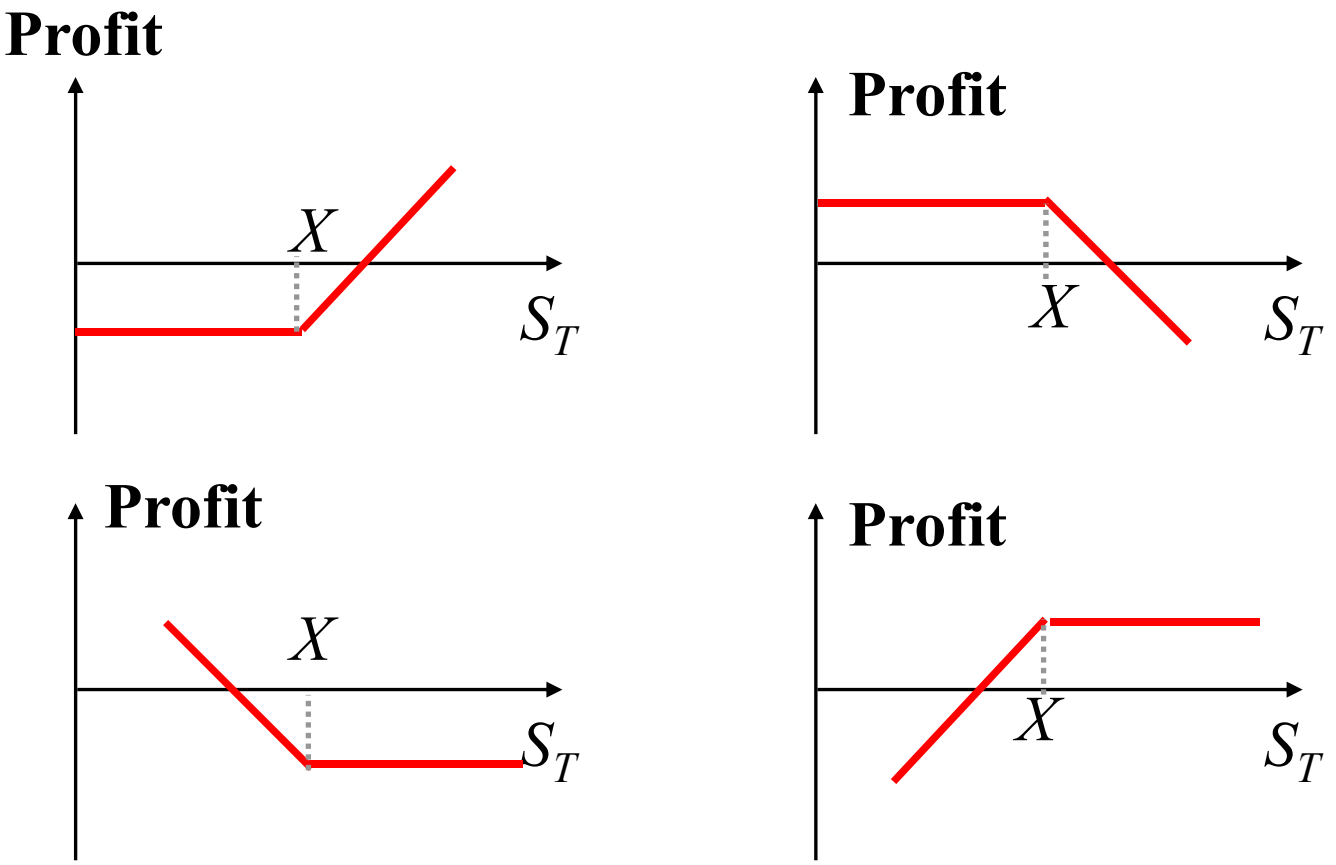
- The following graph represents the intrinsic (at-expiration or maturity) value of call options for both buyer and writer. Note that this differs from the profit diagram that follows in that the profit diagram reflects the initial cost of the option (the premium).
- The option buyer pays the premium to the option seller and if the option finishes out-of-the-money, the writer keeps the premium and the buyer loses the premium.
- Options are considered a zero-sum game because whatever amount the buyer gains, the seller loses, and vice versa.

$$\text{intrinsic value of a call option} = \max\left[0, S-X\right]$$

$$\text{intrinsic value of a put option} = \max\left[0, X-S\right]$$

R.65 Risk management applications of option strategies

Gain/Loss



R.65 Risk management applications of option strategies

Call

- **Buying a call**
  - **Value at expiration** of buying a call**:** max(0,S-X)
  - **Profit** from buying a call: value at expiration minus option premium, max(0,S-X)-c
  - Maximum profit: infinite
  - Maximum loss: option premium (c)
  - Breakeven underlying price at expiration: exercise price plus option premium (X+c)
- When **selling a call**, these results are reversed
  - **Value at expiration** of selling a call**: -**max(0,S-X)
  - **Profit** from selling a call: option premium minus value at expiration, -max(0,S-X)+c
  - Maximum profit: option premium (c)
  - Maximum loss: infinite
  - Breakeven underlying price at expiration: exercise price plus option premium (X+c)

R.65 Risk management applications of option strategies

Put

- **Buying a put**
  - **Value at expiration** of buying a put**:** max(0,X-S)
  - **Profit** from buying a put: value at expiration minus option premium, max(0,X-S)-p
  - Maximum profit: exercise price minus option premium (X-p)
  - Maximum loss: option premium (p)
  - Breakeven underlying price at expiration: exercise price minus option premium (X-p)
- When **selling a put**, these results are reversed
  - **Value at expiration** of selling a put**: -**max(0,X-S)
  - **Profit** from selling a put: option premium minus value at expiration, -max(0,X-S)+p
  - Maximum profit: option premium (p)
  - Maximum loss: exercise price minus option premium (X-p)
  - Breakeven underlying price at expiration: exercise price minus option premium (X-p)

R.65 Risk management applications of option strategies

Covered Call

- A covered call is the combination of a long stock and a short call

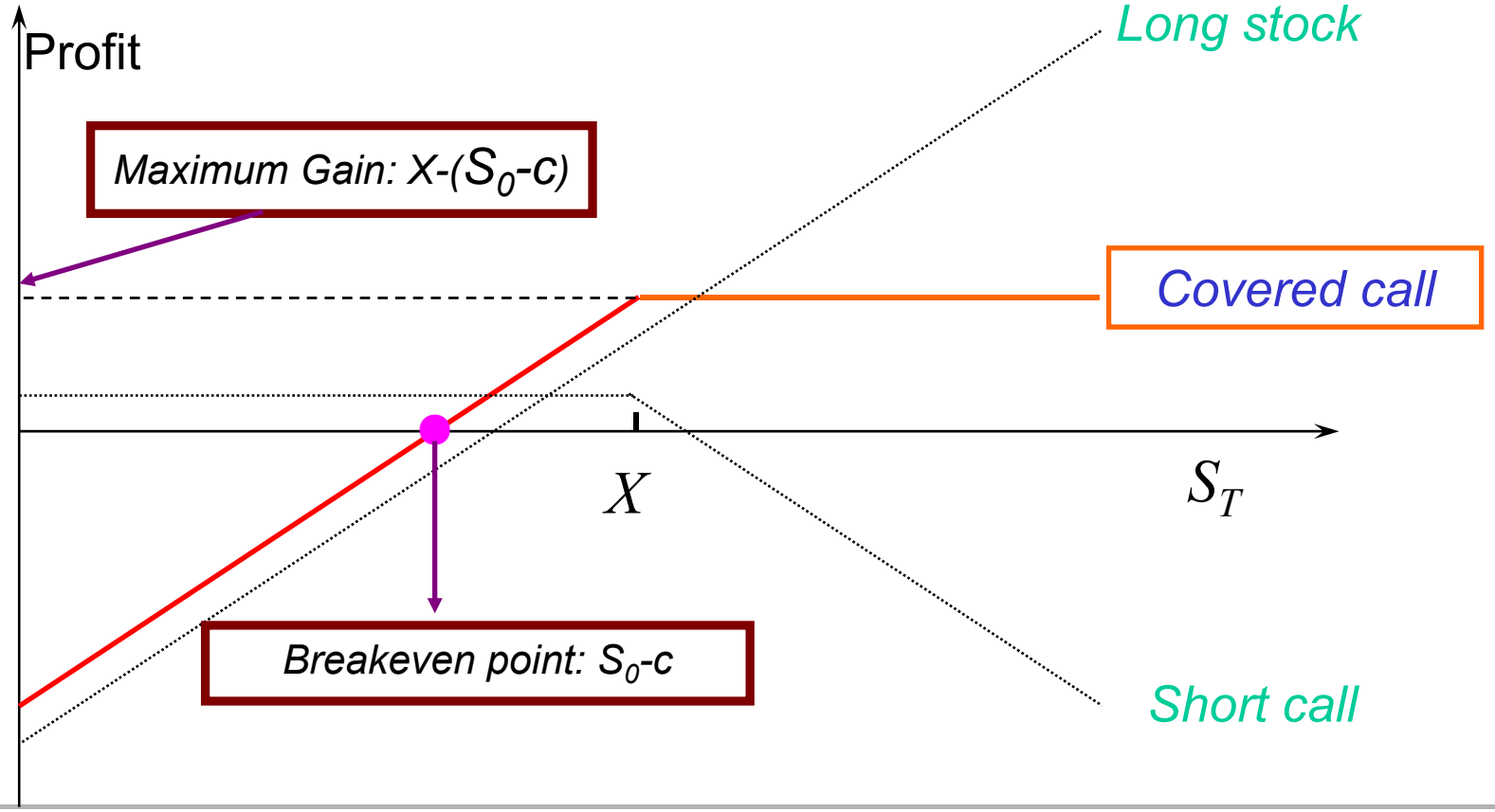
$$\text{covered call} = S - C$$

- The term covered means that the stock covers the inherent obligation assumed in writing the call
- Why would you write a covered call? You feel the stock's price will not go up any time soon, and you want to increase your income by collecting some call option premiums.
- This strategy for enhancing income is not without risk. The call writer is trades the stock's upside potential, above the strike price, for the call premium. .

R.65 Risk management applications of option strategies

Covered Call

$$\text{Covered Call} = -c+S = -p+\frac{X}{(1+r_f)^{T-t}}$$



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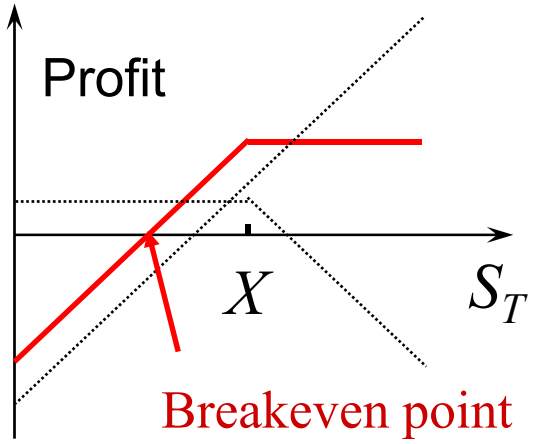
R.65 Risk management applications of option strategies

Breakeven Point-Covered Call

$S_t<X$ Profit= { Stock: S_t-S_0; Option: C } ⇨ Total Profit=S_t-S_0+C

$S_t>=X$ Profit= { Stock: S_t-S_0; Option: $C-(S_t-X)$ } ⇨ Total Profit=$X-S_0+C$

最大收益



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Protective Put

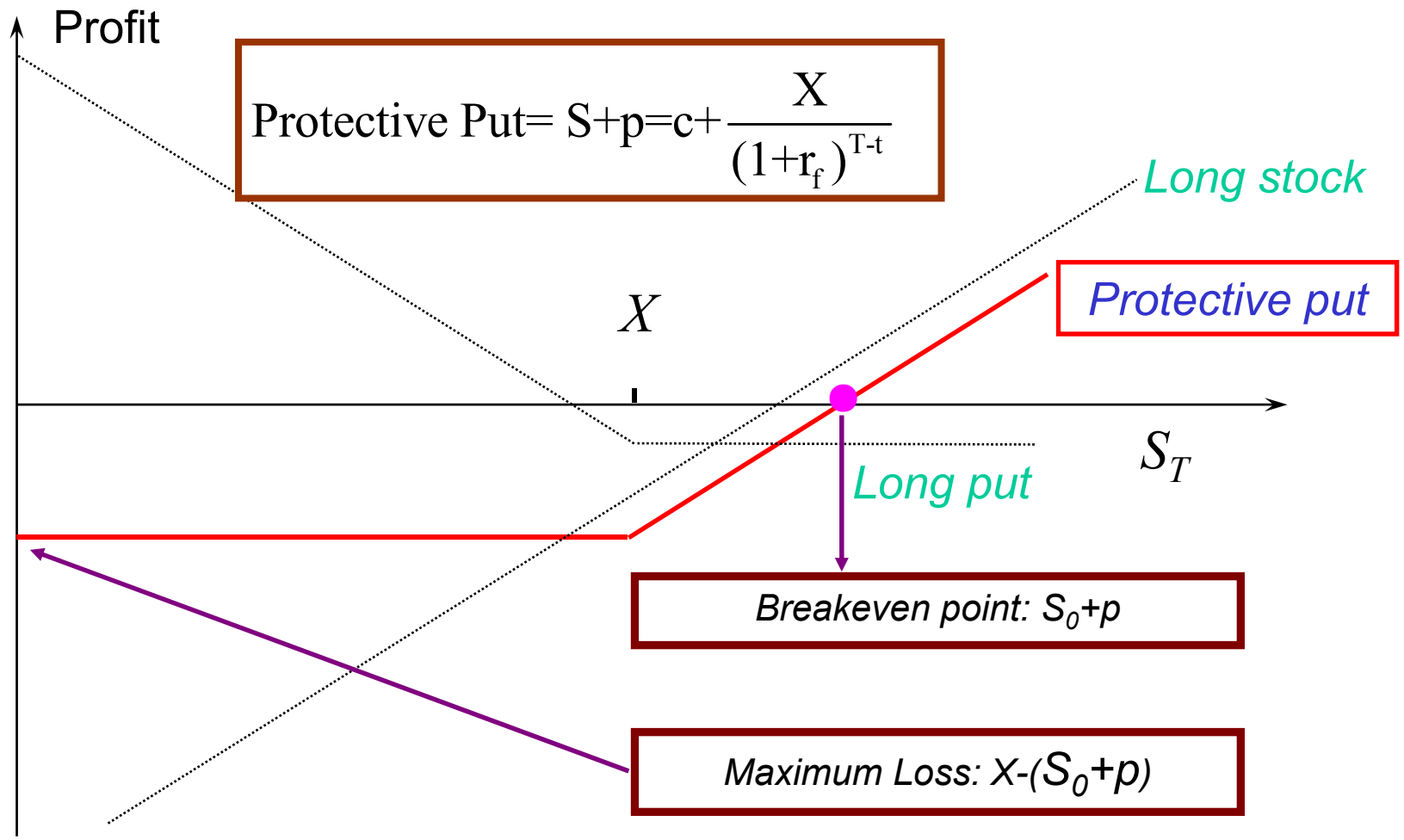
- A protective put is constructed by buying a stock and a put option on that stock

protective put=S+P

- A protective put is an investment management technique designed to protect a stock from a decline in value
- If the stock price is above the strike price, you make money on the stock's appreciation but the gain is reduced by the put premium paid
- If the stock price decreases, the loss on the stock is offset by the gain on the put. The loss on the position is the put premium and any amount that the strike price is below the original stock price

R.65 Risk management applications of option strategies

Protective Put



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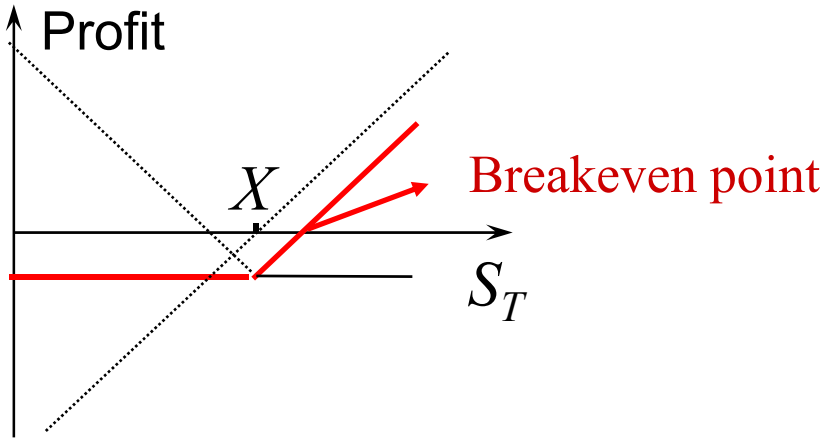
R.65 Risk management applications of option strategies

➢ Breakeven Point- Protective Put

$S_t<X$ Profit= { Stock: S_t-S_0 ; Option: $X-S_t-P$ } ⇨ Total Profit=$X-S_0-P$

最大损失

$S_t>=X$ Profit= { Stock: S_t-S_0 ; Option: $-P$ } ⇨ Total Profit=S_t-S_0-P



R.65 Risk management applications of option strategies

➢Important Summary of risk management applications

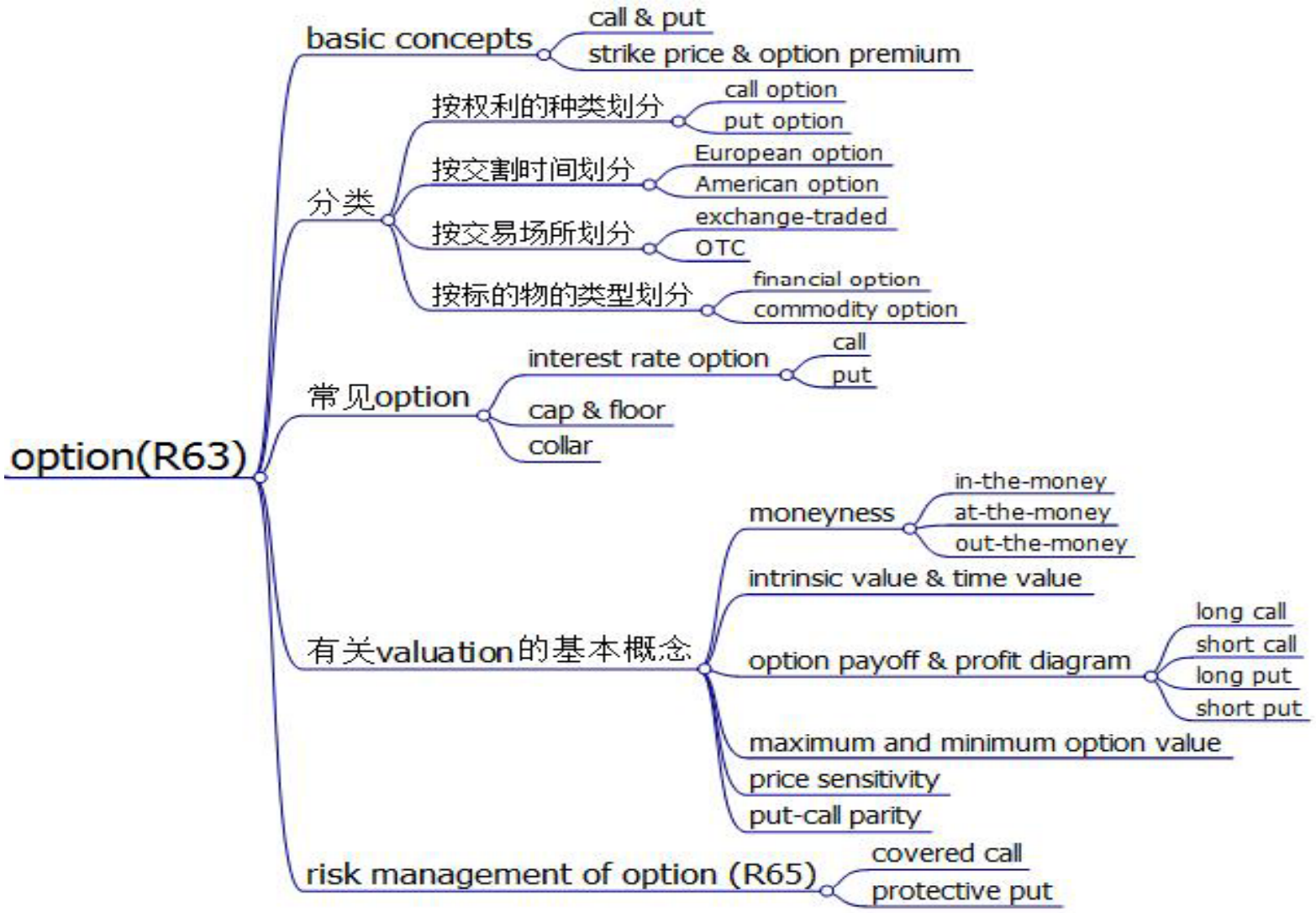
•*Covered call*

- ✓**Consists of**: *short call and long stock*
- ✓**Equivalent to**: *short put and long bond*
- ✓**Similar to**: *Short put*
- ✓**Breakeven point**: S_0-c
- ✓**Maximum Gain**: X-(S_0-c)

•*Protective put*

- ✓**Consists of**: *long stock and long put*
- ✓**Equivalent to**: *long call and long bond*
- ✓**Similar to**: *long call*
- ✓**Breakeven point**: S_0+p
- ✓**Maximum Loss**: X-(S_0+p)

Review



Summary: Calculation

- FRA，计算payoff：

$$(\text{notional principal})\left[\frac{(\text{floating rate at settlement} - \text{forward rate})\left[\frac{\text{days}}{360}\right]}{1+\text{floating rate at settlement}\left[\frac{\text{days}}{360}\right]}\right]$$

- Margin（从例题中学会如何计算）
- Option的四个position（图形是重点）
- Option定价的有关性质（Time value, Moneyness and Intrinsic Value，Minimum and Maximum Option Values，Price Sensitivity，Put-call parity）
- Swaps的payments（例题是掌握的关键）
- Covered call/protective put的profit/value/breakeven price

It’s not the end but just the beginning.

Never stop smiling, not even when you're sad, someone might fall in love with your smile.

永远都不要停止微笑，即使是在你难过的时候，说不定有人会因为你的笑容而爱上你。

Thank you!