CFA 一级知识框架图

Derivatives

专业来自101%的投入！

Framework

Study Session 18
Derivatives

R56 Derivative Markets and Instruments

R57 Basics of Derivative Pricing and Valuation

Reading 56

Derivative Markets and Instruments

Forward	
概念	➢ A forward contract is a 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.
分类	➢ Commodity forward contract ➢ Financial forward contract
目的	➢ Hedge risk ➢ Speculation
交割 ★	➢ At expiration ● Physical settlement ● Cash settlement ➢ Prior to expiration

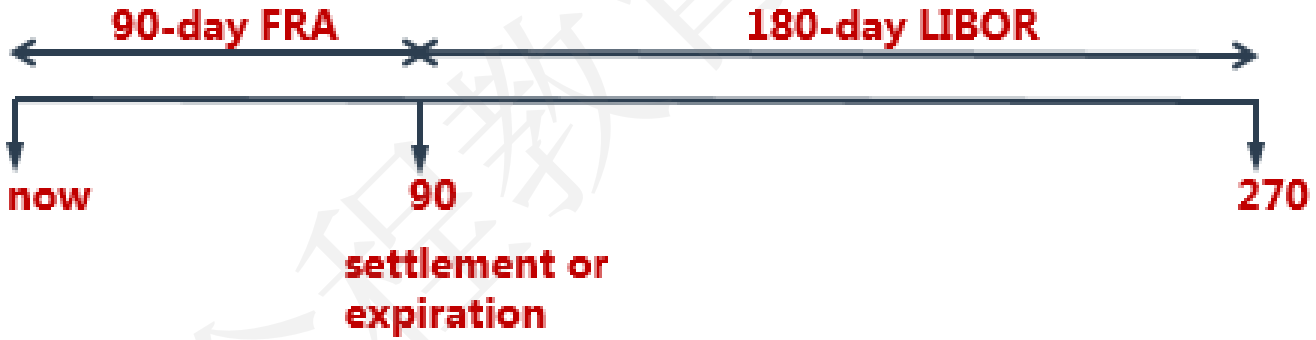
Derivative Markets and Instruments

<table>
<tr><td>概念</td><td colspan="4">➢ 针对未来交易，回避风险</td></tr>
<tr><td rowspan="3">分类
★</td><td colspan="2">根据合约特点分类</td><td colspan="2">根据交易场所分类</td></tr>
<tr><td>Forward commitment</td><td>Contingent claim</td><td>Exchange-traded</td><td>Over-the-counter traded</td></tr>
<tr><td>➢ Forward
➢ Futures
➢ Swap</td><td>➢ Option
➢ CDS</td><td>➢ Futures
➢ Option</td><td>➢ Forward
➢ Swap
➢ Option</td></tr>
<tr><td rowspan="2">优缺点</td><td colspan="2">优点</td><td colspan="2">缺点</td></tr>
<tr><td colspan="2">➢ Price discovery
➢ Risk management: hedge and speculation
➢ Lowering transaction costs
➢ Low capital requirement
➢ Greater liquidity
➢ Ease of going short
➢ Enhance market efficiency</td><td colspan="2">➢ Too risky → High leverage
➢ Complex instruments
➢ Sometimes linked to gambling</td></tr>
</table>

Forward Rate Agreement

概念 ★	➢ An FRA can be viewed as a forward contract to borrow/lend money at a certain rate at some future date. ● Long position → Borrow ● Short position → Lend
标的 ★	➢ LIBOR, Euribor ● 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 ● Euribor is a similar rate for borrowing and lending in Euros
期限	➢ Maturity: 30、60、90、120 day Libor ➢ Off-the-run FRA: non-standardized 45 day Libor

Forward Rate Agreement

★ 报价	➢ Example 3×9FRA 
FRA获得	➢ Real FRA ➢ Synthetic FRA

Futures

对比 Forwards ★★	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
风险控制 ★★	Margin	➢ Initial margin ➢ Maintenance margin ➢ Variation margin 回到IM
	Daily price limit	
	Marking to market	

Futures

对比 Equity Margin ★	Futures margin	Equity margin
	As pledge, control default risk	Borrow capital, has leverage
	Cash outflow	Cash inflow
	No interest paid	Loan, interest paid needed
	Back to initial margin	Back to maintenance margin

Daily price limit

概念	➢ Limit on the extent of price movement from the settlement price of the previous trading day. ● Limit move ● Locked limit

Marking to market

概念	➢ 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.

Swap

概念

- 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.
  - Traded in OTC markets(no secondary markets).
  - Much less regulated.
  - Subject to default risk.
  - Institutions dominate.

Option	
概念	➢ 定义：An option is 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. ➢ Prices ● Option premium ● Strike price
价值状态	➢ 定性看long是否赚钱
内在价值 (intrinsic value)	➢ 定量看long赚多少钱 ● C=max{0，S-X} ● P=max{0，X-S} ➢ Option value=intrinsic value + time value

Reading 57

Basics of Derivative Pricing and Valuation

Arbitrage, Replication & Risk Neutrality

分类 ★	➢ Cash-and-Carry Arbitrage: the Forward Contract is Overpriced ● $FP > S_0 \times (1+R_f)^T$ ➢ Reverse Cash-and-Carry Arbitrage: the Forward Contract is Under-priced ● $FP < S_0 \times (1+R_f)^T$
限制	➢ Limits to arbitrage ● Transaction costs. ● Borrow unlimited amounts of money at risk-free rate. ● Transactions require additional capital to maintain position. ● Gains from an offsetting position might not be liquid. ● One position can not be perfect hedged in practice.

Forward Pricing and Valuation

		Pricing → T=0	Valuation → T=t
公式	T-bill forwards	$FP = S_0 \times (1+R_f)^T$	$V_{long} = S_t - \frac{FP}{(1+R_f)^{T-t}}$
	Dividend-paying stock	$FP = (S_0 - PVD_0) \times (1+R_f)^T$	$V_{long} = (S_t - PVD_t) - \frac{FP}{(1+R_f)^{T-t}}$
	Coupon bonds	$FP = (S_0 - PVC_0) \times (1+R_f)^T$	$V_{long} = (S_t - PVC_t) - \frac{FP}{(1+R_f)^{T-t}}$

Factors affect the value of an option

	Sensitivity Factor	Calls	Puts
因素 ★★	Underlying price	Positively related	Negatively related
	Volatility	Positively related	Positively related
	Risk-free rate	Positively related	Negatively related
	Time to expiration	Positively related	Positively related*
	Strike price	Negatively related	Positively related
	Payments on the underlying	Negatively related	Positively related
	Carrying cost	Positively related	Negatively related

Put-Call Parity	
计算	➢ $c + X/(1+R_f)^T = S + p$ 或 $c + K/(1+R_f)^T = S + p$
复制	$-s = -c + p - X/(1+R_f)^T$　　$c = p + S - X/(1+R_f)^T$ $p = c + X/(1+R_f)^T - S$　　$-p = -c + S - X/(1+R_f)^T$

Option Pricing-Binomial Model

公式	value of an option: $c = \left[\pi_u C_1^+ + \pi_d C_1^- \right] \times \frac{1}{(1+R_f)^T}$ $\pi_u = \frac{1+R_f-d}{u-d}$