
Introduction(Options, Futures, and Other Derivatives)

介绍（期权，期货，及其他衍生产品）

Derivative Markets

➤ Open outcry system (公开喊价系统) and electronic trading

- The open outcry system (e.g., CBOT) is the more traditional system, which involves traders actually indicating their trades through hand signals and shouting.



- Electronic trading does not involve an actual “physical” exchange location, but rather involves matching buyers and sellers electronically via computers (e.g., NASDAQ).

Derivative Markets

➤ **Over-The-Counter (OTC)** market and **Exchange Traded** market

➤ **Advantages** of over-the-counter trading:

- Terms are not set by any exchange.
- Participants have flexibility to negotiate.
- In the event of a misunderstanding, calls are recorded.

➤ **Disadvantages** of over-the-counter trading:

- OTC trading has more credit risk than exchange trading. Exchanges are organized in such a way that credit risk is eliminated.

Basics of Derivative Securities

- An **option** contract is a contract that, in exchange for the option price (期权费), gives the option buyer *the right, but not the obligation*, to buy (sell) an asset at the exercise price from (to) the option seller (buyer) within a specified time period, or depending on the type of option, a precise date (i.e., expiration date).
 - A **call option** gives the option holder the right to purchase the underlying asset by a certain specified date for a specified (in advance) price.
 - A **put option** gives the option holder the right to sell the underlying asset by a selected date for a pre-selected price. Traded in the over-the-counter market.
- A **forward** contract is a contract that specifies the price and quantity of an asset to be delivered sometime in the future.
- A **futures** contract is a more *formalized, legally binding* agreement to buy/sell a commodity/ financial instrument in a pre-designated month in the future, at a price agreed upon today by the buyer/seller. Futures contracts are highly *standardized* regarding quality, quantity, delivery time, and location for each specific commodity. These contracts are typically traded on an exchange.

Option and Forward contract payoffs

➤ Call Option (看涨期权) Payoff

- The payoff on a call option to the option **buyer** is calculated as follows:

$$C_T = \max(0, S_T - X)$$

where:

- ✓ C_T = payoff on call option
 - ✓ S_T = stock price at maturity
 - ✓ X = strike price of option
- The price paid for the call option, C_0 , is referred to as the call **premium**.
Thus, the *profit* to the option buyer is calculated as follows:

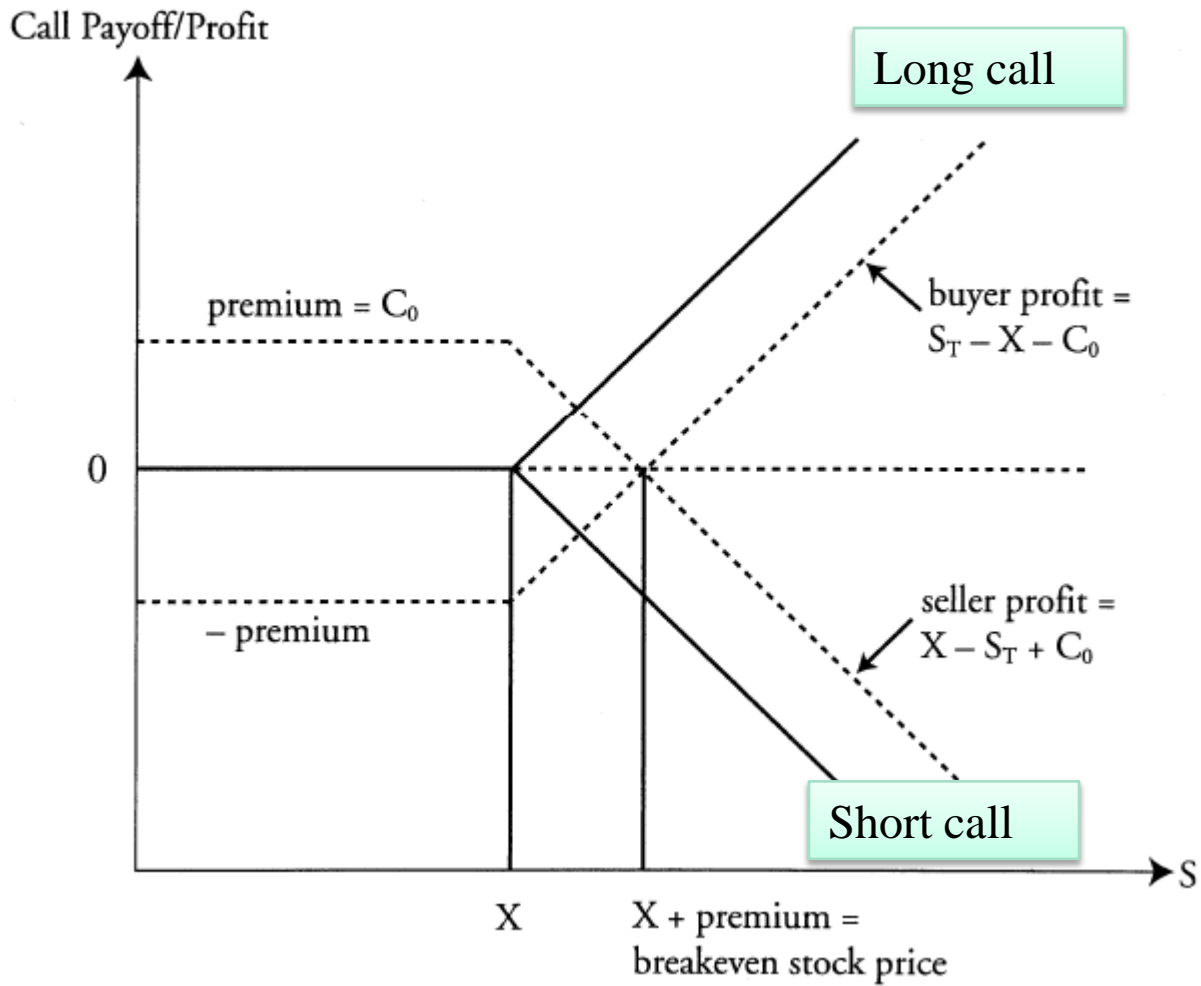
$$\text{Profit} = C_T - C_0$$

where:

- ✓ C_T = payoff on call option
- ✓ C_0 = call premium

Option and Forward contract payoffs

Figure 1: Profit Diagram for a Call at Expiration



Option and Forward contract payoffs

➤ Put Option (看跌期权) Payoff

- The payoff on a put option to the option **buyer** is calculated as follows:

$$P_T = \max (0, X - S_T)$$

where:

- ✓ P_T = payoff on put option
 - ✓ S_T = stock price at maturity
 - ✓ X = strike price of option
- The price paid for the put option, P_0 , is referred to as the **put premium**. Thus, the *profit* to the option buyer is calculated as follows:

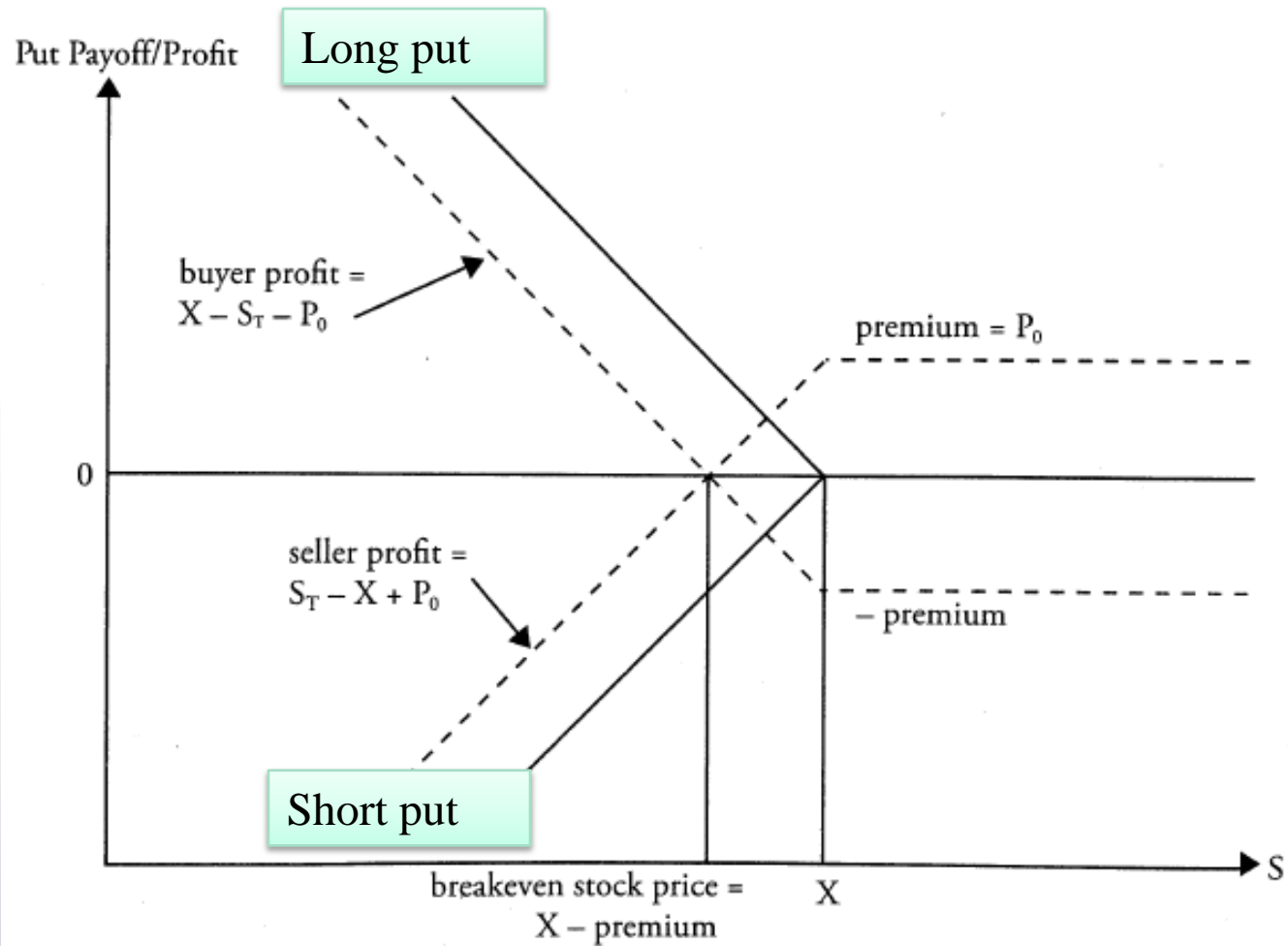
$$\text{Profit} = P_T - P_0$$

where:

- ✓ P_T = payoff on put option
- ✓ P_0 = put premium

Option and Forward contract payoffs

Figure 2: Profit Diagram for a Put at Expiration



Option and Forward contract payoffs

➤ Forward Contract (远期协议) Payoff

- The payoff to a *long position* in a forward contract is calculated as follows:

$$\text{Payoff} = S_T - K$$

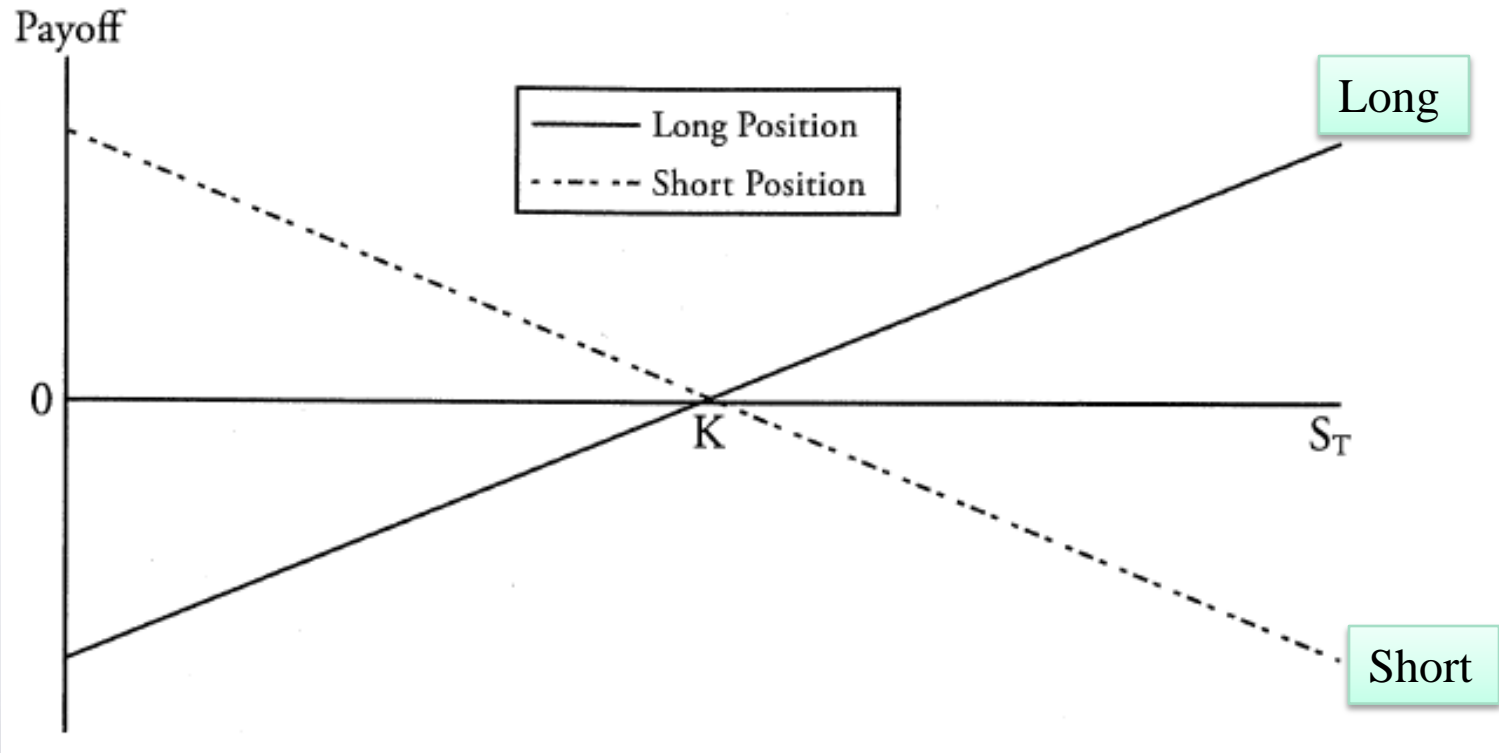
where:

- ✓ S_T = spot price at maturity
 - ✓ K = delivery price
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- Conversely, the payoff to a *short position* in a forward contract is calculated as follows:

$$\text{Payoff} = K - S_T$$

Option and Forward contract payoffs

Figure 3: Forward Contract Payoff



Hedging Strategies

- **Hedgers** use *forward contracts* and *options* to reduce or eliminate financial exposure.
 - An investor or business with a *long exposure to an asset* can hedge exposure by either entering into a *short futures* contract or by *buying a put option*.
 - An investor or business with a *short exposure to an asset* can hedge exposure by either entering into a *long futures* contract or by *buying a call option*.
- *Hedgers use forward contracts to lock in the price of the underlying security.* Forward contracts do not require an initial investment, but hedgers give up any price movement that may have had positive results in the event that the position was left un-hedged.
- **Option contracts** on the other hand function as insurance for the underlying by providing the downside protection that the hedger seeks and allowing for price movement in the direction that could yield positive results. This insurance does not come without a cost, as we described earlier, since hedgers are required to pay a premium to purchase options.

Speculative Strategies

- Speculators have a different motivation for using derivatives than hedgers. They use derivatives to make bets on the market, while hedgers try to eliminate exposures.
- The motivation for using futures in speculation is that the limited amount of initial investment creates significant **leverage**. The amount of investment required for futures is the amount of the *initial margin* required by the exchange. This is generally a small percentage of the notional value of the underlying, and Treasury securities can typically be posted as margin. Futures contracts can result in large gains or large losses, and contract payoffs are symmetrical.
- Options also create significant leverage as investors only need to pay the **option premium** to purchase an option instead of the face value of the underlying. Options differ from futures in that options have asymmetrical payoffs. Gains can be quite large going long options, but losses from long option positions are limited to the option premium.

Arbitrage Opportunities

- **Arbitrageurs** are also frequent users of derivatives. Arbitrageurs seek to earn a risk-free profit through the discovery and manipulation of mispriced securities.
 - They earn a riskless profit by entering into equivalent offsetting positions in one or more markets. Arbitrage opportunities typically do not last long as supply and demand forces will adjust prices to quickly eliminate the arbitrage situation.

Example: Arbitrage of stock trading on two exchanges

Assume stock DEF trades on the New York Stock Exchange (NYSE) and the Tokyo Stock Exchange (TSE). The stock currently trades on the NYSE for \$32 and on the TSE for ¥2,880. Given the current exchange rate is 0.0105 \$/¥, **determine** if an arbitrage profit is possible.

Answer:

Value in dollars of DEF on TSE = $¥2,880 \times 0.0105 \text{ \$/¥} = \$30.24$

Arbitrageur could purchase DEF on TSE for \$30.24 and sell on NYSE for \$32.

Profit per share = $\$32 - \$30.24 = \$1.76$

Risks From Derivatives

- Derivatives are versatile and can be used for *hedging*, *arbitrage*, and pure *speculation*. If, however, the “bet” one makes starts going in the wrong direction, the results can be catastrophic.
- Additionally, the risk exists that a trader with instructions to hedge a position may actually use derivatives to speculate. This risk is known as **operational risk**.
- Controls need to be carefully established and monitored within both financial and nonfinancial corporations to prevent misuse of derivatives. Risk limits should be set, and adherence to risk limits should be monitored.

Common Terms Associated with Derivatives

- Derivative 衍生产品
- Market maker 做市商 ;
- Spot contract 现货合约
- Forward contract 远期合约 ; Futures contract 期货合约
- Call option 看涨期权 ; Put option 看跌期权
- American options 美式期权 ; European options 欧式期权
- long position 多头头寸 ; short position 空头头寸
- exercise, or strike price 执行价格
- Expiration date 到期日
- bid price 做市商的买价 ; offer price/asking price 做市商的卖价
- Hedgers 对冲者
- Speculators 投机者
- Arbitrageurs 套利者

Example

1. Which of the following statements is an advantage of an exchange trading system? On an exchange system:
 - A. terms are not specified.
 - B. trades are made in such a way as to reduce credit risk.
 - C. participants have flexibility to negotiate.
 - D. in the event of a misunderstanding, calls are recorded between parties.

Example

2. Which of the following statements regarding futures contracts is most likely correct? A business with a long exposure to an asset would hedge this exposure by either entering into a:
- A. long futures contract or by buying a call option.
 - B. long futures contract or by buying a put option.
 - C. short futures contract or by buying a call option.
 - D. short futures contract or by buying a put option.

Example

3. BullsEye, Inc., is planning to issue new debt securities next year. The company is concerned that interest rates may rise, which will increase its borrowing costs. Which of the following types of traders best describe the role BullsEye should consider in the futures markets?
- A. Arbitrageur.
 - B. Hedger.
 - C. Speculator.
 - D. Market maker.

Example

4. Mr. Gary Brownstone, FRM, is a portfolio manager for a small regional bank. Brownstone is currently in the process of proposing a new derivatives investment strategy to his investment committee. As part of his presentation, he is preparing an overview of the derivatives markets. Brownstone wants to discuss with the committee how derivatives provide many benefits to investors and other market participants. Which of the following is least likely to be a benefit offered by derivatives markets? Derivatives:
- A. make the pricing for the underlying securities more efficient.
 - B. help institutions lower transaction costs.
 - C. provide arbitrage opportunities to risk-averse investors.
 - D. shift risks among market participants

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