国际财务管理

第三讲　外币衍生金融工具

对外经济贸易大学国际商学院会计学系制作

Foreign Currency Futures

- A *foreign currency futures contract* is an alternative to a forward contract that calls for future delivery of a standard amount of foreign exchange at a fixed time, place and price.
- It is similar to futures contracts that exist for commodities such as cattle, lumber, interest-bearing deposits, gold, etc.
- In the US, the most important market for foreign currency futures is the International Monetary Market (IMM), a division of the Chicago Mercantile Exchange.

Foreign Currency Futures

- 外币期货是指一种缔约在未来某个确定的日子买入或卖出一项有关外汇资产后，在合同有效期间每天结清市价差额的交易工具。
- 第一、期货合同只代表交易双方对有关货币汇价变动方向的一种预测。
- 第二、一份期货合同实际是一份每天都需结算清楚的有约束力的协定。
- 第三、期货的经纪人要求买卖双方都需在缔约时付出一定数量的现金存款作为保证金。

Foreign Currency Futures

Rules of Currency Futures Trading

a. 外币期货合约和外币期货合约的单位

b. 外币期货价格变动规则

c. 外币期货的交割月份

d. 保证金

保证金是期货交易的最大特色之一，保证金分为两种：

初始保证金**(Initial or Original Margin)**

维持保证金**(Maintenance Margin)**。

e. 佣金

Foreign Currency Futures

A man buys one IMM DM futures contract on March 7,1990 at $0.5860/DM

Initial margin	**$2,500**
Maintenance margin	**$2,000**
Contract size	**DM125,000**
Contract value	**$73,250**

(DM125,000×$0.5860/DM)

Foreign Currency Futures

	Settlement price	Contract Value	Cash flow	Margin
7	$0.5868	$73,350	+$100	+$2,500
8	0.5880	73,500	+ 150	+ 2,500
9	0.5869	73,362.5	- 137.5	+ 2,362.50
12	0.5829	72,862.5	- 500	+ 1,862.50
				补 637.50
				+$2,500
13	$0.5835	$72,937.5	+$75	+$2,500
14	以$0.5840/DM卖出	73,000	+ 62.5	0
			-$250	

整个交易过程损失250美元，另外2,500美元在二天之内退还。同样，卖方账户有与此相反流向的结算，买方的亏损即是卖方的盈利。

Hedging with futures

套期保值就是买进（或卖出）与现汇市场数量相当，但交易方向相反的货币期货合约，以期在未来某一时间通过卖出（或买进）外汇期货合约来补偿因现汇市场汇率变动所带来的实际汇率风险。

套期保值的操作可分为两个步骤：

第一步：交易者根据自己的需要，通过买进或卖出期货合约建立第一个期货部位。买入期货合约也称多头套期保值，卖出期货合约也称空头套期保值。

第二步：交易者在期货合约到期前，通过建立另一个与先前所持空盘部位相反的部位来对冲在手的空盘部位。两个部位的币种、合约张数以及合约月份必须一致。

买入套期保值

- 1993年9月13日，中方购买德方价值DM250,000机械设备
- 付款日：12月13日
- 中方决定将12月份收到的一笔美元货款结清这笔生意，当时S (t)= $0.5904/DM，F(t,1/4)=$0.5947/DM .预测德国进一步提高利率，DM↑，可能造成汇兑损失，中方决定以外汇期货交易避险。购入两份DM期货合约，每份DM125,000，交割日12月15日，按$0.5947/DM成交，套期保值过程如下：

买入套期保值

日期	即期市场	期货市场
9月13日	S(t)= $0.5904/DM F(t,1/4)= $0.5947/DM	购入两份12月15日交割的德国马克期货合约，其成交汇率为：DM1＝$0.5947
9月30日		“盈亏拨付”收益：DM250,000×(0.6103－0.5948)= $3,900
12月13日	S(t)=$0.6405/DM 中方用收到的美元货款在即期市场买进250,000 即期市场成本： DM250,000×0.6405 =$160,450	当月期的DM期货汇率升值至DM1＝$0.6410 中方提前平仓了结（卖出先前买入的DM期货合约，获利 DM250,000(0.6410－0.6103) = $7,675 总计获利 11,575

其实际汇率成本为：

$$\frac{(DM\,250{,}000 \times \$0.6405/DM) - \$11{,}575}{DM\,250{,}000} = \$0.5942/DM$$

(比$5947/DM低)

卖出套期保值

美国一家制造商在瑞士有一家工厂，该厂急需资金以支付即期费用，6个月后财务状况会因购买旺季而好转。美国这家制造商刚好有多余的资金可供瑞士工厂使用，于是便汇去了30万瑞士法郎。为了避免将来汇率变动带来的损失，一方面在现货市场买进瑞士法郎，同时又在期货市场卖出同等数量的瑞士法郎。交易过程如下：（时间是假定的）

卖出套期保值

第一步：6月1日，在现货市场上，以$0.4015/SFr买入SFr30万，价值为：

SFr300,000×$0.4015/SFr= $120,450

在期货市场上，以$0.406/SFr卖出2份12月瑞士法郎期货合约，（每合约为125,000瑞士法郎)，共SFr250,000,价值

SFr250,000×$0.406/SFr =$101,500

第二步： 12月1日，在现货市场，以$0.406/SFr的价格卖出SFr30万，价值

SFr 300,000×$0.406/SFr= $121,800

在现货市场上一买一卖，获利

$121,800－$120,450 =$1,350

在期货市场上，买回2份12月期的瑞士法郎期货合约，结束了在期货市场上空头地位，价格是$0.4065/Sfr,价值为

SFr250,000×$0.4065/Sfr = $101,625

这一卖一买，使美国制造商损失

$101,625－$101,500=$125 (盈利$1225）

Forward Contract versus Futures Contract

Foreign currency futures contracts differ from forward contracts in a number of important ways:

- **Futures are standardized in terms of size while forwards can be customized**
- **Futures have fixed maturities while forwards can have any maturity (both typically have maturities of one year or less)**
- **Trading on futures occurs on organized exchanges while forwards are traded between individuals and banks**
- **Futures have an initial margin that is market to market on a daily basis while only a bank relationship is needed for a forward**
- **Futures are rarely delivered upon (settled) while forwards are normally delivered upon (settled)**

Foreign Currency Options

- A *foreign currency option* is a contract giving the option purchaser (the buyer) the right, but not the obligation, to buy or sell a given amount of foreign exchange at a fixed price per unit for a specified time period (until the maturity date).
- There are two basic types of options, *puts* and *calls*.
  - A call is an option to buy foreign currency
  - A put is an option to sell foreign currency

Foreign Currency Options

- The buyer of an option is termed the *holder*, while the seller of the option is referred to as the *writer* or *grantor*.
- Every option has three different price elements:
  - The *exercise* or *strike* price – the exchange rate at which the foreign currency can be purchased (call) or sold (put)
  - The *premium* – the cost, price, or value of the option itself
  - The underlying or actual spot exchange rate in the market

Foreign Currency Options

- An *American* option gives the buyer the right to exercise the option at any time between the date of writing and the expiration or maturity date.
- A *European* option can be exercised only on its expiration date, not before.
- The premium, or option price, is the cost of the option.

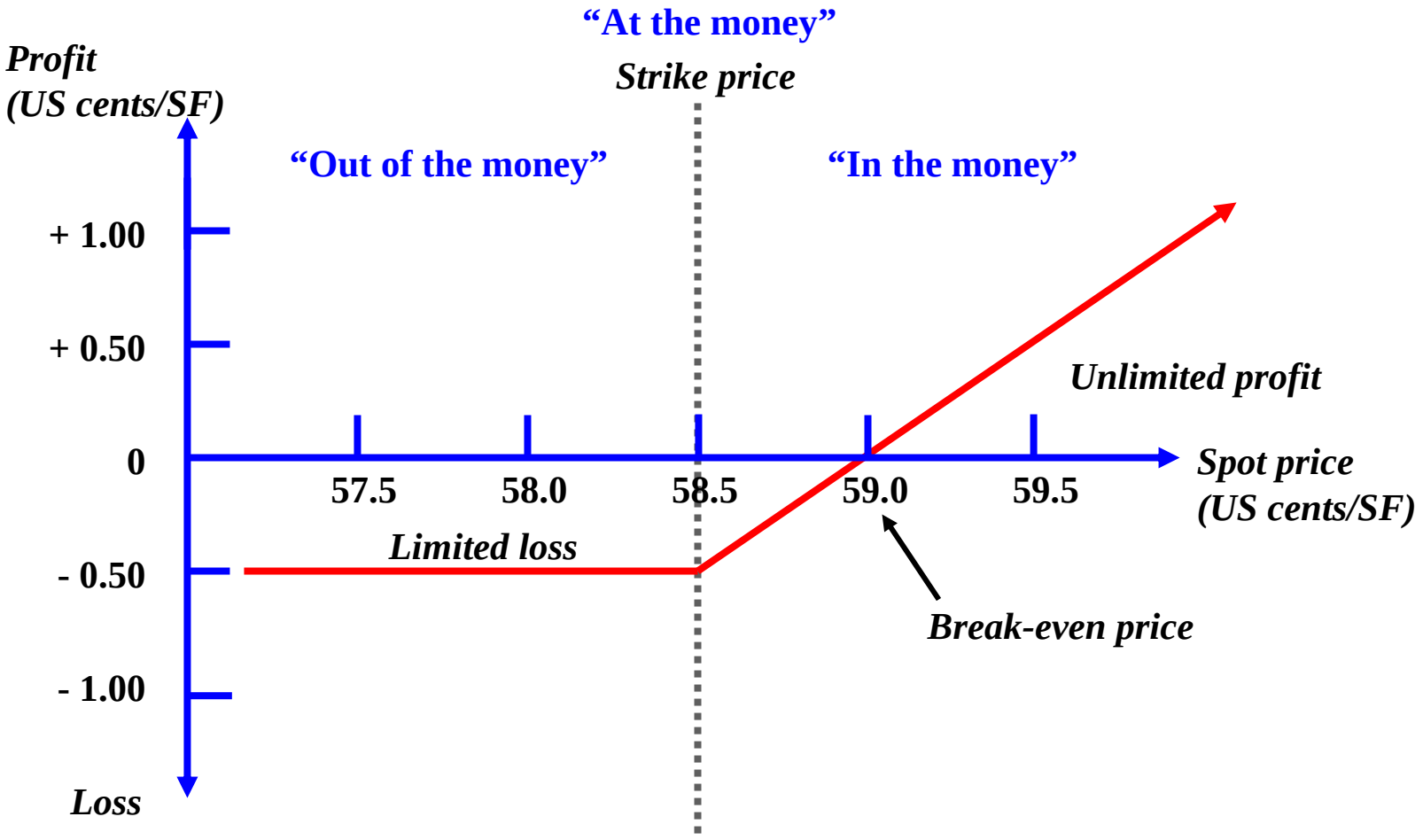
Foreign Currency Options

- An option whose exercise price is the same as the spot price of the underlying currency is said to be *at-the-money* (ATM).
- An option the would be profitable, excluding the cost of the premium, if exercised immediately is said to be *in-the-money* (ITM).
- An option that would not be profitable, again excluding the cost of the premium, if exercised immediately is referred to as *out-of-the money* (OTM)

Buy a Call or Long a Call

- Assume purchase of August call option on Swiss francs with strike price of 58½ ($0.5850/SF), and a premium of $0.005/SF
- At all spot rates below the strike price of 58.5, the purchase of the option would choose not to exercise because it would be cheaper to purchase SF on the open market
- At all spot rates above the strike price, the option purchaser would exercise the option, purchase SF at the strike price and sell them into the market netting a profit (less the option premium)

Exhibit 1 Profit and Loss for the Buyer of a Call Option on Swiss francs

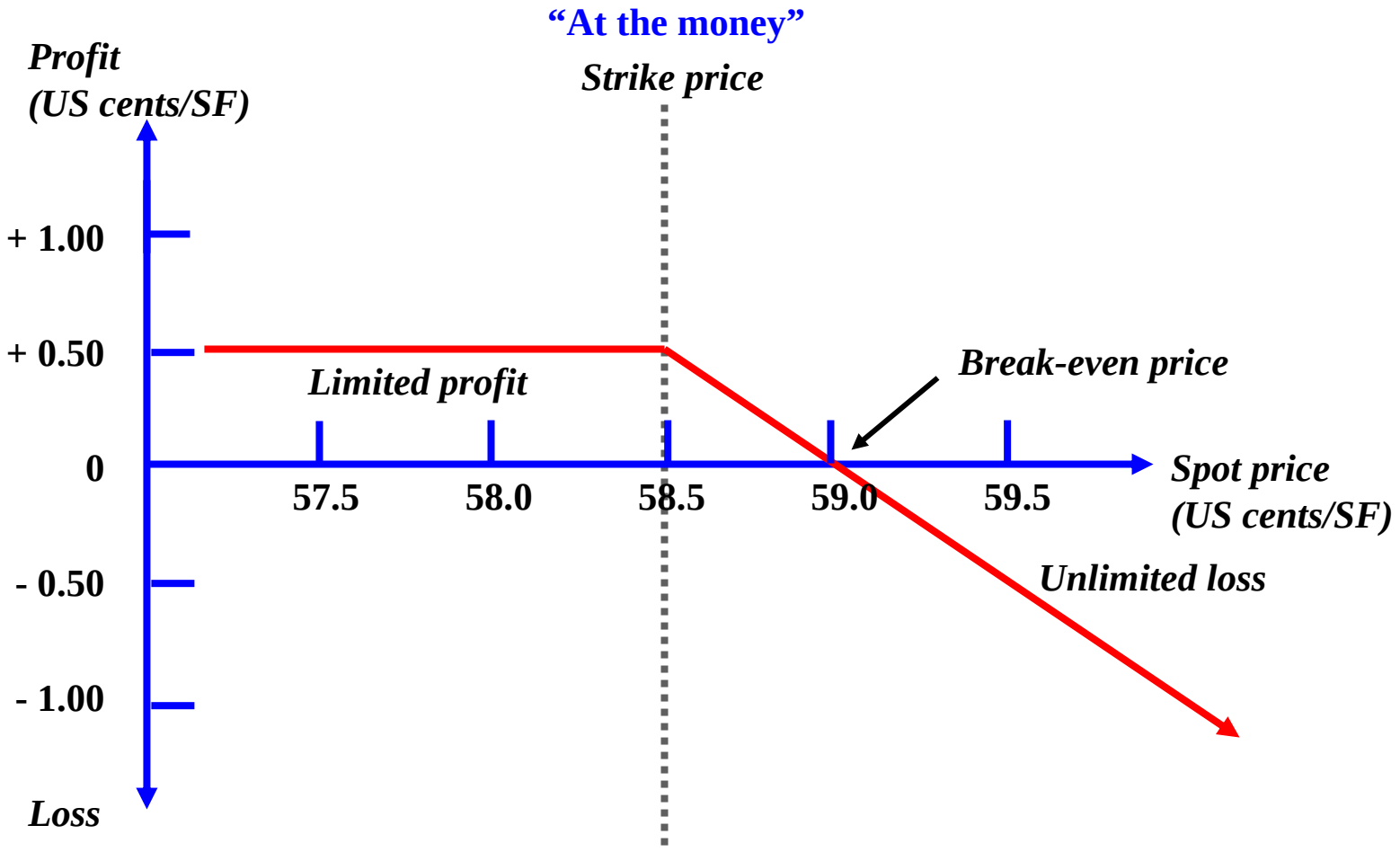


The buyer of a call option on SF, with a strike price of 58.5 cents/SF, has a limited loss of 0.50 cents/SF at spot rates less than 58.5 ("out of the money"), and an unlimited profit potential at spot rates above 58.5 cents/SF ("in the money").

Sell a Call or Short a Call

- Writer of a call:
  - What the holder, or buyer of an option loses, the writer gains
  - The maximum profit that the writer of the call option can make is limited to the premium
  - If the writer wrote the option *naked,* that is without owning the currency, the writer would now have to buy the currency at the spot and take the loss delivering at the strike price
  - The amount of such a loss is unlimited and increases as the underlying currency rises
  - Even if the writer already owns the currency, the writer will experience an opportunity loss

Exhibit 2 Profit and Loss for the Writer of a Call Option on Swiss francs

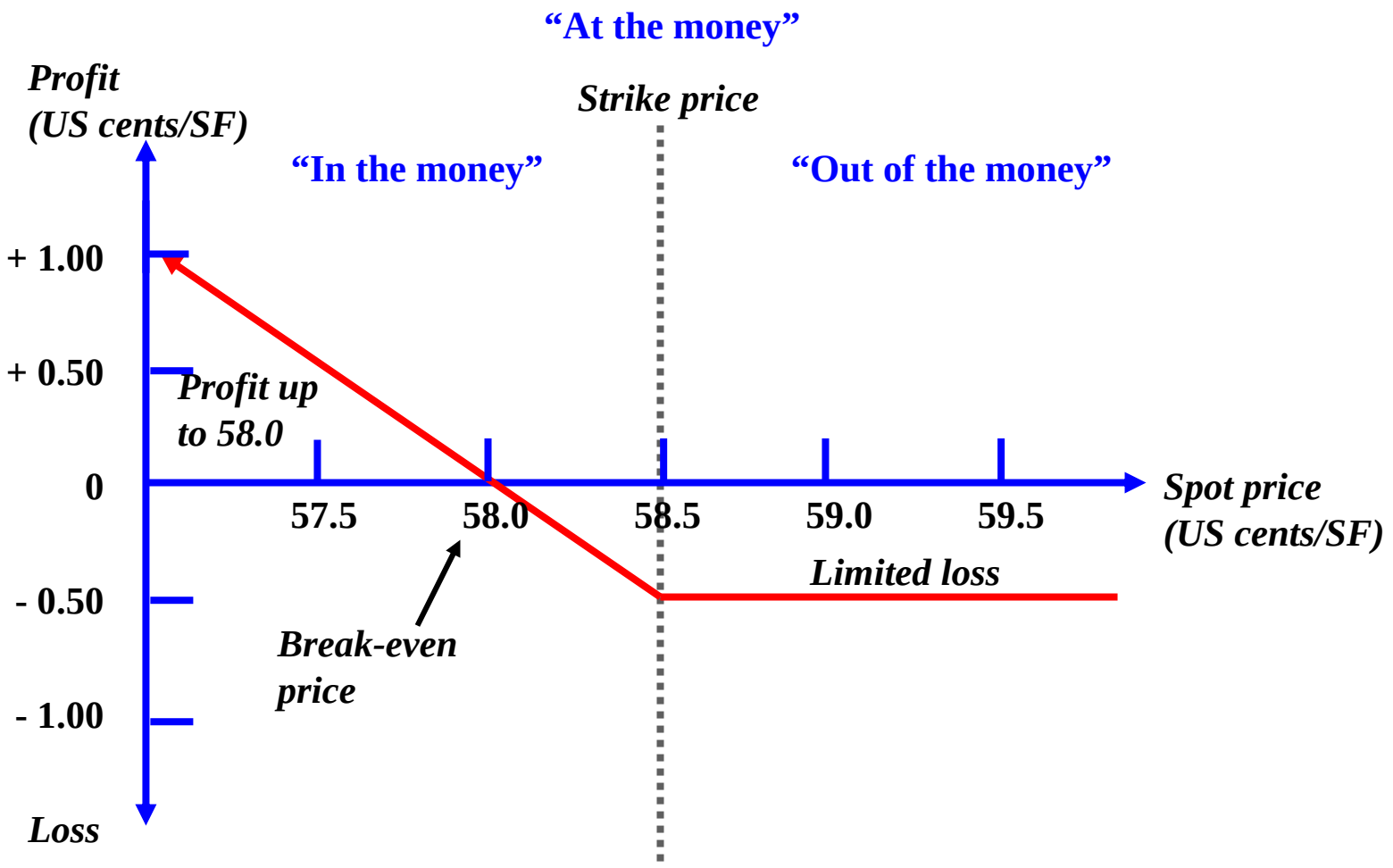


The writer of a call option on SF, with a strike price of 58.5 cents/SF, has a limited profit of 0.50 cents/SF at spot rates less than 58.5, and an unlimited loss potential at spot rates above (to the right of) 59.0 cents/SF.

Buy a Put or Long a Put

- The basic terms of this example are similar to those just illustrated with the call
- The buyer of a put option, however, wants to be able to sell the underlying currency at the exercise price when the market price of that currency drops (not rises as in the case of the call option)
- If the spot price drops to $0.575/SF, the buyer of the put will deliver francs to the writer and receive $0.585/SF
- At any exchange rate above the strike price of 58.5, the buyer of the put would not exercise the option, and would lose only the $0.05/SF premium
- The buyer of a put (like the buyer of the call) can never lose more than the premium paid up front

Exhibit 3 Profit and Loss for the Buyer of a Put Option on Swiss francs

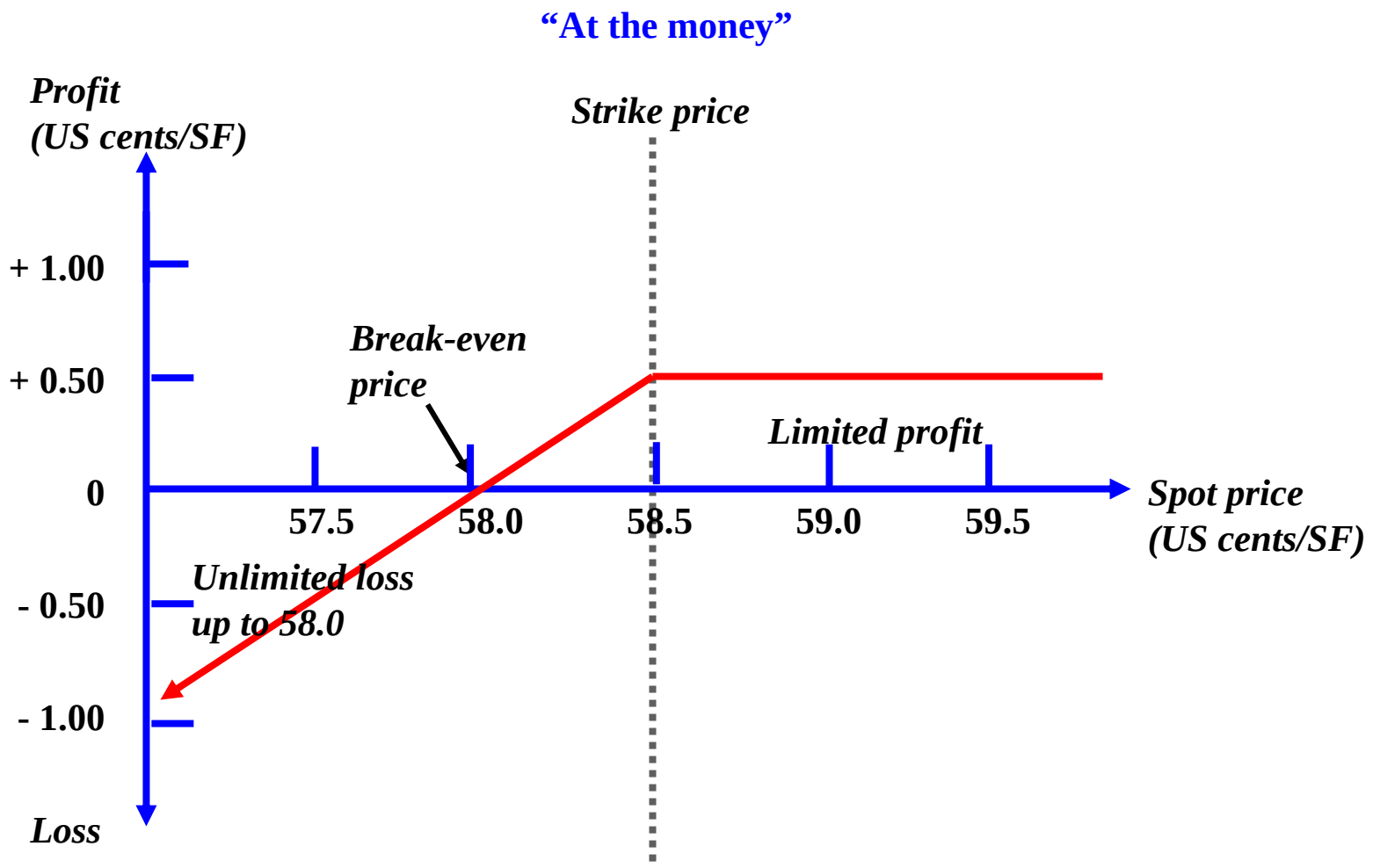


The buyer of a put option on SF, with a strike price of 58.5 cents/SF, has a limited loss of 0.50 cents/SF at spot rates greater than 58.5 ("out of the money"), and an unlimited profit potential at spot rates less than 58.5 cents/SF ("in the money") up to 58.0 cents.

Sell a Put or Short a Put

- Seller (writer) of a put:
  - In this case, if the spot price of francs drops below 58.5 cents per franc, the option will be exercised
  - Below a price of 58.5 cents per franc, the writer will lose more than the premium received fro writing the option (falling below *break-even*)
  - If the spot price is above $0.585/SF, the option will not be exercised and the option writer will pocket the entire premium

Exhibit 4 Profit and Loss for the Writer of a Put Option on Swiss francs



The writer of a put option on SF, with a strike price of 58.5 cents/SF, has a limited profit of 0.50 cents/SF at spot rates greater than 58.5, and an unlimited loss potential at spot rates less than 58.5 cents/SF up to 58.0 cents.

Types of Option

- **Options on Spot Foreign Currency**
- **Options on Foreign Currency Futures**
- **Futures-style Options**

Types of Option

	European Option	American Option
Spot options	1.CBOE 2. OTC	1. PHSX 2. LSX 3. OTC
Options on Futures	No	CME (IMM)
Futures-style options	No	LIFFE
Futures-style futures options	No	No

Option Pricing and Valuation

Option quotations

Information on the options of British Airways （LIFFE）

Option &	Strike	Calls			Puts		
London close	price	April	July	Oct.	April	July	Oct.
430 ½	420	30	51	s	19	42	53
430 ½	460	13	34	50	41 ½	r	76 ½

注： r为3月17日无交易，s为该日没有提供期权报价

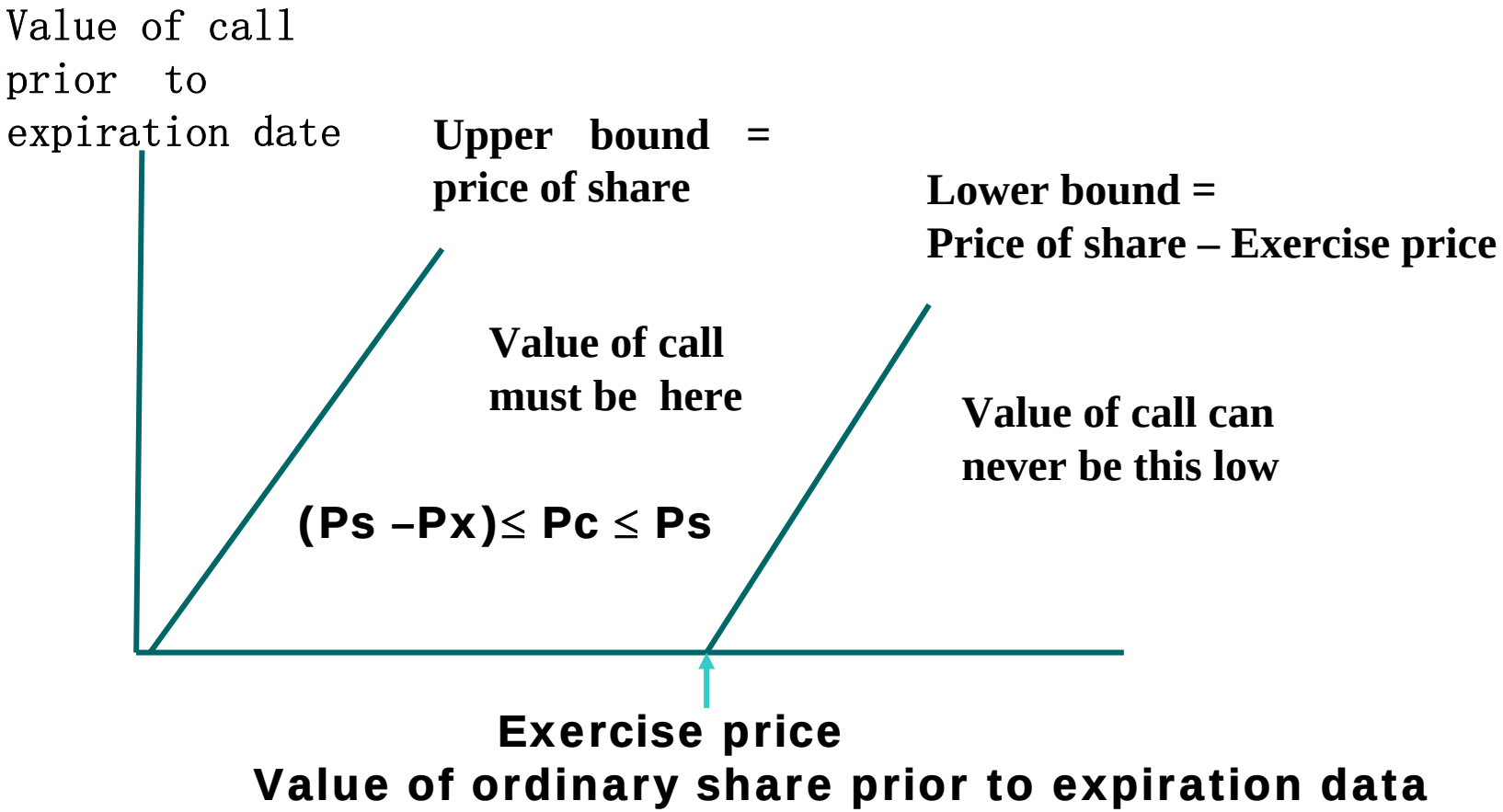
Source: Data from Financial Time, 18 March 1999.

Bounding the value of a call

Consider an American call :

Date	Transaction	
Today	(1) Buy call	- € 9
Today	(2) Exercise call, that is, Buy underlying share at exercise price	-€50
Today	(3) Sell stock at current Market price	+€60
Arbitrage profit		+€ 1

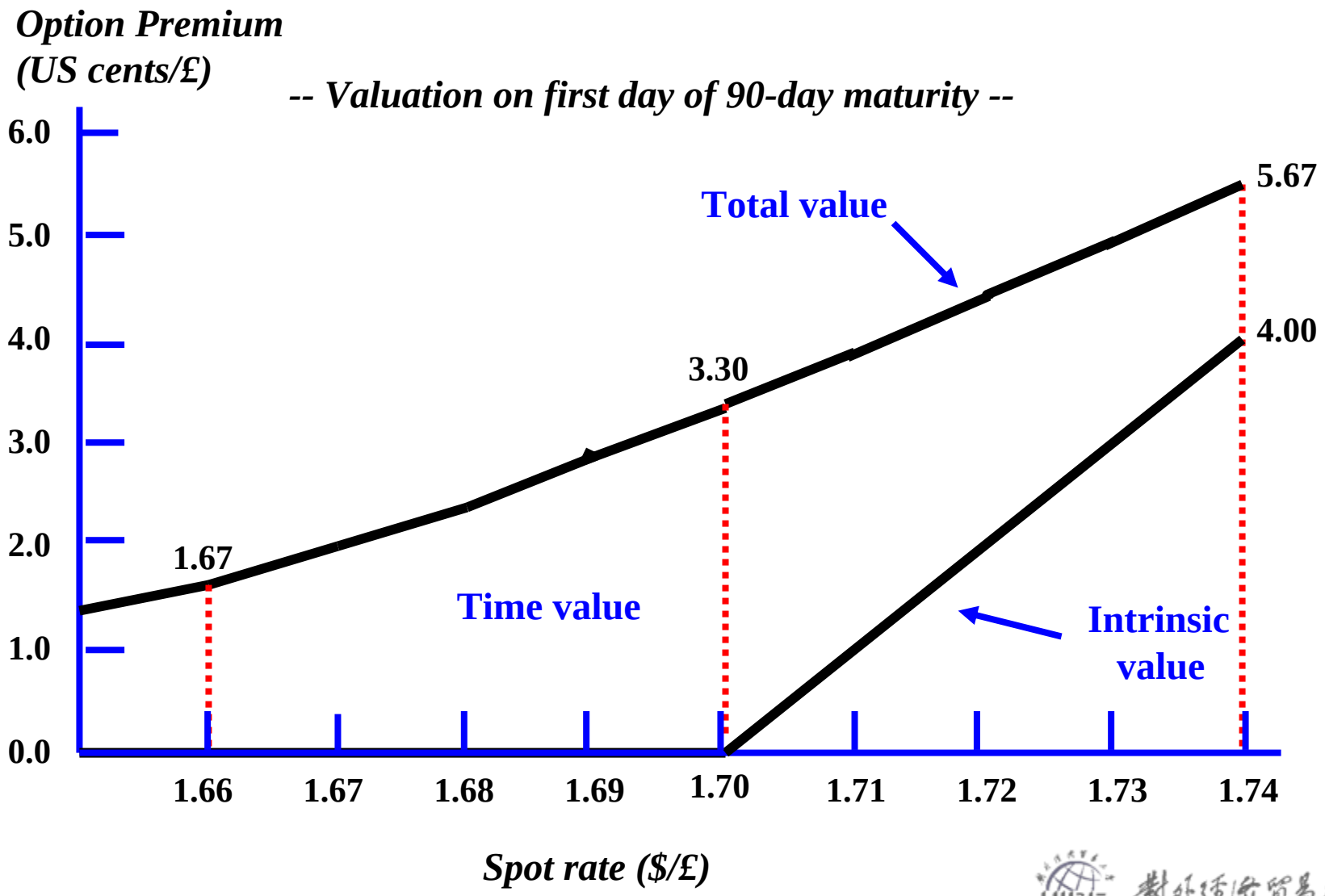
The upper and lower boundaries of call-option value



Option Pricing and Valuation

- The total value (premium) of an option is equal to the intrinsic value plus time value.
- Intrinsic value is the financial gain if the option is exercised immediately.
  - For a call option, intrinsic value is zero when the strike price is above the market price
  - When the spot price rises above the strike price, the intrinsic value become positive
  - Put options behave in the opposite manner
  - On the date of maturity, an option will have a value equal to its intrinsic value (zero time remaining means zero time value)
- The time value of an option exists because the price of the underlying currency, the spot rate, can potentially move further and further into the money between the present time and the option's expiration date.

Exhibit 6 Intrinsic Value, Time Value & Total Value for a Call Option on British Pounds with a Strike Price of $1.70/£



The factors determining call-option value

- The pricing of any currency option combines five elements:
  - Present spot rate
  - Time to maturity
  - Strike Price
  - Risk-free Rate
  - Volatility (standard deviation of daily spot price movements)

Option Pricing and Valuation

$$P_C = f(\overset{+}{P}_S, \overset{-}{P}_X, \overset{+}{t}, \overset{+}{\sigma}^2, \overset{+}{r}_f)$$

Case Study

- 对金融工具价格看跌时的策略

  A 公司在三个月后要支付一笔到期的美元贷款，而该公司的现有外汇收入来源于德国马克。目前即期汇价为**$0.58 / DM**。

Synthetic Long Put (合成式看跌期权）

Sell a Futures

Buy a Call Option }⇔ **Buy a Put Option**

对金融工具价格看跌时的策略

Synthetic Long Put (合成式看跌期权）

具体做法：

卖出德国马克期货，汇价为：**$0.60/DM**

买入德国马克看涨期权，**X=$0.60/DM，**
P=$0.02/DM

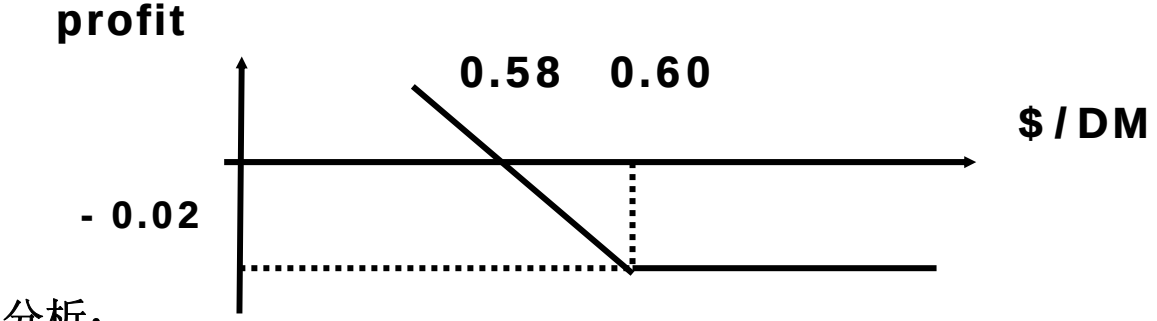
A公司到期的最大风险为：

0.60 - 0.60 + 0.02 = 0.02

盈亏平衡点为**$0.58**。如图所示：

对金融工具价格看跌时的策略

Synthetic Long Put (合成式看跌期权）



分析：

到期日：1)德国马克贬值，汇价=$0.57/DM <$0.58/DM

A 公司放弃看涨期权，　　损失期权费　-$0.02

A出售德国马克期货 赚得($0.60-$0.57)=+$0.03

总收益$0.01/DM

正好用出售DM获得的美元来偿还贷款。

2)德国马克升值，汇价>$0.58/DM

履行德国马克期货合约，以$0.60抛出DM

行使期权，以$0.60买入DM

这一买一卖把头寸轧平，只是损失了期权费$0.02。

公司可用德国马克外汇收入在现货市场上DM→$偿还贷款。若即期汇率大于$0.62，公司不仅享受到升值的好处，还可弥补期权费的损失

对金融工具价格看跌时的策略

Covered Short (保护性空头)

Sell a Future

Sell a Put Option } ⇔ Sell a Call Option

具体做法：

出售德国马克期货，汇价为：**$0.60/DM**

出售德国马克看跌期权，　**X=$0.57/DM，**
P=$0.04/DM

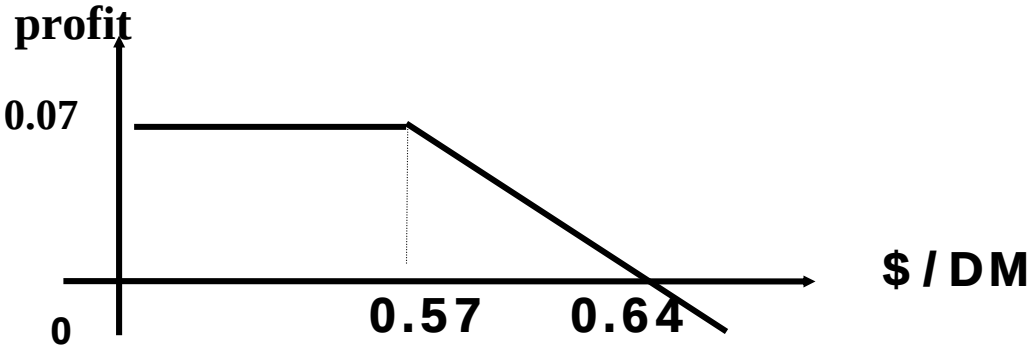
A公司到期的最大利润为：

0.60 - 0.57 + 0.04 = 0.07

盈亏平衡点为：**0.60 + 0.04 = 0.64**　**(风险无限)**

对金融工具价格看跌时的策略

Covered Short (保护性空头)



分析：

到期日：1)德国马克贬值，汇价=$0.54/DM <$0.57/DM

看跌期权的买方行使期权，公司损失 -$0.03

公司收到期权费 +$0.04

公司出售期货赚得 +$0.06

DM头寸轧平，总获利 +$0.07

在现货市场上，公司用DM→$偿还贷款(0.54-0.58) -$0.04

仍获利 +$0.03

公司不仅弥补了马克贬值的风险，而且还增加了$0.03/DM的收益。

2)德国马克升值，汇价=$0.65>$0.64

看跌期权的买方放弃期权，公司获期权费 +$0.04

公司出售期货，亏损($0.60-$0.65) -$0.05

-$0.01

公司通过出售期货获得的美元偿还贷款。若当时的即期汇率越高，则公司亏损越大。

对金融工具价格看涨时的策略

某日本商人投标在美国销售价值**1,000,000**美元的家用电器，开标日在**1**个月后。为了避免中标时可能的日元上涨、美元下跌的风险，此商人必须采取保值措施。他可以采取的方法有：

Synthetic Long Call（合成式看涨期权）

Buy a Futures

Buy a Put Option ⇔ Buy a Call Option

对金融工具价格看涨时的策略

Synthetic Long Call（合成式看涨期权）

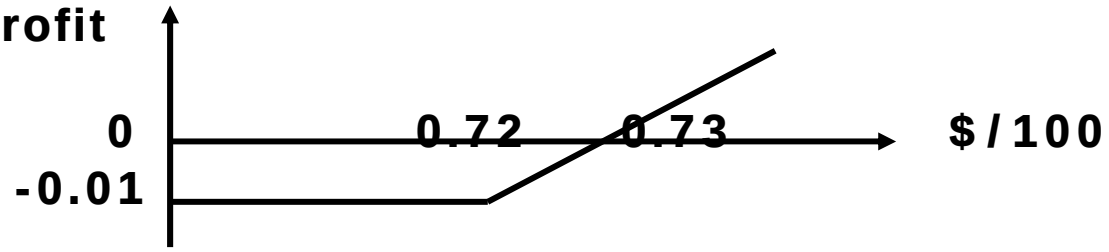
买入日元期货，汇价为100日元＝0.70美元，当时即期汇价为100日元＝0.69美元。同时，买入日元看跌期权，协定价格为100日元＝0.72美元，期权费为每100日元0.03美元，这样，该商人到期最大风险为：

0.70-0.72+0.03=0.01美元

盈亏平衡点：0.70+0.03=0.73美元

对金融工具价格看涨时的策略

Synthetic Long Call（合成式看涨期权）



分析：

在开标日：1)中标获得1,000,000美元

a.日元升值：汇价　$0.73，假设汇价＝$0.78/100

从期货交易中获利($0.78-$0.70)= $0.08

放弃期权，损失期权费　　－ 0.03

获利　$0.05

形成日元多头，美元空头，正好与中标获得美元相抵消。该商人不但抵消了风险，而且可以获得额外收益。

b.日元贬值：汇价　$0.72,假设汇价＝$0.68/100

买入期货，损失($0.70-$0.68)=-$0.02

行使期权，　获利($0.72-$0.68)= $0.04

支付期权费　　- 0.03

损失　$0.01

行使期权与履行期货合约正好把头寸轧平，将开标后所得美元在现汇市场上以$0.68/100　汇价换成日元，享受日元贬值带来的好处。

对金融工具价格看涨时的策略

Synthetic Long Call（合成式看涨期权）

开标日：2)不中标

a.日元升值，汇价＝$0.78/100

购入期货，将日元作现汇抛出，交易获利$0.08

放弃期权，损失期权费　　－$0.03

获利－$0.05

只要开标日即期汇价高于100日元＝0.73美元，他都可以获得额外收入，而且头寸也可以补平。

b.日元贬值，汇价＝$0.68/100

购入期货　损失－$0.02

行使期权　获利　$0.04　共损失$0.01,头寸补平

期权费支出　　－$0.03

对金融工具价格看涨时的策略

Covered Long (保护性多头）

Buy a Futures

Sell a Call Option }⇔ **Sell a Put Option**

具体做法如下：

买入日元期货，汇价为**100**日元＝**0.70**美元

卖出日元看涨期权，协定价格为**100**日元＝**0.72**美元，期权费为每**100**日元**0.04**美元，这样，该商人到期

最大利润为： **$0.72 - $0.70 + $0.04 = $0.06**

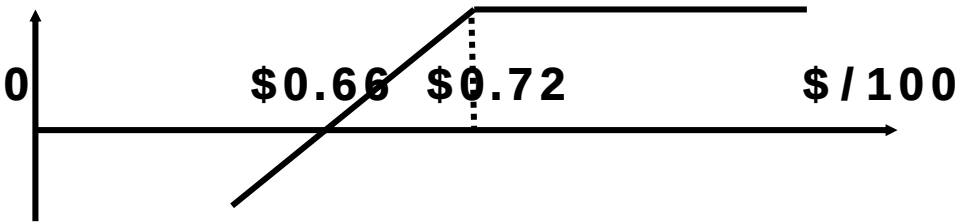
盈亏平衡点： **$0.70 - $0.04 = $0.66**

对金融工具价格看涨时的策略

Covered Long (保护性多头）

如图所示： **Profit**

$0.06



分析：

开标日：**1)** 中标

a. 日元升值，汇价**=$0.74/100**

买入期货，获利**($0.74-$0.70)**	**+$0.04**
期权买方行使期权，卖方亏	**-$0.02**
卖方收到期权费	**+$0.04**
获利	**+$0.06**

出售看涨期权与购入期货正好把日元头寸轧平。把中标获得的**$1,000,000**兑换成日元。由于汇价从**$0.69**上升到**$0.74**，因此损失**$0.05**,但是可用获利的**$0.06**补偿，起到一定的风险弥补作用。

b.日元贬值： 汇价**=$0.68/100**

买入期货损失（**$0.68-$0.70)**	**-$0.02**
期权买方放弃行使，收入期权费	**+$0.04**
获利	**+$0.02**

形成日元多头，美元空头，正好与中标获得的美元相抵消。

对金融工具价格看涨时的策略

Covered Long (保护性多头）

2)不中标

a. 日元升值，汇价**=$0.74/100**

买入期货获利 **+$0.04**

期权买方行使，卖方亏损 **-$0.02**

期权费收入 **+$0.04**

总获利 **+$0.06**

出售看涨期权与购入期货正好把头寸轧平。

b. 日元贬值，汇价**=$0.68/100**

以**$0.70**买入期货，在现货市场按**$0.68**抛出，

亏损 **-$0.02**

期权买方放弃行使，收入期权费 **+$0.04**

获利 **+$0.02**

若日元贬值很厉害，则该商人的风险将不断增大。