Introduction

Chapter 1

The Nature of Derivatives

A derivative is an instrument whose value depends on the values of other more basic underlying variables

Examples of Derivatives

- Forward Contracts
- Futures Contracts
- Swaps
- Options

Derivatives Markets

- Exchange traded
  - Traditionally exchanges have used the open-outcry system, but increasingly they are switching to electronic trading
  - Contracts are standard there is virtually no credit risk
- Over-the-counter (OTC)
  - A computer- and telephone-linked network of dealers at financial institutions, corporations, and fund managers
  - Contracts can be non-standard and there is some small amount of credit risk

Ways Derivatives are Used

- To hedge risks
- To speculate (take a view on the future direction of the market)
- To lock in an arbitrage profit
- To change the nature of a liability
- To change the nature of an investment without incurring the costs of selling one portfolio and buying another

Forward Contracts

- A forward contract is an agreement to buy or sell an asset at a certain time in the future for a certain price (the delivery price)
- It can be contrasted with a spot contract which is an agreement to buy or sell immediately
- It is traded in the OTC market

Foreign Exchange Quotes for GBP on Aug 16, 2001 (See page 3)

	Bid	Offer
Spot	1.4452	1.4456
1-month forward	1.4435	1.4440
3-month forward	1.4402	1.4407
6-month forward	1.4353	1.4359
12-month forward	1.4262	1.4268

Forward Price

- The forward price for a contract is the delivery price that would be applicable to the contract if were negotiated today (i.e., it is the delivery price that would make the contract worth exactly zero)
- The forward price may be different for contracts of different maturities

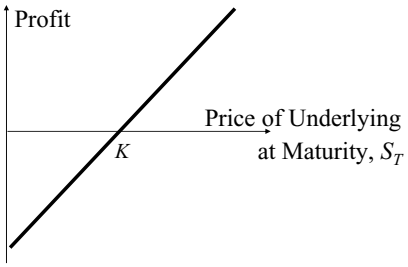
Terminology

- The party that has agreed to buy has what is termed a long position
- The party that has agreed to sell has what is termed a short position

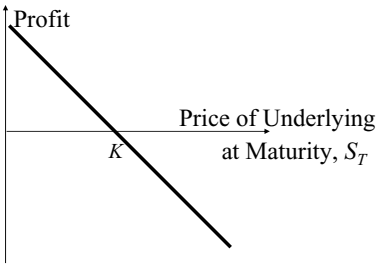
Example (page 3)

- On August 16, 2001 the treasurer of a corporation enters into a long forward contract to buy £1 million in six months at an exchange rate of 1.4359
- This obligates the corporation to pay \$1,435,900 for £1 million on February 16, 2002
- What are the possible outcomes?

Profit from a Long Forward Position



Profit from a Short Forward Position



Futures Contracts

- Agreement to buy or sell an asset for a certain price at a certain time
- Similar to forward contract
- Whereas a forward contract is traded OTC, a futures contract is traded on an exchange

Examples of Futures Contracts

- Agreement to:
  - buy 100 oz. of gold @ US$300/oz. in December (COMEX)
  - sell £62,500 @ 1.5000 US$/£ in March (CME)
  - sell 1,000 bbl. of oil @ US$20/bbl. in April (NYMEX)

1. Gold: An Arbitrage Opportunity?

- Suppose that:
  - The spot price of gold is US$300
  - The 1-year forward price of gold is US$340
  - The 1-year US$ interest rate is 5% per annum
- Is there an arbitrage opportunity?

(We ignore storage costs and gold lease rate)?

2. Gold: Another Arbitrage Opportunity?

- Suppose that:
  - The spot price of gold is US$300
  - The 1-year forward price of gold is US$300
  - The 1-year US$ interest rate is 5% per annum
- Is there an arbitrage opportunity?

The Forward Price of Gold

If the spot price of gold is S and the forward price for a contract deliverable in T years is F, then

$$F = S(1+r)^T$$

where r is the 1-year (domestic currency) risk-free rate of interest.

In our examples, $S = 300$, $T = 1$, and $r = 0.05$ so that

$$F = 300(1+0.05) = 315$$

1. Oil: An Arbitrage Opportunity?

Suppose that:

- The spot price of oil is US$19
- The quoted 1-year futures price of oil is US$25
- The 1-year US$ interest rate is 5% per annum
- The storage costs of oil are 2% per annum

- Is there an arbitrage opportunity?

2. Oil: Another Arbitrage Opportunity?

- Suppose that:
  - The spot price of oil is US$19
  - The quoted 1-year futures price of oil is US$16
  - The 1-year US$ interest rate is 5% per annum
  - The storage costs of oil are 2% per annum
- Is there an arbitrage opportunity?

Exchanges Trading Options

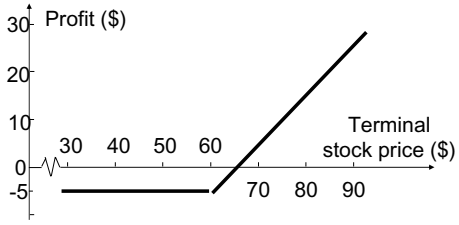
- Chicago Board Options Exchange
- American Stock Exchange
- Philadelphia Stock Exchange
- Pacific Stock Exchange
- European Options Exchange
- Australian Options Market
- and many more (see list at end of book)

Options

- A call option is an option to buy a certain asset by a certain date for a certain price (the strike price)
- A put is an option to sell a certain asset by a certain date for a certain price (the strike price)

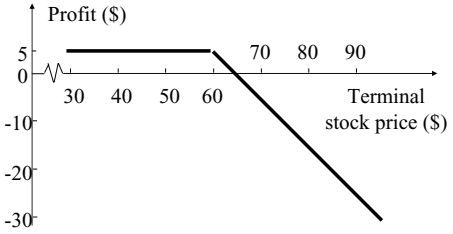
Long Call on Microsoft (Figure 1.2, Page 7)

Profit from buying a European call option on Microsoft: option price = \$5, strike price = \$60



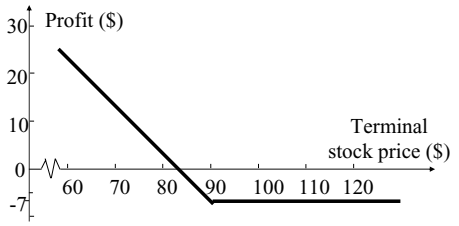
Short Call on Microsoft (Figure 1.4, page 9)

Profit from writing a European call option on Microsoft: option price = \$5, strike price = \$60



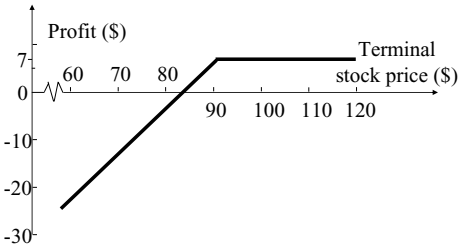
Long Put on IBM (Figure 1.3, page 8)

Profit from buying a European put option on IBM: option price = \$7, strike price = \$90



Short Put on IBM (Figure 1.5, page 9)

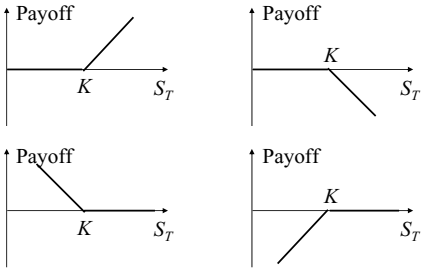
Profit from writing a European put option on IBM: option price = \$7, strike price = \$90



Payoffs from Options

What is the Option Position in Each Case?

K = Strike price, S_T = Price of asset at maturity



Types of Traders

- Hedgers
- Speculators
- Arbitrageurs

Some of the large trading losses in derivatives occurred because individuals who had a mandate to hedge risks switched to being speculators

Hedging Examples (page 11)

- A US company will pay £10 million for imports from Britain in 3 months and decides to hedge using a long position in a forward contract
- An investor owns 1,000 Microsoft shares currently worth \$73 per share. A two-month put with a strike price of \$65 costs \$2.50. The investor decides to hedge by buying 10 contracts

Speculation Example

- An investor with \$4,000 to invest feels that Cisco's stock price will increase over the next 2 months. The current stock price is \$20 and the price of a 2-month call option with a strike of 25 is \$1
- What are the alternative strategies?

Arbitrage Example (pages 12-13)

- A stock price is quoted as £100 in London and \$172 in New York
- The current exchange rate is 1.7500
- What is the arbitrage opportunity?