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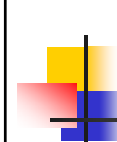
Derivatives



Chapter 1: Introduction

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Outline

- What are derivative securities?
- How are they used?
- Futures, Forwards, Options
 - What are these securities?
 - Where are they traded?
 - Some terminology and examples

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The Nature of Derivatives

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

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Examples of Derivatives

- Futures Contracts
- Forward Contracts
- Swaps
- Options

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Ways Derivatives are Used

- To hedge risks
- To speculate (take a view on the future direction of the asset)
- 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

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Futures Contracts

- A futures contract is an agreement to buy or sell an asset at a certain time in the future for a certain price
- By contrast in a spot contract there is an agreement to buy or sell the asset immediately (or within a very short period of time)

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Futures Price

- The futures prices for a particular contract is the price at which you agree to buy or sell
- It is determined by supply and demand in the same way as a spot price

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Examples of Futures Contracts

Agreement to:

- buy 100 oz. of gold @ US\$400/oz. in December (NYMEX)
- sell £62,500 @ 1.5000 US\$/£ in March (CME)
- sell 1,000 bbl. of oil @ US\$20/bbl. in April (NYMEX)

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Terminology

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

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Example

- January: investor A enters into a long futures contract on COMEX to buy 100 oz of gold @ \$300 in April.
- January: investor B enters into a short futures contract to sell 100 oz of gold @\$300.
- April: the price of gold \$315 per oz. Both parties need to fulfill their obligations.
What is the investor's profit?

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Concept check



- What is the profit/loss of investors A and B?

G) A profits \$15 and B loses \$15

Y) A loses \$15 and B profits \$15

R) Both A and B are even

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Exchanges Trading Futures

- Chicago Board of Trade
- Chicago Mercantile Exchange
- LIFFE (London)
- Eurex (Europe)
- BM&F (Sao Paulo, Brazil)
- TIFFE (Tokyo)
- and many more (see list at end of book)

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Electronic Trading

- Traditionally futures contracts have been traded using the open outcry system where traders physically meet on the floor of the exchange
- Increasingly this is being replaced by electronic trading where a computer matches buyers and sellers

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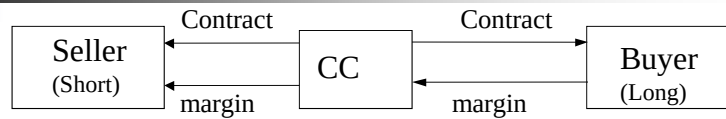


Over-the Counter Markets

- The over-the counter market is an important alternative to exchanges
- It is a telephone and computer-linked network of dealers who do not physically meet
- Trades are usually between financial institutions, corporate treasurers, and fund managers

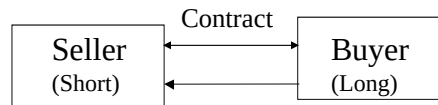
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Exchange traded derivative



Standardized contracts that are less flexible, but more liquid market; Easy to reverse position; No counter party risk

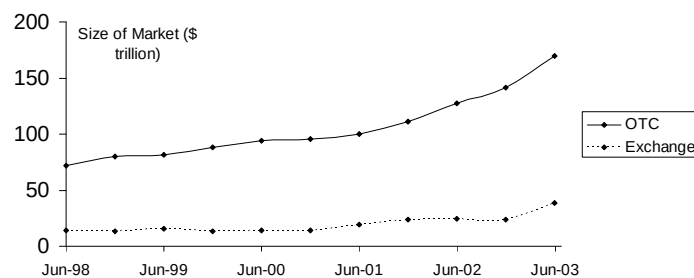
■ OTC (Over The Counter) trade



Customized contracts; Illiquid market; Costly to reverse position; Counter party risk

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Size of OTC and Exchange Markets



Source: Bank for International Settlements. Chart shows total principal amounts for OTC market and value of underlying assets for exchange market

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Forward Contracts

- Forward contracts are similar to futures except that they trade in the over-the-counter market
- Forward contracts are popular on currencies and interest rates

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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 option is an option to sell a certain asset by a certain date for a certain price (the strike price)

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American vs European Options

- An American option can be exercised at any time during its life
- A European option can be exercised only at maturity

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Intel Option Prices (May 29, 2003; Stock Price=20.83);

Strike Price	June Call	July Call	Oct Call	June Put	July Put	Oct Put
20.00	1.25	1.60	2.40	0.45	0.85	1.50
22.50	0.20	0.45	1.15	1.85	2.20	2.85

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Exchanges Trading Options

- Chicago Board Options Exchange
- American Stock Exchange
- Philadelphia Stock Exchange
- Pacific Exchange
- LIFFE (London)
- Eurex (Europe)
- and many more (see list at end of book)

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Options vs Futures/Forwards

- A futures/forward contract gives the holder the obligation to buy or sell at a certain price
- An option gives the holder the right to buy or sell at a certain price

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Types of Traders

- Hedgers
- Speculators
- Arbitrageurs

Some of the largest trading losses in derivatives have occurred because individuals who had a mandate to be hedgers or arbitrageurs switched to being speculators (See for example Barings Bank, Business Snapshot 1.1)

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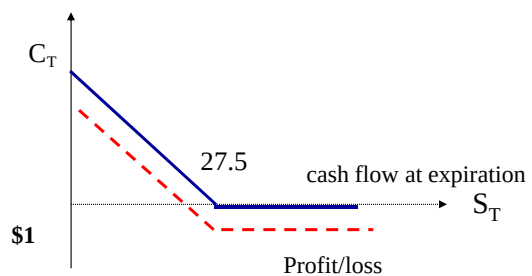


Hedging Examples

- 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 Intel shares currently worth \$28 per share. A two-month put with a strike price of \$27.50 costs \$1. The investor decides to hedge by buying 10 contracts (100 shares/contract)

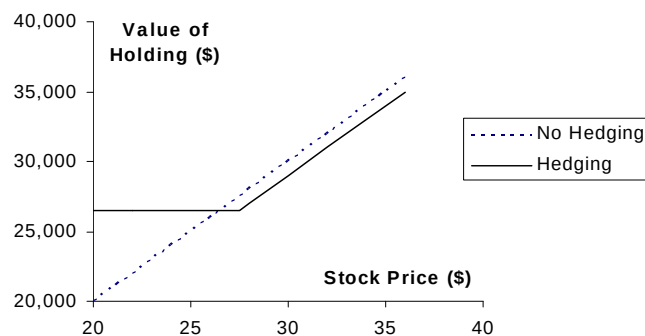
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Intel Option Prices (strike price 27.5; option premium \$1)



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Value of Intel Shares with and without Hedging



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Speculation Example

- An investor with \$4,000 to invest thinks that Amazon.com's stock price will increase over the next 2 months. The current stock price is \$40 and the price of a 2-month call option with a strike of 45 is \$2
- What are the alternative strategies?

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Speculation Example

- Strategies: 1. Buy 100 Amazon stocks 2. Buy 2000 calls options

	Amazon's stock price in 2 months				
	35	40	45	50	55
<u>All stocks</u>					
Value	3500	4000	4500	5000	5500
Return	-12.5%	0%	12.5%	25%	37.5%
<u>All options</u>					
Value	0	0	45	10000	20000
Return	-100%	-100%	-100%	150%	400%

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Concept check



- A stock price is quoted as £100 in London and \$172 in New York
- The current exchange rate is 1.7500
- Is there an arbitrage opportunity?
 - G) Yes
 - Y) May be
 - R) No

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Gold: Arbitrage Opportunity?

- Suppose that:
 - The spot price of gold is US\$390
 - The quoted 1-year futures price of gold is US\$390
 - The 1-year US\$ interest rate is 5% per annum
 - No income or storage costs for gold
- Is there an arbitrage opportunity?

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The Futures Price of Gold

If the spot price of gold is S & the futures price is 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, $S=390$, $T=1$, and $r=0.05$ so that

$$F = 390(1+0.05) = 409.50$$

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Summary

- A derivative is an instrument whose value depends on the values of other underlying variables
- Example of derivatives: futures, forwards, options
 - Traded on exchanges and over the counter
 - The long position and the short position of a forward or futures contract have the obligation to execute the transaction at maturity
 - The long position of an option has the right but not the obligation to exercise the option.
- Derivatives are used in many ways

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