

## Week 1: Introduction to Derivatives

### Futures Contracts

- A futures contract is an agreement to buy or sell a **specified quantity** of a **specified asset** at a **specified time in the future** for a **specified price** (delivery price)

A futures contract is an agreement to buy or sell an asset at a certain time in the future for a certain price

- Buyer needs to pay only a **small fraction (2-5%) of the delivery price** as deposit
- 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 e.g. same business day) -> pay 'now'
  - + The **difference** between spot and future contract is: spot contract you pay right away and receive the asset you buy (or receive the money and delivery the asset if selling)
  - + The spot price is for immediate, or almost immediate, delivery. The futures price is the price for delivery at some time in the future. The two are not usually equal.

### The Nature of Derivatives: What are they?

- A derivative security is an instrument (or contract) whose payoff and, thus, value depends on the values (or, prices) of one (or, more) other variables (referred to as **underlying assets**)
  - + Such security **derives its value from the value of another (traded or not) asset**
  - + The value of the future contract (derivate asset) will **depend** on the price of the asset today (**the underlying asset**).

### Type of Derivatives We Will Consider

- **Futures** and **Forward** Contracts
- Standard (or, Plain Vanilla) **Options**
- Primarily written on (i.e., whose underlying assets are): equities (individual and indices), currencies, commodities
- Traded either in **organized exchanges** or **over-the-counter**

Spot market: trading is immediate (buyers pay and assets received)

Future market: buyers buy but not pay until a certain future date

Organized exchanged: official exchange institutions e.g. New York Stock Exchange

Over-the-counter: parties agree to each other outside of the organized exchange

### Derivatives Trading: Exchanges

- Products and trading terms are **standardized**

- ✚ People can only buy the specific offering in a specific quantity
- ✚ The trading term is standardized.
- Increasingly this is being replaced by **electronic trading** where a computer matches buyers and sellers rather than trading on the floor.

### Derivatives Trading: Over-the Counter (OTC) Markets

- Important alternative to exchanges
- It offers a more flexibility
- 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
  - ✚ Typically, small investors go to organized exchanges, and bigger investors go to OTC.
  - ✚ This means that they are always prepared to quote a bid price (at which they are prepared to take one side of a derivatives transaction) and an offer price (at which they are prepared to take the other side). When they start trading with each other, two market participants often sign an agreement covering all transactions they might enter into in the future.
- Contract **flexibility** (as opposed to standardized), private market, relatively unregulated
- Credit Risk
  - ✚ OTC involves more credit risk.
    - ⇒ When there is an **organized exchange**, the exchange itself, the organization will guarantee the execution of the trade (even when one party fails, the organization will continue the transaction).
    - ⇒ Whereas, in **OTC** if the counterparty betrays, then another party has to bear the loss and no compensation for the loss.
  - ✚ Prior to credit risk, the OTC markets were largely unregulated. Following the credit crisis and failure of Lehman Brothers, there was development of many new regulations affects the operation of OTC markets.
    - ⇒ The purpose of the regulations is to **improve the transparency of OTC markets, improve market efficiency, and reduce systemic risk**

### Big Picture Questions

- WHY derivatives?
  1. Hedging the risk (eliminating the price risk)
  2. Speculation => to make profit for it
    - Trading, in order to make an advantage of the price movements in the future
- **WHO** uses them - HOW to use them?
- How to **PRICE** them?

- How to assess their **riskiness** - Are they “dangerous”?

## LET’S START ANSWERING THE ‘WHY’ AND ‘WHO’

### Hedging Example

- A farmer with wheat in the field knows that the crop will be ready for sale in December
  1. Wait until December, then sell wheat in the **spot market** (sales price uncertain)
  2. Sell (go short) Wheat Futures for December delivery (sales price predetermined)
  - ⇒ Through the futures contracts the farmer **locks in the price** at which he delivers wheat
  - ⇒ Futures can be a form of **insurance** (or, hedging) -> **Eliminate the price risk**
- There is a fundamental difference between the **use of forward contracts and options for hedging**.
  - ✚ Forward contracts are designed to **neutralize risk by fixing the price** that the hedger will pay or receive for the underlying asset.
  - ✚ Option contracts, by contrast, provide insurance. They offer a way for investors to protect themselves against adverse price movements in the future while still allowing **them to benefit from favorable price movements**.
  - ✚ Unlike forwards, options involve the payment of an up-front fee.

### Speculation Example

- Whereas **hedgers want to avoid an exposure to adverse movements in the price of an asset**, speculators wish to take a position in the market. Either they are betting that the price of the asset will go up or they are betting that it will go down.
- In July an investor with \$20,000 feels that the price of wheat will increase over the next 2 months. The current spot price is \$4.00 per bushel and the futures price for the September contract (i.e., expiring in 2 months) is \$4.20
- What could the investor do?
  1. Buy Spot 5000 bushels of Wheat -> put the \$20,000 down now
  2. Buy (Go Long) Wheat Futures -> no money down, except a 5% deposit (see later)
  - ⇒ Futures allow more leverage (no full amount of money need to down now)
- **Trading, in order to make an advantage of the price movements in the future and hopefully can make profit.**
- Futures and options are similar instruments for speculators in that they **both provide a way in which a type of leverage can be obtained**. However, there is an important difference between the two. When a **speculator uses futures** the *potential loss as well as the potential gain is very large*. When **options** are used, no matter how bad things get, the speculator’s *loss is limited to the amount paid for the options*

## Arbitrage Example

- Arbitrage involves locking in a **riskless profit by simultaneously entering into transactions in two or more markets**
- A stock price is quoted as £100 in London and \$182 in New York
- The current exchange rate is 1.8500 (London \$185)
- What is the arbitrage opportunity (or, free lunch)?

Buy low, sell high (the stock is cheaper in NY) => buy in NY, and sell in London \$3 per share **without risk**

The **difference** between speculation and arbitrage is: arbitrage allows people to make no-risk profit; whereas in speculation, the risk (uncertainty) is high.

## **Three Reasons** for Trading Derivatives

- To hedge risks (=insurance)
- To speculate (=take a view on the future direction of a market value)
- To lock in an arbitrage profit (=free lunch)

## **Who Uses Derivatives? For What Purpose?**

1. Treasury/Risk Management departments, consumers/investors hedging FX, interest rate, raw material price risk, firm-wide risk (hedging)
2. Proprietary trading groups/desks exploiting mispricing across related securities (arbitrage)
3. Speculators (Position Traders) engaging in **leveraged** bets (speculation)
4. Hedge funds trade derivatives for all three reasons (See Business Snapshot 1.3)

## **Derivatives Misuse**

- When a trader has a mandate to use **derivatives for hedging or arbitrage, but then switches to speculation, large losses can result.** (*See Business Snapshot 1.4*)
  - ✚ When speculate, if price turns against you => not hedging! => will increase the loss even more
  - ✚ It varies very much, what and how you are using the derivatives for.
    - ⇒ For insurance purpose, ok
    - ⇒ If saying doing insurance, but actually speculating, then big problem

One of the risks faced by a company that trades derivatives is that an employee who has a mandate to hedge or to look for arbitrage opportunities may become a speculator.

## **Futures and Forward Markets**

## Reading: chapter 2

Futures contracts are traded on an exchange and the contract terms are standardized by that exchange.

Forward contracts are traded in the over-the-counter market.

### Futures

- Contract Specification: what, how much, where, how, when, price
- Available on a wide range of underlying assets
- **Exchange** traded (“anonymously”) - If outside of the exchange, it is NOT a future contract.
- Settled daily - Every day, you have a cash inflow / outflow (as long as have a position outstanding).

### *Futures: Contract Specification*

- The asset (what)
- The contract size (how many units of the underlying per contract) e.g. 100 shares of Telstra; \$US 400
  - ✚ The contract **size** specifies the **amount of the asset that has to be delivered under one contract**.
  - ✚ The exchange size is determined by the exchange organization
- The delivery arrangement (where, how)
  - ✚ Where: the asset will be exchanged (in what location – the address)
  - ✚ The place where **delivery** will be made must be **specified by the exchange**. This is particularly important for commodities that involve significant transportation costs.
  - ✚ When **alternative delivery locations are specified**, the price received by the party with the short position is sometimes adjusted according to the location chosen by that party. The price tends to be higher for delivery locations that are relatively far from the main sources of the commodity.
- The delivery month (when)
  - ✚ The exchange must specify the precise period during the month when delivery can be made. For many futures contracts, **the delivery period is the whole month**.
- The delivery prices
  - ✚ The price of which the transaction will take place
- Position limits

- ✚ The contract will also specify, the **biggest position you can take**. So, individual trades do not generate too much volatility
  - ✚ Position limits are the maximum number of contracts that a speculator may hold.
  - ✚ The purpose of these limits is to prevent speculators from exercising undue influence on the market.
- Price limits
- ✚ Daily price movement limits are specified by the exchange.
  - ✚ If in a day the price **moves down** from the previous day's close by an amount equal to the daily price limit, the contract is said to be **limit down**.
  - ✚ If it moves up by the limit, it is said to be **limit up**.
  - ✚ A limit move is a move in either direction equal to the daily price limit.
  - ✚ Normally, trading ceases for the day once the contract is limit up or limit down.
  - ✚ However, in some instances the exchange has the authority to step in and change the limits.
  - ✚ The purpose of daily price limits is to **prevent large price movements** from occurring because of speculative excesses. **However, limits can become an artificial barrier to trading when the price of the underlying commodity is advancing or declining rapidly**. Whether price limits are, on balance, good for futures markets is controversial.

### ***Futures: Underlying***

- Agricultural and other commodities (CBOT, CME)
- Natural resources (NYMEX)
- Foreign currencies (PHLX)
- T-bills and Eurodollars (CME)
- T-bonds (CBOT)
- Equities (ASX 200, S&P 500 – CME)
- ✚ Single stock futures

### ***Futures: Exchange Trading***

- The contract between the two parties is replaced with separate contracts with an **intermediary** (the clearinghouse). It **guarantees the performance** of the parties to each transaction.
- ✚ For me, the effective counter party is NOT Roger, it is the Exchange. As long as I pay the money to Exchange, the Exchange will provide the asset.
- ✚ Technically, two contracts: my contract with Exchange and Roger with Exchange.
- The clearinghouse is both long and short => offsetting position, the intermediary who guarantee the transaction takes place.

- The clearinghouse has to monitor credit risk.
- Open outcry system (on the floor) or electronic platform

### Opening Futures Positions

- To open a position, you **call broker** or enter into the contract **via online trading account**.
  - + Contracts are referred to by their delivery month.
  - + e.g. “long May WTI” (oil futures)
    - You commit to purchase certain number of oil coming May
- No initial payment, except **bid-ask spreads**, **commissions** and **margins** (see later)
  - + No down payment, but need to pay commissions, pay the deposit (margins), the bid-ask spreads
    - ⇒ Bid-ask spreads: at a given point in time, the price which you actually buy does not equal to the price you actually sell, because there is a bid-ask spread (transaction costs that incur)
- Price agreed upon today is the price at which transactions will take place in the future
  - + Buyer pays the seller the futures price and seller deliver the asset. Or does he?

### Closing Out Futures Positions

- Two options: *take delivery* or *reverse a position*
  - + Take the delivery: until the maturity of the contract to pay the money and get the asset
  - + Reverse a position: from long to short position or from short to long
- Most contracts don't lead to delivery (less than 2%).
  - + Might be inconvenient (especially for speculators).
  - + Can be expensive (storage costs, transport).
  - + The reason is that most investors choose to close out their positions prior to the delivery period specified in the contract. Making or taking delivery under the terms of a futures contract is often **inconvenient** and in some instances **quite expensive**
- Reversing a position (especially, the reason for hedgers not hold until maturity)
  - Closing out position: Submitting an order, which is exactly the same but with opposite sign.
    - + Enter into a contract that is opposite of the original contract
    - + Example: **March 6**: long (buy) 1 July corn, **April 12**: short(sell) 1 July corn
      - ⇒ Profit or loss is determined by the change in the **futures price between March 6 & April 12**

### Delivery

- If a futures contract is not closed out before maturity, it is settled by delivering the assets underlying the contract.
- When there are alternatives about what is delivered, where it is delivered, and when it is delivered, the party with the **short (sell) position chooses**.
- A few contracts (for example, those on stock indices) are necessarily (i.e., always) **settled in cash => only money transfer (offsetting of the position) no physical assets transferred**
  - ✦ This is because, it is inconvenient or impossible to deliver the underlying asset.
  - ✦ E.g. future contract on the S&P 500, delivering the underlying asset would involve delivering a portfolio of 500 stocks.
    - ⇒ Because, if going to deliver the SPX 500, need to buy the stock in specified quantities => lots of transaction costs
    - ⇒ Also because, the composition of the index may change over time => the underlying asset is different from original thought.
  - ✦ When a **contract is settled in cash**, all outstanding contracts are declared *closed on a predetermined day*. The final settlement price is set equal to the spot price of the underlying asset at either the open or close of trading on that day.

98% of the time, settlement takes place in cash.

For some assets (e.g. stock) the settlement 100% take places in cash.

### Terminology: Long & Short

- Long: The party that has **agreed to receive (buy) the underlying asset** through the derivative contact acquires a long position on the underlying
- Short: The party that has **agreed to deliver (sell) the underlying** through the derivative contact acquires a short position on the underlying

**Long – receive; Short – delivery (the underlying)**

- Warning: the long/short concept looks plain and simple. Make sure you don't overlook its nuances!

### Payoffs to Long and Short Positions

- **Long**
  - ✦ Generally used to describe the **buyer** of the underlying
  - ✦ Long positions agree to **receive** an asset at today's futures price
  - ✦ **Longs profit when spot price increases**
  - ✦ **Payoff (when closing out) = Spot - Futures**