

# International Finance

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# Derivatives

# The first lesson...

[http://en.wikipedia.org/wiki/List\\_of\\_trading\\_losses](http://en.wikipedia.org/wiki/List_of_trading_losses)

# The second lesson...

<http://www.bis.org/statistics/derstats.htm>

# The Nature of Derivatives

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

# Examples of Derivatives

- Futures Contracts
- Forward Contracts
- Swaps
- Options

# 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

# 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)



# Exchanges Trading Futures

- CBOT and CME (now CME Group)
- Intercontinental Exchange
- NYSE Euronext
- Eurex
- BM&FBovespa (Sao Paulo, Brazil)
- and many more (see list at end of book)

# 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

# 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

# Examples of Futures Contracts

Agreement to:

- buy 100 oz. of gold @ US\$1050/oz. in December
- sell £62,500 @ 1.5500 US\$/£ in March
- sell 1,000 bbl. of oil @ US\$75/bbl. in April

# Terminology

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

# Example

- January: an investor enters into a long futures contract to buy 100 oz of gold @ \$1050 in April
- April: the price of gold \$1065 per oz

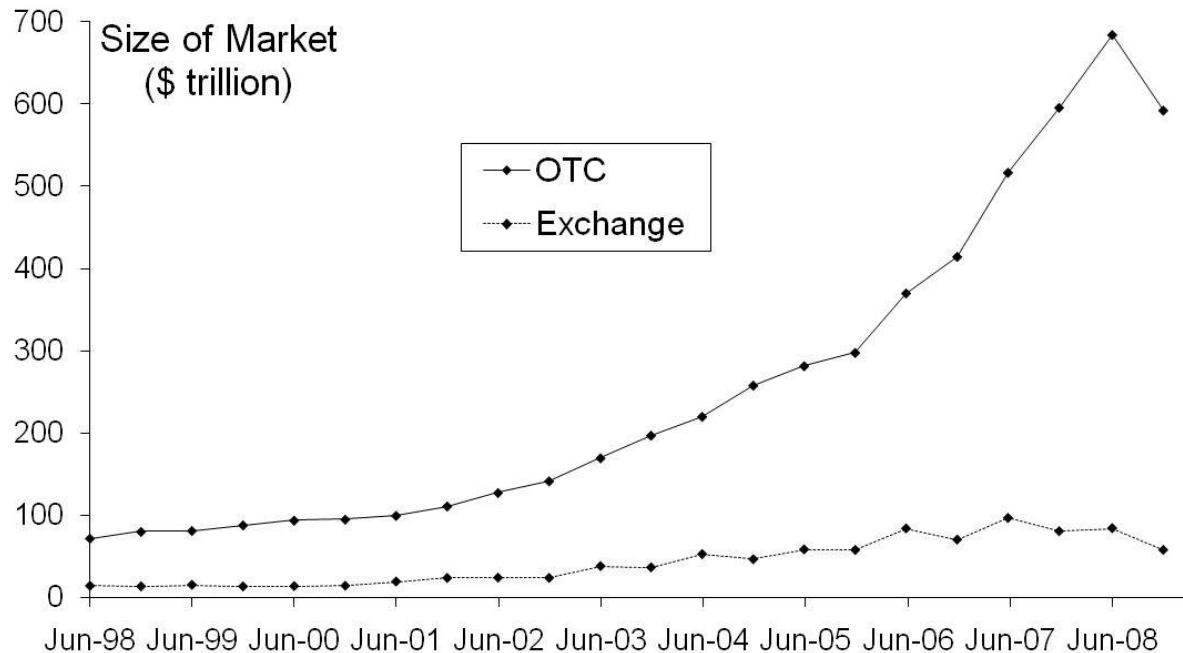
What is the investor's profit?

# 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

# Size of OTC and Exchange Markets

(Figure 1.2, Page 4)



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



# 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

# Foreign Exchange Quotes for USD/GBP exchange rate on July 17, 2009 (See page 5)

	Bid	Offer
Spot	1.6382	1.6386
1-month forward	1.6380	1.6385
3-month forward	1.6378	1.6384
6-month forward	1.6376	1.6383

# 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)

# 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

Google Option Prices (July 17, 2009;  
Stock Price=430.25); See page 6

Strike price (\$)	Calls			Puts		
	Aug	Sept	Dec	Aug	Sept	Dec
	2009	2009	2009	2009	2009	2009
380	51.55	54.60	65.00	1.52	4.40	15.00
400	34.10	38.30	51.25	4.05	8.30	21.15
420	19.60	24.80	39.05	9.55	14.70	28.70
440	9.25	14.45	28.75	19.20	24.25	38.35
460	3.55	7.45	20.40	33.50	37.20	49.90
480	1.12	3.40	13.75	51.10	53.10	63.40

# Exchanges Trading Options

- Chicago Board Options Exchange
- International Securities Exchange
- NYSE Euronext
- Eurex (Europe)
- and many more (see list at end of book)

# 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

# Hedge Funds (see Business Snapshot 1.1, page 10)

- Hedge funds are not subject to the same rules as mutual funds and cannot offer their securities publicly.
- Mutual funds must
  - disclose investment policies,
  - makes shares redeemable at any time,
  - limit use of leverage
  - take no short positions.
- Hedge funds are not subject to these constraints.



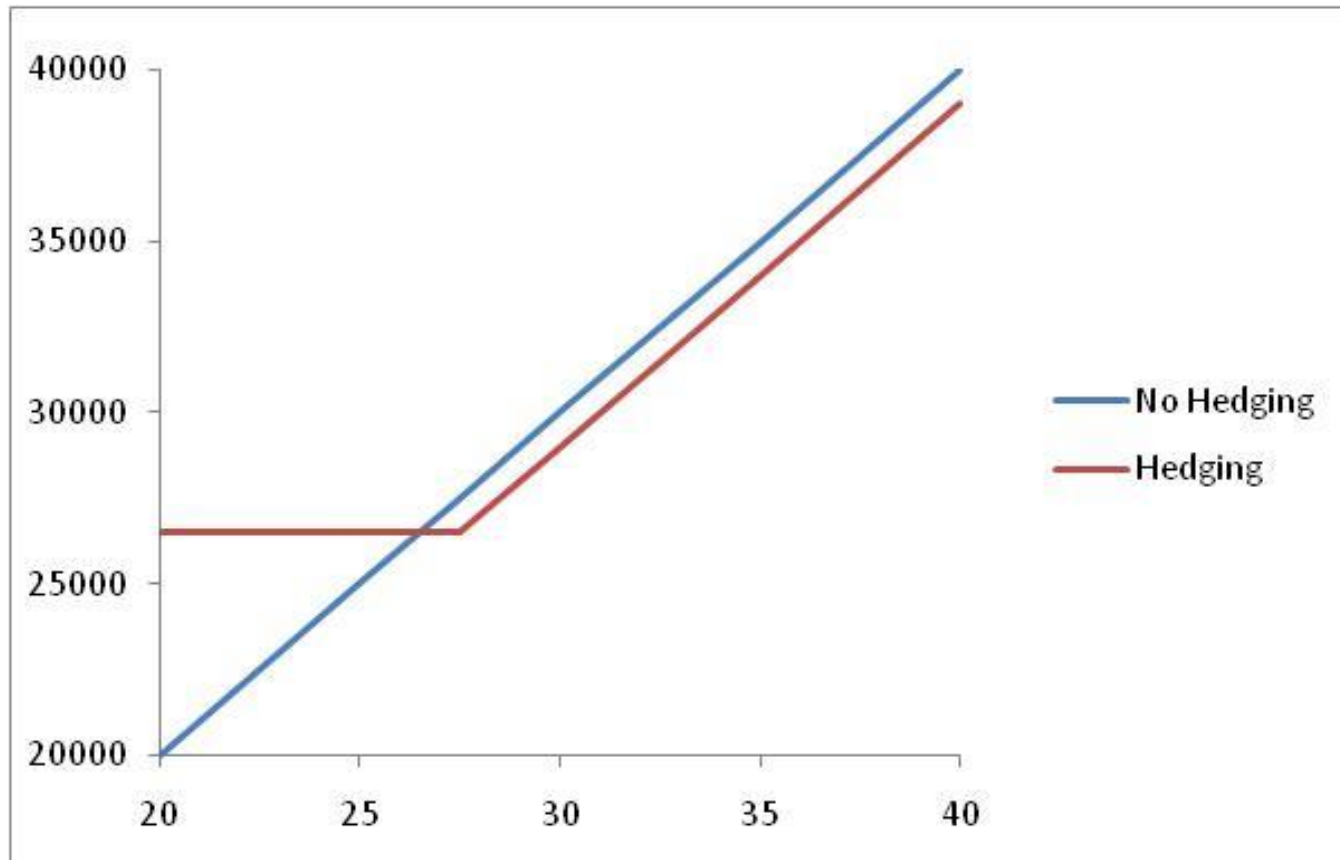
# Three Reasons for Trading Derivatives: Hedging, Speculation, and Arbitrage

- Hedge funds trade derivatives for all three reasons
- When a trader has a mandate to use derivatives for hedging or arbitrage, but then switches to speculation, large losses can result. (See SocGen, Business Snapshot 1.2)

# Hedging Examples (Example 1.1 and 1.2, page

- 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 \$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

# Value of Microsoft Shares with and without Hedging (Fig 1.4, page 12)



# Speculation Example

- An investor with \$2,000 to invest feels that a 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 \$22.50 is \$1
- What are the alternative strategies?

# Arbitrage Example

- A stock price is quoted as £100 in London and \$162 in New York
- The current exchange rate is 1.6500
- What is the arbitrage opportunity?

# 1. Gold: An Arbitrage Opportunity?

- Suppose that:
  - The spot price of gold is US\$1000
  - The quoted 1-year futures price of gold is US\$1100
  - The 1-year US\$ interest rate is 5% per annum
  - No income or storage costs for gold
- Is there an arbitrage opportunity?

## 2. Gold: Another Arbitrage Opportunity?

- Suppose that:
  - The spot price of gold is US\$1000
  - The quoted 1-year futures price of gold is US\$990
  - The 1-year US\$ interest rate is 5% per annum
  - No income or storage costs for gold
- Is there an arbitrage opportunity?

# 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,  $S=1000$ ,  $T=1$ , and  $r=0.05$  so that

$$F = 1000(1+0.05) = 1050$$



# 1. Oil: An Arbitrage Opportunity?

Suppose that:

- The spot price of oil is US\$70
  - The quoted 1-year futures price of oil is US\$80
  - 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?

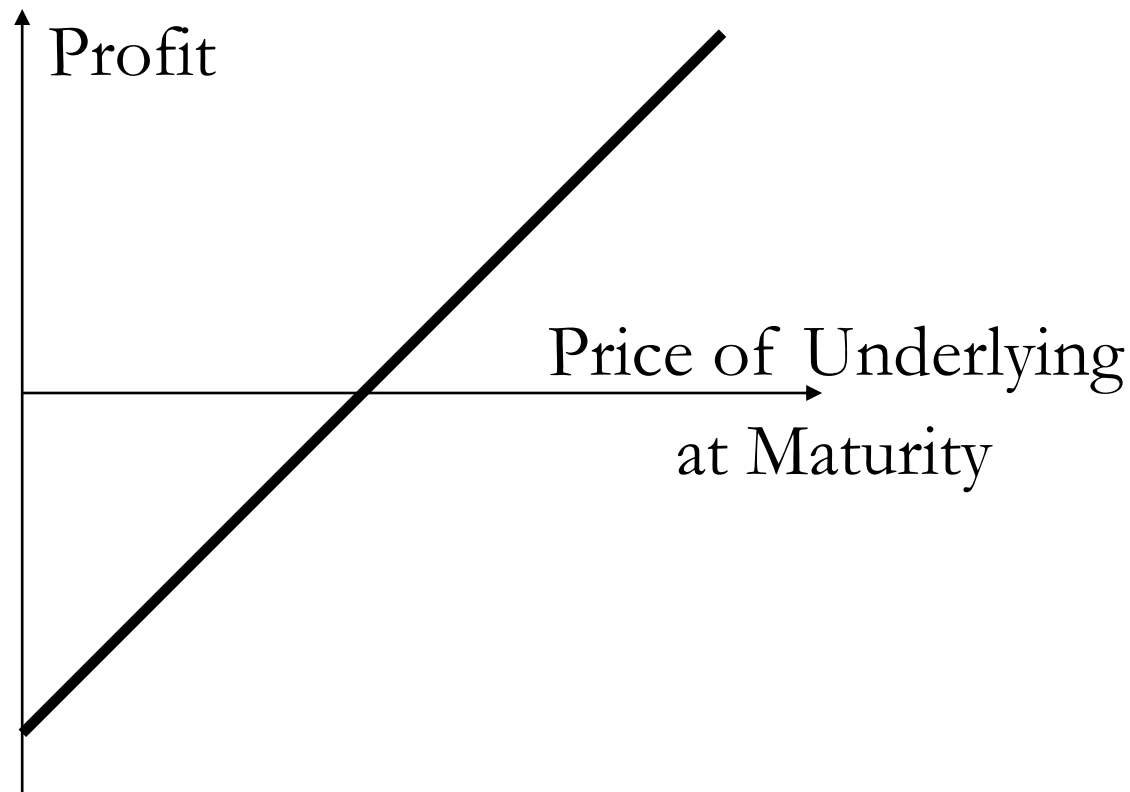
- Suppose that:
  - The spot price of oil is US\$70
  - The quoted 1-year futures price of oil is US\$65
  - The 1-year US\$ interest rate is 5% per annum
  - The storage costs of oil are 2% per annum
- Is there an arbitrage opportunity?

# Forwards and Futures

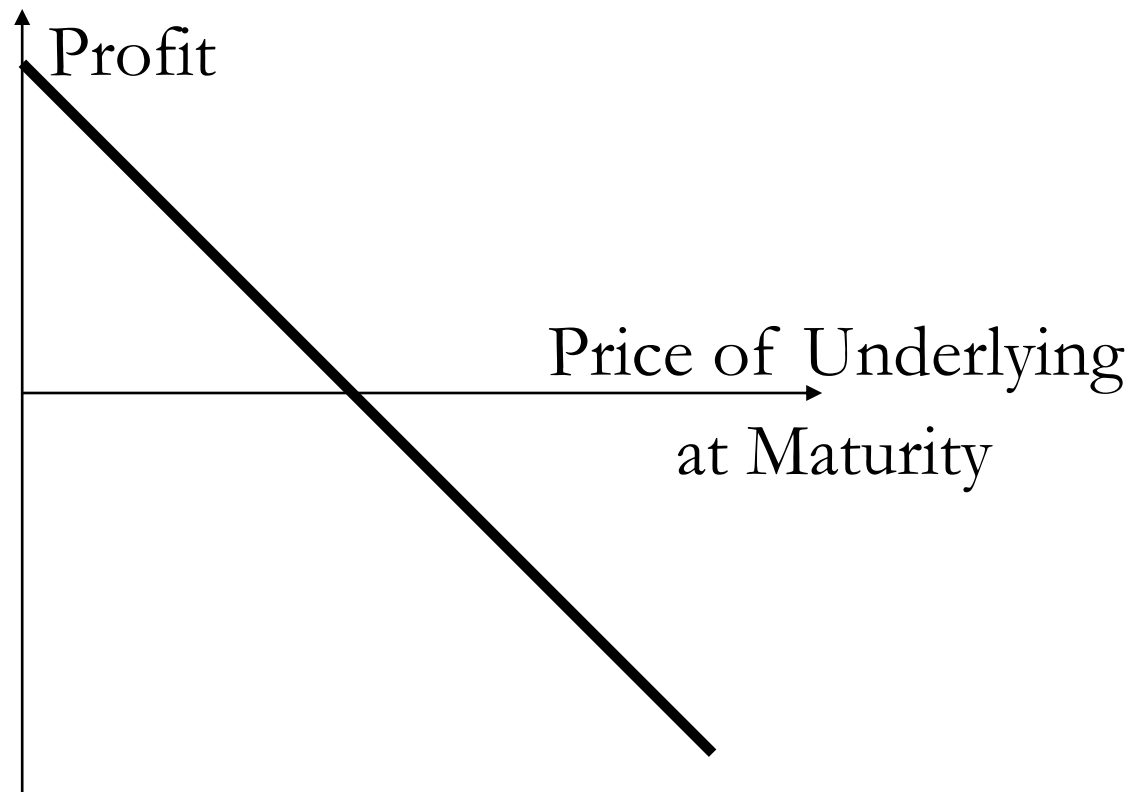
# Forward Contracts

- A forward contract is an OTC agreement to buy or sell an asset at a certain time in the future for a certain price
- There is no daily settlement (but collateral may have to be posted). At the end of the life of the contract one party buys the asset for the agreed price from the other party

# Profit from a Long Forward or Futures Position



# Profit from a Short Forward or Futures Position



# Forward Contracts vs Futures Contracts

(Table 2.3, page 40)

<i>Forward</i>	<i>Futures</i>
Private contract between two parties	Traded on an exchange
Not standardized	Standardized
Usually one specified delivery date	Range of delivery dates
Settled at end of contract	Settled daily
Delivery or final settlement usual	Usually closed out prior to maturity
Some credit risk	Virtually no credit risk

# Foreign Exchange Quotes

- Futures exchange rates are quoted as the number of USD per unit of the foreign currency
- Forward exchange rates are quoted in the same way as spot exchange rates. This means that GBP, EUR, AUD, and NZD are USD per unit of foreign currency. Other currencies (e.g., CAD and JPY) are quoted as units of the foreign currency per USD.



# Futures Contracts

- Available on a wide range of underlyings
- Exchange traded
- Specifications need to be defined:
  - What can be delivered,
  - Where it can be delivered, &
  - When it can be delivered
- Settled daily

# Margins

- A margin is cash or marketable securities deposited by an investor with his or her broker
- The balance in the margin account is adjusted to reflect daily settlement
- Margins minimize the possibility of a loss through a default on a contract

# Example of a Futures Trade

- An investor takes a long position in 2 December gold futures contracts on June 5
  - contract size is 100 oz.
  - futures price is US\$900
  - margin requirement is US\$2,000/contract (US\$4,000 in total)
  - maintenance margin is US\$1,500/contract (US\$3,000 in total)

# Other Key Points About Futures

- They are settled daily
- Closing out a futures position involves entering into an offsetting trade
- Most contracts are closed out before maturity

# Collateralization in OTC Markets

- It is becoming increasingly common for contracts to be collateralized in OTC markets
- Counterparties then post margin with each other to reflect changes in the value of the contract
- Regulators are now insisting that clearinghouses (similar to those used for futures) be used for some OTC contracts

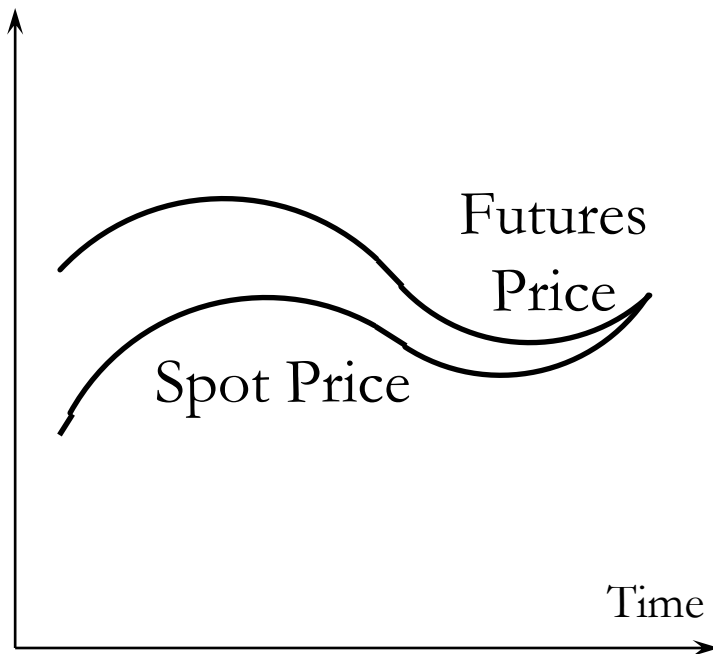
# Delivery

- If a futures contract is not closed out before maturity, it is usually 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 position chooses.
- A few contracts (for example, those on stock indices and Eurodollars) are settled in cash
- When there is cash settlement contracts are traded until a predetermined time. All are then declared to be closed out.

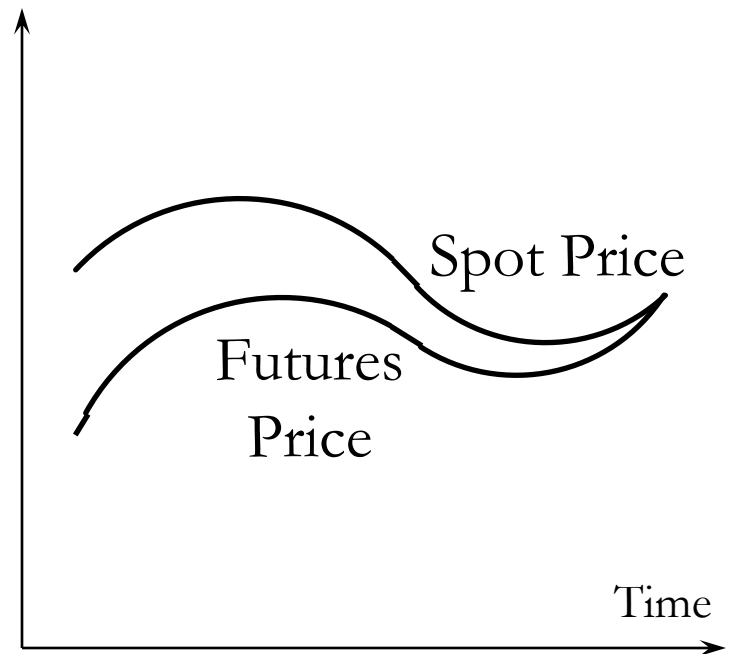
# Some Terminology

- Open interest: the total number of contracts outstanding. This equals to number of long positions or number of short positions
- Settlement price: the price just before the final bell each day. This is used for the daily settlement process
- Volume of trading: the number of trades in 1 day

# Convergence of Futures to Spot (Figure 2.1, page 25)



(a)



(b)



# Futures for Crude Oil on Aug 4, 2009



# Futures for Soybeans on Aug 4, 2009



# Futures for Lean Hogs on Aug 4, 2009



# Regulation of Futures

- Regulation is designed to protect the public interest
- Regulators try to prevent questionable trading practices by either individuals on the floor of the exchange or outside groups