LECTURE 8
Chapter 8 - Futures & Forwards

Futures and Forwards – An Overview

Example 1
To see how futures and forwards work and how they might be useful, consider the portfolio diversification problems facing a farmer growing a single crop, let us say wheat. The entire planting season's revenue depends critically on the highly volatile crop price. The farmer can't easily diversify his position because virtually his entire wealth is tied in the crop. The miller who must purchase wheat for processing faces a portfolio problem that is the mirror image of the farmer's. He is subject to profit uncertainty because of **unpredictable future cost of the wheat**.

Both parties can reduce this source of risk if they enter into a **forward contract** calling for the farmer to deliver the wheat when harvested at a price agreed upon now, regardless of the market price at harvest time. No money needs to change hands at this time. The forward contract is simply a deferred-delivery sale of some asset with the sales price to be paid or received for delivery of the commodity.
The forward contract protects each party from future price fluctuations.

THE FUTURES MARKET FORMALIZE AND STANDARDIZE FORWARD CONTRACTING. Buyers and sellers do not have to rely on a chance matching of their interests; they can trade in centralized futures market (standardized contracts with size, grade of commodity, contract delivery dates) – this creates liquidity

- Future contracts (differ from forwards) call for daily settling up of any gains and loses on the contract – in contrast, the forward contracts, no money changes hands until delivery date.
- In centralized market, buyers and sellers can trade through brokers without personally searching for trading partners

Basics:

- **Futures Price** (agreed upon price of a commodity at delivery)
- Delivery date (maturity date)
- Grades (for agriculture commodity set different grades .i.e. No 2 hard winter wheat or No1 soft red wheat)
- Delivery is also specified (warehouse) – delivery rarely occurs – instead parties to the contract much more commonly close out their positions before contract matures (**reverse before maturity**), taking gains or loses in cash.
    - **Long Position** (purchasing the commodity on delivery date)
    - **Short position** (commits to delivery of the contract maturity)

CHECK THE CURRENT WSJ PAGE (PROVIDED BY THE INSTRUCTOR)

Example 2
Corn – 5,000 bushels
Price: cents per bushel
Expiration dates March 2015

The March 2015 maturity corn contract opened during the day at a future price of 355.50 cents ($3.55) per bushel. The highest during the day was 356.00 cents ($3.56) and lowest 351.00 cents ($3.51) and the settlement price was 354.00cents ($3.54) or 1.50 cents lower than the opening price. The open interest or the number of outstanding contracts was 301,794.

The trader holding the long position, that is, the person who will purchase the good, profits from price increases at maturity. Suppose that when the contract matures in March, the price of corn (spot price) turns out to be $3.64 per bushel. The long position trader who entered the contract at the futures price of $3.64 cents 9/19/2014 – earns a profit of 10 cents per bushel. The eventual price is 10 cents higher than the originally agreed-upon futures price. As each contract calls for delivery of 5,000 bushels – the profit to the long position equals 5,000 bushels x $0.10 = $500 per contract. The short position loses 10 cents per bushel. The short position's loss equals the long position's gain.

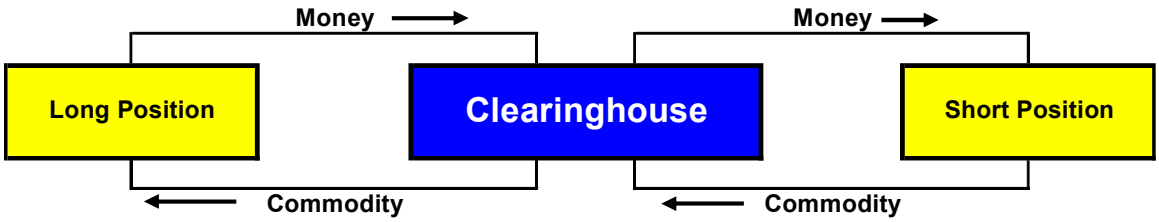
Profit for long = Spot price at maturity – Original futures price
Profit to short = Original futures price – Spot price at maturity.

Existing Contracts

- Agriculture Futures
- Metals and Minerals
- Foreign Currencies
- Financial Futures (fixed Income and Equity indices)

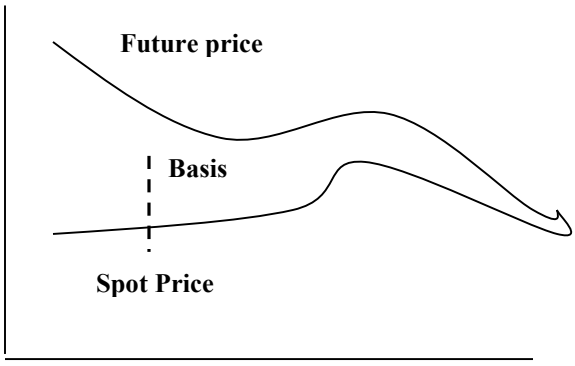
History / Mechanics

- 10 years ago: "trading pit" for each contract – voice and hands
- Electronic platform –
  - Europe with Eurex
  - CBOT / BME – Globex
- Clearinghouse – once it's agreed – seller and buyer settle through the clearinghouse – provides liquidity



Different than a Forward Contract – held until maturity

- **Marking to Market** (The daily settlement of obligations on futures positions)
- **Original Margin:** Each trader establishes a margin account (both Long and short trader) – backed by treasury bills/cash to make sure the cash is there. i.e. if the initial margin for corn is 10%, the trader must post (looking at the WSJ March 2012 prices) at 10% of 651.00 cents or 65.10 cents x 5,000 = $3,255 per contract on the margin account.
- **Maintenance margin / maintenance Margin**: On a daily basis they debit/credit the account to maintain 5% cushion (this margin could be different than the original margin).
- **Convergence property:** The convergence of futures prices and spot prices at the maturity of the futures contract – As a maturity contract calls for immediately delivery, the futures price on that day must equal the spot price.



Example 3 - Marking to Market and Future Contract Profits):
Assume the current futures price for silver for delivery five days from today is (Sep 26, 2014 - $18.66 per ounce). Suppose that over the next five days, the futures price evolves as follows:

Daily Mark-to-Market - Sep 2014

Day		Futures Price	Profit (loss) per ounce	Daily Proceeds x 5,000 ounces / contract		10% Balance *
9/19/2014	Today	$ 18.66				9,330.00
9/22/2014		$ 19.66	$ 1.00	5,000.00	Credit	14,330.00
9/23/2014		$ 19.91	$ 0.25	1,250.00	Credit	15,580.00
9/24/2014		$ 19.61	$ (0.30)	(1,500.00)	Debit	14,080.00
9/25/2014		$ 19.11	$ (0.50)	(2,500.00)	Debit	11,580.00
9/26/2014	Delivery	$ 20.11	$ 1.00	5,000.00	Credit	16,580.00
			sum=	7,250.00		
			Contract=	5,000	ounces	

Future Price X 5,000 ounces x 10%

Cash Vs Actual Delivery

Cash Settlement: The cash value of the underlying asset (rather than the asset itself) is delivered to satisfy the contract (S&P index for example) – *delivering every stock from S&P will be impractical.*

FUTURES MARKET STRATEGIES –

Hedging & Speculation

Hedging and speculation are two polar uses for future markets. A speculation uses a futures contract to profit from movements in future prices, a hedger to protect against price movements.

Example 4

Consider an oil distribution planning to sell 100,000 barrels of oil in December 2014 that wishes to hedge against a possible decline in oil prices. Because each contract calls of 1,000 barrels, it would sell 100 contracts. Any decrease in prices would then generate a profit on the contracts that would offset the lower sales revenue from the oil.

Using the WSJ prices, suppose that the only three possible prices for oil December (stay at $92.50 and up/down $4 from there).

Example 4					
			Oil Prices in December 2013		
			$ 88.50	$ 92.50	$ 96.50
Revenue from Oil Sales		100,000	8,850,000	9,250,000	9,650,000
+ Profit form Futures		100,000	400,000	-	(400,000)
Total Proceeds			9,250,000	9,250,000	9,250,000

Basis Risk and Hedging

The basis is the difference between the futures price and spot price.
The convergence property implies that

Sr – K = basis or K – Sr = 0

Basis Risk is the risk associated with imperfect hedging using futures. It could arise because of the difference between the asset whose price is to be hedged and the asset underlying the derivative, or because of a mismatch between the expiration date of the futures and the actual selling date of the asset.

Under these conditions, the spot price of the asset, and the futures price, do not converge on the expiration date of the future. The amount by which the two quantities differ measures the value of the basis risk. That is,

Basis = Spot price of hedged asset - Futures price of contract

Example 5: Speculating on the basis:
Investor holding 100 ounces of gold, who is short of one gold futures contract. Suppose gold sells for $1,266.80 an ounce, and the futures price for February 2015 $1,236.80 an ounce (WSJ). Therefore, the basis is currently $30 ($1,266.80 - $1,236.80). Tomorrow, the spot price might increase to $1,276.80, while the futures price increases to $1,241.80, so the basis increases to $35 ($1,276.80 - $1,241.80). The investor's gains and losses are as follows:

Gain on holdings of gold (per ounce): $1,276.80 – 1266.80 = $10
Loss on gold futures position (per ounce): $1,241.80 – 1,236.80 = $ 5

An investor gains $10 per ounce on the gold holdings, but loses $5 an ounce on the short futures position. The net gain is the decrease in the basis, or $5 an ounce.

Optimal Hedge Ratio:

The **Hedge Ratio** is the ratio of the size of the position taken in futures contracts to the size of the exposure

$$h = \rho . (\sigma_S / \sigma_K)$$

Example 6:
A company knows that it will buy 1 million gallons of jet fuel in three months. The standard deviation of the change in the price per gallon of jet fuel over a 2-month period (σs) is calculated 0.032 (3.2%). The company chooses to hedge by buying futures contracts on heating oil. The sandard deviation of the change in the futures price over 2-month period (σk) is 0.040 (4.0%) and the coefficient of correlation (ρ) between the 3-month change in the price of jet fuel and 2-month change in the futures price is 0.8. The optimal hedge ratio is herefore:

0.8 x (0.032 / 0.040) = 0.64.

One heating oil futures contract is on 42,000 gallons. The company should therefore buy

0.64 x (1,000,000 / 42,000) = 15.2 or Contracts (~15 contracts)