

LECTURE 2

Futures and Forwards – An Overview

Futures Contracts WSJ.com/commodities												
Metal & Petroleum Futures												
	Open	Contract High	Contract Low	Settle	Chg	Open Interest	Open	Contract High	Contract Low	Settle	Chg	Open Interest
Copper-High (COMX) -25,000 lbs.; \$ per lb.												
May	3.4515	3.5335	3.4460	3.5040	0.0345	981						
July	3.4500	3.5360	3.4360	3.5020	0.0335	80,285						
Gold (COMX) -100 troy oz.; \$ per troy oz.												
June	1590.20	1599.00	1584.50	1588.70	-3.20	167,648						
Aug	1594.10	1601.40	1587.00	1591.00	-3.20	110,360						
Dec	1599.50	1605.00	1592.20	1595.10	-3.20	46,265						
Feb'13	1602.00	1607.00	1593.20	1597.10	-3.20	18,802						
April	1597.00	1602.90	1597.00	1599.20	-3.20	12,365						
June	1599.00	1606.90	1599.00	1601.30	-3.20	13,142						
miNY Gold (COMX) -50 troy oz.; \$ per troy oz.												
June	1591.50	1601.50	1585.00	1588.70	-3.30	2,208						
Aug	1594.75	1602.75	1590.00	1591.00	-3.25	59						
Oct	1602.00	1602.00	1602.00	1593.00	-3.25	4						
Dec	1593.25	1593.25	1593.25	1595.10	-3.15	99						
Palladium (NYM) -50 troy oz.; \$ per troy oz.												
June	602.00	619.50	600.80	610.80	7.20	15,889						
Platinum (NYM) -50 troy oz.; \$ per troy oz.												
June	1457.90	1473.20	1455.50	1461.50	2.20	42,352						
Oct	1469.00	1472.60	1463.30	1464.90	2.40	3,583						
Silver (COMX) -5,000 troy oz.; \$ per troy oz.												
June	28.655	28.775	28.060	28.305	-0.391	272						
July	28.685	28.855	28.035	28.321	-0.394	58,627						
miNY Silver (COMX) -2500 troy oz.; \$ per troy oz.												
July	28.750	28.750	28.075	28.321	-0.391	405						
Sept	28.550	28.550	28.263	28.375	-0.400	3						
Dec	28.800	28.800	28.800	28.440	-0.397	14						
Crude Oil, Light Sweet (NYM) -1,000 bbls.; \$ per bbl.												
June	91.27	93.06	90.84	92.57	1.09	55,178						
July	91.71	93.35	91.12	92.86	1.06	304,446						
Aug	91.79	93.62	91.44	93.14	1.06	96,652						
Sept	92.12	93.88	91.74	93.40	1.06	83,875						
Dec	92.50	94.45	92.28	93.98	1.03	183,108						
Dec'13	91.55	92.45	91.03	92.19	0.94	124,107						
Heating Oil No. 2 (NYM) -42,000 gal.; \$ per gal.												
June	2.8290	2.8725	2.8255	2.8603	0.0303	58,261						
July	2.8352	2.8778	2.8315	2.8654	0.0302	71,332						
Gasoline-NY RBBO (NYM) -42,000 gal.; \$ per gal.												
June	2.8820	2.9480	2.8820	2.9401	0.0506	65,195						
July	2.8171	2.8710	2.8150	2.8646	0.0444	93,135						
Natural Gas (NYM) -10,000 MMBtu.; \$ per MMBtu.												
June	2.722	2.743	2.589	2.609	-1.33	88,863						
July	2.822	2.824	2.669	2.689	-1.33	261,005						
Aug	2.862	2.866	2.715	2.734	-1.32	96,309						
Sept	2.885	2.889	2.748	2.766	-1.30	139,522						
Oct	2.952	2.955	2.812	2.831	-1.31	134,832						
Jan'13	3.601	3.610	3.487	3.495	-1.14	82,159						
Agriculture Futures												
Corn (CBT) -5,000 bu.; cents per bu.												
July	638.25	644.50	628.75	633.00	-2.50	513,939						
Dec	543.00	549.50	534.75	540.50	3.50	377,538						
Ethanol (CBT) -29,000 gal.; \$ per gal.												
June	2.220	2.226	2.199	2.212	-0.00	671						
Aug	2.232	2.232	2.181	2.198	...	2,574						
Oats (CBT) -5,000 bu.; cents per bu.												
July	341.00	343.75	338.75	342.00	2.00	8,379						
Dec	350.00	352.00	349.75	352.00	2.00	3,017						
Soybeans (CBT) -5,000 bu.; cents per bu.												
July	1413.75	1423.00	1408.50	1412.50	7.50	272,967						
Nov	1300.00	1314.75	1293.25	1306.25	18.25	242,056						
Soybean Meal (CBT) -100 tons; \$ per ton.												
July	419.90	422.50	415.50	416.50	-1.40	128,709						
Dec	367.00	372.70	366.10	369.00	3.60	44,320						
Soybean Oil (CBT) -60,000 lbs.; cents per lb.												
July	50.44	51.16	50.25	50.92	.60	191,481						
Dec	51.44	52.15	51.26	51.91	.60	84,678						
Rough Rice (CBT) -2,000 cwt.; \$ per cwt.												
July	1518.00	1546.50	1516.00	1543.00	25.50	11,030						
Sept	1545.00	1570.00	1545.00	1568.00	26.50	2,670						
Wheat (CBT) -5,000 bu.; cents per bu.												
July	700.00	722.00	682.75	704.00	8.75	220,925						
Dec	722.00	746.00	703.75	729.25	9.25	105,315						
Wheat (KC) -5,000 bu.; cents per bu.												
July	709.00	730.00	701.50	715.00	10.00	78,417						
Dec	739.25	762.00	735.50	750.25	11.50	26,888						
Wheat (MPLS) -5,000 bu.; cents per bu.												
July	792.00	810.00	792.00	796.75	4.75	15,989						
Sept	788.00	807.00	788.00	795.00	6.50	10,830						
Cattle-Feeder (CME) -50,000 lbs.; cents per lb.												
May	152.000	152.225	151.500	151.875	.575	3,558						
Aug	161.500	161.500	159.075	159.100	-1.600	23,140						
Cattle-Live (CME) -40,000 lbs.; cents per lb.												
June	120.075	120.425	118.475	118.800	-0.725	69,986						
Aug	122.225	122.425	120.650	120.800	-1.125	129,641						
Hogs-Lean (CME) -40,000 lbs.; cents per lb.												
June	87.900	87.950	86.525	86.700	-0.725	48,602						
Aug	88.550	88.575	87.000	87.050	-1.525	69,110						
Lumber (CME) -10,000 bd. ft.; \$ per 1,000 bd. ft.												
July	290.00	290.00	286.80	287.70	-8.0	5,960						
Sept	290.60	291.10	288.70	289.40	-4.0	2,447						
Milk (CME) -200,000 lbs.; cents per lb.												
May	15.16	15.25	15.16	15.22	.05	4,691						
June	15.35	15.47	15.28	15.44	.05	4,741						
Cocoa (ICE-US) -10 metric tons; \$ per ton.												
July	2,270	2,275	2,225	2,238	-35	76,116						
Sept	2,280	2,286	2,239	2,249	-36	33,863						
Coffee (ICE-US) -37,500 lbs.; cents per lb.												
July	179.00	181.35	174.30	175.15	-4.00	71,871						
Sept	180.90	183.50	176.50	177.35	-3.95	33,179						
Sugar-World (ICE-US) -112,000 lbs.; cents per lb.												
July	20.47	20.66	20.30	20.38	-0.09	324,397						
Oct	20.80	20.98	20.68	20.73	-0.07	167,052						
Sugar-Domestic (ICE-US) -112,000 lbs.; cents per lb.												
July	30.35	30.35	30.35	30.35	-0.30	2,845						
Sept	30.45	30.45	30.45	30.45	-0.44	1,866						
Cotton (ICE-US) -50,000 lbs.; cents per lb.												
July	77.99	79.05	76.49	77.52	-4.7	101,065						
Dec	75.35	76.30	75.75	74.57	-6.4	74,953						
Orange Juice (ICE-US) -15,000 lbs.; cents per lb.												
July	103.80	110.40	101.75	106.80	4.60	15,320						
Nov	106.00	112.25	106.00	111.05	4.90	4,186						
Interest Rate Futures												

INTRODUCTION TO DERIVATIVES

Prof. C. Droussiotis

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 losses 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 losses in cash.
 - **Long Position** (purchasing the commodity on delivery date)
 - **Short position** (commits to delivery of the contract maturity)

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Example 2

Corn – 5,000 bushels

Price: cents per bushel

Expiration dates July 2012

The July 2012 maturity corn contract opened during the day at a future price of 638.25 cents (\$6.38) per bushel. The highest during the day was 644.50 cents (\$6.44) and lowest 628.75 cents (\$6.29) and the settlement price was 633.00 cents (\$6.33) or 2.50 cents lower than the opening price. The open interest or the number of outstanding contracts was 513,939.

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 July, the price of corn (spot price) turns out to be \$6.4825 per bushel. The long position trader who entered the contract at the futures price of \$6.3825 cents 5/22/2012 – 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

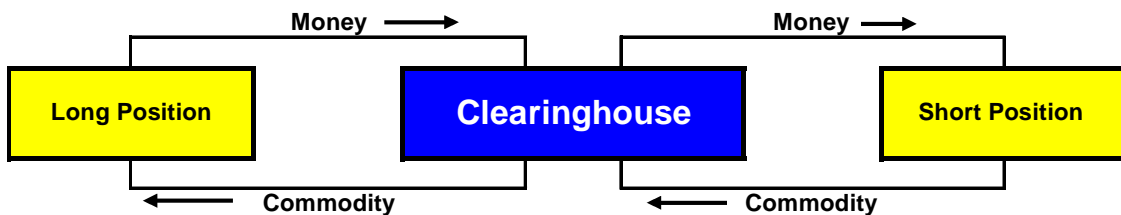
Profit to short = Original futures price – Spot price at maturity.

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

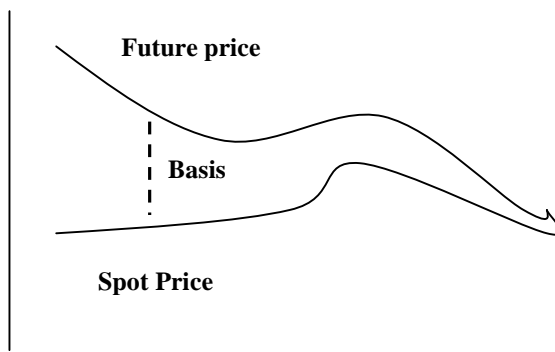


Different than a Forward Contract – held until maturity

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- **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 (June 2012 - \$28.305 per ounce). Suppose that over the next five days, the futures price evolves as follows:

Example 2

Daily Mark-to-Market - June 2012

Day	Futures Price	Profit (loss) per ounce	Daily Proceeds x 5,000 ounces / contract	10% Balance *
6/10/2012 Today	\$ 28.31			14,152.50
6/11/2012	\$ 29.31	\$ 1.00	5,000.00 Credit	19,152.50
6/12/2012	\$ 29.56	\$ 0.25	1,250.00 Credit	20,402.50
6/13/2012	\$ 29.26	\$ (0.30)	(1,500.00) Debit	18,902.50
6/14/2012	\$ 28.76	\$ (0.50)	(2,500.00) Debit	16,402.50
6/15/2012 Delivery	\$ 29.76	\$ 1.00	5,000.00 Credit	21,402.50
		sum =	<u>7,250.00</u>	

Contract = 5,000 bushels

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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 Mar 2012 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 Mar 2012 (stay at \$98.78 and up/down \$4 from there).

Example 4

		Oil Prices in July 2012		
		\$ 88.86	\$ 92.86	\$ 96.86
Revenue from Oil Sales	100,000	8,886,000	9,286,000	9,686,000
+ Profit form Futures	100,000	400,000	-	(400,000)
Total Proceeds		9,286,000	9,286,000	9,286,000

Basis Risk and Hedging

The basis is the difference between the futures price and spot price.

The convergence property implies that

$$S_r - K = \text{basis or } K - S_r = 0$$

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,

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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 \$1,621.00 an ounce, and the futures price for August delivery is \$1,591.00 an ounce (WSJ). Therefore, the basis is currently \$30 (\$1,621 - \$1,591). Tomorrow, the spot price might increase to \$1,631, while the futures price increases to \$1,596, so the basis narrows to \$35 (\$1,631 - \$1,596). The investor's gains and losses are as follows:

Gain on holdings of gold (per ounce):	\$1,631 - \$1,621 = \$10
Loss on gold futures position (per ounce):	\$1,596 - 1,591 = \$ 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

$$h = \rho \cdot (\sigma_S r / \sigma_K)$$

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 3-month period is calculated 0.032 (3.2%). The company chooses to hedge by buying futures contracts on heating oil. The standard deviation of the change in the futures price over 3-month period is 0.040 (4.0%) and the coefficient of correlation between the 3-month change in the price of jet fuel and 3-month change in the futures price is 0.8. The optimal hedge ratio is herefore:

$$0.8 \times (0.032 / 0.040) = 0.64.$$

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

$$0.64 \times (1,000,000 / 42,000) = 15.2 \text{ or Contracts } (\sim 15 \text{ contracts})$$