

## Futures and Options Note 1

### Basic Definitions:

**Derivative Security:** A security whose value depends on the worth of other basic underlying variables. E.G. Futures, Options, Forward Contracts, Swaps. A derivative is a financial instrument whose value is derived from that of another security. Consequently, the worth of a derivative contract is **contingent** of that of another investment [stock, fixed income security, commodity, etc.].

**Contingent Claims:** A stock option that is a derivative security whose value is contingent on the price of the stock.

Derivatives can be used in one of two ways: (1) to hedge an underlying position where an investor hedges financial risk in the cash market by taking the opposite position in a derivative contract or (2) to speculate by using the derivative security to implicitly buy or sell an underlying security on a leveraged basis.

### Contract Overview:

A **futures contract** is a transferable agreement to make [short] or take [long] delivery of a standardized amount and designated quality, at a specified price, at a specified date in the future some tangible [commodity, financial instrument] or intangible [index] entity.

Note: With a **futures contract there is the obligation to make or take delivery** NOT an option to make or take delivery.

A futures market consists of contracts to make or take delivery, however generally these contracts are negotiated with view of NOT making or taking delivery, but rather to:

- Speculate on anticipated price movements
- Hedge an existing or anticipated position in the cash market
- Arbitrage inconsistent prices among financial securities or commodities.
- Differences between Futures vs. Cash [Spot]Market

The majority of contracts are settled by **offset**, which means that prior to expiration, the owner of the futures contract will take the opposite position by purchasing or selling a futures contract to offset the current futures position.

### Futures Market

#### **Organized Exchange**

- [Auction, Open Outcry] Deal, Broker, Direct
- Performance Guaranteed [by Clearinghouse]
- Contract Standardization
- Transferability

High degree of liquidity and information on price of the financial security  
Fixed location, fixed trading hours  
Brokerage fees charged Brokerage fees or Bid/Asked Spread

## Margin Requirements

Contracts generally settled by offset

Regulated by CFTC Loosely regulated by the SEC under SEC Acts of 1933 and 1934

## The Futures Market

A **futures contract** is a commitment to buy or sell a specific commodity, financial instrument or index, of designated quality at a specified price at a specified date in the future.

The **futures market** consists of contracts to make or take delivery in commodities, financial instruments or indexes. The intent of traders in this market is to take one of three possible positions:

- (1) Speculate on anticipated price movements
- (2) Hedge an existing or anticipated position that they may have in the cash (spot) market
- (3) Arbitrage inconsistent prices among financial securities

and depending on which of these strategies they are using, they will be in a position for several hours [short term, day trader] or many days [long term trader].

Although commodities and financial instruments are deliverable, the vast majority [98%] of all contracts are settled by offset rather than delivery sometime over their life. In the case of a financial index futures contract, there can be no delivery since it would be impossible to deliver all to the basket of securities into the contract. Consequently, a financial index futures contract will trade based on the market value of the index and settlement is at, wherever the index is at the time of offset.

A **forward contract** is a cash market transaction in which two parties agree to the purchase and sell of a commodity or financial instrument at some future time under such conditions as the two agree.

Note: The forward contract is a negotiated contract, and generally, one that is similar to a European call, you don't know whether you have made or lost money in the transaction until the time of expiration.

With the marking to market of a futures contract, you will know whether you are making or losing money and have the ability to exit the contract at any time prior to expiration.

## Differences between Futures and Forwards Contracts

### 1. Terms and Conditions of the Contract

**Forward:** Negotiated, subject to interpretation, min. size: \$ 1 million for competitive price

**Futures:** Standard provisions, not exceptions, delays in performance penalized, min. size: \$100K

### 2. Margins

**Forward:** No initial margin required unless negotiated, no daily mark to market until delivery

**Futures:** Initial margins are always required, posted in cash or T-Bills, oversight by the CBOT Clearing Corp., maintenance margin required to maintain initial margins requirement.

### 3. Liquidity

Forward: Very difficult because the contracts are custom and in order to unwind them you must have both parties agree to have some other entity take over a position. [Low]

Futures: Can be offset at any time by buying or selling a contract with the same expiration date and contract characteristics. [High]

### 4. Pricing

Forward: Negotiated through a dealer intermediary or directly with the parties. Price is determined on what may be viewed as mutually beneficial and agreeable.  
Spread on fixed rate commitments: 2/32 to 8/32

Futures: Prices are displayed nationally in real time and is based on what the market will bear for each contract. Spread on fixed rate contracts: 1/32

### 5. Accounting

Forward: mark to market only at the time of expiration [European futures contracting]

Futures: mark to market daily based on how the contracts are being valued in the market [American Futures Contracting].

### 6. Credit Risk

Forward: Only as good as either party in terms of fulfillment of the contract, which will not be completely known until expiration.

Futures: Trades are guaranteed by a clearing broker and the CBOT Clearing Corp.

Summary: Futures and forward markets are designed to let people eliminate price risk inherent in certain financial transactions that call for future delivery of money, financial instruments, or a commodity. These markets will also allow for positions to be taken relative to financial indexes to be able to hedge price risk associated with large baskets of commodities or financial instruments. In this case, the futures position can be settled by offset, whereas, the forward can only be resolved through negotiation or a final determination of gain/loss at time of expiration

### 7. Delivery

Forward: tailored to fit the needs of participants.

Futures: delivery date and contract size standardized.

## 8. Commissions

Forward: Bid/Ask Spread

Futures: Published rates [either flat or based on size of contract]

## 9. Security Deposit

Forward: Negotiable

Futures: 3 to 8% of the contract position

## 10. Accessibility and Regulation

Forward: Mostly large customers who contract amongst a large set of financial institutions; Self regulating

Futures: Anyone who can come up with the initial commission and pay margin; CFTC, SEC and the Exchanges

Futures and forward markets are designed to let people eliminate price risk inherent in transactions that call for future delivery of money, a security or commodity. They do so by allowing people to establish the terms of exchange prior to the scheduled delivery date.

E.G. Futures on Fixed Income Securities [Fixed Rate/Bonds]

Buy Contracts (**Long**) are purchased if bond prices are expected to rise (**interest rates fall**) and sell (**Short**) contracts are purchased if prices are expected to fall (**interest rates rise**).

## Differences Between the Futures and Cash (Spot) Markets

### Futures Market

Organized Exchange (Auction, Open Outcry)

Performance Guarantee by Clearing Corp.

Standardized Contract

Contracts Transferable

Highly Liquid

Brokerage Fee Charged

### Cash (Spot) Market

Dealer, Broker, Direct Placement

No guarantee

Agreements not Standardized

Agreements May Not Be Transferable

Less Liquid – depends on marketability of security

Brokerage Fee or Bid/Ask Spread

Margin Requirement (initial/maintenance)	Margin less likely
Usually settled by Offset	Usually results in physical delivery
Regulated by the CFTC through Ag Dept.	Loosely Regulated through the SEC

### Types of Futures Contracts

Short Term Contracts: Based on \$ 1 million par value with the underlying security having a duration of 90 days or less(e.g. T-Bill Contract priced based on discount)

Long Term Contracts: Based on \$100K - \$200K par value with the underlying security having a duration of 10 years or longer

### Long Term Contract Examples

Type	Par Value	Sample Quote	Min. Fluctuation	Tick Value
2-Yr. Treas. Note	\$200,000	102.225	¼ of 1/32	1 pt. = \$2,000 1 Tick = \$2,000/ 4 x 32 = \$15.625
10-Yr. Treas. Note	\$100,000	99.10	1/32	1 pt. = \$1,000 1 Tick = \$1,000/32 = \$31.25
30-Yr. Treas. Bond	\$100,000	114.10	1/32	1 pt. = \$1,000 1 Tick = \$31.25

### Short Term Contract Examples

Eurodollar Time Deposit	\$1,000,000	90.07	.01% of Index Value	Tick Value = \$25
90-day Domestic CDs	\$1,000,000	91.06	.01% of Index Value	Tick Value = \$25
13-Week US T-Bills	\$1,000,000	92.01	.01% of Index Value	Tick Value = \$25

1 Point = 100 ticks = \$25 x 100 or \$2,500

NOTE: The short term contracts can not be settled by delivery, but rather offset because there is no underlying instrument on which the futures contract is based. The underlying is an index consisting of a set of securities. This delivery method has certain advantages or disadvantages based on the purpose on

which the contract is being used [to hedge interest rate risk or speculate on a fundamental move in rates].

### Fulfillment Requirements when Settling a Futures Contract

Most contracts are settled by offset, however when delivery occurs delivery occurs according to the following process:

The short indicates their decision to initiate delivery:

Day 1: Notification of Intention Day – short informs broker of intention to deliver. Announcement can take place on any day during the delivery month. (Note: with T-Bonds any day, except the last 8 days of the delivery month is acceptable); the broker then informs the clearing house of impending delivery.

Day 2: Position Day – the Clearing House selects the oldest standing long to receive delivery and tells the long of the soon to be completed delivery.

Day 3: Settlement Day – the long settles with the short, by paying the short the:

$\text{Original Contract Price} \times \# \text{ Contracts} \times \text{Size of each Contract}$

and then the short delivers to the long the asset/title to complete the contract.

Reasons why an institution or individual entity may use futures relate to: uncertainty with respect to inflation, level of interest rates, foreign exchange, price movements in commodities all of which create a need to transfer risk.

### Underlying Risk Factors:

Rapid Growth in Monetary Base

Primary Focus of the Fed. Reserve on Controlling Monetary Aggregates (Not Interest Rates)

Floating Exchange Rates Balance of Trade Deficits, US Dollar Balances Overseas, Price of Oil [as a defacto currency]

## Use of Overseas Balances Denominated in US Dollars

Eurodollar Time Deposits – time deposits denominated in dollars held in banks outside the US, including foreign branches of US Banks.

### Motivation for US Depositors

==> To obtain higher interest rates on funds deposited with a foreign bank, and at the same time face no current exchange rate risk because the deposit remains in US Dollars.

### Creation of a Euro\$ Time Deposit

GE currently holds \$50 billion in a Chase time deposit. However, GE determines it can earn a higher rate of interest elsewhere. Not wanting to lose the deposit, Chase suggests that GE deposit the \$50 billion as a Euro\$ deposit at its London Branch where deposits earn a higher rate of interest. All transactions are carried out through CHIPS (the Clearing House Interbank Payment System) and consists exclusively of paper transfers. At no time does the Euro\$moneymoney actually leave the US. Funds that start in the US stay there – the accounting entries are as follows:

<u>GE B/S</u>		<u>Chase, NY B/S</u>	
Chase Savings	-50	Reserves - 50   Savings	-50
Euro\$Deposit London	+50	Reserves +50   London Office Acct.	+50

“due to” Chase NY → Chase, London

<u>Chase, London</u>	
NY Office Acct.	+50   Euro \$ Deposit +50

“due to” Chase, London → Chase, NY

Note: Interest received and technically held overseas may be subject to tax advantages in regards to the treatment of income –i.e., GE may benefit from holding Euro\$ deposits because they can defer taxes on the income until it is repatriated back into the US. [A major externality in favor of US Corporations].



## Futures Market Participants

Exchanges are organizations incorporated in the states where they reside. The organization is governed by the membership – Full or Associate members are bought and sold and have ranged dramatically in price based on market conditions over time.

Some exchanges, such as the Chicago Board of Trade [CBOT] have conditional memberships which provide some benefits enjoyed by full members.

CBOT = 1402 memberships, 681 Associate Memberships, 9 conditional Memberships.

22 Members of the Board of Governors and approximately 500 staff members.

## CME (Chicago Mercantile Exchange)

1,300 Memberships

24 Members of the Board of Governors

Approximately 292 staff members.

## 4 Major Futures Market Participants

	<u>Trading Volume</u>	<u>Open Interest</u>
Floor Traders	40%	3%
Arbitraguers	15%	5%
Speculators	24%	30%
Commercial Hedgers	21%	62%

Open Interest = total number of contracts not offset or satisfied by delivery for a given contract.

### Floor Traders:

(1) Scalpers – traders who seek to take advantage of short term changes in the price of a contract.

=> Their roles resemble that of a stock specialist, although scalpers are not obligated to make a market.

- (2) Day Traders – a type of scalper who focuses on intra-day changes in the value of contracts.  
-Carries a longer position in larger amounts, some follow a trend, others are contrarian.
- (3) Position Traders – take positions based on expectations of price movements over several days; transactions are based on basic shifts in supply/demand for actuals (underlying assets in the spot market).

### Arbitrageurs

Ensure cash and futures prices converge at delivery. An arbitrageur seeks to exploit differences between the futures price and the cost to carry in relation to spot prices on commodities. If there are significant anomalies then there may be cash and carry, or reverse cash and carry arbitrage. For example, if the futures price + cost to carry is significantly less than the spot price, then an arbitrageur will simultaneously sell the commodity in the cash market and buy the futures contract for future delivery into the short cash market position --- thereby locking in a profit on the difference between the **cash price less the futures price** [which is called **basis**].

Note: Arbitrage makes the markets more efficient ==> by taking the above mentioned arbitrage position, the cash price will be driven down, and the futures price will go up in response to increase demand, thereby narrowing the basis to the point where the only difference equals the cost to carry [which implies no excess profits].

### Speculators

Assume price risk on futures contracts as they attempt to anticipate commodity [or financial asset] price changes.

Past statistical characteristics of Speculators

Approx. 200,000 Active Speculators

50% over 50; 15% less than 35

36% in the market have been trading more than 6 years

### Commercial Hedgers

Consists of Institutions (Banks, Insurers, Grain Companies, Brokers, Large Farm Operations, Manufactures] with underlying securities or commodities that need to be hedged. They are taking positions over the period when they hold the securities or commodities, or may be

seeking to acquire them in a short period of time. These hedgers will maintain a position for as long as they need to maintain price and so their activities account for a large amount of open interest in the futures market.

## Corn Futures Contract Specification [CME Group]

Source: [www.cmegroup.com](http://www.cmegroup.com)

Contract Size:	5,000 Bushels [approx.. 127 metric tons]
Deliverable Grade:	#2 Yellow at contract price; #1 at a 1.5 cent/bushel premium, #3 Yellow at a 1.5 cent discount
Pricing Unit:	Cents per bushel
Tick Size (min. fluctuation):	$\frac{1}{4}$ of one cent per bushel (i.e., \$12.50 per contract). $5,000 \text{ bushels} \times \frac{1}{4} = 1,250 \text{ cents} \rightarrow 1,250 \text{ cents} / 100 = \$12.50$
Contract Months/Symbols:	March (H), July (N), September (U) & December (Z)
Trading Hours:	<u>CME Globex (Electronic Platform):</u> Sunday-Friday 7 PM to 7:45 CT and Monday – Friday, 8:30AM-1:15 PM CT <u>Open Outcry Auction on Trading Floor:</u> Monday – Friday, 8:30 AM to 1:15 PM CT
Daily Price Limit:	View Daily Price Limits for initial and expanded price limits. There shall be no price limits on the current month contact on or after the second business day preceding the first day of the delivery month.
Settlement:	Daily Grains Settlement – see specifications at website Final Settlement Procedure – see specifications at website
Last Trade Date:	The business day prior to the 15 calendar day of the contract month.
Last Delivery Date:	The second business day following the last trading day of the delivery month.
Product Ticker Symbols:	CME Globex (Electronic Platform): ZC Open Outcry (Trading Floor): C

### Example of a Corn Futures Hedge

A Grundy Center, Iowa farmer has 500 acres of high yielding land that produces 150 bushels of corn per acre each growing season. In May 2013, the 500 acres were planted in corn and then insured against hail and wind crop damage. Input costs including fertilizer, seed, insurance, and chemicals amounted to \$1.75 per acre. At the time of planting spot corn prices for standard 1 was \$4.50. After about 4 weeks into the growing season, although there had been some major storms in Grundy County, the field was a good share and likely to produce at or above 150 bushels corn per acre. Across the state of Iowa, and Illinois there had been no major drought, hail, excess rain or wind damage to crops. Consequently, by June 12<sup>th</sup> the price of corn is down to \$4.25 per acre. Given this emerging situation, the farmer is concerned that there may be excess supply of corn at the time of harvest leading to lower corn prices. Lower prices could mean a substantial loss in profit or no profit at all. Therefore, this farmer is looking at using a CME corn futures contract to lock in \$4.25 per bushel corn which will guarantee him a profit this year.

The 90-day futures prices for corn [i.e., Sept. ] are as follows

	Bid	Asked
1 Contract [5,000 Bushels]	4.25	4.30

Delivery Date: September 15<sup>th</sup>.

How might this farmer use the futures market to hedge his underlying corn crop price exposure?

The hedge must involve locking in the \$4.25 price on the Sept. futures contract and then either delivering the corn at the end of the growing season into the contract or settling the contract by offset and then selling the corn at the local grain elevator. Therefore the farmer will take a short [sell] position by selling contracts at the 4.25 bid price, and put down the initial and maintenance margin to retain the position until September.

How much corn does the farmer expect to produce this year?

The answer to this question depends on a fairly accurate assessment of how many bushels of corn the farm is able to produce this year. In order to deal with this uncertainty it would be useful to perform sensitivity analysis under several different yield scenarios [e.g. 100, 150, 200 bushels of corn per acre] in order to gauge how this might impact futures results. For purposes of this problem, we will go with 150 bushels an acre—the mathematics will be the same using other viable estimates.

How many contracts should be shorted?

The number of contracts, in this case, will be equal to:

75,000 bushels of corn produced/5,000 bushels per contract = 15 contracts.

Define the hedging operation:

The farmer sells short 15 September futures contracts at \$4.25, putting down initial margin which means that the farmer agrees to deliver or settle by offset 15 contracts representing 75,00 bushels of standard grade [# 2 Yellow] corn [15 contracts x 5,000 bushels per contract = 75,000 bushels].

During the period from June to September the price of corn will change each day and to the extent that September corn futures contract finishes above \$4.25 the farmer will put in additional maintenance margin into the futures trading account. If the price of the September contract ends the day less than \$4.25 there will be additional maintenance margin that will flow into the farmer's futures trading account. In September the farmer will need to settle this account either by offset or through deliver.

There are two possible scenarios to consider:

### **Scenario 1: The September 2013 CME Corn Futures Contract ends UP with the following pricing**

	Bid	Asked
1 Contract [5,000 Bushels]	4.50	4.55

Delivery Date: September 15<sup>th</sup>.

In this circumstance the farmer has two options

#### **Settlement by Offset**

The farmer can buy 15 September Corn futures contracts at the Asked price of \$4.55.

The cost of this method of offsetting the short position will be:

$$15 \text{ contracts} \times 5,000 \text{ bushels/contract} \times \$4.55 = \$342,250.$$

The debit created through the short based on the sale in June is:

$$15 \text{ contracts} \times 5,000 \text{ bushels /contract} \times \$4.25 = \$318,750.$$

Therefore, the farmer has sustained a loss in this position of:

$$\$318,750 - \$342,250 = -\$23,500; \text{ which is equivalent to the} \\ \text{movement in corn prices from June to September.}$$

Under this scenario the farmer will then sell the 75,000 bushels of corn produced

this season at the local elevator for \$4.50/ bushel that results in receipt of funds in the amount of  $75,000 \times \$4.50$  or \$337,500.

Conclusion: The farmer loses \$23,500 from the futures position, but generates \$337,500 on the cash sale of his crop in the local market. The result is revenue of \$314,000 or \$4.19/bushel.

### Settlement by Physical Delivery

The farmer can transport the 75,000 bushels of corn at the time of harvest to a delivery station in fulfillment of the 15 contracts. If the corn is standard grade the revenue received will be equal to \$318,750 less whatever the transportation charges may be. Note here that if the transportation charges are likely to exceed \$.06 [ $(\$4.25 - \$4.19)/75,000$  bushels] per bushel then the farmer should settle by offset as the cheapest to deliver.

### Scenario 2: The September 2013 CME Corn Futures Contract ends Down with the following pricing

	Bid	Asked
1 Contract [5,000 Bushels]	3.55	3.60

Delivery Date: September 15<sup>th</sup>.

In this circumstance the farmer has two options

#### Settlement by Offset

The farmer can buy 15 September Corn futures contracts at the Asked price of \$3.60.

The cost of this method of offsetting the short position will be:

$$15 \text{ contracts} \times 5,000 \text{ bushels/contract} \times \$3.60 = \$270,000.$$

The debit created through the short based on the sale in June is:

$$15 \text{ contracts} \times 5,000 \text{ bushels /contract} \times \$4.25 = \$318,750.$$

Therefore, the farmer has sustained a gain in this position of:

$$\$318,750 - \$270,000 = +\$48,750; \text{ which is equivalent to the movement in corn prices from June to September.}$$

Under this scenario the farmer will then sell the 75,000 bushels of corn produced this season at the local elevator for \$3.55/ bushel that results in receipt of funds in the amount of  $75,000 \times \$3.55$  or \$266,250.

Conclusion: The farmer gains \$48,750 from the futures position, and generates \$266,250 on the cash sale of his crop in the local market. The result is revenue of \$315,000 or \$4.20/bushel.

## Settlement by Physical Delivery

The farmer can transport the 75,000 bushels of corn at the time of harvest to a delivery station in fulfillment of the 15 contracts. If the corn is standard grade the revenue received will be equal to \$318,750 less whatever the transportation charges may be. Note here that if the transportation charges are likely to exceed \$.05 [ $(\$4.25 - \$4.20)/75,000$  bushels] per bushel then the farmer should settle by offset as the cheapest to deliver.