



Financial market institutions

13. Financial Futures Markets



Lecturer: Sayyora Abdirahimova



Learning Objectives

- Understand futures contract characteristics
- Know how and where futures contracts trade
- Be able to compute profits and losses on futures positions
- Utilize futures contracts for hedging purposes
- Learn the dynamics of futures pricing



History

- The first U.S. futures exchange was the Chicago Board of Trade (CBOT), formed in 1848.
- Other U.S. exchanges also began in the last half of the 1800s.
 - Kansas City Board of Trade (KCBT) traces its roots to January 1876.
 - Chicago Mercantile Exchange (CME) was formed in 1874 when the Chicago Product Exchange was organized to trade butter.
- Sellers wanted to rid themselves of the price risk associated with owning inventories of grain or butter and buyers wanted to establish prices for these products in advance of delivery.



What is a Futures Contract?

- A futures contract is a binding agreement between a seller and a buyer to make (seller) and to take (buyer) delivery of the underlying commodity (or financial instrument) at a specified future date with agreed upon payment terms. Most futures contracts don't actually result in delivery of the underlying commodity.
- Futures contracts are standardized with respect to the delivery month; the commodity's quantity, quality, and delivery location; and the payment terms.



Futures Exchanges Provide

- Rules of conduct that traders must follow or risk expulsion.
- An organized market place with established trading hours by which traders must abide.
- Standardized trading through rigid contract specifications, which ensure that the commodity being traded in every contract is virtually identical.
- A focal point for the collection and dissemination of information about the commodity's supply and demand, which helps ensure all traders have equal access to information.
- A mechanism for settling disputes among traders without resorting to the costly and often slow U.S. court system.
- Guaranteed settlement of contractual and financial obligations via the exchange clearinghouse.



The Purpose of Futures Markets

➤ Price discovery

- Futures markets provide a central market place where buyers and sellers from all over the world can interact to determine prices.

➤ Transfer price risk

- Futures give buyers and sellers of commodities the opportunity to establish prices for future delivery. This price risk transfer process is called hedging.



Changes in a Futures Contract's Value

- A futures contract's value is simply the number of units (bushels, hundredweight, etc.) in each contract times the current price.
- Each contract specifies the volume of grain or livestock it covers.
 - Trade grain and oilseed futures contracts cover 5,000 bushels.
 - Live cattle futures contract covers 40,000 pounds (400 hundredweight).
 - Lean hog futures contract covers 40,000 pounds (400 hundredweight).
 - Feeder cattle futures contract covers 50,000 pounds (500 hundredweight).
- The effect of a change in contract value depends on whether you previously sold or purchased a futures contract.
 - A decrease in contract value (a price decline) is a loss to anyone who previously purchased a futures contract, but a gain for a trader who previously sold a futures contract.
 - An increase in contract value (a price increase) is a gain to anyone who previously purchased a futures contract (i.e., is long), but is a loss for a trader who previously sold a futures contract (i.e., is short).



Figure 1. Marking-to-Market Buyer and Seller Accounts at Exchange Clearinghouse.

Buyer (Long)		
Date	Action	Price
Day 1	Buy at	\$6.00/bushel
Day 2	No action (but price increases)	\$6.10/bushel
		\$0.10/bushel gain x 5,000 bushels
		\$500 gain from day 1
Seller (Short)		
Date	Action	Price
Day 1	Sell at	\$6.00/bushel
Day 2	No action (but price increases)	\$6.10/bushel
		\$0.10/bushel loss x 5,000 bushels
		\$500 loss from day 1



Futures Market

- Chicago Board of Trade (CBOT): the first and largest commodities exchange
- Forward contract: an agreement between two parties to buy or sell a commodity at a specific future time for an agreed upon price.
 - Popular among producers, processors, and merchant
 - Counterparty risk (producers unable or unwilling to deliver or buyers vanish)
- To remedy the situation, CBOT developed a standardized agreement Futures contract



Futures Contract

- Futures contract: standardized agreement between two parties committing one to buy and the other to sell at a set price on or before a given date in the future
 - **Margin**: performance bonds or good-faith deposits to insure contract performance
 - **Initial Margin**: Minimum amount required to initiate a trade
 - **Maintenance margin**: Minimum amount required at all times to sustain a market position
 - **Margin call**: when margin level is lower than maintenance margin



Mark-to-market

- Daily settlement of gains and losses between buyers and sellers.
 - If spot price rises, sellers pay buyers in cash for the change in price
 - If spot prices falls, buyers owe sellers
 - If a futures trader losses too much, more money will need t be put in the margin account.



Futures characteristics

- Seven major underlying asset groups
- Delivery
 - physical delivery (only 1% to 2%)
 - cash settlement
- Long position: buyer of a future contract
Short position: seller of a future contract
- Trading
 - open-outcry: by voice and hand signals
 - Electronically: by network
- Floor broker and dual trader execute customer orders
- Can be terminated by an offsetting transaction



Contractual Provisions

- Underlying asset: Commodity, currency, financial instrument index or other item
- Amount and quality of the underlying asset
- Delivery cycle: months for which the futures contracts can be traded
- Expiration date
- Settlement Mechanism and Delivery Location





Examples

- 100 oz gold
 - Tick size: \$.10 per troy ounce, \$10 per contract
 - A gold price change of \$3.00 causes a \$300 mark to market
 - Initial margin = \$1,053
- CME S&P 500
 - \$250 times the Standard & Poor's 500 Stock Price Index
 - .01 index points = \$2.50
 - Initial margin = \$19,688
- Euro
 - 125,000 Euro
 - \$.0001 per Euro = \$12.50 per contract
 - Initial margin = \$900
- 10-year T-note
 - Face value at maturity of \$100,000
 - Every 1/32 move in the bond price leads to a \$15.625 mark to market per contract
 - Initial margin = \$1,013
- Many contracts have “mini” versions.

Figure 19.2 Futures Contract Specifications Are Available on the Internet

Futures Contract on Sugar No. 11 (World)

Contract specifications are current as of **January 8, 2004** and may be subject to change. Verify information with your broker.

Calls for delivery of cane sugar, stowed in bulk, FOB from any twenty-eight foreign countries of origin as well as the United States

Trading Unit

112,000 lbs. (50 Long tons)

Trading Hours

9:00 am to 12:00 pm;
closing period
commences at 11:58 am

Price Quotation

Cents per pound

Delivery Months

March, May, July,
October

Ticker Symbol

SB

Minimum Fluctuation

1/100 cent/lb.,
equivalent to \$11.20 per
contract.

Last Trading Day:

Last business day of
the month preceding
delivery month.

Notice Day:

1st business day after
the last trading day.

Daily Price Limits:

None

Position Limits/Position Accountability

Spot Month - 5,000 contracts as of the 2nd business day following the expiration of the regular option contract traded on the expiring futures contract. Additionally, Position Accountability rules apply to all futures and options contract months. *Contact the Exchange for more information.*

Grade

Raw centrifugal cane sugar based on 96 degrees average polarization.

Deliverable Growths:

Growths of Argentina, Australia, Barbados, Belize, Brazil, Colombia, Costa Rica, Dominican Republic, El Salvador, Ecuador, Fiji Islands, French Antilles, Guatemala, Honduras, India, Jamaica, Malawi, Mauritius, Mexico, Nicaragua, Peru, Republic of the Philippines, South Africa, Swaziland, Taiwan, Thailand, Trinidad, United States, and Zimbabwe.

Delivery Points:

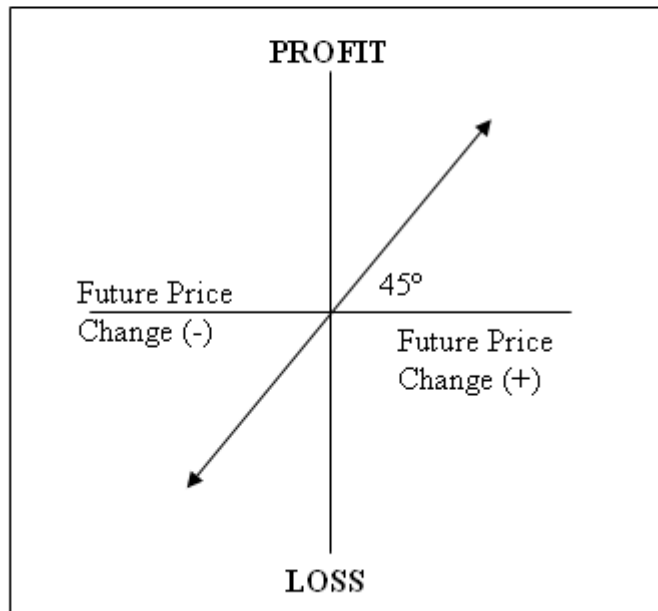
A port in the country of origin or in the case of landlocked countries, at a berth or anchorage in the customary port of export. Subject to minimum standards established by the Exchange's rules.



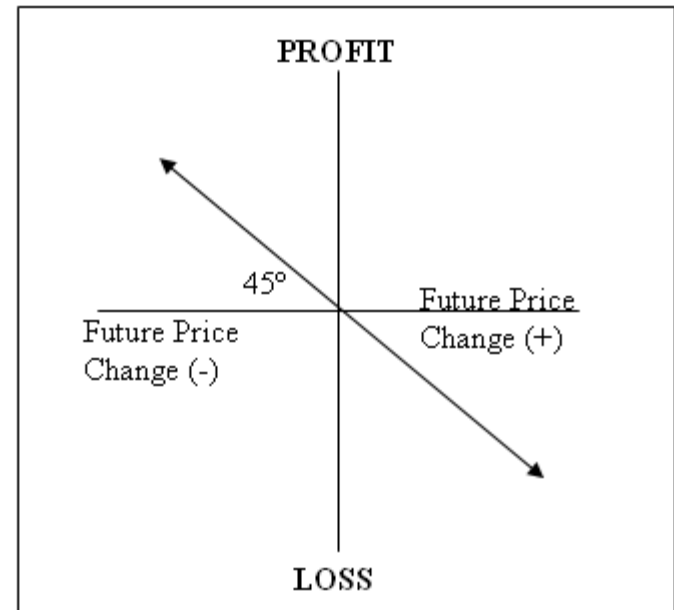
Payoff for futures positions

Figure 19.3 Futures Contracts Represent a Zero-Sum Game Between Buyers and Sellers

A. Payoff for a long futures position.



B. Payoff for a short futures position.





Options on Futures

- Future options: the right, but not the obligation, to buy or sell some specific futures contract at a certain price
 - Sellers of futures options are obligated to perform
 - Loss potential for buyers is limited to the premium
 - Unlimited loss potential for Sellers of futures options

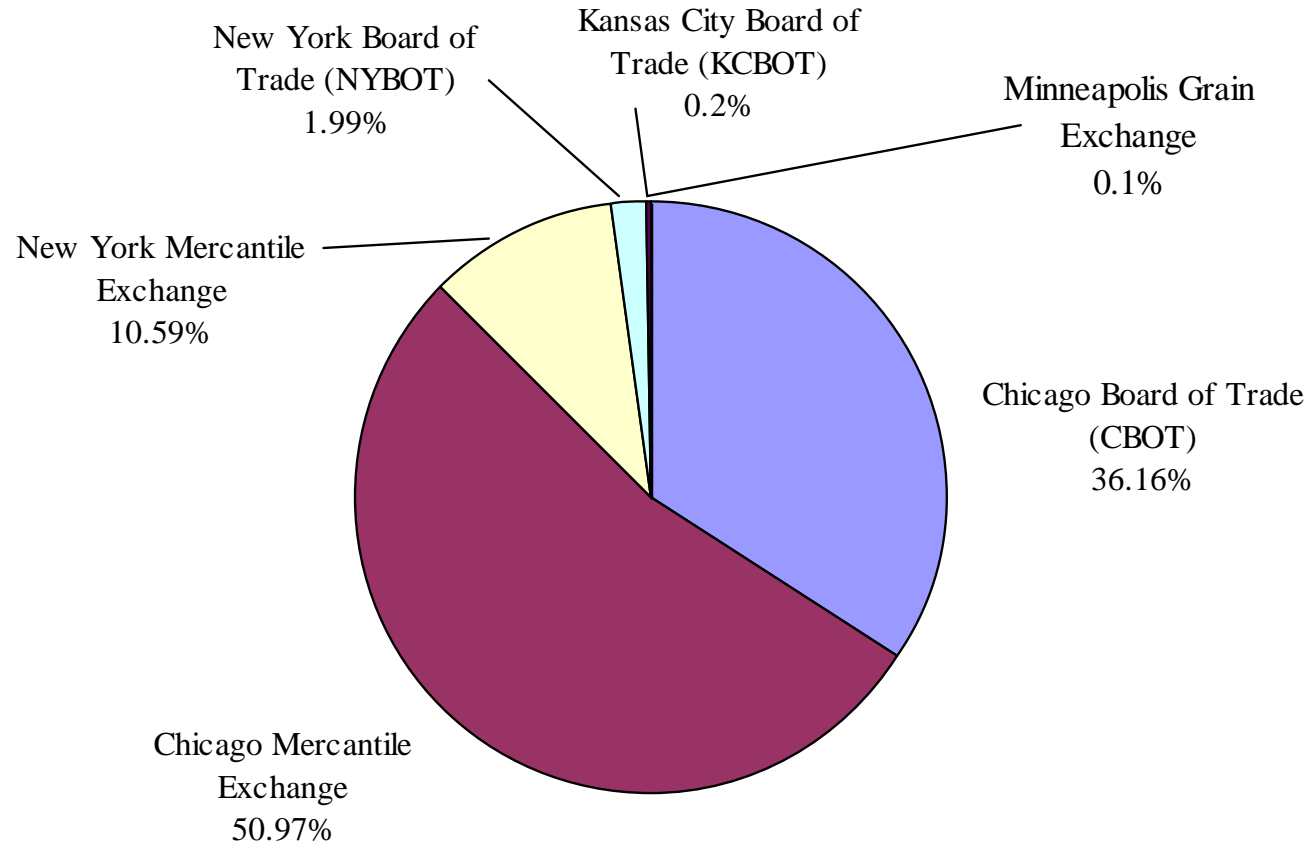




US futures exchanges

- Big three: CBOT, Chicago Mercantile Exchange, and the New York Mercantile Exchange
 - **CBOT**: Open outcry and electronic trading (e-cbot)
 - **Chicago Mercantile Exchange**: Foreign currencies expertise. Electronic system (GLOBEX)
 - **New York Mercantile Exchange**: specialized in energy and metals.

Figure 19.4 There are Six US Futures Exchanges



Data Source: Exchange Web Sites.



**Table 19.2 Sugar Futures Contract Commodity Trading Example
Contract Specifications**

Size of the Contract	112,000 lbs
Minimum Price Change	
Of one ounce	1/100 cents/lb
Of one contract	\$11.20
Initial Margin Level	\$700
Maintenance Margin Level	\$500

Day 1

Investor buys 10 sugar futures contract at 5.29¢/lb.

(Position value = $10 \times 112,000 \times \$0.0529/\text{lb} = \$59,248$)

Investor deposits initial margin \$7,000.00

Price rises to close at 5.32¢/lb.; investor loss of

0.03¢/lb. (\$33.60 per contract) paid to clearinghouse -\$336.00

Account balance at end of Day 1 \$6,664.00

Day 2

Opening Account Balance (from Day 1) \$6,664.00

Price rises further to close at 5.40¢/lb.; investor loss of 0.08¢/lb.

(\$89.60 per contract) paid to clearinghouse \$896.00

Account balance on Day 2, after loss is paid to clearinghouse \$5,768.00

Day 3

Opening Account Balance (from Day 2)	\$5,768.00
Price jumps to 5.52¢/lb.; investor loss of 0.12¢/lb. (\$134.40 per contract) paid to clearinghouse	\$1,344.00
Intraday account balance on Day 3, after loss is paid to clearinghouse	\$4,424.00
Margin call of \$2,576 made to restore the account to the initial margin level (\$7,000)	\$2,576.00
Account balance at end of Day 3, after the margin call is met	\$7,000.00

Day 4

Opening Account Balance (from Day 3)	\$7,000.00
Price falls 0.05¢/lb. to 5.47¢/lb.; investor gain of \$56 per contract)	\$560.00
Account balance	\$7,560.00
Trader offsets the short futures position at 5.47¢/lb, and liquidates the account	\$7,560.00
Account balance at the end of Day 4	0

Profit/Loss Summary

Profit/Loss = $10 \times (\text{Contract Selling Price} - \text{Contract Buying Price}) = 10 \times (112,000 \text{ lbs} \times (5.29\text{¢/lb.} - 5.47\text{¢/lb.})) = -\$2,016.00$ (loss)

Profit/Loss = Sum of Deposits (-) and Receipts (+)

Day 1	Initial Margin Deposit	-\$7,000.00
Day 3	Margin Call Deposit	-\$2,576.00
Day 4	Account Liquidated Receipt	+\$7,560.00



Hedgers vs. Speculators

- Hedgers: seek to reduce risks
 - Purpose: lock in a favorable contract price
 - Insurance policy for their business
 - Taking a future position opposite to that of a cash market position

- Speculators: seek to profit from price changes
 - Not using commodities in any manufacturing capacity
 - Strictly for the purpose of acquiring profits



Hedging Concepts

- **Basis**: difference between a commodity's cash price (spot price) and the futures price
- Hedging strategies with futures can eliminate price risk, but not basis risk. (cross hedging)
- **Hedge ratio**: underlying asset price volatility divided by the price volatility of the hedging instrument
- **Intramarket spread**: long position in one contract month against a short position in another contract month at the same market
- **Intermarket spread**: long position in one market and a short position in another market trading same or closely related commodity (TED, NOB)

Figure 19.5 The Difference Between Cash and Futures Prices is the Cash-Futures Basis

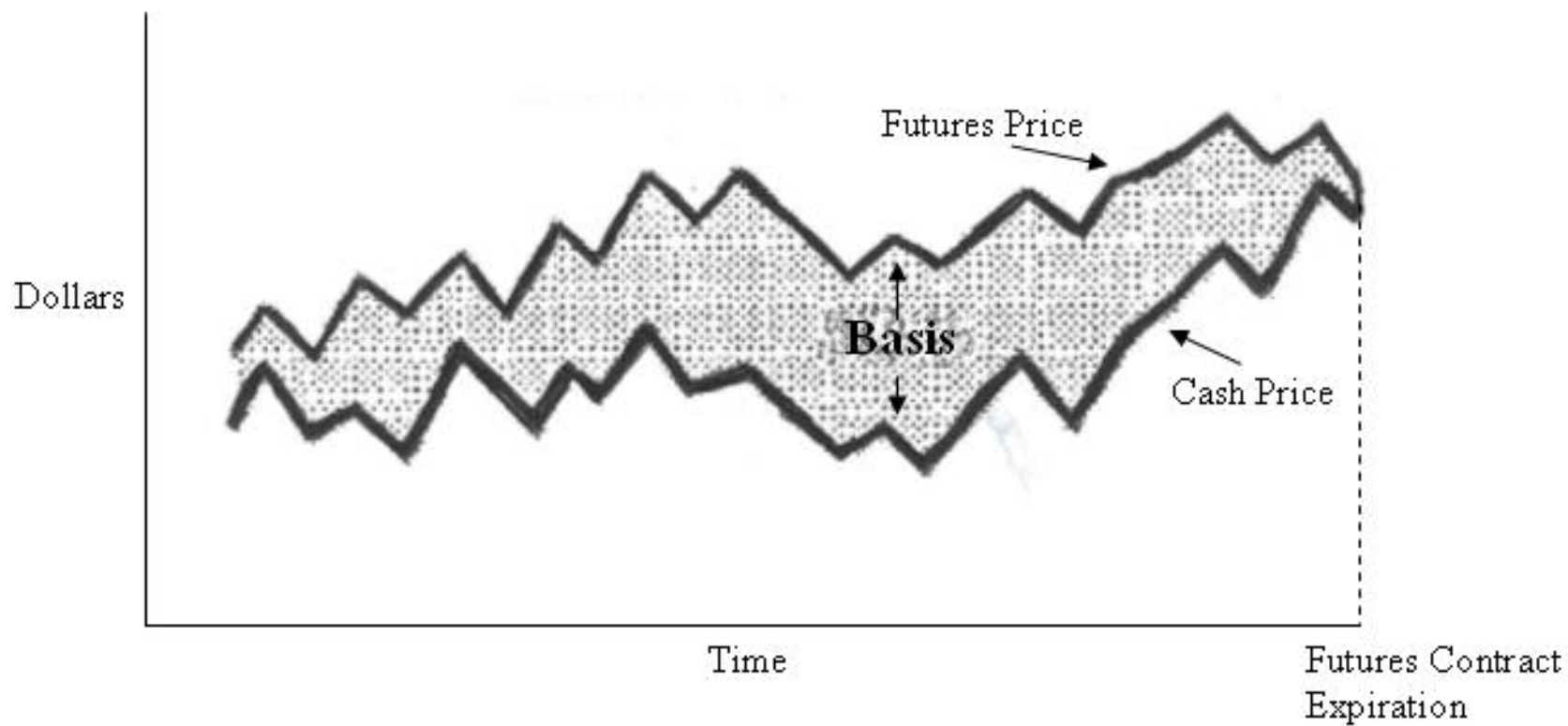




Table 19.3 A Hypothetical Hedging Example for the Heating Oil Market

Prices per gallon on June 1:

	Cash Price (Spot Price)	(Oct) Futures
	65¢	60¢
<i>A. Cash and futures prices rise (in tandem), such that:</i>		
Prices (per gal.)	Local Cash	(Oct) Futures
on Oct. 1	75¢	70¢
<i>B. Cash and futures prices fall (in tandem), such that:</i>		
Prices (per gal.)	Local Cash	(Oct) Futures
On Oct 1	60¢	55¢
<i>C. Cash and futures prices remain the same, such that:</i>		
Prices (per gal.)	Local Cash	(Oct) Futures
On Oct 1	65¢	60¢

Effective price for the heating oil in any case : 65 cents



Program trading

- Index arbitrage: stock index futures to offset security risk through a host of complicated investment strategy
 - Exploits divergences between actual and theoretical futures prices
- Program trading of index arbitrage: investment strategy of using a mix of index futures, leveraged stock portfolios, and stock options to profit from mispricing.



Financial derivative markets

- **Swap**: arrangement whereby two companies agree to lend to each other on different term. (floating or fixed)
- **Swaption**: options to engage in an interest rate swap
- **Cap**: upper limits on the interest rate paid on floating rate
- **Collar**: upper and lower limits on the interest paid on floating rate



Futures pricing

- Same asset trading in different markets will have the same price (Law of one price)
- Strict relationship between the prices for underlying assets and related financial derivatives

$$\begin{aligned} \text{Commodity futures prices} &= \text{Spot price} + \text{Cost of carry} \\ &= \text{Spot price} \left(1 + \frac{\text{Risk - free interest rate}}{100} + \frac{\text{Percentage storage cost}}{100} \right) \end{aligned}$$

$$\begin{aligned} \text{Financial futures price} &= \text{Spot price for financial instrument} + \frac{\text{Borrowing costs of carry}}{100} - \frac{\text{Dividend yield or interest income}}{100} \\ &= \text{Spot price} \left(1 + \frac{\text{Risk - free interest rate}}{100} - \frac{\text{Percentage income on financial instrument}}{100} \right) \end{aligned}$$



Example

(problem 19.7 at the end of the chapter)

The spot price for a T-note: 105-23

Annual risk free rate: 4%

T-note's yield: 6% per year

Delivery month: in three month

What would you expect the futures price to be?

Solution

Borrowing cost for three months: $\frac{1}{4} \times 4\% = 1\%$

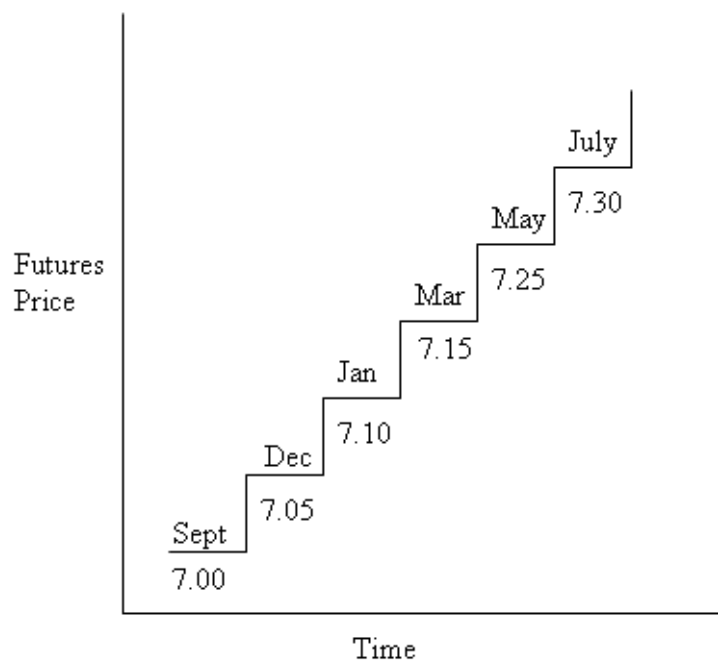
Interest income $\frac{1}{4} \times 6\% = 1.5\%$

Futures price = $105 \frac{23}{32}^{\text{nds}} \times (1 + 0.01 - 0.015) = 105.7188$
 $\times 0.995 = 105.1902 = 105-06$



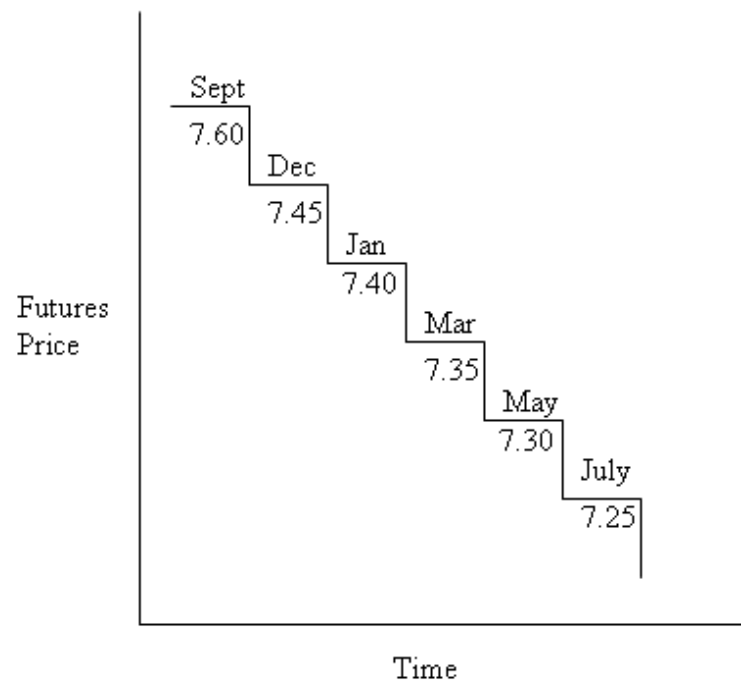
Figure 19.6 Intramarket Spreads Reflect Influences of Supply, Demand and Carrying Costs

A. With carrying costs, the futures price for each succeeding delivery month is usually higher.



Contango

B. In some futures markets, futures prices are inverted with highest prices for the nearby spot month.



Backwardation



Futures markets regulation

- Commodity Futures Trading Commission (CFTC)
 - Independent federal regulatory agency with jurisdiction over futures trading
 - Monitors registrant supervision system, internal controls and sales practice compliance program

- National Futures Association (NFA)
 - Any company or individual futures traders must apply for registration through NFA.
 - Self regulatory organization



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