

CHAPTER 17 Futures Markets and Risk Management

17.1 THE FUTURES CONTRACT

Futures and Forwards

- Forward - an agreement calling for a future delivery of an asset at an agreed-upon price
- Futures - similar to forward but feature formalized and standardized characteristics
- Key difference in futures
 - Secondary trading - liquidity
 - Marked to market
 - Standardized contract units
 - Clearinghouse warrants performance

Key Terms for Futures Contracts

- Futures price - agreed-upon price at maturity
- Long position - agree to purchase
- Short position - agree to sell
- Profits on positions at maturity
 - Long = spot minus original futures price
 - Short = original futures price minus spot

Figure 17.2 Profits to Buyers and Sellers of Futures and Options Contracts

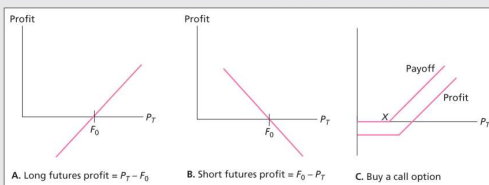


FIGURE 17.2

Profits to buyers and sellers of futures and options contracts

A: Long futures position (buyer) B: Short futures position (seller) C: Buy call option

Types of Contracts

- Agricultural commodities
- Metals and minerals (including energy contracts)
- Foreign currencies
- Financial futures
 - Interest rate futures
 - Stock index futures

Table 17.1 Sample of Futures Contracts

TABLE 17.1

Sample of futures contracts

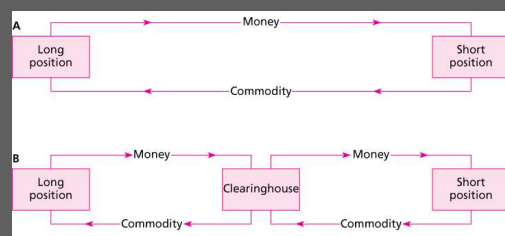
| Foreign Currencies | Agricultural | Metals and Energy | Interest Rate Futures | Equity Indexes |
|--------------------|--------------|-------------------|-----------------------|---------------------------|
| British pound | Corn | Copper | Eurodollars | Dow Jones Industrials |
| Canadian dollar | Oats | Aluminum | Euroyen | S&P Midcap-400 |
| Japanese yen | Soybeans | Gold | Euro-denominated bond | Nasdaq 100 |
| Euro | Soybean meal | Platinum | Euroswiss | NYSE index |
| Swiss franc | Soybean oil | Palladium | Sterling | Russell 2000 index |
| Australian dollar | Wheat | Silver | British gov't bond | Nikkei 225 (Japanese) |
| Mexican peso | Barley | Crude oil | German gov't bond | FTSE index (British) |
| Brazilian real | Flaxseed | Heating oil | Italian gov't bond | CAC index (French) |
| | Canola | Gas oil | Canadian gov't bond | DAX index (German) |
| | Rye | Natural gas | Treasury bonds | All ordinary (Australian) |
| | Cattle | Gasoline | Treasury notes | Toronto 35 (Canadian) |
| | Milk | Propane | Treasury bills | Titans 30 (Italian) |
| | Hogs | Commodity index | LIBOR | Dow Jones Euro STOXX 50 |
| | Pork bellies | Electricity | EURIBOR | Industry indexes, e.g., |
| | Cocoa | Weather | Municipal bond index | banking |
| | Coffee | | Federal funds rate | natural resources |
| | Cotton | | Bankers' acceptance | chemical |
| | Orange juice | | S&P 500 index | health care |
| | Sugar | | Interest rate swaps | technology |
| | Lumber | | | retail |
| | Rice | | | utilities |
| | | | | telecom |

17.2 MECHANICS OF TRADING IN FUTURES MARKETS

The Clearinghouse and Open Interest

- Clearinghouse - acts as a party to all buyers and sellers.
 - Obligated to deliver or supply delivery
- Closing out positions
 - Reversing the trade
 - Take or make delivery
 - Most trades are reversed and do not involve actual delivery
- Open Interest

Figure 17.3 Trading With and Without a Clearinghouse



Marking to Market and the Margin Account

- Initial Margin - funds deposited to provide capital to absorb losses
- Marking to Market - each day the profits or losses from the new futures price and reflected in the account.
- Maintenance or variance margin - an established value below which a trader's margin may not fall.

Margin and Trading Arrangements

- Margin call - when the maintenance margin is reached, broker will ask for additional margin funds
- Convergence of Price - as maturity approaches the spot and futures price converge
- Delivery - Actual commodity of a certain grade with a delivery location or for some contracts cash settlement
- Cash Settlement - some contracts are settled in cash rather than delivery of the underlying assets

17.3 FUTURES MARKET STRATEGIES

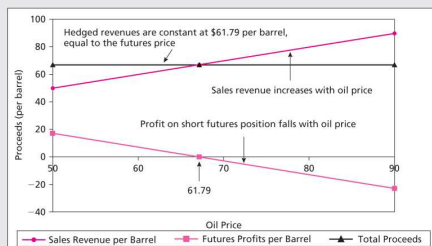
Trading Strategies

- Speculation -
 - short - believe price will fall
 - long - believe price will rise
- Hedging -
 - long hedge - protecting against a rise in price
 - short hedge - protecting against a fall in price

Figure 17.4 Hedging Revenues Using Futures, Example 17.5 (Futures Price = 61.79)

FIGURE 17.4

Hedging revenues using futures, Example 17.5 (Futures price = \$61.79)



Basis and Basis Risk

- Basis - the difference between the futures price and the spot price
 - over time the basis will likely change and will eventually converge
- Basis Risk - the variability in the basis that will affect profits and/or hedging performance

17.4 THE DETERMINATION OF FUTURES PRICES

Futures Pricing

- Spot-futures parity theorem - two ways to acquire an asset for some date in the future
 - Purchase it now and store it
 - Take a long position in futures
 - These two strategies must have the same market determined costs

Parity Example Using Gold

Strategy 1: Buy gold now at the spot price (S_0) and hold it until time T when it will be worth S_T

Strategy 2: Enter a long position in gold futures today and invest enough funds in T-bills (F_0) so that it will cover the futures price of S_T

Parity Example Outcomes

| Strategy A: | Action | Initial flows | Flows at T |
|-------------|----------------------------------|------------------|-------------|
| | Buy gold | - S_0 | S_T |
| Strategy B: | Action | Initial flows | Flows at T |
| | Long futures | 0 | $S_T - F_0$ |
| | Invest in Bill $F_0(1+r_f)^T$ | - $F_0(1+r_f)^T$ | F_0 |
| | Total for B | - $F_0(1+r_f)^T$ | S_T |

Price of Futures with Parity

Since the strategies have the same flows at time T

$$F_0 / (1 + r_f)^T = S_0$$

$$F_0 = S_0 (1 + r_f)^T$$

The futures price has to equal the carrying cost of the gold

Figure 17.5 S&P 500 Monthly Dividend Yield

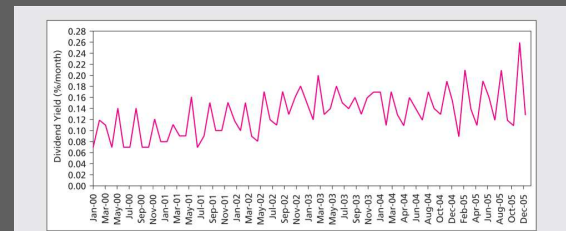


FIGURE 17.5

S&P 500 monthly dividend yield

Source: Data for figure obtained from *Stocks, Bonds, Bills, and Inflation 2006 Yearbook*, Ibbotson Associates, Chicago, 2006

Figure 17.6 Gold Futures Prices

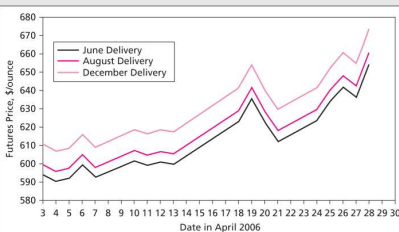


FIGURE 17.6

Gold future prices

17.5 FINANCIAL FUTURES

Stock Index Futures

- Available on both domestic and international stocks
- Advantages over direct stock purchase
 - lower transaction costs
 - better for timing or allocation strategies
 - takes less time to acquire the portfolio

Table 17.2 Stock Index Futures

| Contract | Underlying Market Index | Contract Size | Exchange |
|------------------------------|--|---|---|
| S&P 500 | Standard & Poor's 500 index. A value-weighted arithmetic average of 500 stocks. | \$250 times the S&P 500 index. | Chicago Mercantile Exchange |
| Dow Jones Industrials (DJIA) | Price-weighted arithmetic average of 30 blue-chip stocks. | \$10 times the Dow Jones Industrial Average | Chicago Board of Trade |
| S&P Midcap | Index of 400 firms of mid-range market value. | \$500 times index. | Chicago Mercantile Exchange |
| Nasdaq 100 | Value-weighted arithmetic average of 100 of the largest over-the-counter stocks. | \$100 times the OTC index. | Chicago Mercantile Exchange |
| Russell 2000 | Index of 2,000 smaller firms. | \$500 times the index. | Chicago Mercantile Exchange |
| Nikkei | Nikkei 225 stock average. | ¥5 times the Nikkei index. | Chicago Mercantile Exchange |
| FTSE 100 | Financial Times-Stock Exchange Index of 100 U.K. firms. | £ 10 times the FTSE Index. | London International Financial Futures Exchange |
| CAC 40 | Index of 40 of the largest French firms. | 10 euros times the index. | Euronext Paris |
| DAX 30 | Index of 30 of the largest German firms. | 25 euros times the index. | Eurex |
| DJ Euro STOXX 50 | Value-weighted index of 50 large stocks in Eurozone. | 10 euros times the index. | Eurex |

Table 17.3 Correlations Among Major US Stock Market Indexes

| | DJIA | NYSE | Nasdaq | S&P 500 | Russell 2000 |
|--------------|-------|-------|--------|---------|--------------|
| DJIA | 1.000 | | | | |
| NYSE | 0.931 | 1.000 | | | |
| Nasdaq | 0.839 | 0.825 | 1.000 | | |
| S&P 500 | 0.957 | 0.973 | 0.899 | 1.000 | |
| Russell 2000 | 0.758 | 0.837 | 0.855 | 0.822 | 1.000 |

Note: Correlations computed using monthly returns for 5 years ending in March 2006.

Creating Synthetic Stock Positions

- Synthetic stock purchase
 - Purchase of the stock index instead of actual shares of stock
- Creation of a synthetic T-bill plus index futures that duplicates the payoff of the stock index contract
 - Shift between Treasury bills and broad-based stock market holdings

Index Arbitrage

Exploiting mispricing between underlying stocks and the futures index contract

Futures Price too high - short the future and buy the underlying stocks

Futures price too low - long the future and short sell the underlying stocks

Difficult to do in practice

Transactions costs are often too large

Trades cannot be done simultaneously

Additional Financial Futures Contracts

- Foreign Currency
 - Forwards versus futures
- Interest Rate Futures

Figure 17.7 U.S. Dollar Foreign-Exchange Rates

| Currencies | | March 6, 2007 | |
|---|-----------|---------------|-----------|
| U.S.-dollar foreign-exchange rates in late New York trading | | | |
| Currency/currency | Rate | Change | Rate |
| | per \$100 | per \$100 | per \$100 |
| Americas | | | |
| Argentina peso ¹ | 3725 | 3.20B | 1.4 |
| Brazil real | 4721 | 2.11Z | -0.3 |
| Canada dollar | 876 | 1.76 | 0.8 |
| 1-mo forward | 876 | 1.76 | 0.8 |
| 1-yr forward | 876 | 1.76 | 0.8 |
| Chile peso | 854 | 1.13B | 0.9 |
| 1-mo forward | 854 | 1.13B | 0.9 |
| 1-yr forward | 854 | 1.13B | 0.9 |
| Colombia peso | 20997 | 223.76 | -0.4 |
| Costa Rica dollar | 508 | 11.46 | -1.2 |
| 1-mo forward | 508 | 11.46 | -1.2 |
| 1-yr forward | 508 | 11.46 | -1.2 |
| Dominican peso | 20.62 | 28.27 | -0.6 |
| 1-mo forward | 20.62 | 28.27 | -0.6 |
| 1-yr forward | 20.62 | 28.27 | -0.6 |
| Ecuador dollar | 20966 | 245.92 | 0.6 |
| 1-mo forward | 20966 | 245.92 | 0.6 |
| 1-yr forward | 20966 | 245.92 | 0.6 |
| Asia-Pacific | | | |
| Australia dollar | 778 | 1.297 | 1.9 |
| 1-mo forward | 778 | 1.297 | 1.9 |
| 1-yr forward | 778 | 1.297 | 1.9 |
| China yuan | 7.26 | 7.94 | -0.8 |
| 1-mo forward | 7.26 | 7.94 | -0.8 |
| 1-yr forward | 7.26 | 7.94 | -0.8 |
| Hong Kong dollar | 7.75 | 7.81 | 0.5 |
| 1-mo forward | 7.75 | 7.81 | 0.5 |
| 1-yr forward | 7.75 | 7.81 | 0.5 |
| India rupee | 47.26 | 48.19 | 0.2 |
| 1-mo forward | 47.26 | 48.19 | 0.2 |
| 1-yr forward | 47.26 | 48.19 | 0.2 |
| Indonesia rupiah | 20315 | 9217 | 2.5 |
| 1-mo forward | 20315 | 9217 | 2.5 |
| 1-yr forward | 20315 | 9217 | 2.5 |
| Japan yen | 136.04 | 136.04 | -2.8 |
| 1-mo forward | 136.04 | 136.04 | -2.8 |
| 1-yr forward | 136.04 | 136.04 | -2.8 |
| Malaysia ringgit | 2.36 | 1.41 | -0.5 |
| 1-mo forward | 2.36 | 1.41 | -0.5 |
| 1-yr forward | 2.36 | 1.41 | -0.5 |
| New Zealand dollar | 46.22 | 1.64 | 1.2 |
| 1-mo forward | 46.22 | 1.64 | 1.2 |
| 1-yr forward | 46.22 | 1.64 | 1.2 |
| Philippines peso | 46.77 | 46.77 | -0.1 |
| 1-mo forward | 46.77 | 46.77 | -0.1 |
| 1-yr forward | 46.77 | 46.77 | -0.1 |
| Singapore dollar | 45.26 | 45.26 | -0.4 |
| 1-mo forward | 45.26 | 45.26 | -0.4 |
| 1-yr forward | 45.26 | 45.26 | -0.4 |
| South Korea won | 2016.51 | 147.6 | 1.9 |
| 1-mo forward | 2016.51 | 147.6 | 1.9 |
| 1-yr forward | 2016.51 | 147.6 | 1.9 |
| Taiwan dollar | 30.21 | 30.21 | -0.2 |
| 1-mo forward | 30.21 | 30.21 | -0.2 |
| 1-yr forward | 30.21 | 30.21 | -0.2 |
| Thailand baht | 30.46 | 32.05 | -2.2 |
| 1-mo forward | 30.46 | 32.05 | -2.2 |
| 1-yr forward | 30.46 | 32.05 | -2.2 |
| Europe | | | |
| Canada dollar | 876 | 1.76 | 0.8 |
| Denmark krone | 6.56 | 6.56 | 0.0 |
| 1-mo forward | 6.56 | 6.56 | 0.0 |
| 1-yr forward | 6.56 | 6.56 | 0.0 |
| France franc | 166.63 | 166.63 | 0.0 |
| 1-mo forward | 166.63 | 166.63 | 0.0 |
| 1-yr forward | 166.63 | 166.63 | 0.0 |
| Germany mark | 1.936 | 1.936 | 0.0 |
| 1-mo forward | 1.936 | 1.936 | 0.0 |
| 1-yr forward | 1.936 | 1.936 | 0.0 |
| Greece drachma | 340.75 | 340.75 | 0.0 |
| 1-mo forward | 340.75 | 340.75 | 0.0 |
| 1-yr forward | 340.75 | 340.75 | 0.0 |
| Italy lira | 2036.27 | 2036.27 | 0.0 |
| 1-mo forward | 2036.27 | 2036.27 | 0.0 |
| 1-yr forward | 2036.27 | 2036.27 | 0.0 |
| Japan yen | 136.04 | 136.04 | -2.8 |
| 1-mo forward | 136.04 | 136.04 | -2.8 |
| 1-yr forward | 136.04 | 136.04 | -2.8 |
| Netherlands guilder | 2.20371 | 2.20371 | 0.0 |
| 1-mo forward | 2.20371 | 2.20371 | 0.0 |
| 1-yr forward | 2.20371 | 2.20371 | 0.0 |
| Spain peseta | 166.63 | 166.63 | 0.0 |
| 1-mo forward | 166.63 | 166.63 | 0.0 |
| 1-yr forward | 166.63 | 166.63 | 0.0 |
| Sweden krona | 10.48 | 10.48 | 0.0 |
| 1-mo forward | 10.48 | 10.48 | 0.0 |
| 1-yr forward | 10.48 | 10.48 | 0.0 |
| Switzerland franc | 75.48 | 75.48 | 0.0 |
| 1-mo forward | 75.48 | 75.48 | 0.0 |
| 1-yr forward | 75.48 | 75.48 | 0.0 |
| UK pound | 1.936 | 1.936 | 0.0 |
| 1-mo forward | 1.936 | 1.936 | 0.0 |
| 1-yr forward | 1.936 | 1.936 | 0.0 |
| Middle East/Africa | | | |
| Bahrain dinar | 2.463 | 2.463 | 0.0 |
| 1-mo forward | 2.463 | 2.463 | 0.0 |
| 1-yr forward | 2.463 | 2.463 | 0.0 |
| Egypt pound | 1.206 | 1.206 | 0.0 |
| 1-mo forward | 1.206 | 1.206 | 0.0 |
| 1-yr forward | 1.206 | 1.206 | 0.0 |
| Israel sheqel | 4.854 | 4.854 | 0.0 |
| 1-mo forward | 4.854 | 4.854 | 0.0 |
| 1-yr forward | 4.854 | 4.854 | 0.0 |
| Jordan dinar | 1.412 | 1.412 | 0.0 |
| 1-mo forward | 1.412 | 1.412 | 0.0 |
| 1-yr forward | 1.412 | 1.412 | 0.0 |
| Kuwait dinar | 2.463 | 2.463 | 0.0 |
| 1-mo forward | 2.463 | 2.463 | 0.0 |
| 1-yr forward | 2.463 | 2.463 | 0.0 |
| Lebanon pound | 2000 | 2000 | 0.0 |
| 1-mo forward | 2000 | 2000 | 0.0 |
| 1-yr forward | 2000 | 2000 | 0.0 |
| Saudi Arabia riyal | 2067 | 2067 | 0.0 |
| 1-mo forward | 2067 | 2067 | 0.0 |
| 1-yr forward | 2067 | 2067 | 0.0 |
| Sudan pound | 1.206 | 1.206 | 0.0 |
| 1-mo forward | 1.206 | 1.206 | 0.0 |
| 1-yr forward | 1.206 | 1.206 | 0.0 |
| Tunisia dinar | 2000 | 2000 | 0.0 |
| 1-mo forward | 2000 | 2000 | 0.0 |
| 1-yr forward | 2000 | 2000 | 0.0 |

FIGURE 17.7
Spot and forward prices in foreign exchange
Source: From The Wall Street Journal, March 6, 2007.
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17.6 SWAPS

Swaps

- Large component of derivatives market
 - Over \$200 trillion outstanding
 - Interest Rate Swaps
 - Currency Swaps
- Interest rate swaps are based on LIBOR

Figure 17.8 Interest Rate Swap

