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

Types of Contracts

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

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

<table>
<thead>
<tr>
<th>Figure 17.2</th>
<th>Profits to Buyers and Sellers of Futures and Options Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Long Futures profit = ( P_1 - P_0 )</td>
<td>B. Short Futures profit = ( P_0 - P_1 )</td>
</tr>
</tbody>
</table>
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

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)

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

<table>
<thead>
<tr>
<th>Strategy A: Action</th>
<th>Initial flows</th>
<th>Flows at T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy gold</td>
<td>-So</td>
<td>ST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy B: Action</th>
<th>Initial flows</th>
<th>Flows at T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long futures</td>
<td>0</td>
<td>ST - FO</td>
</tr>
<tr>
<td>Invest in Bill</td>
<td>FO(1+r_f)T</td>
<td>FO</td>
</tr>
<tr>
<td>Total for B</td>
<td>-FO(1+r_f)T</td>
<td>ST</td>
</tr>
</tbody>
</table>

Price of Futures with Parity

Since the strategies have the same flows at time \( T \)

\[
\frac{F_0}{(1 + r_f)^T} = S_0
\]

\[
F_0 = S_0 (1 + r_f)^T
\]

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

Figure 17.5 S&P 500 Monthly Dividend Yield

Figure 17.6 Gold Futures Prices
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

<table>
<thead>
<tr>
<th>Contract</th>
<th>Underlying Market Index</th>
<th>Contract Size</th>
<th>Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P 500</td>
<td>Standard &amp; Poor’s 500 Index</td>
<td>$250 times the S&amp;P 500 index</td>
<td>Chicago Mercantile Exchange</td>
</tr>
<tr>
<td>Dow Jones Industrial (DJIA)</td>
<td></td>
<td>$10 times the Dow Jones Industrial Average</td>
<td>Chicago Board of Trade</td>
</tr>
<tr>
<td>S&amp;P Midcap 400</td>
<td>Index of 400 companies with mid-range market value</td>
<td>Chicago Mercantile Exchange</td>
<td></td>
</tr>
<tr>
<td>Russell 2000</td>
<td>Index of 2,000 medium-sized companies</td>
<td>$2,500 times the Russell 2000 Index</td>
<td>Chicago Mercantile Exchange</td>
</tr>
<tr>
<td>FTSE 100</td>
<td>Financial Times Stock Exchange Index of 100 (UK)</td>
<td>London International Financial Futures Exchange</td>
<td></td>
</tr>
<tr>
<td>CAC 40</td>
<td>Index of 40 of the largest French companies</td>
<td>Euros</td>
<td></td>
</tr>
<tr>
<td>Dan 30</td>
<td>Index of 30 of the largest German companies</td>
<td>Euros</td>
<td></td>
</tr>
<tr>
<td>DAX Euro STOXX 50</td>
<td>Value-weighted Index of 50 large stocks in Eurozone</td>
<td>Euros</td>
<td></td>
</tr>
</tbody>
</table>

Table 17.3 Correlations Among Major US Stock Market Indexes

<table>
<thead>
<tr>
<th></th>
<th>DJIA</th>
<th>NYSE</th>
<th>Nasdaq</th>
<th>S&amp;P 500</th>
<th>Russell 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>DJIA</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NYSE</td>
<td>0.931</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasdaq</td>
<td>0.839</td>
<td>0.825</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>0.957</td>
<td>0.973</td>
<td>0.899</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Russell 2000</td>
<td>0.758</td>
<td>0.837</td>
<td>0.815</td>
<td>0.823</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 17.2 Stock Index Futures

- 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

Creating Synthetic Stock Positions

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
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

Company B pays a fixed rate of 7.05% to the swap dealer in return for LIBOR. Company A receives 6.95% from the dealer in return for LIBOR. The swap dealer receives a cash flow each period equal to the difference between the two rates.