CHAPTER 10

INDEX FUTURES CONTRACTS

INTRODUCTION

Following the successful introduction of exchange rate futures contracts, numerous futures exchanges began to develop and introduce other futures contracts for financial products. One of the more successful groups of these contracts are futures contracts based on stock indexes. The first stock index contract was traded at the Kansas City Board of Trade (KCBOT) in 1982 and is based on the Value Line Index. However, the volume of trade in this contract remains small. The most well-known and well-traded contract is that based on the Standard and Poor's 500 Index (S&P 500). This contract is traded at the Chicago Mercantile Exchange (CME). Contracts are also traded on the Japanese Nikkei 225 Index and the NASDAQ 100 Index at the CME.

Interestingly, there was no futures contract on the most well-known stock index, the Dow Jones Industrial Average (DJIA), until recently. Dow Jones blocked the introduction of a futures contract based on this index by the Chicago Board of Trade (CBOT) because of a copyright disagreement. In response, the American Stock Exchange created the Major Market Index (MMI) and licenced use of the index to the CBOT. Dow Jones and the CBOT recently overcame their differences, and the exchange introduced a futures contract based on the DJIA in late 1997. In a related development, the MMI has been licensed to the CME. There is also a futures contract of the second most well-known stock index, the New York Stock Exchange Composite Index. But this contract is traded at the New York Futures Exchange (NYFE) and the volume also is small. Futures contracts on the stock indexes reported for most western European countries and many Far East countries are traded most often on the native futures exchanges. However, no stock index futures contract is as successful at the CME's S&P 500.

In addition to being based on stock indexes, futures contracts are based on other types of indexes. Examples include the Goldman-Saches Commodity Index (GSCI), the Municipal Bond Index, and the U.S. Dollar Index. The GSCI measures inflation in a basket of world traded commodities, the Muni Bond Index captures variation in interest rates in the municipal bond market, and the U.S. Dollar Index measures the strength of the dollar relative to a basket of world currencies. These indexes are not as popular as the stock indexes, but the mechanics are similar and many other index contracts will likely be introduced in the future. You are encouraged to dig into the principles of index contracts. Index based contracts have very strong advantages over traditional futures contracts in that there is no delivery. The contract is typically cash settled, and the derivation, modification, and reporting of index values are the responsibility of an organization other than the futures exchange.

There promises to be many changes in the futures contracts offered on different indexes. This is one area on which the exchanges and markets are unsettled. New contracts are being developed and introduced, and older once very favored contracts are losing trading volume. The remainder of this chapter will work examples with stock index futures contracts. The specifics of the contracts are not as important as the underlying concepts. Basically, hedgers using index futures contracts have or will have assets in a cash position the value of which they are interested in protecting. This problem is identical to that of a trader with assets in agricultural commodities, other physical commodities such as metals, or currencies. In this case, the assets are stocks, and the futures contract is not priced in the same units as is the cash asset.

DEFINITION OF VARIOUS COMMON INDEXES

Understanding the definition of a specific stock index is critical for understanding how to use the index in a hedging program. It is also important for just being informed about the developed economies and financial markets. Many different stock indexes are reported in the financial press and broadcast news. However, few people are familiar with the actual construction of the indexes.

First, a stock index is a weighted average of stock prices. In all indexes, a sample of stock prices is summed after each is weighted and then the total is weighted by a divisor.

$$Index = \frac{\sum_{i=1}^{Sample} Price_i \times Weight_i}{Divisor}$$

The index is a simple average if each price is given equal weight of one over the sample size and the divisor is set equal to one. The simple average can be converted to an index of base 100 if the divisor is the resulting simple average divided by 100. This time period then becomes the base period. If prices change, the index changes, and the index measures change relative to the base period. For example, suppose the weighted average share price in 1997 is \$35.00. We can create an index of 100 for that year by using 35/100 as the divisor.

$$Index_{1997} = (\$35/35) \times 100$$

Then, if in 1998 the weighted average share price is \$38.15, the index becomes 109 (\$38.15/35 × 100) and reflects the 9 percent appreciation in stock prices.

The factors that distinguish stock indexes from each other are the specific stocks in the sample and the choice of the weighting. The choice of stocks in an index is usually determined by location such as the country of origin or the exchange on which all of the stocks are traded. For example, the largest stock exchange in the world is the New

York Stock Exchange (NYSE), and the NYSE Composite Index summarizes the price of all stocks traded on that exchange. The index can then be further refined by grouping stocks of like industries, such as industrial, transportation, utility, or high-technology companies; by grouping stocks by the size of the underlying companies in the index, such as medium sized (midcaps) or small (small-caps) companies; or by grouping stocks by other company characteristics, such as growth or income-generating companies.

The second factor that determines what is measured by the index is the weighting procedure. There are in general two types of stock indexes, *value-weighted indexes and price-weighted indexes*. In a value-weighted index, the price of the stock affects the index based on the total amount of the stock issued. The more stock that a company has outstanding, the greater the impact the price of that stock has on the index. Changes in value-weighted indexes are largely due to price changes in stocks of large companies.

In a price-weighted index, the price of the stock affects the index based on the magnitude of that stock's price. The higher-priced the stock, the greater the impact the price of that stock has on the index. Changes in price-weighted indexes are largely due to price changes in stocks of companies with high prices.

Value-weighted indexes are most useful for traders with large stock portfolios. By definition, a large percentage of investor portfolios will hold stocks of companies that have issued a large amount of stock. Price-weighted indexes are useful to traders of more aggressive portfolios. High-performing stocks are always in demand and will usually be high priced. The S&P 500 and NYSE Composite indexes are value weighted. The DJIA, MMI, and Nikkei are price-weighted indexes.

The S&P 500 is the most widely used index in the U.S. finance industry. The index is constructed from the stock prices of 500 firms in a variety of industries. These stocks are some of the largest and commonly traded, and comprise about 75 percent of the volume of stocks traded on the NYSE. This is the reason for the popularity of the index. The contribution of each stock in the index is proportional to its value. The weight used for each stock price is the number of outstanding shares. Stocks with larger numbers of shares, and higher prices contribute more to the value of the index. The index is as follows:

$$S\&P\ 500\ Index_t = \frac{\sum_{i=1}^{500} Price_{it} \times Number_{it}}{Original\ Valuation} \times 10.$$

The Original Valuation was the average value of the price and share number combination of 500 stocks during the years 1941–43. The S&P 500 Index is based on that time period and would equal one without the additional multiplication by ten. The S&P 500 Index was close to 1,000 at the end of 1997. This implies that stock prices have appreciated 100-fold (1,000/10) since the early 1940s.

Every index must be adjusted from time to time. New companies are created, old companies go out of business, some companies merge with others, and single companies spin off divisions into separate companies. All of these may change the value of the index. Also, company actions such as stock splits, dividends, and the substitution of one type of stock for another may change the value of the index. The financial organizations that create and report various indexes modify the divisor following these changes to prevent the index from changing due to changes in the composition of stocks. The point of having the index is to communicate a composite of stock prices, not to have an index that is affected by the changing composition of firms in the index or by stock changes by individual firms. The method for doing this can be easily shown through an example.

Suppose Standard and Poors wants to remove a stock from the index that is trading at $25 per share and include a stock that is trading at $100 per share. An equal number of shares of both companies are being traded. Suppose the index is currently at 1,000 points. Removing a low-priced stock and substituting it with the same number of shares of a high-priced stock will increase the index. Suppose the new value would be 1,005. But the increase has nothing to do with changes in the market-value of stock prices, only the prices that S&P are reporting. To prevent this, S&P adjusts the divisor in the index. Suppose the divisor before the change was 0.955. The divisor is reduced the amount necessary so that the index is 1,000 before and after the change. The new divisor is derived from

$$\textit{Old Divisor} \times \textit{Old Index} \,/\, \textit{Index after Change} = \textit{New Divisor}$$

or for the example

$$0.955 \times 1000/1005 = 0.955 \times 0.995 = 0.950.$$

The new divisor is then used to calculate the index using current prices. The calculation will yield 1,000 based on current prices. The new divisor will also be used with prices observed in the future to calculate future values of the index. This will be done until the next change in the stocks in the index.

The New York Stock Exchange Composite Index is very similar to the S&P 500 Index. The NYSE Composite Index makes use of all of the stocks traded on the exchange. This is almost 1,800 stocks in late 1997. The index is also value weighted. We pose a question to you at this point. If the S&P 500 and the NYSE Composite Index are both value weighted and the S&P 500 are usually the 500 largest stocks on the NYSE, how correlated will percent changes in the two indexes be? Before we answer that, the following equation is used to construct the index:

$$\textit{NYSE Index}_t = \frac{\sum_{i=1}^{1800} \textit{Price}_{it} \times \textit{Number}_{it}}{\textit{Original Valuation}} \times 50.$$

The original valuation was based on all share prices as of 31 December 1965. The NYSE Composite Index was close to 500 at the end of 1997, so stock prices have appreciated 10-fold or 900 percent since December 31, 1965.

The answer: Percent changes in the NYSE Composite Index and the S&P 500 Index are very highly correlated. The correlation statistic is above 0.96. There are 1,200 more stocks in the NYSE Composite Index that are not in the S&P 500 Index, but these smaller stocks make up less than one-fifth of the value of stocks in the NYSE Composite Index. In fact, the value of stocks from less than 100 of the largest firms comprise more than 50 percent of the value of stocks traded on the NYSE. Any two value-weighted indexes that include the majority of the largest stocks will move together very closely.

The Dow Jones Industrial Average, Major Market Index, and Nikkei 225 Index are, as noted, price-weighted indexes. In a price-weighted index, the weight for each individual stock in the general formula above is set equal to one.

$$Index_t = \frac{\sum_{i=1}^{Sample} Price_{it}}{Divisor}$$

This implies that all stock prices are given equal weight in the index. The formulation makes the index easy to calculate but leads to potentially strange changes in the index. For example, a stock price that increases in price from $5 to $10 per share will have the same impact as an increase from $100 to $105 per share. Further, the $5 change in the price of a small company with a small number of stocks will have the same impact as that of a $5 change in the price of a large company with a large number of stocks.

As with the value-weighted index, the divisor is used to adjust the sum of the prices to account for stock splits and dividends. For example, suppose a company whose stock is trading at $200 per share offers a split to replace each share with four new shares. After the split, the stock should be valued at $50 per share. If this stock is in a price-weighted index, the index value will drop. The financial organization that calculates and reports the index will adjust the divisor upward so that the value of the index will be the same before and after the stock split. The same formula reported earlier for calculating a new divisor is used.

Price-weighted indexes such as the DJIA, MMI, and Nikkei are reported and used much like the value-weighted indexes such as the S&P 500 and NYSE Composite. However, you should remember the differences. The S&P 500 and the NYSE Composite Indexes are both broad-based indexes designed to capture overall movements in the stock market. Being value weighted, the two indexes mainly capture movements in the price of well-capitalized firms—those firms with large amounts of outstanding stocks. The DJIA is designed to capture price movements of stocks for firms categorized as industrial. MMI is designed to follow the DJIA, being constructed when Dow Jones was not interested in working with the CBOT in trading a futures contract based on the index. The MMI is comprised of 20 stocks whereas the DJIA is 30 stocks, and most of the stocks in the MMI are also in the DJIA. The Nikkei obviously captures conditions in the Japanese stock market. Although the Nikkei is not value-weighted, the index is comprised of 225 of the largest publicly traded companies in Japan. Stocks of smaller companies and stocks of specific industry segments tend to be more volatile than stocks of large well-capitalized companies and broader market segments. Therefore, indexes based on smaller companies and narrow market segments tend to be more volatile than more broad-based indexes. It is important to understand this idea when speculating or hedging with index futures. The next two sections will elaborate on this point.

> **It is easy to see why index futures are so widely watched and used. If you are holding a portfolio of stocks that at least roughly parallels the stocks in the Dow Jones Industrial Average, you can protect the value of that portfolio by going short in the futures index. Alternatively, you (or the manager of your retirement account) could spend some of the earnings to buy puts, perhaps even out-of-the money puts, to protect against a break in the stock market. Years ago, the only way to do that was to actually sell the stocks.**

INDEX TRADING EXAMPLES

Index contracts are perhaps the easiest contracts for which to construct trading examples. In the previous section, we discussed what and how the different indexes were constructed. Pricing of these contracts through the futures market is very simple. The value of a futures contract is the index multiplied by a specified dollar amount. For example, the S&P 500 Index futures contract is $250 multiplied by the index value. The Nikkei 225 Index futures contract is $5 multiplied by the index. The net return to the person trading the index is the value of the index change between the sell and the buy multiplied by the index price weight or

(Sell Index − Buy Index) × Index Price Weight = Net Return.

Table 10.1 presents an example of futures prices for different indexes as reported in the *Wall Street Journal* for 2 October 1997. And Table 10.2 presents a broader list of indexes traded at the exchanges in Chicago and New York. Let's work a couple of trading examples for clarity.

Suppose the current December S&P 500 contract is trading at 969.10. The trader thinks the contract is undervalued. He thinks that the actual index in December will be higher. The trader submits a buy order and takes a long position at 969.10. Suppose that after one month, the December contract is trading at 983.60. Believing that he has held the position long enough, he offsets the long position by selling the contract back. The net return for this S&P 500 example will be

(983.6 − 969.1) × $250 = $3,625.

The following is a second example using the index that summarizes the Japanese stock market. Suppose the December Nikkei 225 contract is currently trading at 17570. The trader thinks the contract is overvalued and that the actual index will be lower in December. The trader submits a sell order and takes a short position at 17570. Suppose, after two weeks, the December contract is trading at 17050. The trader believes the risk of holding the contract longer is not worth the potential reward. The short position is bought back. The net return to the trader is the change in the index multiplied by the index price weight which for the Nikkei 225 is

(17570 − 17050) × $5 = $2,600.

Index trading is very simple in terms of the mechanics of simple trades. You use direct long or short positions. *The subtlety in index trading is in understanding exactly what combination of stocks each index measures, how these stocks move together, and how the different indexes move together.* This is important for two reasons. First, for hedging, it is important to understand how changes in the value of a futures contract compare with changes in the value of different bundles of stocks. This is critical for determining how much to hedge and whether or not hedging will be effective. This is a lengthy topic and is discussed in the next section. Second, for speculators, the size of different index contracts are rather large and movements in the index can be substantial in terms of dollars given the size of the contract. Therefore, trading different spreads is an attractive alternative to a single long or short position. The remainder of this section presents some spread trade examples.

TABLE 10.1
Index Futures Contract Quotes on 2 October 1997

	Open	High	Low	Settle	Change
S&P 500 INDEX (CME) $500 × index					
Dec	964.75	969.70	961.10	969.10	+5.70
Mr98	973.00	979.50	971.80	979.45	+5.75
June	987.40	990.50	983.05	989.50	+5.75
Sept	—	—	—	1000.80	+5.75
Est vol 65,362; vol Wed 65,217; open int 188,136, -158					
Indx prelim High 960.46; Low 952.94; Close 960.46, +5.05					
NIKKEI 225 STOCK AVERAGE (CME) $5 × index					
Dec	17610	17610	17480	17570	–290
Est vol 601; vol Wed 857; open int 15,640, +178					
Indx prelim High 17875.52; Low 17415.18; Close 17455.04, +387.12					
NASDAQ 100 (CME) $100 × index					
Dec	1119.50	1127.00	1114.00	1126.50	+11.00
Mr98	1135.00	1142.25	1133.90	1142.25	+11.00
Est vol 1,863; vol Wed 3,111; open int 5,074, +179					
Indx prelim High 1113.51; Low 1102.05; Close 1112.89, +10.84					
GSCI (CME) $250 × nearby index					
Oct	200.60	204.00	199.50	203.70	+2.30
Nov	201.80	205.00	201.10	205.00	+2.50
Est vol 1,955; vol Wed 3,034; open int 23,364, +150					
Indx prelim High 204.24; Low 199.42; Close 203.91, +2.48					
U.S. DOLLAR INDEX (FINEX) 1,000 × USDX					
Dec	97.54	97.64	97.11	97.42	+.03
Mr98	—	—	—	97.28	+.03
Est vol 1,800; vol Wed 1,084; open int 9,709, +348					
Indx prelim High 97.80; Low 97.31; Close 97.64, +0.04					

Source: Wall Street Journal.

TABLE 10.2
Index Futures Contract Specifications

Index	Expiration Months	Size	Exchange
S&P 500 Index	Mar, June, Sep, Dec	$250 × index	CME
S&P 400 Midcap Index	Mar, June, Sep, Dec	$500 × index	CME
Major Market Index	Mar, June, Sep, Dec	$500 × index	CME
NASDAQ 100	Mar, June, Sep, Dec	$100 × index	CME
Dow Jones Industrial Avg	Mar, June, Sep, Dec	$10 × index	CBOT
Value Line Index	Mar, June, Sep, Dec	$500 × index	KCBOT
NYSE Composite	Mar, June, Sep, Dec	$500 × index	NYFE

Through 1997 much of the substantial gains in stock market indexes were realized due to increases in prices of large, well-capitalized firms. Small and medium-sized firms did not see the same gains. Suppose that early in the fall a speculator thinks that large stocks are overvalued relative to medium-sized firms. Therefore, the price of the midcap firms should gain relative to the large firms. *The trader buys three S&P Midcap 400 Index contracts and sells two S&P 500 Index contracts.* All three contracts expire the following March. The speculator trades three S&P Midcap 400 contracts for every two S&P 500 contracts because the first is roughly two-thirds the size of the second. The Midcap 400 index futures contract is valued at $500 multiplied by the index and the S&P 500 index futures contract is $250 multiplied by the index, but the Midcap 400 index is approximately one-third the number of the S&P index.

Suppose when the trades were initiated the S&P Midcap 400 futures contract was trading at 337.75 and the S&P 500 contract was at 979.45. Between the fall and spring of next year, the S&P Midcap 400 contract increases 3 percent to 347.88 and the S&P 500 contract increases 2.5 percent to 1003.94. The trader's intuition was correct, prices of midcap firms increased relative to large firms. Let's examine the trading returns. For the S&P Midcap 400, the return is

$$(347.88 - 337.75) \times \$500/\text{contract} \times 3 \text{ contracts} = \$15{,}195$$

and for the S&P 500 contract, the return is

$$(979.45 - 1003.94) \times \$250/\text{contract} \times 2 \text{ contracts} = -\$12{,}245$$

so the speculative strategy returns ($15,195 – $12,245) = $2,950. The two individual trades resulted in large returns and losses, but the combined strategy or spread had less risk.

For a second spread example, suppose a speculator examines the index prices for the S&P 500 contract associated with different expiration dates. The March contract is trading at 979.45 and the June contract is trading at 989.80. These index values imply that the market consensus is that the actual S&P 500 Index will appreciate slightly less than 1.1 percent between March and June. The speculator believes that the appreciation will be greater over this three-month period based on economic and business conditions that appear to be emerging and that the market consensus will change to reflect this before the March contract expires. The speculator sells the March contract and buys the June. Two months later, the March contract is trading at 924.45 and the June contract is at 945.26 when the speculator offsets the trades. The return to the March contract is

$$(979.45 - 924.45) \times \$250 = \$13{,}750$$

and the return to the June contract is

$$(945.26 - 989.80) \times \$250 = -\$11{,}135$$

so the net return is $2,615. Notice the market decreased substantially, but the differential between March and June increased. The change in the differential is what the speculator anticipated, and it does not matter that the overall market level also changed.

INDEX HEDGING EXAMPLES

The use of stock index futures contracts for hedging stock portfolios is not always as simple as the use of futures contracts for hedging grains, livestock, and other physical commodities. Rarely does a stock portfolio manager control a group of stocks that matches exactly with any reported index. This creates a type of basis risk, of course, not really different from that which users of grain sorghum face when they use corn to hedge sorghum or other types of feedgrain purchases. It is important that the hedger understand how changes in the value of different stock index futures contracts compare with changes in the value of stocks in the portfolio that the hedger manages. This is important for determining how many stock index futures contracts to trade and anticipating whether or not hedging will be effective in managing risk through protecting the value of the portfolio. This is the topic of this section, and we start with two examples to illustrate the problem.

Suppose there are two portfolio managers that work for a mutual fund company. Each person manages a portfolio of different types of stocks. One portfolio is comprised of high-technology computer-related firms and the other portfolio is comprised of utility and related companies. Both portfolios are valued at $50 million. In early October 1997, both managers are worried about the stock market being overvalued, stock prices falling, and the value of their portfolios decreasing. Both managers hedge their portfolios by selling S&P 500 Index futures. The December index is trading at 980. They each sell 204 contracts. This number of contracts protects each dollar of the cash position with a dollar in the futures position (980 × $250 per contract). Between early and late October, the December S&P 500 Index decreases 5 percent to 931 before the managers buy their contracts back and lift their hedges. However, the cash market position for the two portfolio managers is rather different. The high-technology portfolio is worth $46.875 million and the utility portfolio is worth $48.5 million. The futures position has made each manager $2.499 million. However, the high-technology portfolio manager has lost $3.125 million in value, while the utility portfolio manager has lost $1.5 million. The net position from the hedge of the high-technology portfolio manager is –$0.626 million and the net position of the utility portfolio manager is +$0.999 million. This hedge example is presented in Table 10.3.

The high-technology portfolio was underhedged and the utility portfolio was overhedged. The overall market index decreased 5 percent. However, the value of the high-technology portfolio decreased 6.25 percent, while the value of the utility portfolio decreased 3 percent. *All stocks and all portfolios do not mirror changes in the overall market index. Some stock values change more than the market index and some change less.* How do we construct a measure so that the proper level of hedging is followed?

The tool used is the same as that used to measure the variability in returns of different portfolios. Variability in returns is measured with a tool denoted as Beta. Beta (β) can be measured with the following linear model

$$IPPoR_t = \alpha + \beta \, MRoR_t + e_t$$

where $IPRoR_t$ denotes the individual portfolio rate of return for time t, $MRoR_t$ denotes the market rate of return for the same time period t, α and β are parameters to be estimated with the data, and e_t is the random unexplainable error. Data are selected to capture the desired time period for the rate of return. For example, we may be inter-

TABLE 10.3 Portfolio Hedging Example Where Managers Cover $1 in the Cash Market with $1 in the Futures Market

Date	Cash Market	Futures Market
High-Technology Portfolio		
October	Stock portfolio worth $50 million.	Sell 204 December futures contracts at 980 covering $49.98 million.
December	Stock portfolio worth $46.875 million.	Buy 204 December futures contracts at 931.
	–$3.125 million loss.	+$2.499 million gain.
	Portfolio and cash worth $49.374 million.	
Utility Portfolio		
October	Stock portfolio worth $50 million.	Sell 204 December futures contracts at 980 covering $49.98 million.
December	Stock portfolio worth $48.5 million.	Buy 102 December futures contracts at 931.
	–$1.5 million loss.	+$2.499 million gain.
	Portfolio and cash worth $50.999 million.	

ested in daily, monthly, or annual rates of return. This model is then estimated with linear regression. All commercial spreadsheet software will perform this exercise with the proper data.

The parameter β is the Beta of the portfolio. Beta measures the individual portfolio rate of return relative to the market rate of return. *If Beta equals 1 then the individual portfolio moves one-for-one with the market.* A 1 percent increase or decrease in the market rate of return will be matched by a 1 percent increase or decrease in the rate of return for the individual portfolio. In our earlier example, neither of the two portfolios had a Beta of 1. If Beta is less than 1, the rate of return for the individual portfolio is less variable than that of the market. For example, if the market return is +5 percent or –5 percent, the gain for the individual portfolio will be less than +5 percent or the loss will be less than –5 percent. If Beta is more than 1, the rate of return for the individual portfolio is greater than that of the market. For example, if the market return is +10 percent or –10 percent, the gain for the individual portfolio will be greater than +10 percent or the loss will be greater than –10 percent.

Different portfolios of stocks have different Betas. Some groups of stocks offer returns that are lower and more stable than the overall market—low-risk or low-Beta stocks, and some groups of stocks offer returns that are higher and more variable than the overall market—high-risk or high-Beta stocks. This is the problem experienced in earlier the hedge example. High-technology stocks are high-Beta stocks and utilities are low-Beta stocks. The high-technology portfolio decreased more than the S&P 500 future contract, and the utility portfolio decreased less than the futures contract. However, a second problem emerges in that we should not use the Beta from the model above to figure out how much to hedge. The Beta above measures the parallel movements between two *cash market* series. The individual portfolio cash value was compared to the overall spot or cash market index. Futures markets for different stock indexes are more variable than underlying spot market indexes. So, the portfolio manager needs to estimate Beta using futures prices of the market index. This model is

$$IPPoR_t = \alpha + \beta_{fm}\, FMRoR_t + e_t$$

where $FMRoR_t$ denotes the rate of return of the futures index for time period t, and α and β_{fm} are new parameters to be estimated with the data. The data must be more carefully selected. The time period should capture the length of the hedge. For example, the manager may be interested in hedging the portfolio for one day, one week, or one month. Again, this model is then estimated with linear regression.

Returning to our example, suppose the high-technology portfolio manager estimates the futures market Beta to be 1.25, and the utilities portfolio manager estimates the futures market Beta to be 0.6. These Beta estimates imply that the high-technology portfolio is 25 percent more variable than the futures market index and that the variability of the utility portfolio is only 60 percent of that of the futures index. The portfolio manager calculates the number of futures contracts necessary to cover the dollar value of the cash portfolio and multiplies that number by the futures market Beta or

$$\text{Number of Contracts} = (\text{Cash Portfolio Value / Futures Value Per Contract}) \times \beta_{fm}.$$

This adjusts the hedge position for the variability of the underlying cash portfolio. If the underlying portfolio is more variable than the futures index—Beta is greater than 1—the hedger need to trade more dollars of futures contracts than the value of the cash position. The high-technology portfolio manager will trade

$$255 \text{ contracts} = (\$50 \text{ million} / (980 \times \$250 \text{ per contract})) \times 1.25.$$

If the underlying portfolio is less variable than the futures index—Beta is less than 1—the hedger needs to trade fewer dollars of futures contracts than the value of the cash position. The utility portfolio manager will trade

$$122 \text{ contracts} = (\$50 \text{ million} / (980 \times \$250 \text{ per contract})) \times 0.6.$$

We can double-check these inferences with numbers from the example. Remember, the stock index futures contract decreases from 980 to 931. If the high-technology manager trades 255 contracts, this will generate a \$3.124 million gain in futures to offset the \$3.125 million loss in the value of the portfolio. Likewise, if the utility portfolio manager trades 122 contracts, this will generate a \$1.4945 million gain in futures to offset the \$1.5 million loss in the value of the portfolio. The hedge example is reworked in Table 10.4.

Now, the portfolios are hedged such that the changes in the value of groups of stocks more closely match the change in the value of the futures position. The futures gains and the cash market losses do not offset each other perfectly because each futures contract is worth approximately one-quarter million dollars of stocks. Thus, the gains and losses can easily be incorrect by this figure.

There is a second reason that the hedge examples may not work as perfectly in practice. *This is because of basis error and basis risk*. However, basis error and basis

TABLE 10.4
Portfolio Hedging Example Where Managers Cover a 1% Change in the Cash Position Value with Sufficient Contracts to Net a 1% Change in the Futures Position Value

Date	Cash Market	Futures Market
High-Technology Portfolio		
October	Stock portfolio worth $50 million.	Sell 255 December futures contracts at 980 covering $62.495 million.
December	Stock portfolio worth $46.875 million.	Buy 255 December futures contracts at 931.
	–$3.125 million loss.	+$3.136 million gain.
	Portfolio and cash worth $49.999 million.	
Utility Portfolio		
October	Stock portfolio worth $50 million.	Sell 122 December futures contracts at 980 covering $29.98 million.
December	Stock portfolio worth $48.5 million.	Buy 122 December futures contracts at 931.
	–$1.5 million loss.	+$1.4945 million gain.
	Portfolio and cash worth $49.9945 million.	

risk are measured differently for stock and other indexes. We used the tool Beta to measure the proper balance between cash and futures positions. For example, the high-technology portfolio is on average 25 percent more variable than the futures market index (average Beta of 1.25), and the utility portfolio is on average 40 percent less variable than the futures index (average Beta of 0.6). Thus, to protect their respective positions the two portfolio managers will hedge 125 percent and 60 percent of their cash positions. But the key thing to recognize is that the Beta measures *average variability*. There is no guarantee that the changes in the portfolio relative to the futures index will match the estimated Beta for *any one hedge*. Returning to our example, suppose the high-technology portfolio actually decreases 30 percent more than the index (actual Beta of 1.30), and the utility portfolio decreases 45 percent less than the index (actual Beta of 0.55). This example is presented in Table 10.5. This is the equivalent of basis risk for the index trader.

In addition to calculating the futures market Beta using the S&P 500 Index futures contract, the portfolio managers would be wise to compare the rates of return of their individual portfolios to other futures market indexes. For example, the manager may wish to compare returns to the individual portfolio to returns from the Value Line Index, the Nikkei, or the index from a European stock market. A model with a more precise estimate of Beta, one with a lower standard error, suggests that contract is a more effective hedging vehicle and that basis risk is lower. This would likely be the case for a portfolio that was comprised of small company stocks or stocks of Far East or European companies.

It may also make sense for the portfolio manager to make joint comparisons of the individual portfolio to several futures market indexes. Suppose the portfolio in question

TABLE 10.5 Portfolio Hedging Example with Basis Error and Where Managers Cover a 1% Change in the Cash Position Value with Sufficient Contracts to Net a 1% Change in the Futures Position Value

Date	Cash Market	Futures Market
	High-Technology Portfolio	
October	Stock portfolio worth $50 million.	Sell 255 December futures contracts at 980 covering $62.475 million.
December	Stock portfolio worth $46.75 million.	Buy 255 December futures contracts at 931.
	–$3.25 million loss.	+$3.124 million gain.
	Portfolio and cash worth $49.847 million.	
	Utility Portfolio	
October	Stock portfolio worth $50 million.	Sell 122 December futures contracts at 980 covering $29.98 million.
December	Stock portfolio worth $48.625 million.	Buy 122 December futures contracts at 931.
	–$1.375 million loss.	+$1.4945 million gain.
	Portfolio and cash worth $50.1195 million.	

is a combination of stocks from domestic and foreign companies. Then the most effective method of hedging may be to take positions in several futures contracts. The manager would examine the model

$$IPRoR_t = \alpha + \beta_{dfm}\, DFMRoR_t + \beta_{ffm}\, FFMRoR_t + e_t$$

where $DFMRoR_t$ denotes the rate of return of the domestic futures index for time period t, $FFMRoR_t$ denotes the rate of return of the foreign futures index for time period t, and α, β_{dfm}, and β_{ffm} are parameters to be estimated with the data. β_{dfm} and β_{ffm} identify the proportion of domestic and foreign futures contracts to use relative to the size of the cash position.

The concepts and methods discussed in this section so far have focused on general stock index trading and hedging, and at first they may appear to be out of context for producers, marketers, and users of agricultural products. However, these tools can be useful to a manager of a publicly traded agribusiness company. Further, the concepts and tools are useful to any business involved with hedging, including the farm firm.

Stock index futures can be used to hedge the value of a publicly trading agribusiness. To the extent that changes in the stock price of an agribusiness parallel changes in one of the stock index futures, the value of this stock can be protected. Hedging the value of an individual stock is the same type of exercise as hedging the value of a portfolio of stocks. The parallel movement between individual stocks and a broader market index is known as *systematic risk*. The basis risk associated with this hedge will be rather large. Further, hedging with futures will not protect the stock value from poor management, bad decision making, and low profits. This is *unsystematic risk* and is specific to the firm. In this latter case, the stock price of the individual firm can decrease irrespective of changes in the market.

The futures market Beta is also a useful concept and tool for any hedger. The idea it communicates is that the hedger is interested in protecting the potential change in the value of a cash position *with the proper proportion of futures contracts to the cash position so that losses in one market are offset by gains in the other*. It is unlikely that the manager of a stock portfolio can trade a futures contract that matches the content of his or her portfolio exactly. Rather, the manager trades a futures position that change in the dollar value comes close to matching the dollar value change in the cash position. The same concept can be applied to any commodity and is particularly useful for hedging commodities for which no futures markets exist. For example, no futures market exists for 450-pound calves, U.S. barley, grain sorghum, or feeder pigs. The CME feeder cattle contract, the corn or the Canadian barley contracts, and the live hog contract could be used, but it would require the hedger to know the proper futures-to-cash ratio. It requires knowledge of the proper number of futures contracts needed to protect the value of a cash position.

Let's work one more stock index hedge example. The example is summarized in Table 10.6. Suppose it is late October and the stock market decreased rather strongly the week before. However, unlike the decline in October 1987, many investors are viewing this as an opportunity to buy stocks. There are lines at many brokerage houses of customers wanting to place orders to buy actual stocks. In October 1987, the lines were of people wanting to sell. An astute portfolio manager would recognize that in a few days she will have new dollars with which to use to purchase stocks. However, the market seems to be rallying now and it may be bid up to precorrection levels before she has access to the new customer deposits. Anticipating the availability of $25 million in new funds within a week, the portfolio manager buys 105 December S&P 500 Index contracts at 950. One week later, the index and the December contract have increased 2.75 percent. The portfolio manager lifts the hedge, uses the $682,500 in futures gains to supplement the $25 million in new deposits, and makes stock purchases in the cash market which has continued to rally. This hedge essentially allows the portfolio manager to purchase stocks at prerally prices. It is exactly parallel to the anticipatory hedges used by grain exporting firms who expect China, for example, to buy wheat in the near future and the exporters want to "anticipate" that need by buying wheat futures now. The hedge as described would be effective if the manager is interested in purchasing a group of stocks with an overall Beta equal

TABLE 10.6
Anticipated Stock Purchase Hedge

Date	Cash Market	Futures Market
October	Stock portfolio cost $25 million.	Buy 105 December futures contracts at 950 covering $25 million.
November	Stock portfolio cost $25.6875 million.	Sell 105 December futures contracts at 976.
	−$0.6875 million loss.	+$0.6825 million gain.
	Portfolio cost $25.005 million.	

to 1. If the manager is interested in more volatile stocks, she will need to take a long position in the futures market greater than $25 million. If the manager is interested in less volatile stocks, she can take a long position in the futures market less than $25 million and still have an effective hedge. Note that the Beta level is important in each case.

A "matching" problem here is present in many hedge situations. The issue is definitely there in many agricultural applications. An example is the cattle feeder needing long hedges on lightweight feeder cattle and short hedges on the much heavier fed cattle he sells.

INDEX PRICING MODELS

This section presents a model that explains the rationale for different anticipated stock index values for contracts deliverable at different times in the future. For example, if it is currently October, what is the main economic reason for the futures contract that expires in December to be different from the contract that expires in March? This model examines the basis relationship that can be expected between the futures contract index value and the actual cash market index for hedges that are lifted prior to the expiration month. If a stock index hedge is lifted in October and the December contract is used in the hedge, what is the expected difference between futures and cash index?

The model is a slightly more complex version of that used to explain the difference in prices of two exchange rate contracts. The model is again based on the cost of carry. The futures price for any financial instrument will equal the spot price plus the cost of carrying the instrument to the delivery date. However, in this case, stocks pay dividends and the dividend plus interest on the dividend after its payment can be used to offset the carrying costs. In equation form,

$$F_{t,T} = S_1 (1 + C_{t,T}) - \sum_{i=1}^{N} D_i (1 + R_{s,T})$$

where $F_{t,T}$ is the futures price of the stock index at time t of a contract that expires at time T, S_t is the spot index in time t, $C_{t,T}$ is the cost-of-carry portfolio from t to T, D_i is the dividend on the ith stock of which there are N, and $R_{s,T}$ is the interest earned on the dividend from the time of its receipt s until T. The cost-of-carry equation can be rewritten as follows if the cost of carry is a percentage:

$$F_{t,T} = S_t (1 + r)^{T-t} - \sum_{i=1}^{N} D_i (1 + r)^{T-s}$$

where r is an annual interest rate, $T - t$ represents the length of time the instrument is held, and $T - s$ is the amount of time after the dividend is paid. For example, if the portfolio of 20 stocks costs the purchaser $1,000, the cost of carry and return on the dividend are 10 percent, the portfolio is held 12 months, and a $0.50 dividend is paid on all stocks after six months, then the future price of the portfolio will be

$$\$1{,}000\,(1 + 0.10)^1 - \$10\,(1 + 0.10)^{0.5} = \$1{,}089.51$$

in the long run. This long-run price of this portfolio will be factored into the futures price of the index.

Increases in the interest rate increase the opportunity cost of holding stocks and attracting investment capital away from the stock market, and current stock prices depreciate relative to future stock prices. Increases in dividends decrease the opportunity cost of holding stocks, thus attracting investment capital into the stock market, which causes current stock prices to appreciate relative to futures stock prices.

Further, as the futures contract approaches expiration, as t approaches T, the carry cost shrinks to zero, there is no opportunity for a dividend, and the spot price and the futures price converge.

$$F_{T,T} = S_T$$

The premium between the current value of the index and the futures price of the index, or between a nearby and a distant futures contract will reflect the anticipated growth in stock prices. In a properly functioning economy, we expect the economy to grow and stocks to appreciate in value. Thus, futures contracts for these future periods should reflect the anticipated appreciation and the anticipated stock index level at expiration. However, the link between the future value of the index and the current value is created by expected dividends and the opportunity cost of investment capital, and investors responding to these incentives will determine the premium over time. This is a very long-run concept, however. In the short run, stock prices appear to be influenced quite a bit by expectations and other factors. This is the topic of the next section.

INDEX FUNDAMENTALS

Stock index fundamentals are not as complex as those for currencies but are more complicated than fundamentals for some physical commodities. There are simply few good supply and demand models that will predict stock index levels. This is not to say there are no good methods for valuing stocks. There are disciplines in finance and accounting centered around stock and company valuation. However, the models appear to lose their explanatory power as stocks are aggregated into broader market or categorical indexes. In this section we do not address valuation of individual stocks. The reader interested in this topic should consult one of the numerous finance texts on the topic. Rather, we attempt to provide some insight into the behavior of broader market indexes.

Understanding stock index levels and changes in those levels requires some knowledge of macroeconomics and the operation of an economy. However, stocks are also speculative vehicles so that opportunity costs and expectations impact prices. Thus, stock prices, like currencies, behave much like any other commodity in that price is determined by the interaction and balance of supply and demand. If the demand for stocks increases, prices will increase. If the demand for stocks decrease, prices will decrease.

In the long run, stock price levels and the respective market indexes are determined by macroeconomic forces and equilibrium investment relationships. Economies are rather closed systems. Spending by consumers on goods and services goes to the firms providing those goods and services. That spending pays for the cost of resources used, production costs, management, and other services, and the remainder is returned to the owners of the firm or the stockholders. Wealth does not escape the system unless it is wasted, and supply and demand are linked in this system. Resources are the source of the wealth created, demand for goods and services creates spending, providers of the goods and services earn the spending, and the system grows through this multiplier effect. The economy grows through the consumption of resources, investment in provision of goods and services, and increases in productivity. In the long run, stock prices reflect the growth and productivity of the economy.

Stock prices should reflect the returns to investment in the provision of goods and services to the economy. Thus, stock prices reflect the sum of discounted future dividends paid by firms. The discount rate applied to the dividend stream is the opportunity cost of investing in businesses. In addition to purchasing stocks, investors could lend money directly to firms through the debt market. Investors can also lend money to the government. The profile of investment opportunities contains choices of various riskiness. There are high risk and low risk stock ventures, and high and low risk debt ventures with government debt offering a riskless rate of return. Investors evaluate this profile.

Productivity and growth in the economy will result in increased dividends. This will make stocks attractive relative to debt instruments and will increase the overall market index as investors make purchases. Statistics that capture dividend payments and that are frequently reported are the *price-to-earnings ratios*. This statistic is the individual stock price relative to previous dividends and is widely reported in the financial press. Increases in interest rates, primarily through actions by the central bank, will make debt instruments attractive relative to stocks but will require stock to earn higher rates of return in the long run. *Thus, changes in interest rates by the central bank often have profound effects on stock prices and stock market indexes.* Anticipating changes in interest rates by the Federal Reserve System is a major endeavor by financial institutions, and interest rate deliberations are kept secret because of this. Current monetary policy is to use interest rate control to maintain low inflation rates. Anticipating changes in the central bank rate thus involves anticipating changes in inflation.

An equation that is used as a base to stock price valuation is as follows

$$S_t = [E(S_T) + \sum_{t=1}^{T} D_t (1 + r)^t] \frac{1}{(1 + r)^T}$$

where S_t is the current stock price, $E(S_T)$ is the expected stock price T periods in the future, D_t is the dividend paid during time t, and r is the interest rate. We see that the current stock price is the expected future stock price plus discounted dividends, the total of which is discounted back to the current time period. If the investor does not intend to sell the stock in the future, then there is no expected future stock price and T gets very large in the formula. From this formula, we see the importance of dividends and the interest rate for long-term stock valuation. However, in the short term, expectations play a very important role.

If investors purchase stocks with the specific expectation of selling them at a higher price, or if investors short sell stocks with expectations of purchasing them back at lower prices, this can create speculative bubbles like those observed in the price history of a stock or index. Investors buy because they think stock prices are going higher. The act of purchasing pushes stock prices higher and the expectation is realized and reinforced. Investors usually continue to push stock prices higher. The follow-the-herd psychology so prevalent in the commodity markets is also present in the stock market and stock index futures market. *The conclusion that can be drawn here is that technical analysis should be an effective tool for timing purchases and sales.* Or, at least, technical analysis should be more effective than following emotional instincts.

The importance of expectations in determining trading patterns and influencing prices is recognized in the use of circuit breakers. If stock market indexes or futures on the indexes move down excessively, stock market and futures exchanges have policies in place to close trading for short periods of time. The Federal Reserve System can also suspend trading. Those familiar with futures markets will recognize these as limit moves and may remember trading being closed or sharply constrained following a limit move.

The performance of the stock market and various indexes through 1997 deserve discussion. The market has made substantial gains through this time. Some indexes are registering 20 percent to 30 percent returns over the previous year and price-to-earnings ratios are at or near all-time highs. High price-to-earnings ratios are not good. It implies investors have paid a lot for stocks and that dividends have not increased at the same pace. There has been considerable discussion about whether these growth rates, and in fact whether these price levels, are sustainable. The market corrected hard in October 1987, decreasing 15 percent to 18 percent, but the correction was very short lived. What do the fundamentals tell us? The picture is not clear. There are credible models and research that suggest the current price-to-earnings ratios cannot be maintained and that earnings will not increase. Rather, the future holds a real price depreciation—nominal stock prices will fall or will increase in price slower than the inflation rate. There is much discussion about a new economy, usually related to improved productivity through computers and management consolidation. The discussion also ties in an increasingly global economy and the benefits of international trade. However, while the discussion sounds good, the scientific evidence of even something that should be easy to measure, such as improved productivity through increased use of computers, is very hard to find. And yet the stock market continues to appreciate in the face of this evidence.

A point that does not receive as much discussion is the change in the investment behavior of the average household. Governments are trying to reduce their responsibility for providing retirement funds to citizens. In response, more households are investing in stocks—either directly or through organized mutual funds—in response to these incentives. This would improve demand for stocks and put buying pressure on the market. The improved demand for stocks is especially apparent given low interest rates and returns to debt instruments. This ties the stock market behavior back to the equations presented earlier that link stock index price through time to opportunity costs. And we should remember the discussion about speculative bubbles.

The long-term factors that influence stock prices and market indexes are productivity and economic growth. Changes in dividend returns and in long-term interest rates are the primary determinants of long-term changes in stock prices. Interest rate actions by central banks and investor expectations are the primary determinants of short-term changes in stock prices. The psychology of the market is there just as it is in commodity markets, and it would be hard to convince you that what happens in the stock market will not be a factor in what it does

tomorrow. If that day-to-day dependence is there, then all the technical tools discussed in prior chapters will help you in buying and selling stocks or in using stock index futures.

SUMMARY

Stock indexes seem to have become of a part of our daily lives. More indexes are watched and are widely reported. Their increasing importance is probably because we are taking more of a responsibility for providing for ourselves in retirement years. This increased interest could also be because of the recent astounding growth in the various indexes. In any case, indexes are used as an indicator of the well-being of the economy. *The futures contracts for the various indexes seem to be going through more of a period of change than growth.* There are booms and busts in popularity and contracts are rewritten to attract more volume. The lackluster interest may change if the market succumbs to a reversal in fortune—or at least a slower growth. These instruments can be important risk management tools for the growing wealth amassed in mutual funds.

In addition to stock indexes, several other indexes track inflation, bond prices, and the U.S. dollar. The concept of an index is very popular with futures exchange management, and more indexes will likely be traded in the future.

With the variety of indexes available, it is important for the trader to be aware of what the index measures. *All indexes are a composite measure of price level.* The prices are for publicly traded stocks in the various stock indexes. Stock indexes, and indexes in general, are value weighted or price weighted. Value weighting implies that the index is a weighted average of prices, where each price is weighted by the number of shares issued by the company. Price-weighted indexes are simple averages. Price-weighted indexes are most affected by changes in the price of high-priced stocks. The S&P 500 Index and NYSE Composite Index are value weighted. The DJIA and Nikkei 225 are price weighted.

The index also depends on the prices in the sample. A variety of indexes are available and being considered for trade, and they differ mainly by what stocks go into the sample. There are stock indexes futures now for midcap firms (medium sized), small firms, and growth firms. Indexes are also available for trade in most western European and Asian futures exchanges.

Indexes are simple to trade. The value of a position is the index multiplied by a dollar amount. The gain or loss on the trade is the difference between the level of the index at the sell point versus the buying point, times this amount. Trading these indexes could be very useful to people with portfolios of stocks, the value of which they wish to protect.

However, *hedging is not so simple. Any individual index will not likely match the combination of stocks in a specific trader's portfolio.* It is unlikely that a 1 percent change in the value of a trader's stock portfolio will be matched by a 1 percent change in the stock index or futures contracts on the index. There are portfolios that are more variable than the market index, higher risk portfolios, and portfolios that are less variable, low risk portfolios. The trader must understand the degree to which changes in the value of the portfolio move in parallel with changes in various indexes.

Currently, traders use the tool "Beta" to measure the degree with which their portfolios follow the market index. A similar futures market Beta must be calculated to measure the degree to which changes in the value of the portfolio follows changes in the value of the futures index. This futures market Beta measures the futures position as a percent of the cash position that should be traded to completely hedge the portfolio. For example, if the futures market Beta is 0.75, that suggests the trader should sell futures contracts worth 75 percent of the value of the cash portfolio. Likewise, a futures market Beta of 1.25 suggests establishing a futures position of 125 percent of the value of the cash position.

There is little basis risk in the stock index market. The buying and selling in the futures market pushes the value of the futures contract very close to the index in the expiration month. However, only four index futures contracts are traded for any particular calendar and there will be differences between the cash and futures index for nonexpiration months. This difference in predictable. The futures contract value is the value of the index that is anticipated in the expiration month. Therefore, a trader can work backwards in time to determine nonexpiration-month levels of the index given estimates of the rate of appreciation of the index.

The fundamental economic factors that affect the value of different stock indexes are well rehearsed. Stock prices reflect the market consensus of the well-being of the economy. A strong and growing economy creates wealth, and this prospect is priced into the value of capital assets. However, the stock market also reacts strongly to opportunity costs of investment. If returns to other capital assets are low, such as debt instruments and their respective interest rates, investors will tend to bid aggressively for stocks. This market is also subject to the psychological factors that overprice and underprice other commodities. Some market conditions are common regardless of the product traded.

Futures contracts for stock indexes, and indeed indexes for other assets as well, will likely continue to grow in importance. And these futures will also likely continue to change. *Contracts will be designed, written, and rewritten to help asset holders manage risk and attract speculative capital.*

KEY POINTS

- *Futures contracts on stock indexes* are some of the *most important financial futures contracts*. Further, there are futures contracts based on other indexes which measure other dimensions of risk and performance in the economy.
- The futures industry is on the verge of *a proliferation of stock index contracts*. New indexes are emerging that summarize the performance of different industry groups within the U.S. domestic stock markets and *indexes for stock markets in various foreign countries*.
- The contracts can be used by portfolio managers to *insulate the value of their portfolios* from changes in the market. This includes gains as well as losses.
- Indexes are *simple to trade*. The value of a position is the *index multiplied by a dollar amount*. The gain or loss on the trade is the difference between the level of the index at the sell point versus the buying point, times this dollar amount.
- Hedging is more complex. A *futures market Beta* must be calculated to measure the degree to which changes in the value of the portfolio *follow changes in the value of the index*. This futures market Beta measures the futures position as a percent of the cash position that should be traded to completely hedge the portfolio.

- *Little basis risk* exists in the stock index market in expiration months. Further, the difference between the cash and futures index for nonexpiration months is *relatively predictable*. The futures contract value is the value of the index that is anticipated in the expiration month.
- The *fundamental economic factors* that affect the value of different stock indexes reflect the well-being of the economy. However, the stock market also *reacts strongly to opportunity costs of investment in interest-bearing debt instruments*. If *interest rates are low*, then *stock prices tend* to *be high*. This market is also subject to the *psychological factors* that make technical analysis useful.
- Stock indexes futures contracts *will continue to grow in importance* and will *continue to change to attract traders*.

USEFUL REFERENCES

Steven C. Blank, Colin A. Carter, and Brian H. Schmiesing, *Futures and Options Markets: Trading in Financials and Commodities*, Prentice-Hall, Englewood Cliffs, NJ, 1991. Good intermediate text with coverage of financial futures. Good coverage of interest rate futures.

Robert T. Daigler, *Managing Risk with Financial Futures: Pricing, Hedging and Arbitrage*, Probus Publishing Company, Chicago, IL, 1993. A solid and comprehensive text with many examples. The author is presenting many research results. Very useful for interest rate, stock index, and exchange rate examples.

Robert E. Fink and Robert B. Feduniak, *Futures Trading: Concepts and Examples,* New York Institute of Finance, New York, 1988. A good basic introduction to financial futures.

John C. Hull, *Introduction to Futures and Options Markets*, 3rd ed., Prentice Hall, Upper Saddle River, NJ, 1998. An introduction to the mathematics of financial futures.

Robert W. Kolb, *The Financial Futures Primer*, Blackwell Publishers, Malden, MA, 1997. An excellent introduction to financial futures. Many trading examples are presented. Some of the important subtleties of financial futures are also discussed.

Paul Krugman, *The Age of Diminished Expectations*, 3rd ed., The MIT Press, Cambridge, MA, 1994. An excellent book that discusses current topics of issue for the U.S. and world economy. The text is very useful for understanding the reactions of exchange rate, stock index, and interest rate markets.

Raymond M. Leuthold, Joan C. Junkus, and Jean E. Cordier, *The Theory and Practice of Futures Markets*, Lexington Books, Lexington, MA, 1989. A more advanced treatment of futures and hedging. Extensive focus on interest rate, stock index, and exchange rate futures.

Charles W. Smithson and Clifford W. Smith, Jr., with D. Sykes Wilford, *Managing Financial Risk: A Guide to Derivative Products, Financial Engineering, and Value Maximization*, Irwin Professional Publishing, Chicago, 1995. A fairly simple treatment of more advanced financial management topics. The focus is mainly on options and derivative pricing with interest rate, stock index, and exchange rate examples.