CHAPTER 34

Valuing Futures and Forward Contracts

A futures contract is a contract between two parties to exchange assets or services at a specified time in the future at a price agreed on at the time of the contract. In most conventionally traded futures contracts, one party agrees to deliver a commodity or security at some time in the future, in return for an agreement from the other party to pay an agreed-on price on delivery. The former is the seller of the futures contract, while the latter is the buyer.

This chapter explores the pricing of futures contracts on a number of different assets—perishable commodities, storable commodities, and financial assets—by setting up the basic arbitrage relationship between the futures contract and the underlying asset. It also examines the effects of transactions costs and trading restrictions on this relationship and on futures prices. Finally, the chapter reviews some of the evidence on the pricing of futures contracts.

FUTURES, FORWARD, AND OPTION CONTRACTS

Futures, forward, and option contracts are all viewed as derivative contracts because they derive their value from an underlying asset. There are, however, some key differences in the workings of these contracts.

How a Futures Contract Works

There are two parties to every futures contract: the seller of the contract, who agrees to deliver the asset at the specified time in the future, and the buyer of the contract, who agrees to pay a fixed price and take delivery of the asset. (See Figure 34.1.)

While a futures contract may be used by a buyer or seller to hedge other positions in the same asset, price changes in the asset after the futures contract agreement is made provide gains to one party at the expense of the other. If the price of the underlying asset increases after the agreement is made, the buyer gains at the expense of the seller. If the price of the asset drops, the seller gains at the expense of the buyer.

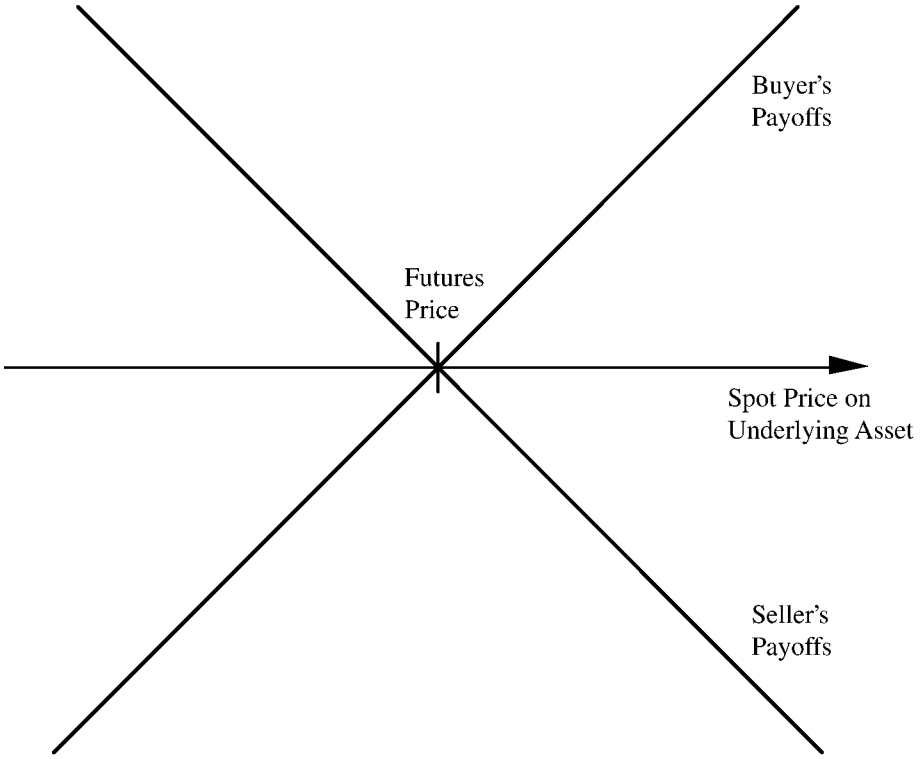


FIGURE 34.1 Cash Flows on Futures Contracts

Futures versus Forward Contracts

While futures and forward contracts are similar in terms of their final results, a forward contract does not require that the parties to the contract settle up until the expiration of the contract. Settling up usually involves the loser (i.e., the party that guessed wrong on the direction of the price) paying the winner the difference between the contract price and the actual price. In a futures contract, the differences are settled every period, with the winner's account being credited with the difference, while the loser's account is reduced. This process is called marking to the market. While the net settlement is the same under the two approaches, the timing of the settlements is different and can lead to different prices for the two types of contracts. The difference is illustrated in the following example, using a futures contract in gold.

ILLUSTRATION 34.1: Futures versus Forward Contracts: Gold Futures Contract

Assume that the three-period futures contract on gold has a price of $415. The following table summarizes the cash flow (CF) to the buyer and seller of this contract on a futures and forward contract over the next three time periods, as the price of gold changes over the next three periods.

Time Period	*Gold Price*	*Buyer's CF: Forward*	*Seller's CF Forward*	*Buyer's CF: Futures*	*Seller's CF: Futures*
1	$420	$ 0	$ 0	$ 5	–$ 5
2	$430	$ 0	$ 0	$10	–$10
3	$425	$10	–$10	–$ 5	$ 5
Net		$10	–$10	$10	–$10

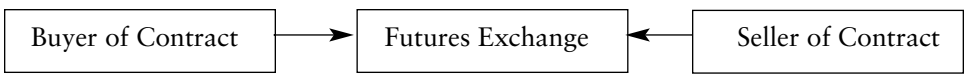
The net cash flow from the seller to the buyer if $10 in both cases, but the timing of the cash flows is different. On the forward contract, the settlement occurs at maturity. On the futures contract, the profits or losses are recorded each period.

Futures and Forward Contracts versus Option Contracts

While the difference between a futures and a forward contract may be subtle, the difference between these contracts and option contracts is much greater. In an options contract, the buyer is not obligated to fulfill his or her side of the bargain, which is to buy the asset at the agreed-on strike price in the case of a call option and to sell the asset at the strike price in the case of a put option. Consequently, the buyer of an option will exercise the option only if it is in his or her best interest to do so (i.e., if the asset price exceeds the strike price in a call option and vice versa in a put option). The buyer of the option, of course, pays for this privilege up front. In a futures contract, both the buyer and the seller are obligated to fulfill their sides of the agreement. Consequently, the buyer does not gain an advantage over the seller and should not have to pay an up-front price for the futures contract itself. Figure 34.2 summarizes in a payoff diagram the differences in payoffs on the two types of contracts to a buyer.

TRADED FUTURES CONTRACTS—INSTITUTIONAL DETAILS

A futures contract is an agreement between two parties. In a traded futures contract, an exchange acts as an intermediary and guarantor, and also standardizes and regulates how the contract is created and traded.



This section will examine some of the institutional features of traded futures contracts.

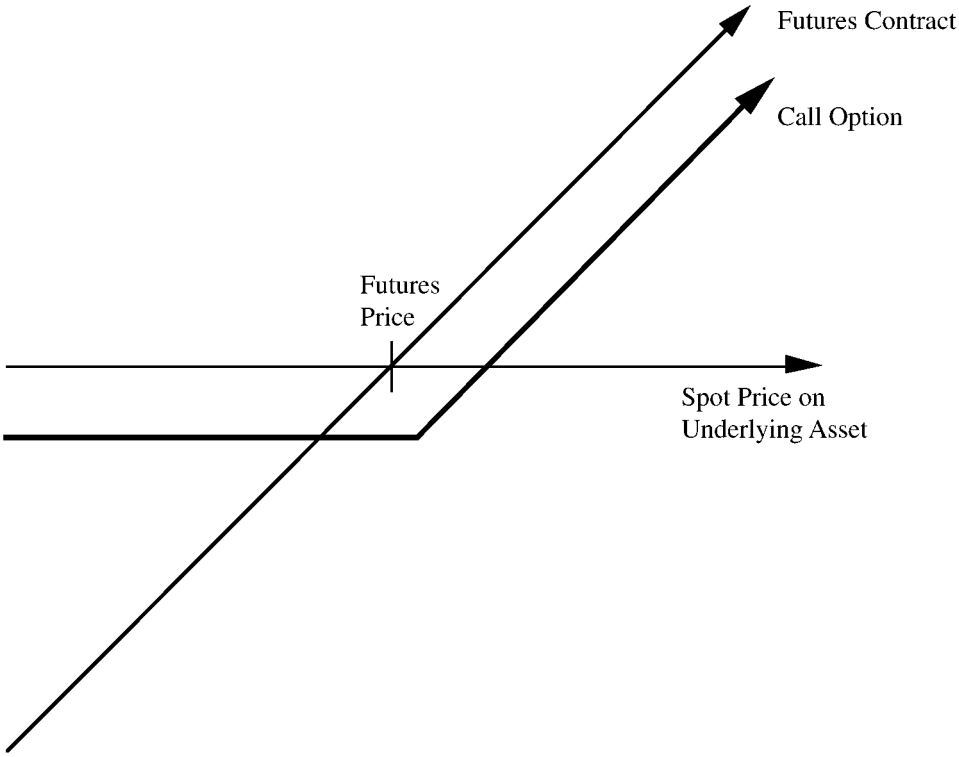


FIGURE 34.2 Buying a Futures Contract versus Buying a Call Option

Standardization

Traded futures contracts are standardized to ensure that contracts can be easily traded and priced. The standardization occurs at a number of levels:

- *Asset quality and description.* The type of asset that can be covered by the contract is clearly defined. For instance, a crude oil contract traded on the New York Mercantile Exchange requires the delivery of specific domestic crude oil with 0.42 percent sulfur or less. A Treasury bond futures contract traded on the Chicago Board of Trade (CBOT) requires the delivery of bonds with a face value of $100,000 with a maturity of greater than 15 years.[1]

[1]The reason the exchange allows equivalents is to prevent investors from buying a significant portion of the specified Treasury bonds and cornering the market.

- *Asset quantity.* Each traded futures contract on an asset provides for the delivery of a specified quantity of the asset. For instance, a gold futures contract traded on the Chicago Board of Trade requires the delivery of 100 ounces of gold at the contract's expiration.

The purpose of the standardization is to ensure that the futures contracts on an asset are perfect substitutes for each other. This allows for liquidity and also allows parties to a futures contract to get out of positions easily.

Price Limits

Futures exchanges generally impose price movement limits on most futures contracts. For instance, the daily price movement limit on orange juice futures contract on the New York Board of Trade is 5 cents per pound or $750 per contract (which covers 15,000 pounds). If the price of the contract drops or increases by the amount of the price limit, trading is generally suspended for the day, though the exchange reserves the discretion to reopen trading in the contract later in the day. The rationale for introducing price limits is to prevent panic buying and selling on an asset based on faulty information or rumors, and to prevent overreaction to real information. If investors are allowed more time to react to extreme information, it is argued, the price reaction will be more rational and reasoned.

Margin Requirements for Trading

In a futures agreement, there is no payment made by the buyer to the seller, nor does the seller have to show proof of physical ownership of the asset at the time of the agreement. In order to ensure, however, that the parties to the futures contract fulfill their sides of the agreement, they are required to deposit funds in a margin account. The amount that has to be deposited at the time of the contract is called the initial margin. As prices move subsequently, the contracts are marked to market, and the profits or losses are posted to the investor's account. The investor is allowed to withdraw any funds in the margin account in excess of the initial margin. Table 34.1 summarizes price limits and contract specifications for many traded futures contracts as of June 2001.

If the investor has a string of losses because of adverse price movements, his or her margin will decrease. To ensure that there are always funds in the account, the investor is expected to maintain a maintenance margin, which is generally lower than the initial margin. If the funds in the margin account fall below the maintenance margin, the investor will receive a margin call to replenish the funds in the account. These extra funds that have to be brought in is known as a variation margin. Maintenance margins can vary across contracts and even across different customers. Table 34.2, for instance, shows the relationship between maintenance and initial margins for a sampling of futures contracts from the Chicago Mercantile Exchange.

TABLE 34.1 Futures Contracts: Description, Price Limits, and Margins

Contract	Exchange	Specifications	Tick Value	Initial Margin / Contract	Daily Limit / Unit
		Softs			
Coffee	NYBOT	37,500 lbs.	$18.75/.05¢	$ 2,450	None
Sugar	NYBOT	112,000 lbs.	$11.20/.01¢	$ 840	None
Cocoa	NYBOT	10 metric tons	$10/1¢	$ 980	None
Cotton	NYBOT	50,000 lbs.	$ 5/.01¢	$ 1,000	3¢
Orange juice	NYBOT	15,000 lbs.	$ 7.50/.05¢	$ 700	5¢
		Metals			
Gold	NYMEX	100 troy oz.	$10/10¢	$ 1,350	$75
Kilo gold	CBOT	1 gross kgm.	$ 3.22/10¢	$ 473	$50
Silver	NYMEX	5,000 troy oz.	$25/.5¢	$ 1,350	$1.50
5,000 oz. silver	CBOT	5,000 troy oz.	$ 5/.1¢	$ 270	$1
Copper	NYMEX	25,000 lbs.	$12.50/.05¢	$ 4,050	$0.20
Platinum	NYMEX	50 troy oz.	$ 5/10¢	$ 2,160	$25
Palladium	NYMEX	100 troy oz.	$ 5/5¢	$67,500	None
		Energy			
Crude	NYMEX	1,000 barrels	$10/1¢	$ 3,375	$7.50 first
Unleaded	NYMEX	42,000 gallons	$ 4.20/.01¢	$ 3,375	20¢ first
Heating oil	NYMEX	42,000 gallons	$ 4.20/.01¢	$ 3,375	20¢ first
Natural gas	NYMEX	10,000 mm Btu	$10/.01¢	$ 4,725	$1
		Agriculture			
Live cattle	CME	40,000 lbs.	$10/2.5¢	$ 810	1.5¢
Feeder cattle	CME	50,000 lbs.	$12.50/2.5¢	$ 945	1.5¢
Lean hogs	CME	40,000 lbs.	$10/2.5¢	$ 999	2¢
Pork bellies	CME	40,000 lbs.	$10/2.5¢	$ 1,620	3¢
Lumber	CME	110,000 ft.	$11/10¢	$ 1,013	$10
		Currencies			
Eurocurrency	CME	125,000 euros	$12.50/.01¢	$ 2,349	400 ticks
Swiss franc	CME	125,000 Sfr	$12.50/.01¢	$ 1,755	400 ticks
Japanese yen	CME	12,500,000 yen	$12.50/.0001¢	$ 2,835	400 ticks
British pound	CME	62,500 Bp	$ 6.25/.02¢	$ 1,418	800 ticks
Canadian dollar	CME	100,000 C$	$10/.01¢	$ 608	400 ticks
Australian dollar	CME	100,000 A$	$10/.01¢	$ 1,215	400 ticks
Mexican peso	CME	500,000 pesos	$12.50/.0025¢	$ 2,500	2000 ticks
Dollar index	NYBOT	$1,000 times dollar index	$10/.01¢	$ 1,995	2 pts.
		Interest Rates			
T-bond	CBOT	$100,000 face value	$31.25/1/32	$ 2,363	None
T-note (10)	CBOT	$100,000 face value	$31.25/1/32	$ 1,620	None
T-note (5)	CBOT	$100,000 face value	$31.25/1/32	$ 1,080	None
Muni bond	CBOT	$1,000 times the closing value of The Bond Buyer™ 40 Index	$31.25/1/32	$ 1,350	None
MIDAM bond	MIDAM	$50,000 face value	$15.62/1/32	$ 878	3 pts.
T-bills	CME	$1,000,000	$25/.05¢	$ 540	None
Eurodollars	CME	$1,000,000	$25/.05¢	$ 810	None

(Continued)

TABLE 34.1 *(Continued)*

Contract	Exchange	Specifications	Tick Value	Initial Margin/ Contract	Daily Limit/ Unit
		Indexes			
S&P 500	CME	$250 times S&P 500 index	$25/.10 pts.	$21,563	None
NYSE index	NYBOT	$250 times S&P 500 index	$25/.05 pts.	$19,000	None
Nasdaq 100	CME	$100 times Nasdaq	$ 5/.05 pts.	$33,750	None
Mini Nasdaq	CME	$20 times Nasdaq	$10/.50 Pts.	$ 6,750	None
Mini S&P	CME	$50 times S&P 500 index	$12.50/.25 pts	$ 4,313	None
Dow Jones Futures	CBOT	$10 times Dow Jones index	$10/1 pt.	$ 6,750	None
Value Line	KCBT	$100 times Value Line index	$25/.05 pts.	$ 3,500	None
Nikkei	CME	$5 times Nikkei index	$25/5 pts.	$ 6,750	None
GSCI	CME	$250 times GSCI	$12.50/.05 pts.	$ 3,750	None
CRB	NYBOT		$25/.05 pts.	$ 1,500	None
		Grains			
Soybeans	CBOT	5,000 bushels	$12.50/.25¢	$ 945	50¢
Soymeal	CBOT	100 tons	$10/10¢	$ 810	$20
Bean oil	CBOT	60,000 lbs.	$ 6/.01¢	$ 473	2¢
Wheat	CBOT	5,000 bushels	$12.50/.25¢	$ 743	30¢
Corn	CBOT	5,000 bushels	$12.50/.25¢	$ 473	20¢
Oats	CBOT	50,00 bushels	$12.50/.25¢	$ 270	20¢

CBOT: Chicago Board of Trade.
KCBT: Kansas City Board of Trade.
NYBOT: New York Board of Trade.
NYMEX: New York Mercantile Exchange.
CME: Chicago Mercantile Exchange.
MIDAM: Mid American Exchange.

TABLE 34.2 Initial versus Maintenance Margins

Agriculture Group	Maintenance Margin (per Contract)	Initial Margin Markup Percentage	Initial Margin (per Contract)
Corn	$350	135%	$473
Oats	$200	135%	$270
Rough rice	$500	135%	$675
Soybeans	$700	135%	$945
Soybean meal	$600	135%	$810
Soybean oil	$350	135%	$473
Wheat	$550	135%	$743

ILLUSTRATION 34.2: Calculating Initial and Maintenance Margins

Assume that you buy 100 wheat futures contracts on the CME and that the spot price of wheat today is $3.15. Your initial margin can be computed based on the $743 per contract specified by the exchange:

$$\text{Initial margin} = \$743 \times 100 \text{ contracts} = \$74{,}300$$

Assume that the price of wheat drops to $3.14 per bushel tomorrow. The contract will be marked to market, resulting is a loss to you:

$$\begin{aligned}\text{Loss from marking to market} &= \text{Change in price} \times \text{Bushels per contract} \times \text{Number of contracts} \\ &= (\$3.15 - \$3.14) \times 5{,}000 \times 100 = \$5{,}000\end{aligned}$$

The equity in your account is now:

$$\text{Equity after marking to market} = \$74{,}300 - \$5{,}000 = \$69{,}300$$

You are still safely above the maintenance margin requirement, but a series of price drops can cause your equity to drop below the maintenance margin:

$$\text{Maintenance margin} = \$550 \times 100 = \$55{,}000$$

If you drop below this level, you will get a margin call. Failure to meet the margin call will result in the position being liquidated.

PRICE LIMITS: EFFECTS ON LIQUIDITY

The logic of price limits is that they act as a brake on the market and prevent panic buying or selling. Implicit in their use is the assumption that trading can sometimes exacerbate volatility and cause prices to swing to unjustifiably high or low levels. The problem with price limits, however, is that they do not discriminate between rational price movements (caused by shifts in the underlying demand or supply of a commodity) and irrational ones. Consequently, price limits can limit liquidity when investors need it the most and slow down the process of price adjustment.

An interesting way to frame the question on price limits is to ask whether you would be willing to pay more or less for an asset that has price limits associated with trading than for an asset without those price limits. The trade-off between lower volatility (from restrictions on trading) and less liquidity will determine how you answer the question.

PRICING OF FUTURES CONTRACTS

Most futures contracts can be priced on the basis of arbitrage: that is, a price or range of prices can be derived at which investors will not be able to create positions involving the futures contract and the underlying asset that make riskless profits with no initial investment. The following sections examine the pricing relationships for a number of futures contracts.

Perishable Commodities

Perishable commodities offer the exception to the rule that futures contracts are priced on the basis of arbitrage, since the commodity has to be storable for arbitrage to be feasible. On a perishable futures contract, the futures price will be influenced by:

- *Expected spot price of the underlying commodity.* If the spot price on the underlying commodity is expected to increase before the expiration of the futures contract, the futures prices will be greater than the current spot price of the commodity. If the spot price is expected to decrease, the futures price will be lower than the spot price.
- *Any risk premium associated taking the futures position.* Since there is a buyer and a seller on a futures contract, the size and the direction of the risk premium will be vary from case to case, and will depend on whether the buyer is viewed as providing a service to the seller or vice versa. In an agricultural futures contract, where farmers or producers are the primary sellers of futures contracts, and individual investors are the buyers, it can be argued that the latter are providing a service to the former, and thus should be rewarded. In this scenario, the futures price will be lower than the expected spot price.

$$\text{Futures price} = \text{Spot price} - \text{Expected risk premium}$$

In this type of relationship between futures and spot prices, prices are said to exhibit "normal backwardation."

In a futures contract, where buyers of the futures contract are industrial users (a good example would be Hershey's, a chocolate manufacturer, buying sugar futures to lock in favorable prices), and the sellers are individual investors, the buyers are being provided the service, and the sellers could demand a reward, leading to a risk premium that is positive. In this case, the futures price will be greater than the expected spot price, and futures prices are said to exhibit "normal contango."

In most modern commodity futures markets, neither sellers nor buyers are likely to be dominated by users or producers, and the net benefit can accrue to either buyers or sellers and there is no a priori reason to believe that risk premiums have to be positive or negative. In fact, if buyers and sellers are both speculating on the price, rather than hedging output or input needs, the net benefit can be zero, leading to a zero risk premium. In such a case the futures price should be equal to the expected spot price.

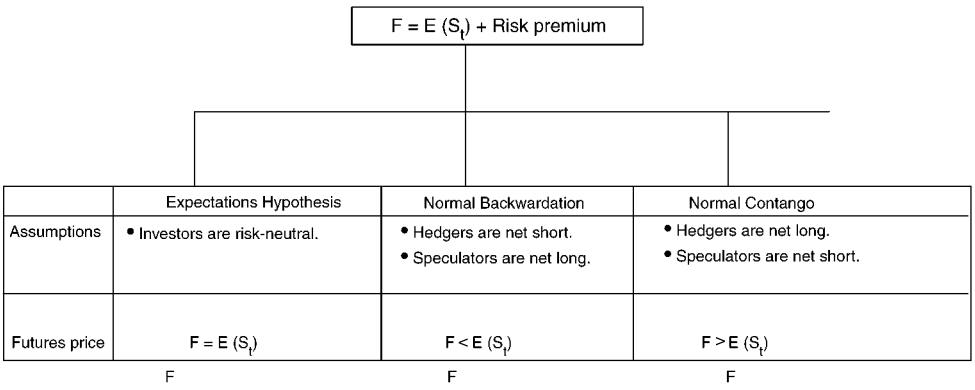


FIGURE 34.3 Futures on Perishable Commodities

These three possible scenarios for the futures price, relative to the expected spot price, are graphed in Figure 34.3. The empirical evidence from commodity futures markets is mixed. An early study by Houthaker (1957) found that futures prices for commodities were generally lower than the expected spot prices, a finding that is consistent with normal backward action. Telser (1958), however, reported contradictory evidence from the wheat and corn futures markets.

Storable Commodities

The distinction between storable and perishable goods is that storable goods can be acquired at the spot price and stored till the expiration of the futures contract, which is the practical equivalent of buying a futures contract and taking delivery at expiration. Since the two approaches provide the same result, in terms of having possession of the commodity at expiration, the futures contract, if priced right, should cost the same as a strategy of buying and storing the commodity. The two additional costs of the latter strategy are:

1. Since the commodity has to be acquired now, rather than at expiration, there is an added financing cost associated with borrowing the funds needed for the acquisition now.

$$\text{Added interest cost} = \text{Spot price} \times [(1 + \text{Interest rate})^{\text{life of futures contract}} - 1]$$

2. If there is a storage cost associated with storing the commodity until the expiration of the futures contract, this cost has to be reflected in the strategy as well. In addition, there may be a benefit to having physical ownership of the commodity. This benefit is called the convenience yield and will reduce the futures price. The net storage cost is defined to be the difference between the total storage cost and the convenience yield.

If F is the futures contract price, S is the spot price, r is the annualized interest rate, t is the life of the futures contract, and k is the annual storage costs; net of the convenience yield, (as a percentage of the spot price) for the commodity, the two equivalent strategies and their costs can be written as follows:

Strategy 1: Buy the futures contract; take delivery at expiration; pay $F.

Strategy 2: Borrow the spot price of the commodity (S) and buy the commodity; pay the additional costs:

$$\text{Interest cost} = S[(1 + r)^t - 1]$$

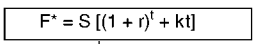
$$\text{Cost of storage, net of convenience yield} = Skt$$

If the two strategies have the same costs,

$$F^* = S + S[(1 + r)^t - 1] + Skt$$
$$= S[(1 + r)^t + kt]$$

This is the basic arbitrage relationship between futures and spot prices. Any deviation from this arbitrage relationship should provide an opportunity for arbitrage (i.e., a strategy with no risk and no initial investment, will provide positive profits). These arbitrage opportunities are described in Figure 34.4.

This arbitrage is based on several assumptions. First, investors are assumed to borrow and lend at the same rate, which is the riskless rate. Second, when the futures contract is underpriced, it is assumed that the buyer of the futures contract (the arbitrageur) can sell short on the commodity and that he or she can recover from the owner of the commodity the storage costs that are saved as a conse-



	If F > F*		If F < F*	
Time	Action	Cash Flows	Action	Cash Flows
Now:	1. Sell futures contract.	0	1. Buy futures contract.	0
	2. Borrow spot price at risk-free rate.	S	2. Sell short on commodity.	S
	3. Buy spot commodity.	–S	3. Lend money at risk-free rate.	–S
At t:	1. Collect commodity; pay storage cost.	–Skt	1. Collect on loan.	$S(1 + r)^t$
	2. Deliver on futures contract.	F	2. Take delivery of futures contract.	–F
	3. Pay back loan.	$-S(1 + r)^t$	3. Return borrowed commodity; collect storage costs.	+Skt
NCF =		**$F - S[1 + r)^t - kt] > 0$**		**$S[(1 + r)^t + kt] - F > 0$**

Key inputs

F* = Theoretical futures price
F = Actual futures price
S = Spot price of commodity
r = Riskless rate of interest (annualized)
t = Time to expiration on the futures contract
k = Annualized carrying cost, net of convenience yield (as % of spot price)

Key assumptions

1. The investor can lend and borrow at the riskless rate.
2. There are no transaction costs associated with buying or selling short the commodity.
3. The short seller can collect all storage costs saved because of the short selling.

FIGURE 34.4 Storable Commodity Futures: Pricing and Arbitrage

quence. To the extent that these assumptions are unrealistic, the bounds on prices within which arbitrage is not feasible expand. Assume, for instance, that the rate of borrowing is r_b and the rate of lending is r_a, and that short seller cannot recover any of the saved storage costs and has to pay a transactions cost of t_s. The futures price will then fall within a bound:

$$(S - t_s)(1 + r_a)^t < F^* < S[(1 + r_b)^t + kt]$$

If the futures price falls outside this bound, there is a possibility of arbitrage, and this is illustrated in Figure 34.5.

Stock Index Futures

Futures on stock indexes have become an important and growing part of most financial markets. Today, you can buy or sell futures on the Dow Jones, the S&P 500, the Nasdaq, and the Value Line indexes.

An index future entitles the buyer to any appreciation in the index over and above the index futures price, and the seller to any depreciation in the index from the same benchmark. To evaluate the arbitrage pricing of an index future, consider the following strategies:

Strategy 1: Sell short on the stocks in the index for the duration of the index futures contract; invest the proceeds at the riskless rate. (This strategy requires that the owners of the stocks be compensated for the dividends they would have received on the stocks.)

Strategy 2: Sell the index futures contract.

Modified Assumptions

1. Investor can borrow at r_b ($r_b > r$) and lend at r_a ($r_a < r$).
2. The transactions cost associated with selling short is t_s (where t_s is the dollar transactions cost).
3. The short seller does not collect any of the storage costs saved by the short selling.

$F_h^* = S[(1 + r_b)^t + kt]$
$F_l^* = (S - t_s)(1 + r_a)$

If $F > F_h^*$ | If $F < F_l^*$

Time	Action	Cash Flows	Action	Cash Flows
Now:	1. Sell futures contract.	0	1. Buy futures contract.	0
	2. Borrow spot price at r_b.	S	2. Sell short on commodity.	$S - t_s$
	3. Buy spot commodity.	$-S$	3. Lend money at r_a.	$-(S - t_s)$
At t:	1. Collect commodity from storage.	$-Skt$	1. Collect on loan.	$(S - t_s)(1 + r_a)^t$
	2. Deliver on futures contract.	F	2. Take delivery of futures contract.	$-F$
	3. Pay back loan.	$-S(1 + r_b)^t$	3. Return borrowed commodity; collect storage costs.	0
NCF =		$\mathbf{F - S[(1 + r_b)^t - kt] > 0}$		$\mathbf{(S - t_s)(1 + r_a)^t - F > 0}$

F_h = Upper limit for arbitrage bound on futures prices F_l = Lower limit for arbitrage bound on futures prices

FIGURE 34.5 Storable Commodity Futures: Pricing and Arbitrage with Modified Assumptions

Both strategies require the same initial investment, have the same risk, and should provide the same proceeds. Again, if S is the spot price of the index, F is the futures prices, y is the annualized dividend yield on the stock, and r is the riskless rate, the cash flows from the two contracts at expiration can be written as:

$$F^* = S(1 + r - y)^t$$

If the futures price deviates from this arbitrage price, there should be an opportunity for arbitrage. This is illustrated in Figure 34.6.

This arbitrage is conditioned on several assumptions. First, it, like the commodity futures arbitrage, assumes that investors can lend and borrow at the riskless rate. Second, it ignores transactions costs on both buying stock and selling short on stocks. Third, it assumes that the dividends paid on the stocks in the index are known with certainty at the start of the period. If these assumptions are unrealistic, the index futures arbitrage will be feasible only if prices fall outside a band, the size of which will depend on the seriousness of the violations in the assumptions.

Assume that investors can borrow money at r_b and lend money at r_a, and that the transactions costs of buying stock is t_c and selling short is t_s. The band within which the futures price must stay can be written as:

$$(S - t_s)(1 + r_a - y)^t < F^* < (S + t_c)(1 + r_b - y)^t$$

The arbitrage that is possible if the futures price strays outside this band is illustrated in Figure 34.7.

In practice, one of the issues that you have to factor in is the seasonality of dividends since the dividends paid by stocks tend to be higher in some months than others. Figure 34.8 graphs out dividends paid as a percent of the S&P 500 index on

$F^* = S(1 + r - y)^t$

Time	If $F > F^*$: Action	Cash Flows	If $F < F^*$: Action	Cash Flows
Now:	1. Sell futures contract.	0	1. Buy futures contract.	0
	2. Borrow spot price of index at risk-free rates	S	2. Sell short stocks in the index.	S
	3. Buy stocks in index.	–S	3. Lend money at risk-free rate.	–S
At t:	1. Collect dividends on stocks.	$S[(1 + y)^t - 1]$	1. Collect on loan.	$S(1 + r)^t$
	2. Deliver on futures contract.	F	2. Take delivery of futures contract.	–F
	3. Pay back loan.	$-S(1 + r)^t$	3. Return borrowed stocks; pay forgone dividends.	$-S[(1 + r - y)^t - F >]$
NCF =		**$F - S(1 + r - y)^t > 0$**		**$S(1 + r - y)^t - F > 0$**

Key inputs

F* = Theoretical futures price
F = Actual futures price
S = Spot level of index
r = Riskless rate of interest (annualized)
t = Time to expiration on the futures contract
y = Dividend yield over lifetime of futures contract as % of current index level

Key assumptions

1. The investor can lend and borrow at the riskless rate.
2. There are no transaction costs associated with buying or selling short stocks.
3. Dividends are known with certainty.

FIGURE 34.6 Stock Index Futures: Pricing and Arbitrage

Modified Assumptions

1. Investor can borrow at r_b ($r_b > r$) and lend at r_a ($r_a < r$).
2. The transaction cost associated with selling short is t_s (where t_s is the dollar transaction cost) and the transaction cost associated with buying the stocks in the index is t_c.

$$F_h^* = (S + t_c)(1 + r_b - y)^t$$
$$F_l^* = (S - t_s)(1 + r_a - y)^t$$

If $F > F_h^*$ | If $F < F_l^*$

Time	Action	Cash Flows	Action	Cash Flows
Now:	1. Sell futures contract.	0	1. Buy futures contract.	0
	2. Borrow spot price at r_b.	$S + t_c$	2. Sell short stocks in the index.	$S - t_s$
	3. Buy stocks in the index.	$-S - t_c$	3. Lend money at r_a.	$-(S - t_s)$
At t:	1. Collect dividends on stocks.	$S[(1 + y)^t - 1]$	1. Collect on loan.	$(S - t_s)(1 + r_a)^t$
	2. Deliver on futures contract.	F	2. Take delivery of futures contract.	$-F$
	3. Pay back loan.	$-(S + t_c)(1 + r_b)^t$	3. Return borrowed stocks: pay forgone dividends.	$-S[(1 + y)^t - 1]$
NCF =		$\mathbf{F - (S + t_c)(1 + r_b - y)^t > 0}$		$\mathbf{(S - t_s)(1 + r_a - y)^t - F > 0}$

F_h = Upper limit for arbitrage bound on futures prices F_l = Lower limit for arbitrage bound on futures prices

FIGURE 34.7 Stock Index Futures: Pricing and Arbitrage with Modified Assumptions

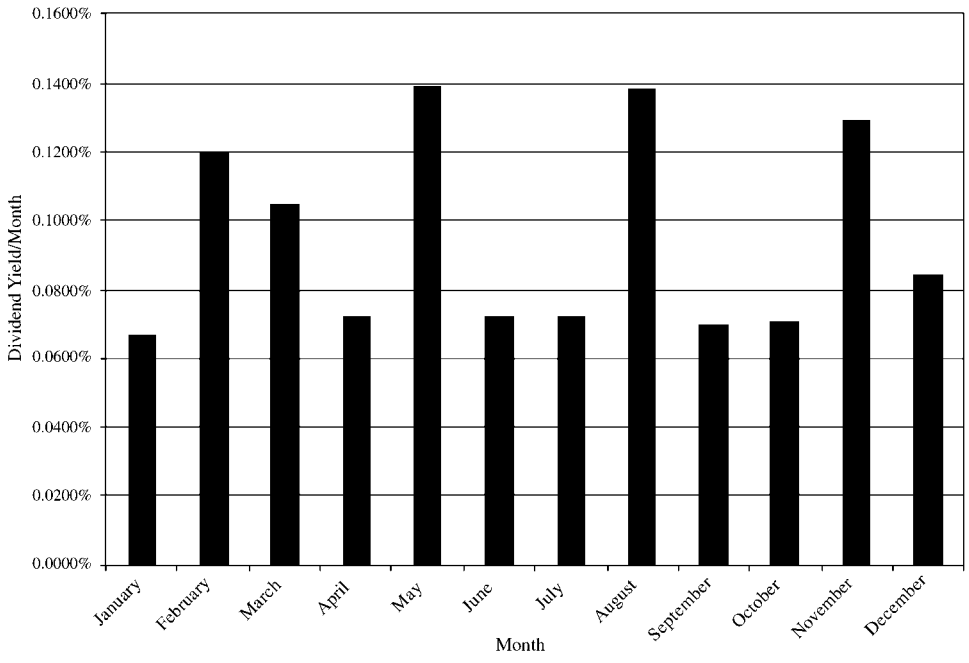


FIGURE 34.8 Dividend Yields by Month of Year—2000

U.S. stocks in 2000 by month of the year. Thus, dividend yields seem to peak in February, May, August, and November.

Treasury Bond Futures

The Treasury bond futures traded on the CBOT require the delivery of any government bond with a maturity greater than 15 years, with a no-call feature for at least the first 15 years. Since bonds of different maturities and coupons will have different prices, the CBOT has a procedure for adjusting the price of the bond for its characteristics. The conversion factor itself is fairly simple to compute, and is based on the value of the bond on the first day of the delivery month, with the assumption that the interest rate for all maturities equals 8 percent per annum (with semiannual compounding). The following example calculates the conversion factor for a 9 percent coupon bond with 20 years to maturity.

ILLUSTRATION 34.3: Calculation Conversion Factors for T-Bond Futures

Consider a 9% coupon bond with 20 years to maturity. Working in terms of a $100 face value of the bond, the value of the bond can be written as follows, using the interest rate of 8%:

$$\text{PV of bond} = \sum_{t=.5}^{t=20} \frac{4.50}{(1.08)^t} + \frac{100}{(1.08)^{20}} = \$111.55$$

The conversion factor for this bond is 111.55. Generally speaking, the conversion factor will increase as the coupon rate increases and with the maturity of the delivered bond.

The Delivery Option and the Wild Card Play

This feature of Treasury bond futures (i.e., that any one of a menu of Treasury bonds can be delivered to fulfill the obligation on the bond) provides an advantage to the seller of the futures contract. Naturally, the cheapest bond on the menu, after adjusting for the conversion factor, will be delivered. This delivery option has to be priced into the futures contract.

There is an additional option embedded in Treasury bond futures contracts that arises from the fact that the T-bond futures market closes at 2 P.M., whereas the bonds themselves continue trading until 4 P.M. The seller does not have to notify the clearing house until 8 P.M. about his or her intention to deliver. If bond prices decline after 2 P.M., the seller can notify the clearinghouse of intention to deliver the cheapest bond that day. If not, the seller can wait for the next day. This option is called the wild card play.

Valuing a T-Bond Futures Contract

The valuation of a Treasury bond futures contract follows the same lines as the valuation of a stock index future, with the coupons of the Treasury bond replacing the dividend yield of the stock index. The theoretical value of a futures contract should be:

$$F^* = (S - PVC)(1 + r)^t$$

where F* = Theoretical futures price for Treasury bond futures contract
S = Spot price of Treasury bond
PVC = Present value of coupons during life of futures contract
r = Risk-free interest rate corresponding to futures life
t = Life of the futures contract

If the futures price deviates from this theoretical price, there should be the opportunity for arbitrage. These arbitrage opportunities are illustrated in Figure 34.9.

This valuation ignores the two options just described—the option to deliver the cheapest-to-deliver bond and the option to have a wild card play. These give an advantage to the seller of the futures contract and should be priced into the futures contract. One way to build this into the valuation is to use the cheapest deliverable bond to calculate both the current spot price and the present value of the coupons. Once the futures price is estimated, it can be divided by the conversion factor to arrive at the standardized futures price.

Currency Futures

In a currency futures contract, you enter into a contract to buy a foreign currency at a price fixed today. To see how spot and futures currency prices are related, note that holding the foreign currency enables the investor to earn the risk-free interest rate (R_f) prevailing in that currency while the domestic currency earn the domestic risk-free rate (R_d). Since investors can buy currency at spot rates and assuming that there are no restrictions on investing at the risk-free rate, we can derive the relationship between the spot and futures prices. Interest rate parity relates the differential between futures and spot prices to interest rates in the domestic and foreign market.

$F^* = (S - PVC)(1 + r)^t$

If $F > F^*$ | If $F < F^*$

Time	Action	Cash Flows	Action	Cash Flows
Now:	1. Sell futures contract.	0	1. Buy futures contract.	0
	2. Borrow spot price of bond at risk-free rate.	S	2. Sell short Treasury bonds.	S
	3. Buy Treasury bonds.	$-S$	3. Lend money at risk-free rate.	$-S$
Till t:	1. Collect coupons on bonds; invest.	$PVC(1 + r)^t$	1. Collect on loan.	$S(1 + r)^t$
	2. Deliver the cheapest bond on contract.	F	2. Take delivery of futures contract.	$-F$
	3. Pay back loan.	$-S(1 + r)^t$	3. Return borrowed bonds; pay forgone coupons with interest.	$-PVC(1 + r)^t$
NCF =		**$F - (S - PVC)(1 + r)^t > 0$**		**$(S - PVC)(1 + r)^t - F > 0$**

Key inputs
F* = Theoretical futures price
F = Actual futures price
S = Spot level of Treasury bond
r = Riskless rate of interest (annualized)
t = Time to expiration on the futures contract
PVC = Present value of coupons on bond during life of futures contract

Key assumptions
1. The investor can lend and borrow at the riskless rate.
2. There are no transaction costs associated with buying or selling short bonds.

FIGURE 34.9 Treasury Bond Futures: Pricing and Arbitrage

$$\frac{\text{Futures price}_{d,f}}{\text{Spot price}_{d,f}} = \frac{(1+R_d)}{(1+R_f)}$$

where futures $\text{price}_{d,f}$ is the number of units of the domestic currency that will be received for a unit of the foreign currency in a futures contract, and spot $\text{price}_{d,f}$ is the number of units of the domestic currency that will be received for a unit of the same foreign currency in a spot contract. For instance, assume that the one-year interest rate in the United States is 5 percent, and the one-year interest rate in Germany is 4 percent. Furthermore, assume that the spot exchange rate is $0.65 per deutsche mark. The one-year futures price, based on interest rate parity, should be as follows:

$$\frac{\text{Futures price}_{d,f}}{\$0.65} = \frac{(1.05)}{(1.04)}$$

resulting in a futures price of $0.65625 per deutsche mark.

Why does this have to be the futures price? If the futures price were greater than $0.65625, say $0.67, an investor could take advantage of the mispricing by selling the futures contract, completely hedging against risk and ending up with a return greater than the risk-free rate. When a riskless position yields a return that exceeds the risk-free rate, it is called an arbitrage position. The actions the investor would need to take are summarized in Table 34.3, with the cash flows associated with each action in parentheses next to the action. This arbitrage results in a riskless profit of $0.0143, with no initial investment. The process of arbitrage will push down the futures price toward the equilibrium price.

TABLE 34.3 Arbitrage When Forward Contracts Are Mispriced

Forward Rate Mispricing	Actions to Take Today	Actions at Expiration of Forward Contract
If futures price > $0.65625	1. Sell a futures contract at $0.67 per deutsche mark ($0.00). 2. Borrow the spot price in the U.S. domestic markets @ 5% (+$0.65). 3. Convert the dollars into deutsche marks at spot price (–$0.65/+1 DM). 4. Invest deustche marks in the German market @ 4% (–1 DM).	1. Collect on deutsche mark investment (+1.04 DM). 2. Convert into dollars at futures price (–1.04/+$0.6968). 3. Repay dollar borrowing with interest ($0.6825). Profit = $0.6968 – $0.6825 = $0.0143
If futures price < $0.65625	1. Buy a futures price at $0.64 per deutsche mark ($0.00). 2. Borrow the spot rate in the German market @ 4% (+1 DM). 3. Convert the deutsche marks into dollars at spot rate (–1 DM/+$0.65). 4. Invest dollars in the U.S. market @ 5% (–$0.65).	1. Collect on dollar investment (+$0.6825). 2. Convert into dollars at futures price (–$0.6825/1.0664 DM). 3. Repay DM borrowing with interest (1.04). Profit = 1.0664 – 1.04 = .0264 DM

If the futures price were lower than \$0.65625, the actions would be reversed, with the same final conclusion. Investors would be able to take no risk, invest no money, and still end up with a positive cash flow at expiration. Table 34.3 lays out the actions that would lead to a riskless profit of .0264 DM.

EFFECTS OF SPECIAL FEATURES IN FUTURES CONTRACTS

The arbitrage relationship provides a measure of the determinants of futures prices on a wide range of assets. There are, however, some special features that affect futures prices. One is the fact that futures contracts require marking to the market, while forward contracts do not. Another is the existence of trading restrictions such as price limits on futures contracts. The following section examines the pricing effects of each of these special features.

Futures versus Forward Contracts

As described earlier in this section, futures contracts require marking to market while forward contracts do not. If interest rates are constant and the same for all maturities, there should be no difference between the value of a futures contract and the value of an equivalent forward contract. When interest rates vary unpredictably, forward prices can be different from futures prices. This is because of the reinvestment assumptions that have to be made for intermediate profits on a futures contract and the borrowing rate assumptions that have to be made for intermediate losses. The effect of this interest rate–induced volatility on futures prices will depend on the relationship between spot prices and interest rates. If they move in opposite directions (as is the case with stock indexes and Treasury bonds), the interest rate risk will make futures prices greater than forward prices. If they move together (as is the case with some real assets), the interest rate risk can actually counter price risk and make futures prices less than forward prices. In most real-world scenarios, and in empirical studies, the difference between futures and forward prices is fairly small and can be ignored.

There is another difference between futures and forward contracts that can cause their prices to deviate and it relates to credit risk. Since the futures exchange essentially guarantees traded futures contracts, there is relatively little credit risk, since the exchange itself would have to default for buyers or sellers of contracts not to be paid. Forward contracts are between individual buyers and sellers. Consequently, there is potential for significant default risk, which has to be taken into account when valuing a forward contract.

Trading Restrictions

The existence of price limits and margin requirements on futures contracts are generally ignored in the valuation and arbitrage conditions described in this chapter. It is, however, possible that these restrictions on trading, if onerous enough, could impact value. The existence of price limits, for instance, has two effects. One is that it might reduce the volatility in prices by protecting against market overreaction to information, and thus make futures contracts more valuable. The other is that it make futures contracts less liquid, and this may make them less valuable. The net effect could be positive or negative.

CONCLUSION

The value of a futures contract is derived from the value of the underlying asset. The opportunity for arbitrage will create a strong linkage between the futures and spot prices, and the actual relationship will depend on the level of interest rates, the cost of storing the underlying asset, and any yield that can be made be holding the asset. In addition, the institutional characteristics of the futures markets, such as price limits and marking to market, as well as delivery of options, can affect the futures price.

QUESTIONS AND SHORT PROBLEMS

1. The following futures prices of gold are from the *Wall Street Journal* futures page. The current cash (spot) price of gold is $403.25. Make your best estimates of the implied interest rates (from the arbitrage relationship) in the futures prices. (You can assume zero carrying costs for gold.)

Contract Expiring In	*Trading At*
1 month	$404.62
2 months	$406.11
3 months	$407.70
6 months	$412.51
12 months	$422.62

2. You are a portfolio manager who has just been exposed to the possibilities of stock index futures. Respond to the following situations:
   a. Assume that you have the resources to buy and hold the stocks in the S&P 500. You are given the following data (assume that this is January 1):

      Level of the S&P 500 index = 258.90
      June S&P 500 futures contract = 260.15
      Annualized rate on T-bill expiring June 26 (expiration date) = 6%
      Annualized dividend yield on S&P 500 stocks = 3%

      Assume that dividends are paid out continuously over the year. Is there potential for arbitrage? How would you go about setting up the arbitrage?
   b. Assume now that you are known for your stock selection skills. You have 10,000 shares of Texaco in your portfolio (now selling for 38) and are extremely worried about the direction of the market until June. You would like to protect yourself against market risk by using the December S&P 500 futures contract (which is at 260.15). If Texaco's beta is 0.8, how would you go about creating this protection?
3. Assume that you are a mutual fund manager with a total portfolio value of $100 million. You estimate the beta of the fund to be 1.25. You would like to hedge against market movements by using stock index futures. You observe that the S&P 500 June futures are selling for 260.15 and that the index is at 258.90. Answer the following questions:
   a. How many stock index futures would you have to sell to protect against market risk?

b. If the risk-free rate is 6% and the market risk premium is 8%, what return would you expect to make on the mutual fund (assuming you don't hedge)?
c. How much would you expect to make if you hedge away all market risk?

4. Given the following information on gold futures prices, the spot price of gold, the riskless interest rate, and the carrying cost of gold, construct an arbitrage position. (Assume that it is December 1987 now.)

   December 1988 futures contract price = 515.60/troy oz.
   Spot price of gold = 481.40/troy oz.
   Interest rate (annualized) = 6%
   Carrying cost (annualized) = 2%

   a. What would you have to do right now to set up the arbitrage?
   b. What would you have to do in December to unwind the position? How much arbitrage profit would you expect to make?
   c. Assume now that you can borrow at 8%, but you can lend at only 6%. Establish a price band for the futures contract within which arbitrage is not feasible.

5. The following is a set of prices for stock index futures on the S&P 500.

Maturity	*Futures Price*
March	246.25
June	247.75

   The current level of the index is 245.82, and the current annualized T-bill rate is 6%. The annualized dividend yield is 3%. (Today is January 14. The March futures expire on March 18, and the June futures on June 17.)
   a. Estimate the theoretical basis and actual basis in each of these contracts.
   b. Using one of the two contracts, set up an arbitrage. Also show how the arbitrage will be resolved at expiration. (You can assume that you can lend or borrow at the risk-free rate and that you have no transaction costs or margins.)
   c. Assume that a good economic report comes out on the wire. The stock index goes up to 247.82 and the T-bill rate drops to 5%. Assuming arbitrage relationships hold and that the dollar dividends paid do not change, how much will the March future go up by?

6. You are provided the following information:

   Current price of wheat = $19,000 for 5,000 bushels
   Riskless rate = 10% (annualized)
   Cost of storage = $200 a year for 5,000 bushels
   One-year futures contract price = $20,400 (for a contract for 5,000 bushels)

   a. What is F* (the theoretical price)?
   b. How would you arbitrage the difference between F and F*? (Specify what you will do now and at expiration, and what your arbitrage profits will be.)
   c. If you can sell short (cost $100 for 5,000 bushels) and cannot claim any of the storage cost for yourself on short sales,[2] at what rate would you have to be able to lend for this arbitrage to be feasible?

[2]In theory, we make the unrealistic assumption that a person who short sells (i.e., borrows somebody else's property and sells it now) will be able to collect the storage costs saved by the short sales from the other party to the transaction.

CHAPTER 35

Overview and Conclusion

The problem in valuation is not that there are not enough models to value an asset, it is that there are too many. Choosing the right model to use in valuation is as critical to arriving at a reasonable value as understanding how to use the model. This chapter attempts to provide an overview of the valuation models introduced in this book, and a general framework that can be used to pick the right model for any task.

CHOICES IN VALUATION MODELS

In the broadest possible terms, firms or assets can be valued in one of four ways: asset-based valuation approaches where you estimate what the assets owned by a firm are worth currently, discounted cash flow valuation approaches that discount cash flows to arrive at a value of equity or the firm, relative valuation approaches that base value on how comparable assets are priced, and option pricing approaches that use contingent claim valuation. Within each of these approaches, there are further choices that help determine the final value.

There are at least two ways in which you can value a firm using asset-based valuation techniques. One is liquidation value, where you consider what the market will be willing to pay for assets if the assets were liquidated today. The other is replacement cost, where you evaluate how much it would cost you to replicate or replace the assets that a firm has in place today.

In the context of discounted cash flow valuation, cash flows to equity can be discounted at the cost of equity to arrive at a value of equity, or cash flows to the firm can be discounted at the cost of capital to arrive at the value for the firm. The cash flows to equity themselves can be defined in the strictest sense as dividends or in a more expansive sense as free cash flows to equity. These models can be further categorized on the basis of assumptions about growth into stable-growth, two-stage, three-stage and n-stage models. Finally, the measurement of earnings and cash flows may be modified to match the special characteristics of the firm/asset—current earnings for firms/assets that have normal earnings, or normalized earnings for firms/assets whose current earnings may be distorted either by temporary factors or cyclical effects.

In the context of multiples, you can use either equity or firm value as your measure of value and relate it to a number of firm-specific variables—earnings, book value, and sales. The multiples themselves can be estimated by using comparable firms in the same business or from cross-sectional regressions that use the broader universe. For other assets, such as real estate, the price can similarly be expressed as

a function of gross income or per square foot of space. Here the comparables would be other properties in the same locale with similar characteristics.

Contingent claim models can also be used in a variety of scenarios. When you consider the option that a firm has to delay making investment decisions, you can value a patent or an undeveloped natural resource reserve as an option. The option to expand may make young firms with potentially large markets trade at a premium on their discounted cash flow values. Finally, equity investors may derive value from the option to liquidate troubled firms with substantial debt. (See Figure 35.1.)

WHICH APPROACH SHOULD YOU USE?

The values that you obtain from the four approaches can be very different, and deciding which one to use can be a critical step. This judgment, however, will depend on several factors, some of which relate to the business being valued but many of which relate to you as the analyst.

Asset or Business Characteristics

The approach you use to value a business will depend on how marketable its assets are, whether it generates cash flows, and how unique it is in terms of its operations.

Marketability of Assets Liquidation valuation and replacement cost valuation are easiest to do for firms that have assets that are separable and marketable. (See Figure 35.2.) For instance, you can estimate the liquidation value for a real estate company because its properties can be sold individually, and you can estimate the value of each property easily. The same can be said about a closed-end mutual fund. At the other extreme, consider a brand-name consumer product like Gillette. Its assets

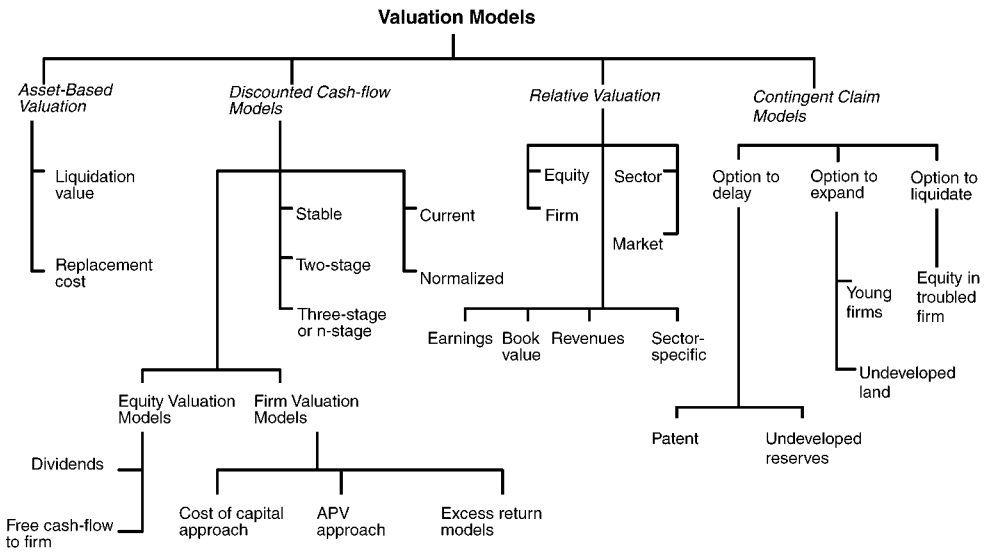


FIGURE 35.1 The Choices in Valuation Models

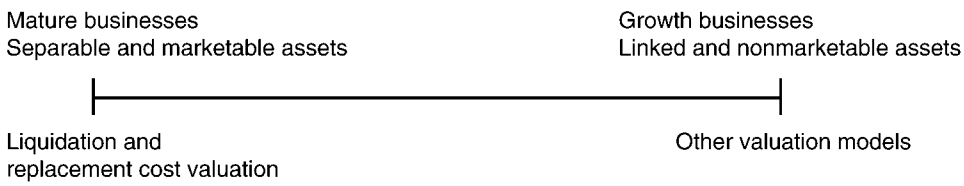


FIGURE 35.2 Asset Marketability and Valuation Approaches

are not only intangible but difficult to separate out. For instance, you cannot separate the razor business easily from the shaving cream business, and brand name value is inherent in both businesses.

You can also use this same analysis to see why the liquidation or replacement cost value of a high-growth business may bear little resemblance to true value. Unlike assets in place, growth assets cannot be easily identified or sold.

Cash Flow Generating Capacity You can categorize assets into three groups based on their capacity to generate cash flows: assets that are either generating cash flows currently or are expected to do so in the near future, assets that are not generating cash flows currently but could in the future in the event of a contingency, and assets that will never generate cash flows. (See Figure 35.3.)

1. The first group includes most publicly traded companies, and these firms can be valued using discounted cash flow models. Note that a distinction is not drawn between negative and positive cash flows, and young start-up companies that generate negative cash flow can still be valued using discounted cash flow models.
2. The second group includes assets such as drug patents, promising (but not viable) technology, undeveloped oil or mining reserves, and undeveloped land. These assets may generate no cash flows currently and could generate large cash flows in the future but only under certain conditions—if the FDA approves the drug patent, if the technology becomes commercially viable, if oil prices and commercial property values go up. While you could estimate expected values using discounted cash flow models by assigning probabilities to these events, you will understate the value of the assets if you do so. You should value these assets using option pricing models.
3. Assets that are never expected to generate cash flows include your primary residence, a baseball card collection, or fine art. These assets can only be valued using relative valuation models.

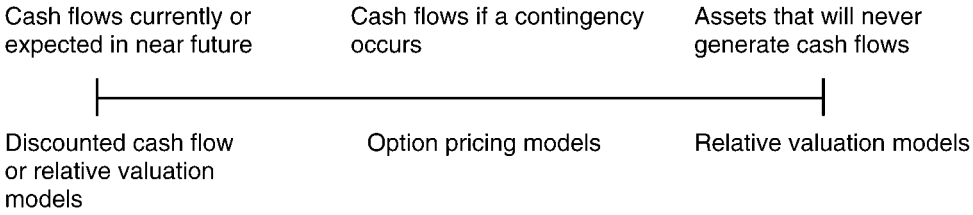


FIGURE 35.3 Cash Flows and Valuation Approaches

Uniqueness (or Presence of Comparables) In a market where thousands of stocks are traded and tens of thousands of assets are bought and sold every day, it may be difficult to visualize an asset or business that is so unique that you cannot find comparable assets. On a continuum, though, some assets and businesses are part of a large group of similar assets, with no or very small differences across the assets. (See Figure 35.4.) These assets are tailor-made for relative valuation, since assembling comparable assets (businesses) and controlling for differences is simple. The further you move from this ideal, the less reliable is relative valuation. For businesses that are truly unique, discounted cash flow valuation will yield much better estimates of value.

Analyst Characteristics and Beliefs

The valuation approach that you choose to use will depend on your time horizon, the reason that you are doing the valuation in the first place, and what you think about markets—whether they are efficient, and if they are not, what form the inefficiency takes.

Time Horizon At one extreme, in discounted cash flow valuation you consider a firm as a going concern that may last into perpetuity. At the other extreme, with liquidation valuation, you are estimating value on the assumption that the firm will cease operations today. With relative valuation and contingent claim valuation, you take an intermediate position between the two. (See Figure 35.5.) Not surprisingly, then, you should be using discounted cash flow valuation if you have a long time horizon, and relative valuation if you have a shorter time horizon. This may explain why discounted cash flow valuation is more prevalent when valuing a firm for an acquisition, and relative valuation is more common in equity research and portfolio management.

Reason for Doing the Valuation Analysts value businesses for a number of reasons, and the valuation approach used will vary depending on the reason. (See Figure 35.6.) If you are an equity research analyst following steel companies,

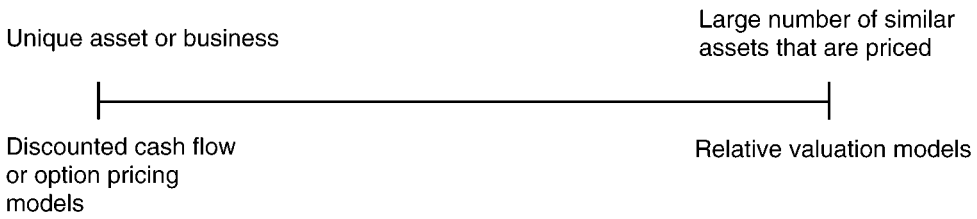


FIGURE 35.4 Uniqueness of Asset and Valuation Approaches

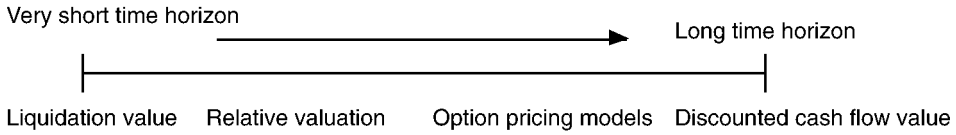


FIGURE 35.5 Investor Time Horizon and Valuation Approaches

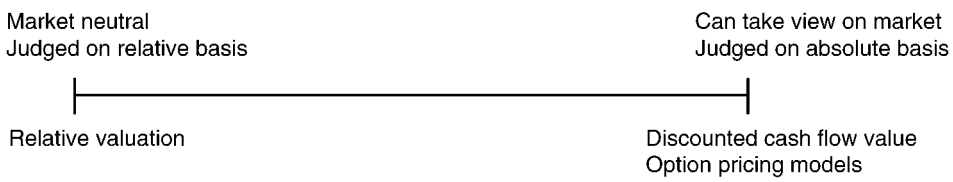


FIGURE 35.6 Market Neutrality and Valuation Approaches

your job description is simple. You are asked to find the most under- and overvalued companies in the sector, and not take a stand on whether the sector overall is under- or overvalued. You can see why multiples would be your weapon of choice when valuing companies. This effect is likely to be exaggerated if the way you are judged and rewarded is on a relative basis (i.e., your recommendations are compared to those made by other steel company analysts). But if you are an individual investor setting money aside for retirement or a private businessperson valuing a business for purchase, you want to estimate intrinsic value. Consequently, discounted cash flow valuation is likely to be more appropriate for your needs.

Beliefs about Markets Embedded in each approach are assumptions about markets and how they work or fail to work. (See Figure 35.7.) With discounted cash flow valuation, you are assuming that market prices deviate from intrinsic value but that they correct themselves over long periods. With relative valuation, you are assuming that markets are on average right, and that while individual firms in a sector or market may be mispriced, the sector or overall market is fairly priced. With asset-based valuation models, you are assuming that the markets for real and financial assets can deviate and that you can take advantage of these differences. Finally, with option pricing models, you are assuming that markets are not very efficient at assessing the value of flexibility that firms have, and that option pricing models will therefore give you an advantage. In each and every one of these cases, though, you are assuming that markets will eventually recognize their mistakes and correct them.

CHOOSING THE RIGHT DISCOUNTED CASH FLOW MODEL

The model used in valuation should be tailored to match the characteristics of the asset being valued. The unfortunate truth is that the reverse is often true. Time and

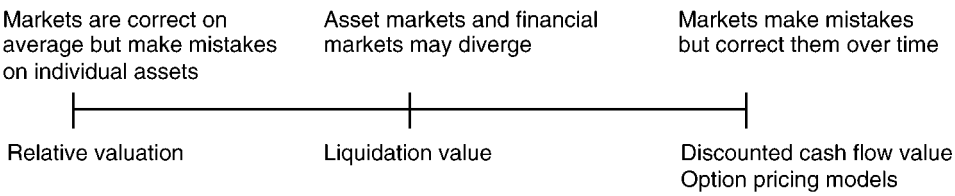


FIGURE 35.7 Views on Market and Valuation Approaches

BRIDGING THE PHILOSOPHICAL DIVIDE

Philosophically, there is a big gap between discounted cash flow valuation and relative valuation. In discounted cash flow valuation, we take a long-term perspective, evaluate a firm's fundamentals in detail, and try to estimate a firm's intrinsic value. In relative valuation, we assume that the market is right on average and estimate the value of a firm by looking at how similar firms are priced. There is something of value in both approaches, and it would be useful if we could borrow the best features of relative valuation while doing discounted cash flow valuation, or vice versa.

Assume that your instincts lead you to discounted cash flow valuation, but that you are expected, as an analyst, to be market-neutral. You can stay market-neutral in a discounted cash flow framework if you use the implied risk premium for the market (described in Chapter 7) to estimate the cost of equity for the valuation. You can also bring in information about comparable firm margins and betas when estimating fundamentals for your firm. Your estimate of intrinsic value will then be market-neutral and include information about comparables.

Alternatively, assume that you prefer relative valuation. Your analysis can carry the rigor of a discounted cash flow valuation if you can bring in the details of the fundamentals into your comparisons. The chapters on relative valuation attempted to do this by noting the link between multiples and fundamentals, and also by examining how best to control for these differences in the analysis.

resources are wasted trying to make assets fit a prespecified valuation model, either because it is considered to be the best model or because not enough thought goes into the process of model choice. There is no one best model. The appropriate model to use in a particular setting will depend on a number of the characteristics of the asset or firm being valued.

Choosing a Cash Flow to Discount

With consistent assumptions about growth and leverage, you should get the same value for your equity using the firm approach (where you value the firm and subtract outstanding debt) and the equity approach (where you value equity directly). If this is the case, you might wonder why you would pick one approach over the other. The answer is purely pragmatic. For firms that have stable leverage (i.e., they have debt ratios that are not expected to change during the period of the valuation), there is little to choose between the models in terms of the inputs needed for valuation. You use a debt ratio to estimate free cash flows to equity in the equity valuation model, and to estimate the cost of capital in the firm valuation model. Under these circumstances, you should stay with the model that you are more intuitively comfortable with.

For firms that have unstable leverage (i.e., they have too much or too little debt and want to move toward their optimal or target debt ratio during the period of the

valuation), the firm valuation approach is much simpler to use because it does not require cash flow projections from interest and principal payments and is much less sensitive to errors in estimating leverage changes. The calculation of the cost of capital requires an estimate of the debt ratio, but the cost of capital itself does not change as much as a consequence of changing leverage as does the cash flow to equity. If you prefer to work with assumptions about dollar debt rather than debt ratios, you can switch to the adjusted present value approach.

In valuing equity, you can discount dividends or free cash flows to equity. You should consider using the dividend discount model under the following circumstances:

- You cannot estimate cash flows with any degree of precision either because you have insufficient or contradictory information about debt payments and reinvestments or because you have trouble defining what comprises debt. This was the rationale for using dividend discount models for valuing financial service firms in Chapter 21.
- There are significant restrictions on stock buybacks and other forms of cash return, and you have little or no control over what the management of a firm does with the cash. In this case, the only cash flows you can expect to get from your equity investment are the dividends that managers choose to pay out.

In all other cases, you will get much more realistic estimates of a firm's value using the free cash flow to equity, which may be greater than or lower than the dividend.

Should You Use Current or Normalized Earnings?

Most valuations begin with the current financial statements of the firm and use the reported earnings in those statements as the base for projections. There are some firms, though, where you may not be able to do this, either because the firm's earnings are negative or because these earnings are abnormally high or low (a firm's earnings are abnormal if they do not fit in with the firm's own history of earnings).

When earnings are negative or abnormal, you can sometimes replace current earnings with a normalized value, estimated by looking at the company's history or industry averages, and value the firm based on these normalized earnings. This is the easiest route to follow if the causes for the negative or abnormal earnings are temporary or transitory, as in the following cases:

- A cyclical firm will generally report depressed earnings during an economic downturn and high earnings during an economic boom. Neither may capture properly the true earnings potential of the firm.
- A firm may report abnormally low earnings in a period during which it takes an extraordinary charge.
- A firm in the process of restructuring may report low earnings during the restructuring period as the changes made to improve firm performance are put into effect.

The presumption here is that earnings will quickly bounce back to normal levels and that little will be lost by assuming that this will occur immediately.

For some firms, though, the negative or low earnings may reflect factors that

are unlikely to disappear quickly. There are at least three groups of firms where the negative earnings are likely to be a long-term phenomenon and may even threaten the firm's survival:

1. *Firms with long-term operating, strategic, or financial problems* can have extended periods of negative or low earnings. If you replace current earnings with normalized earnings and value these firms, you will overvalue them.
   - If a firm seems to be in a hopeless state and likely to go bankrupt, the only models that are likely to provide meaningful measures of value are the option pricing model (if financial leverage is high) or a model based on liquidation value.
   - If the firm is troubled but unlikely to go bankrupt, you will have to nurse it back to financial health. In practical terms, you will have to adjust the operating margins over time to healthier levels and value the firm based on its expected cash flows.
2. *An infrastructure firm* may report negative earnings in its initial periods of growth, not because it is unhealthy but because the investments it has made take time to pay off. The cash flows to the firm and equity are often also negative, because the capital expenditure needs for this type of firm tend to be disproportionately large relative to depreciation. For these firms to have value, capital expenditure has to drop once the infrastructure investments have been made and operating margins have to improve. The net result will be positive cash flows in future years and a value for the firm today.
3. *Young start-up companies* often report negative earnings early in their life cycles, as they concentrate on turning interesting ideas into commercial products. To value such companies, you have to assume a combination of high revenue growth and improving operating margins over time.

Growth Patterns

In general, when valuing a firm, you can assume that your firm is already in stable growth, assume a period of constant high growth and then drop the growth rate to stable growth (two-stage growth), or allow for a transition phase to get to stable growth (three-stage or n-stage models). There are several factors you should consider in making this judgment:

Growth Momentum The choice of growth pattern will be influenced by the level of current growth in earnings and revenues. You can categorize firms, based on growth in recent periods, into three groups.

1. Stable-growth firms report earnings and revenues growing at or below the nominal growth rate in the economy that they operate in.
2. Moderate-growth firms report earnings and revenues growing at a rate moderately higher than the nominal growth rate in the economy; as a rule of thumb, consider any growth rate within 8 to 10 percent of the growth rate of the economy as a moderate growth rate.
3. High-growth firms report earnings and revenues growing at a rate much higher than the nominal growth rate in the economy.

For firms growing at the stable rate, the steady state models that assume constant growth provide good estimates of value. For firms growing at a moderate rate, the two-stage discounted cash flow model should provide enough flexibility in terms of capturing changes in the underlying characteristics of the firm, while a three-stage or n-stage model may be needed to capture the longer transitions to stable growth that are inherent in high-growth-rate firms.

Source of Growth (Barriers to Entry) The higher expected growth for a firm can come from either general competitive advantages acquired over time such as a brand name or reduced costs of production (from economies of scale) or specific advantages that are the result of legal barriers to entry—licenses or product patents. The former are likely to erode over time as new competitors enter the marketplace, while the latter are more likely to disappear abruptly when the legal barriers to entry are removed. The expected growth rate for a firm that has specific sources of growth is likely to follow the two-stage process where growth is high for a certain period (for instance, the period of the patent) and drops abruptly to a stable rate after that. The expected growth rate for a firm that has general sources of growth is more likely to decline gradually over time as new competitors come in. The speed with which this competitive advantage is expected to be lost is a function of several factors, including:

- *Nature of the competitive advantage.* Some competitive advantages, such as brand name in consumer products, seem to be more difficult to overcome and consequently are likely to generate growth for longer periods. Other competitive advantages, such as a first-mover advantage, seem to erode much faster.
- *Competence of the firm's management.* More competent management will be able to slow, though not stop, the loss of competitive advantage over time by creating strategies that find new markets in which to exploit the firm's current competitive advantage and that attempt to find new sources of competitive advantage.
- *Ease of entry into the firm's business.* The greater the barriers to industry in entering the firm's business, because of either capital requirements or technological factors, the slower will be the loss of competitive advantage.

These factors are summarized and presented in Figure 35.8, with the appropriate discounted cash flow model indicated for each combination of the factors.

CHOOSING THE RIGHT RELATIVE VALUATION MODEL

Many analysts choose to value assets using relative valuation models. In making this choice, two basic questions have to be answered: Which multiple will be used in the valuation? Will this multiple be arrived at using the sector or the entire market?

Which Multiple Should I Use?

The chapters on multiples presented a variety of multiples. Some were based on earnings, some on book value, and some on revenues. For some multiples, current values were used, and for others forward or forecast values were used. Since the

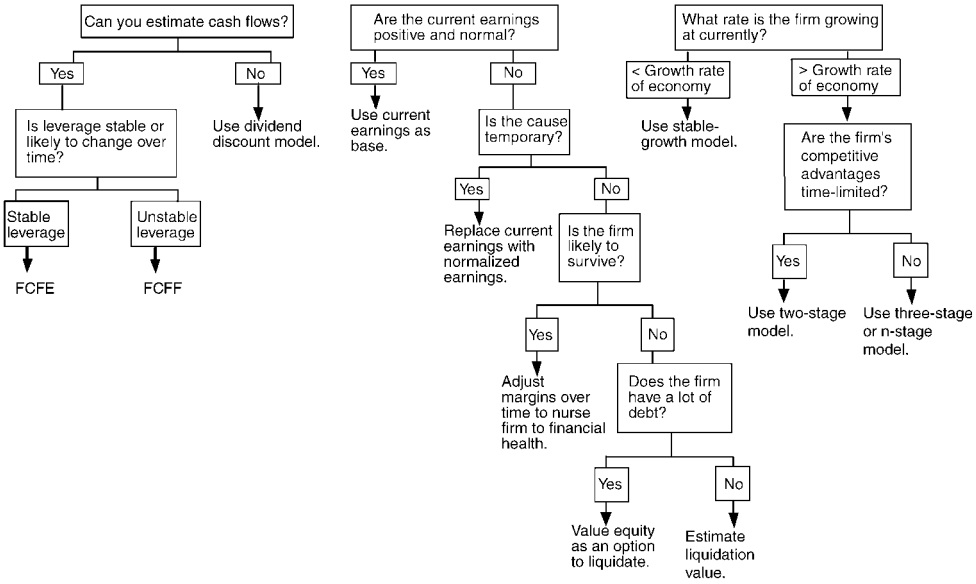


FIGURE 35.8 Discounted Cash Flow Models

STATUS QUO VERSUS OPTIMAL MANAGEMENT

The chapters on valuing acquisitions and troubled firms noted that the value of a firm can be substantially higher if you assume that it is optimally run than if it is run by incumbent management. A question that you are often faced with in valuation is whether you should value the firm with incumbent management or with the optimal management. The answer is simple in some cases and complicated in others:

- If you are interested in acquiring the firm and intend to change the management, you should value the firm with the optimal management policies in place. Whether you will pay that amount in the acquisition will depend on your bargaining power and how long you think it will take you to change the way the firm is run.
- If you are a small investor looking at buying stock in the firm, you cannot change incumbent management yourself but you can still pay a premium if you believe that there is a possibility of change. If there are strong mechanisms for corporate governance—hostile takeovers are common and poor managers get replaced quickly—you can assume that the value will quickly converge on the optimal value. If, however, it is difficult to dislodge incumbent management, you should value the firm based on their continued stewardship of the firm.
- If you are an institutional investor, you fall between these two extremes. While you may not intend to take over the firm and change the way it is run, you could play a role in making this change happen.

values you obtain are likely to be different using different multiples, deciding which multiple to use can make a big difference to your estimate of value. There are three ways you can answer this question: One is to adopt the cynical view that you should use the multiple that reflects your biases, the second is to value your firm with different multiples and try to use all of the values that you obtain; and the third is to pick the best multiple and base your valuation on it.

The Cynical View You can always use the multiple that best fits your story. Thus, if you are trying to sell a company, you will use the multiple which gives you the highest value for your company. If you are buying the same company, you will choose the multiple that yields the lowest value. While this clearly crosses the line from analysis into manipulation, it is a more common practice than you might realize. Even if you never plan to employ this practice, you should consider ways in which you can protect yourself from being victimized by it. First, you have to recognize that conceding the choice of multiple and comparables to an analyst is the equivalent of letting him or her write the rules of the game. You should play an active role in deciding which multiple should be used to value a company and what firms will be viewed as comparable firms. Second, when presented with a value based on one multiple, you should always ask what the value would have been if an alternative multiple had been used.

The Bludgeon View You can always value a company using a dozen or more multiples and then use all of the values, different thought they might be, in your final recommendation. There are three ways in which can present the final estimate of value. The first is in terms of a range of values, with the lowest value that you obtained from a multiple being the lower end of the range and the highest value being the upper limit. The problem with this approach is that the range is usually so large that it becomes useless for any kind of decision making. The second approach is a simple average of the values obtained from the different multiples. While this approach has the virtue of simplicity, it gives equal weight to the values from each multiple even though some multiples may yield more precise answers than others. The third approach is a weighted average, with the weight on each value reflecting the precision of the estimate. This weight can either be a subjective one or a statistical measure—you can, for instance, use the standard error on a prediction from a regression.

The Best Multiple While we realize that you might be reluctant to throw away any information, the best estimates of value are usually obtained by using the one multiple that is best suited for your firm. There are three ways in which you can find this multiple:

1. *Fundamentals approach*. You should consider using the variable that is most highly correlated with your firm's value. For instance, current earnings and value are much more highly correlated in consumer product companies than in technology companies. Using price-earnings ratios makes more sense for the former than for the latter.
2. *Statistical approach*. You could run regressions of each multiple against the fundamentals that we determined affected the value of the multiple in earlier

chapters, and use the R-squared of the regression as a measure of how well that multiple works in the sector. The multiple with the highest R-squared is the multiple that you can best explain using fundamentals and should be the multiple you use to value companies in that sector.

3. *Conventional multiple approach*. Over time, we usually see a specific multiple become the most widely used one for a specific sector. For instance, price-to-sales ratios are the most commonly used multiple to analyze retail companies.

Table 35.1 summarizes the most widely used multiples by sector. In an ideal world, you should see all three approaches converge—the fundamental that best explains value should also have the highest R-squared and be the conventional multiple used in the sector. In fact, when the multiple in use conventionally does not reflect fundamentals, which can happen if the sector is in transition or evolving, you will get misleading estimates of value.

Market or Sector Valuation

In most relative valuations, you value a firm relative to other firms in the industry in which the firm operates, and attempt to answer a simple question: Given how other firms in the business (sector) are priced by the market, is this firm under- or overvalued? Within this approach, you can define comparable firms either narrowly, as being firms that not only operate in the business in which your firm operates but also look like your firm in terms of size or market served, or broadly, in which case you will have far more comparable firms. If you are attempting to control for differences across firms subjectively, you should stick with the narrower group. But if you plan to control for differences statistically—with a regression, for instance—you should go with the broader definition.

The chapters on relative valuation presented an alternative approach to relative valuation, where firms were valued relative to the entire market. When you do this,

TABLE 35.1 Most Widely Used Multiples by Sector

Sector	Multiple Used	Rationale/Comments
Cyclical manufacturing	PE, relative PE	Often with normalized earnings.
High tech, high growth	PEG	Big differences in growth across firms make it difficult to compare PE ratios.
High growth/negative earnings	PS, VS	Assume future margins will be positive.
Infrastructure	VEBITDA	Firms in sector have losses in early years, and reported earnings can vary depending on depreciation method.
REIT	P/CF	Restrictions on investment policy and large depreciation charges make cash flows better measure than equity earnings.
Financial services	PBV	Book value often marked to market.
Retailing	PS	If leverage is similar across firms.
	VS	If leverage is different.

you are not only using a much larger universe of questions, but asking a different question: Given how other firms in the market are priced, is this firm under- or overvalued? A firm can be undervalued relative to its sector but overvalued relative to the market if the entire sector is mispriced.

The approach you use to relative valuation will depend again on what your task is defined to be. If you want to stay narrowly focused on your sector and make judgments on which stocks are under- or overvalued, you should stick with sector-based relative valuation. If you have more leeway and are trying to find under- or overvalued stocks across the market, you should look at the second approach—perhaps in addition to the first one.

WHEN SHOULD YOU USE THE OPTION PRICING MODELS?

The chapters on applying option pricing models to valuation presented a number of scenarios where option pricing may yield a premium on traditional discounted cash flow valuation. You should keep in mind the following general propositions when using option pricing models:

CAN A FIRM BE UNDERVALUED AND OVERVALUED AT THE SAME TIME?

If you value a firm using both discounted cash flow and relative valuation models, you may very well get different answers using the two: The firm may be undervalued using relative valuation models but overvalued using discounted cash flow models. What do we make of these differences, and why do they occur? If a firm is overvalued using a discounted cash flow model and undervalued using relative valuation, it is usually an indication that the sector is overvalued relative to its fundamentals. For instance, in March 2000 we valued Amazon at $30 a share using a discounted cash flow model, when it was trading at $70 a share; it was clearly overvalued. At the same time, a comparison of Amazon to other dot-com firms suggested that it was undervalued relative to these firms.

If a firm is undervalued using a discounted cash flow model and overvalued using relative valuation, it indicates that the sector is undervalued. By March 2001 Amazon's stock price had dropped to $15, but the values of all Internet stocks had dropped by almost 90 percent. In March 2001 a discounted cash flow valuation suggested that Amazon was undervalued, but a relative valuation indicated that it was now overvalued relative to the sector.

As an investor, you can use both discounted cash flow and relative valuation to value a company. Optimally, you would like to buy companies that are undervalued using both approaches. That way, you benefit from market corrections both across time (which is the way you make money in discounted cash flow valuation) and across companies.

- *Use options sparingly.* Restrict your use of options to where they make the biggest difference in valuation. In general, options will affect value the most at smaller firms that derive the bulk of their value from assets that resemble options. Therefore, valuing patents as options to estimate firm value makes more sense for a small biotechnology firm than it does for a drug giant like Merck. While Merck may have dozens of patents, it derives much of its value from a portfolio of developed drugs and the cash flows they generate.
- *Opportunities are not always options.* You should be careful not to mistake opportunities for options. Analysts often see a firm with growth potential and assume that there must be valuable options embedded in the firm. For opportunities to become valuable options, you need some degree of exclusivity for the firm in question; this can come from legal restrictions on competition or a significant competitive edge.
- *Do not double count options.* All too often, analysts incorporate the effect of options on fundamentals and in company value and then proceed to add on premiums to reflect the same options. Consider, for instance, the undeveloped oil reserves owned by an oil company. While it is legitimate to value these reserves as options, you should not add this value to a discounted cash flow valuation of the company if your expected growth rate in the valuation is set higher because of the firm's undeveloped reserves.

CONCLUSION

The analyst faced with the task of valuing a firm/asset or its equity has to choose among three different approaches—discounted cash flow valuation, relative valuation, and option pricing models—and within each approach, between different models. This choice will be driven largely by the characteristics of the firm/asset being valued—the level of its earnings, its growth potential, the sources of earnings growth, the stability of its leverage, and its dividend policy. Matching the valuation model to the asset or firm being valued is as important a part of valuation as understanding the models and having the right inputs.

Once you decide to go with one or another of these approaches, you have further choices to make—whether to use equity or firm valuation in the context of discounted cash flow valuation, which multiple you should use to value firms or equity, and what type of option is embedded in a firm.

references

Chapter 1 Introduction to Valuation

Buffett, W. E., and L. A. Cunningham. 2001. *The essays of Warren Buffett: Lessons of corporate America*. Minneapolis, MN: Cunningham Group.

Cottle, S., R. Murray, and F. Bloch. 1988. *Security analysis*. New York: McGraw-Hill.

Graham, B., D. L. Dodd, and S. Cottle. 1962. *Security analysis*, 4th ed. New York: McGraw-Hill.

Chapter 2 Approaches to Valuation

Black, F., and M. Scholes. 1972. The valuation of option contracts and a test of market efficiency. *Journal of Finance* 27:399–417.

Damodaran, A. 1994. *Damodaran on Valuation*. New York: John Wiley & Sons.

Hooke, J. C. 2001. *Security analysis on Wall Street*. New York: John Wiley & Sons.

Chapter 3 Understanding Financial Statements

Choi, F. D. S., and R. M. Levich. 1990. *The capital market effects of international accounting diversity*. New York: Dow Jones–Irwin.

Stickney, C. P. 1993. *Financial statement analysis*. Fort Worth, TX: Dryden Press.

White, G. I., A. Sondhi, and D. Fried. 1997. *The analysis and use of financial statements*. New York: John Wiley & Sons.

Williams, J. R. 1998. *GAAP guide*. New York: Harcourt Brace.

Chapter 4 The Basics of Risk

Amihud, Y., B. Christensen, and H. Mendelson. 1992. Further evidence on the risk-return relationship. Working paper. New York University.

Bernstein, P. 1992. *Capital ideas*. New York: Free Press.

Bernstein, P. 1996. *Against the Gods*. New York: John Wiley & Sons.

Chan, L. K., and J. Lakonishok. 1993. Are the reports of beta's death premature? *Journal of Portfolio Management* 19:51–62.

Chen, N., R. Roll, and S. A. Ross. 1986. Economic forces and the stock market. *Journal of Business* 59:383–404.

Elton, E. J., and M. J. Gruber. 1995. *Modern portfolio theory and investment management*. New York: John Wiley & Sons.

Fama, E. F., and K. R. French. 1992. The cross-section of expected returns. *Journal of Finance* 47:427–466.

Jensen, M. C. 1969. Risk, the pricing of capital assets, and the evaluation of investment portfolios. *Journal of Business* 42:167–247.
Kothari, S. P., and J. Shanken. 1995. In defense of beta. *Journal of Applied Corporate Finance* 8(1):53–58.
Lintner, J. 1965. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics* 47:13–37.
Markowitz, H. M. 1991. Foundations of portfolio theory. *Journal of Finance* 46(2):469–478.
Roll, R. 1977. A critique of the asset pricing theory's tests: Part I: On past and potential testability of theory. *Journal of Financial Economics* 4:129–176.
Ross, S. A. 1976. The arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13(3):341–360.
Seyhun, H. N. 1986. Insiders' profits, costs of trading and market efficiency. *Journal of Financial Economics* 16:189–212.
Sharpe, W. F 1964. Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance* 19:425–442.
Weston, J. F., and T. E. Copeland. 1992. *Managerial finance*. Forth Worth: Dryden Press.

Chapter 5 Option Pricing Theory and Models

Black, F., and M. Scholes. 1972. The valuation of option contracts and a test of market efficiency. *Journal of Finance* 27:399–417.
Cox, J. C., and M. Rubinstein. 1985. *Options markets*. Upper Saddle River, NJ: Prentice Hall.
Cox, J. C., and S. A. Ross. 1976. The valuation of options for alternative stochastic processes. *Journal of Financial Economics* 3:145–166.
Cox, J. C., S. A. Ross, and M. Rubinstein. 1979. Option pricing: A simplified approach. *Journal of Financial Economics* 7:229–264.
Geske, R. 1979. The valuation of compound options. *Journal of Finance* 7:63–82.
Hull, J. C. 1999. *Options, futures and other derivatives*. Upper Saddle River, NJ: Prentice Hall.
Hull, J. C. 1995. *Introduction to futures and options markets*. Upper Saddle River, NJ: Prentice Hall.
Merton, R. C. 1973. The theory of rational option pricing. *Bell Journal of Economics* 4(1):141–183.
Merton, R. C. Option pricing when the underlying stock returns are discontinuous. *Journal of Financial Economics* 3:125–144.

Chapter 6 Market Efficiency—Definitions, Tests, and Evidence

Alexander, S. S. 1964. Price movements in speculative markets: Trends or random walks? In *The Random Character of Stock Market Prices*. Cambridge, MA: MIT Press.
Arbel, A., and P. J. Strebel. 1983. Pay attention to neglected stocks. *Journal of Porfolio Management* 9:37–42.
Banz, R. 1981. The relationship between return and market value of common stocks. *Journal of Financial Economics* 9:3–18.

Basu, S. 1977. The investment performance of common stocks in relation to their price-earnings: A test of the efficient market hypothesis. *Journal of Finance* 32:663–682.

Basu, S. 1983. The relationship between earnings yield, market value and return for NYSE common stocks: Further evidence. *Journal of Financial Economics* 12:129–156.

Bernstein, R. 1995. *Style investing*. New York: John Wiley & Sons.

Capaul, C., I. Rowley, and W. F. Sharpe. 1993. International value and growth stock returns. *Financial Analysts Journal* 49:27–36.

Carhart, M. M. 1997. On the persistence of mutual fund performance. *Journal of Finance* 52:57–82.

Chambers, A. E., and S. H. Penman. 1984. Timeliness of reporting and the stock price reaction to earnings announcements. *Journal of Accounting Research* 22:21–47.

Chan, L. K., Y. Hamao, and J. Lakonishok. 1991. Fundamentals and stock returns in Japan. *Journal of Finance* 46:1739–1789.

Chan, S. H., J. Martin, and J. Kensinger. 1990. Corporate research and development expenditures and share value. *Journal of Financial Economics* 26:255–276.

Conrad, J. 1989. The price effect of option introduction. *Journal of Finance* 44:487–498.

Cootner, P. H. 1961. Common elements in futures markets for commodities and bonds. *American Economic Review* 51(2):173–183.

Cootner, P. H. 1962. Stock prices: Random versus systematic changes. *Industrial Management Review* 3:24–45.

Damodaran, A. 1989. The weekend effect in information releases: A study of earnings and dividend announcements. *Review of Financial Studies* 2:607–623.

DeBondt, W. F. M., and R. Thaler. 1985 Does the stock market overreact? *Journal of Finance* 40:793–805.

DeBondt , W. F. M., and R. Thaler. 1987. Further evidence on investor overreaction and stock market seasonality. *Journal of Finance* 42:557–581.

Dimson, E., and P. R. Marsh. 1984. An analysis of brokers' and analysts' unpublished forecasts of UK stock returns. *Journal of Finance* 39:1257–1292.

Dimson, E., and P. R. Marsh. 1986. Event studies and the size effect: The case of UK press recommendations. *Journal of Financial Economics* 17:113–142.

Dimson, E., and P. R. Marsh. 2001. Murphy's law and market anomalies. *Journal of Portfolio Management* 25:53–69.

Fama, E. F. 1965. The behavior of stock market prices. *Journal of Business* 38:34–105.

Fama, E. F. 1970. Efficient capital markets: A review of theory and empirical work. *Journal of Finance* 25:383–417.

Fama, E. F., and K. R. French. 1988. Permanent and temporary components of stock prices. *Journal of Political Economy* 96:246–273.

Fama, E. F., and K. R. French. 1992. The cross-section of expected returns. *Journal of Finance* 47:427–466.

Fama, E. F., and M. Blume. 1966. Filter rules and stock market trading profits. *Journal of Business* 39:226–241.

Gibbons, M. R., and P. Hess. 1981. Day of the week effects and asset returns. *Journal of Business* 54:579–596.

Gultekin, M. N., and B. N. Gultekin. 1983. Stock market seasonality: International evidence. *Journal of Financial Economics* 12:469–481.

Haugen, R. A. 1990. *Modern investment theory*. Englewood Cliffs, NJ: Prentice Hall.
Haugen, R. A., and Lakonishok, J. 1988. *The incredible January effect*. Homewood IL: Dow Jones–Irwin.
Jaffe, J. 1974. Special information and insider trading. *Journal of Business* 47:410–428.
Jegadeesh, N., and S. Titman. 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48(1):65–91.
Jegadeesh, N., and S. Titman. 2001. Profitability of momentum strategies: An evaluation of alternative explanations. *Journal of Finance* 56(2):699–720.
Jennergren, L. P. 1975. Filter tests of Swedish share prices. In *International Capital Markets*, 55–67. New York: North-Holland.
Jennergren, L. P., and P. E. Korsvold. 1974. Price formation in the Norwegian and Swedish stock markets—Some random walk tests. *Swedish Journal of Economics* 76:171–185.
Jensen, M. 1968. The performance of mutual funds in the period 1945–64. *Journal of Finance* 2:389–416.
Jensen, M., and G. A. Bennington. 1970. Random walks and technical theories, some additional evidence. *Journal of Finance* 25:469–482.
Kaplan, R. S., and R. Roll. 1972. Investor evaluation of accounting information: Some empirical evidence. *Journal of Business* 45:225–257.
Keim, D. 1983. Size related anomalies and stock return seasonality: Further empirical evidence. *Journal of Financial Economics* 12.
McConnell, J. J., and C. J. Muscarella. 1985. Corporate capital expenditure decisions and the market value of the firm. *Journal of Financial Economics* 14:399–422.
Michaely, R., and K. L. Womack. 1999. Conflict of interest and the credibility of underwriter analyst recommendations. *Review of Financial Studies* 12:653–686.
Niederhoffer, V., and M. F. M. Osborne. 1966. Market making and reversal on the stock exchange. *Journal of the American Statistical Association* 61:891–916.
Peters, E. E. 1991. *Chaos and order in the capital markets*. New York: John Wiley & Sons.
Pradhuman, S. 2000. *Small cap dynamics*. Princeton, NJ: Bloomberg Press.
Praetz, P. D. 1972. The distribution of share price changes. *Journal of Business* 45(1):49–55.
Reinganum, M. R. 1983. The anomalous stock market behavior of small firms in January: Empirical tests for tax-loss effects. *Journal of Financial Economics* 12.
Rendleman, R. J., C. P. Jones, and H. A. Latene. 1982. Empirical anomalies based on unexpected earnings and the importance of risk adjustments. *Journal of Financial Economics* 10:269–287.
Richards, R. M., and J. D. Martin. 1979. Revisions in earnings forecasts: How much response? *Journal of Portfolio Management* 5:47–52.
Ritter, J., and N. Chopra. 1989. Portfolio rebalancing and the turn of the year effect. *Journal of Finance* 44:149–166.
Roll, R. 1983. Vas ist das? *Journal of Portfolio Management* 9:18–28.
Roll, R. 1984. A simple implicit measure of the bid-ask spread in an efficient market. *Journal of Finance* 39:1127–1139.
Rosenberg, B., K. Reid, and R. Lanstein. 1985. Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11:9–17.
Seyhun, H. N. 1998. *Investment intelligence from insider trading*. Cambridge, MA: MIT Press.

Shiller, R. 1999. *Irrational exuberance*. Princeton, NJ: Princeton University Press.
Sunder, S. 1973. Relationship between accounting changes and stock prices: Problems of measurement and some empirical evidence. In *Empirical Research in Accounting: Selected Studies* 1–45. Toronto: Lexington.
Sunder, S. 1975. Stock price and risk related accounting changes in inventory valuation. *Accounting Review* 305–315.
Womack, K. 1996. Do brokerage analysts' recommendations have investment value? *Journal of Finance* 51:137–167.
Woodruff, C. S., and A. J. Senchack, Jr. 1988. Intradaily price-volume adjustments of NYSE stocks to unexpected earnings. *Journal of Finance* 43(2):467–491.

Chapter 7 Riskless Rates and Risk Premiums

Altman, E. I. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance* 23:589–609.
Altman, E. I., and V. Kishore. 2000. The default experience of U.S. bonds. Working paper. Salomon Center, New York University.
Booth, L. 1999. Estimating the equity risk premium and equity costs: New way of looking at old data. *Journal of Applied Corporate Finance* 12(1):100–112.
Bruner, R. F., K. M. Eades, R. S. Harris, and R.C. Higgins. 1998. Best practices in estimating the cost of capital: Survey and synthesis. *Financial Practice and Education* 14–28.
Chan, K. C., G. A. Karolyi, and R. M. Stulz. 1992. Global financial markets and the risk premium on U.S. equity. *Journal of Financial Economics* 32:132–167.
Damodaran, A. 1999. *Estimating the equity risk premium*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.
Elton, E., M. J. Gruber, and J. Mei. 1994. Cost of capital using arbitrage pricing theory: A case study of nine New York utilities. *Financial Markets, Institutions and Instruments* 3:46–73.
Fama, E. F., and K. R. French. 1988. Permanent and temporary components of stock prices. *Journal of Political Economy* 96:246–273.
Godfrey, S., and R. Espinosa. 1996. A practical approach to calculating the cost of equity for investments in emerging markets. *Journal of Applied Corporate Finance* 9(3):80–81.
Ibbotson, R. G., and G. P. Brinson. 1993. *Global investing*. New York: McGraw-Hill.
Indro, D. C., and W. Y. Lee. 1997. Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premium. *Financial Management* 26:81–90.
Pettit, J. 1999. Corporate capital costs: A practitioner's guide. *Journal of Applied Corporate Finance* 12(1):113–120.
Rosenberg, B., and V. Marathe. 1979. Tests of capital asset pricing hypotheses. *Research in Finance* 1:115–124.
Stocks, bonds, bills and inflation. 1999. Chicago: Ibbotson Associates.
Stulz, R. M.. 1999. Globalization, corporate finance, and the cost of capital. *Journal of Applied Corporate Finance* 12(1).

Chapter 8 Estimating Risk Parameters and Costs of Financing

Blume, M. 1979. Betas and their regression tendencies: Some further evidence. *Journal of Finance* 34(1):265–267.

Brown, S. J., and J. B. Warner. 1980. Measuring security price performance. *Journal of Financial Economics* 8(3):205–258.
Brown, S. J., and J. B. Warner. 1985. Using daily stock returns: The case of event studies. *Journal of Financial Economics* 14(1):3–31.
Bruner, R. F., K. M. Eades, R. S. Harris and R. C. Higgins. 1998. Best practices in estimating the cost of capital: Survey and synthesis. *Financial Practice and Education* 14–28.
Dimson, E. 1979. Risk measurement when shares are subject to infrequent trading. *Journal of Financial Economics* 7(2):197–226.
Hamada, R. S. 1972. The effect of the firm's capital structure on the systematic risk of common stocks. *Journal of Finance* 27:435–452.
Scholes, M., and J. T. Williams. 1977. Estimating betas from nonsynchronous data. *Journal of Financial Economics* 5(3):309–327.

Chapter 9 Measuring Earnings

Aboody, D., and B. Lev. 1998. The value relevance of intangibles: The case of software capitalization. *Journal of Accounting Research* 36(0):161–191.
Bernstein, L. A., and J. G. Siegel. 1979. The concept of earnings quality. *Financial Analysts Journal* 35:72–75.
Damodaran, A. 1999. *The treatment of operating leases*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.
Damodaran, A. 1999. *The treatment of R&D*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.
Deng, Z., and B. Lev. 1998. The valuation of acquired R&D. Working paper. New York University.

Chapter 10 From Earnings to Cash Flows

Brennan, M. J. 1970. Taxes, market valuation and corporation financial policy. *National Tax Journal* 417–427.
Graham, J. R. 2000. How big are the tax benefits of debt? *Journal of Finance* 55(5):1901–1941.
Graham, J. R. Proxies for the corporate marginal tax rate. *Journal of Financial Economics* 42(2):187–221.

Chapter 11 Estimating Growth

Arnott, R. D. 1985. The use and misuse of consensus earnings. *Journal of Portfolio Management* 11:18–27.
Bathke, A. W., Jr., and K. S. Lorek. 1984. The relationship between time-series models and the security market's expectation of quarterly earnings. *Accounting Review* 163–176.
Box, G., and G. Jenkins. 1976. *Time series analysis: Forecasting and control*. Oakland, CA: Holden-Day.
Brown, L. D., and M. S. Rozeff. 1979. Univariate time series models of quarterly accounting earnings per share: A proposed model. *Journal of Accounting Research* 178–189.

Brown, L. D., and M. S. Rozeff. 1980. Analysts can forecast accurately! *Journal of Portfolio Management* 6:31–34.
Collins, W., and W. Hopwood. 1980. A multivariate analysis of annual earnings forecasts generated from quarterly forecasts of financial analysts and univariate time series models. *Journal of Accounting Research* 20:390–406.
Cragg, J. G., and B. G. Malkiel. 1968. The consensus and accuracy of predictions of the growth of corporate earnings. *Journal of Finance* 23:67–84.
Crichfield, T., T. Dyckman, and J. Lakonishok. 1978. An evaluation of security analysts forecasts. *Accounting Review* 53:651–668.
Foster, G. 1977. Quarterly accounting data: Time series properties and predictive ability results. *Accounting Review* 52:1–31.
Fried, D., and D. Givoly. 1982. Financial analysts forecasts of earnings: A better surrogate for earnings expectations. *Journal of Accounting and Economics* 4:85–107.
Fuller, R. J., L. C. Huberts, and M. Levinson. 1992. It's not higgledy-piggledy growth! *Journal of Portfolio Management* 18:38–46.
Givoly, D., and J. Lakonishok. 1984. The quality of analysts' forecasts of earnings. *Financial Analysts Journal* 40:40–47.
Hawkins, E. H., S. C. Chamberlin, and W. E. Daniel. 1984. Earnings expectations and security prices. *Financial Analysts Journal* 40:24–27, 30–38, 74.
Little, I. M. D. 1960. *Higgledy piggledy growth*. Oxford: Institute of Statistics.
O'Brien, P. 1988. Analysts' forecasts as earnings expectations. *Journal of Accounting and Economics* 10:53–83.
Vander Weide, J. H., and W. T. Carleton 1988. Investor growth expectations: Analysts vs. history. *Journal of Portfolio Management* 14:78–83.
Watts, R. 1975. *The time series behavior of quarterly earnings*. Working paper. University of Newcastle.

Chapter 12 Closure in Valuation: Estimating Terminal Value

Altman, E. I. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance* 23:589–609.
Grant, R. M., 1998. *Contemporary strategy analysis*. Malden, MA: Blackwell.
Mauboussin, M., and P. Johnson. 1997. Competitive advantage period: The neglected value driver. *Financial Management* 26(2):67–74.
Porter, M. E. 1980. *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.

Chapter 13 Dividend Discount Models

Bethke, W. M., and S.E. Boyd. 1983. Should dividend discount models be yield-tilted? *Journal of Portfolio Management* 9:23–27.
Estep, T. 1987. Security analysis and stock selection: Turning financial information into return forecasts. *Financial Analysts Journal* 43:34–43.
Estep, T. 1985. A new method for valuing common stocks. *Financial Analysts Journal* 41:26, 27, 30–33.
Fuller, R. J., and C. Hsia. 1984. A simplified common stock valuation model. *Financial Analysts Journal* 40:49–56.

Gordon, M. 1962. *The investment, financing and valuation of the corporation*. Homewood, IL: Irwin.
Haugen, R. 1997. *Modern investment theory*. Upper Saddle River, NJ: Prentice Hall.
Jacobs, B. I., and K. N. Levy. 1988a. Disentangling equity return irregularities: New insights and investment opportunities. *Financial Analysts Journal* 44:18–44.
Jacobs, B. I., and K. N. Levy. 1988b. On the value of "value." *Financial Analysts Journal* 44:47–62.
Litzenberger, R. H., and K. Ramaswamy. 1979. The effect of personal taxes and dividends on capital asset prices: Theory and empirical evidence. *Journal of Financial Economics* 7:163–196.
Sorensen, E. H., and D. A. Williamson. 1985. Some evidence on the value of the dividend discount model. *Financial Analysts Journal* 41:60–69.

Chapter 14 Free Cash Flow to Equity Discount Models

Damodaran, A. 2001. *Corporate finance: Theory and practice*, 2d ed. New York: John Wiley & Sons.

Chapter 15 Firm Valuation: Cost of Capital and Adjusted Present Value Approaches

Altman, E. I., and V. Kishore. 2000. *The default experience of U.S. bonds*. Working paper, Salomon Center, New York University.
Barclay, M. J., C. W. Smith, and R. L. Watts. 1995. The determinants of corporate leverage and dividend policies. *Journal of Applied Corporate Finance* 7(4):4–19.
Bhide, A. 1993. Reversing corporate diversification. In *The new corporate finance—Where theory meets practice*, ed. D. H. Chew Jr. New York: McGraw-Hill.
Damodaran, A. 2001. *Corporate finance: Theory and practice*, 2d ed. New York: John Wiley & Sons.
Davis, D., and K. Lee. 1997. A practical approach to capital structure for banks. *Journal of Applied Corporate Finance* 10(1):33–43.
Denis, D. J., and D. K. Denis. 1993. Leveraged recaps in the curbing of corporate overinvestment. *Journal of Applied Corporate Finance* 6(1):60–71.
Graham, J. 1996. Debt and the marginal tax rate. *Journal of Financial Economics* 41:41–73.
Inselbag, I., and H. Kaufold. 1997. Two DCF approaches and valuing companies under alternative financing strategies. *Journal of Applied Corporate Finance* 10(1):115–122.
Jensen, M. C. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76:323–329.
Kaplan, S. N. 1989. Campeau's acquisition of Federated: Value destroyed or value added? *Journal of Financial Economics* 25:191–212.
Mackie-Mason, J. 1990. Do taxes affect corporate financing decisions? *Journal of Finance* 45:1471–1494.
Miller, M. 1977. Debt and taxes. *Journal of Finance* 32:261–275.

Modigliani, F., and M. Miller. 1958. The cost of capital, corporation finance and the theory of investment. *American Economic Review* 48:261–297.
Myers, S. C. 1976. Determinants of corporate borrowing. *Journal of Financial Economics* 5:147–175.
Myers, S. C., and N. S. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13:187–221.
Opler, T., M. Saron, and S. Titman. 1997. Designing capital structure to create stockholder value. *Journal of Applied Corporate Finance* 10:21–32.
Palepu, K. G. 1986. Predicting takeover targets: A methodological and empirical analysis. *Journal of Accounting and Economics* 8(1):3–35.
Palepu, K. G. 1990. Consequences of leveraged buyouts. *Journal of Financial Economics* 26:247–262.
Pinegar, J. M., and L. Wilbricht. 1989. What managers think of capital structure theory: A survey. *Financial Management* 18(4):82–91.
Shapiro, A. 1989. *Modern corporate finance*. New York: Macmillan.
Smith, A. J. 1990. Corporate ownership structure and performance: The case of management buyouts. *Journal of Financial Economics* 27:143–164.
Smith, C. W. 1986. Investment banking and the capital acquisition process. *Journal of Financial Economics* 15:3–29.
Titman, S. 1984. The effect of capital structure on a firm's liquidation decision. *Journal of Financial Economics* 13:137–151.
Warner, J. N. 1977. Bankruptcy costs: Some evidence. *Journal of Finance* 32:337–347.

Chapter 16 Estimating Equity Value per Share

Carpenter, J. 1998. The exercise and valuation of executive stock options. *Journal of Financial Economics* 48:127–158.
Cuny, C. C., and P. Jorion. 1995. Valuing executive stock options with endogenous departure. *Journal of Accounting and Economics* 20:193–205.
Damodaran, A. 1999. *Dealing with cash, marketable securities and cross holdings*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.
Lease, R. C., J. J. McConnell, and W. H. Mikkelson. 1983. The market value of control in publicly-traded corporations. *Journal of Financial Economics* 11:439–471.

Chapter 17 Fundamental Principles of Relative Valuation

Damodaran, A. 2001. *It's all relative: First principles of relative valuation*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.

Chapter 18 Earnings Multiples

Cragg, J. G., and B. G. Malkiel. 1968. The consensus and accuracy of predictions of the growth of corporate earnings. *Journal of Finance* 23:67–84.
Goodman, D. A., and J. W. Peavy, III. 1983. Industry relative price-earnings ratios as indicators of investment returns. *Financial Analysts Journal* 39:60–66.
Kisor, M., Jr., and V. S. Whitbeck. 1963. A new tool in investment decision-making. *Financial Analysts Journal* 19:55–62.

Leibowitz, M. L., and S. Kogelman. 1992. Franchise value and the growth process. *Financial Analysts Journal* 48:53–62.
Levy, H., and Z. Lerman. 1985. Testing P/E ratio filters with stochastic dominance. *Journal of Portfolio Management* 11:31–40.
Peters, D. J. 1991. Valuing a growth stock. *Journal of Portfolio Mangement* 17:49–51.

Chapter 19 Book Value Multiples

Capaul, C., I. Rowley, and W. F. Sharpe. 1993. International value and growth stock returns. *Financial Analysts Journal* 49:27–36.
Chan, L. K., Y. Hamao, and J. Lakonishok. 1991. Fundamentals and stock returns in Japan. *Journal of Finance* 46:1739–1789.
Fama, E. F., and K. R. French. 1992. The cross-section of expected returns. *Journal of Finance* 47:427–466.
Jacobs, B. I., and K. N. Levy. 1988. On the value of "value." *Financial Analysts Journal* 44:47–62.
Lang, L. H. P., R. M. Stulz, and R. A. Walkling. 1991. A test of the free cash flow hypothesis: The case of bidder returns. *Journal of Financial Economics* 29:315–335.
Porter, M. E. 1980. *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.
Rosenberg, B., K. Reid, and R. Lanstein. 1985. Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11:9–17.
Wilcox, J. W. 1984. The P/B-ROE valuation model. *Financial Analysts Journal* 40:58–66.

Chapter 20 Revenue Multiples and Sector-Specific Multiples

Itami, H. 1987. *Mobilizing invisible assets*. Cambridge, MA: Harvard University Press.
Jacobs, B. I., and K. N. Levy. 1988. Disentangling equity return irregularities: New insights and investment opportunities. *Financial Analysts Journal* 44:18–44.
Senchack, A. J., Jr., and J. D. Martin. 1987. The relative performance of the PSR and PER investment strategies. *Financial Analysts Journal* 43:46–56.

Chapter 21 Valuing Financial Service Firms

Copeland, T. E., T. Koller, and J. Murrin. 1999. *Valuation: Measuring and managing the value of companies*. New York: John Wiley & Sons.

Chapter 22 Valuing Firms with Negative Earnings

Damodaran, A. 2001. *Dealing with negative earnings*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.

Chapter 23 Valuing Young or Start-Up Firms

Damodaran, A. 2001. *The dark side of valuation*. Upper Saddle River, NJ: Prentice Hall.

Chapter 24 Valuing Private Firms

Beaver, W. H., P. Kettler, and M. Scholes. 1970. The association between market determined and accounting determined risk measures. *Accounting Review* 45(4):654–682.

Kim, S. H., T. Crick, and S. H. Kim. 1986. Do executives practice what academics preach? *Management Accounting* 68:49–52.

Maher, J. M. 1976. Discounts for lack of marketability for closely held business interests. *Tax Magazine* 1:562–571.

Moroney, R. E. 1973. Most courts overvalue closely held stocks. *Tax Magazine* 1:144–155.

Pratt, S., R. F. Reilly, and R. P. Schweihs. 2000. *Valuing a business: The analysis and appraisal of closely held companies*. New York: McGraw-Hill.

Rosenberg, B., and J. Guy. 1976. Beta and investment fundamentals; Beta and investment fundamentals—II. *Financial Analysts Journal* 32(3):60–72; 32(4):62–70.

Rosenberg, B., and J. Guy. 1995. Prediction of beta from investment fundamentals. *Financial Analysts Journal* 51(1):101–112.

Silber, W. L. 1991. Discounts on restricted stock: The impact of illiquidity on stock prices. *Financial Analysts Journal* 47:60–64.

Chapter 25 Acquisitions and Takeovers

Bhide, A. 1989. The causes and consequences of hostile takeovers. *Journal of Applied Corporate Finance* 2:36–59.

Bhide, A. 1993. Reversing corporate diversification. In *The new corporate finance—Where theory meets practice*, ed. D. H. Chew Jr. New York: McGraw-Hill.

Bradley, M., A. Desai, and E. H. Kim. 1983. The rationale behind interfirm tender offers. *Journal of Financial Economics* 11:183–206.

Bradley, M., A. Desai, and E. H. Kim. 1988. Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. *Journal of Financial Economics* 21:3–40.

Dann, L. Y., and H. DeAngelo. 1983. Standstill agreements, privately negotiated stock repurchases, and the market for corporate control. *Journal of Financial Economics* 11:275–300.

Dann, L. Y., and H. DeAngelo. 1988. Corporate financial policy and corporate control: A study of defensive adjustments in asset and ownership structure. *Journal of Financial Economics* 20:87–128.

DeAngelo, H., and E. M. Rice. 1983. Antitakeover charter amendments and stockholder wealth. *Journal of Financial Economics* 11:329–360.

DeAngelo, H., L. DeAngelo, and E. M. Rice. 1984. Going private: The effects of a change in corporate ownership structure. *Midland Corporate Finance Journal* 35–43.

Deng, Z., and B. Lev. 1998. *The valuation of acquired R&D*. Working paper. New York University.

Dubofsky, P., and P. R. Varadarajan. 1987. Diversification and measures of performance: Additional empirical evidence. *Academy of Management Journal* 597–608.

Fruhan, W. E., W. C. Kester, S. P. Mason, T. R. Piper, and R. S. Ruback. 1992. *Congoleum: Case problems in finance*. Homestead, IL: Irwin.

Gaughan, P. A. 1999. *Mergers, Acquisitions and Corporate Restructurings*. New York: John Wiley & Sons.

Healy, P. M., K.G . Palepu, and R.S . Ruback. 1992. Does corporate performance improve after mergers? *Journal of Financial Economics* 31:135–176.

Hong, H., R. S. Kaplan, and G. Mandelkar. 1978. Pooling vs. purchase: The effects of accounting for mergers on stock prices. *Accounting Review* 53(1):31–47.

Jarrell, G. A., J. A. Brickley, and J. M. Netter. 1988. The market for corporate control: The empirical evidence since 1980. *Journal of Economic Perspectives* 2:49–68.

Jensen, M.C. 1986. Agency costs of free cashflow, corporate finance and takeovers. *American Economic Review* 76:323–329.

Jensen, M. C., and R. S. Ruback. 1983. The market for corporate control. *Journal of Financial Economics* 11:5–50.

Kaplan, S., and M. S. Weisbach. 1992. The success of acquisitions: The evidence from divestitures. *Journal of Finance* 47:107–138.

Karpoff, J. M., and P. H. Malatesta. 1990. The wealth effects of second-generation state takeover legislation. *Journal of Financial Economics* 25:291–322.

KPMG. 1999. *Unlocking shareholder value: The keys to success*. New York: KPMG Global Research Report.

Krallinger, J. C. 1997. *Mergers and acquisitions: Managing the transaction*. New York: McGraw-Hill.

Lewellen, W. G. 1971. A pure financial rationale for the conglomerate merger. *Journal of Finance* 26:521–537.

Lindenberg, E., and M. P. Ross. 1999. To purchase or to pool: Does it matter? *Journal of Applied Corporate Finance* 12:32–47.

Linn, S., and J. J. McConnell. 1983. An empirical investigation of the impact of anti-takeover amendments on common stock prices. *Journal of Financial Economics* 11:361–399.

Michel, A., and I. Shaked. 1984. Does business diversification affect performance? *Financial Management* 13:5–14.

Mitchell, M. L., and K. Lehn. 1990. Do bad bidders make good targets? *Journal of Applied Corporate Finance* 3:60–69.

Myers, S. C., and N. S. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13:187–221.

Nail, L. A., W. L. Megginson, and C. Maquieira. 1998. Wealth creation versus wealth redistributions in pure stock-for-stock mergers. *Journal of Financial Economics* 48:3–33.

Parrino, J. D., and R. S. Harris. Takeovers, management replacement and post-acquisition operating performance: Some evidence from the 1980s. *Journal of Applied Corporate Finance* 11:88–97.

Roll, R. 1986. The hubris hypothesis of corporate takeovers. *Journal of Business* 59:197–216.

Sirower, M. L. 1996. *The synergy trap*. New York: Simon & Schuster.

Stapleton, R. C. 1985. A note on default fisk, leverage and the MM theorem. *Journal of Financial Economics* 2:377–381.

Varadarajan, P. R., and V. Ramanujam. 1987. Diversification and performance: A reexamination using a new two-dimensional conceptualization of diversity in firms. *Academy of Management Journal* 30:369–380.

Weston, J. F., K. S. Chung, and J. A. Siu. 1998. *Takeovers, restructuring and corporate governance*. New York: Simon & Schuster.

Chapter 26 Valuing Real Estate

Fama, E. F., and G. W. Schwert. 1977. Asset returns and inflation. *Journal of Financial Economics* 5:115–146.

Ibbotson, R. G., and G. P. Brinson. 1993. *Global investing*. New York: McGraw-Hill.

Chapter 27 Valuing Other Assets

Mei, J., and M. Moses. 2001. *Art as an investment and the underperformance of masterpieces: Evidence from 1875–2000*. Working paper. Stern School of Business, New York University.

Chapter 28 The Option to Delay and Valuation Implications

Avellaneda, M., and P. Lawrence. 2000. *Quantitative modeling of derivative securities*. New York: Chapman & Hall.

Brennan, M. J., and E. S. Schwartz. 1985. Evaluating natural resource investments. *Journal of Business* 58:135–158.

Siegel, D., J. Smith, and J. Paddock. 1993. Valuing offshore oil properties with option pricing models. In *The new corporate finance*, ed. D. H. Chew Jr. New York: McGraw-Hill.

Chapter 29 The Options to Expand and to Abandon: Valuation Implications

Amram, M., and N. Kulantilaka. 1998. *Real options: Managing strategic investments in an uncertain world*. New York: Oxford University Press.

Copeland, T. E., and V. Antikarov. 2001. *Real options: A practitioners guide*. New York: Texere.

Mauboussin, M. 1998. *Get real*. Credit Suisse First Boston.

Chapter 30 Valuing Equity in Distressed Firms

Copeland, T. E., and V. Antikarov. 2001. *Real options: A practitioners guide*. New York: Texere.

Chapter 31 Value Enhancement: A Discounted Cash Flow Valuation Framework

Brickley, J., C. Smith, and J. Zimmerman. 1995. The economics of organizational architecture. *Journal of Applied Corporate Finance* 8:19–31.

Copeland, T. E., T. Koller, and J. Murrin. 1999. *Valuation: Measuring and managing the value of companies*. New York: John Wiley & Sons.

Damodaran, A. 1999. Value enhancement: Back to the future. *Contemporary Finance Digest* 3:2–47.

Fruhan, W. E. 1979. *Financial strategy: Studies in the creation, transfer and destruction of shareholder value*. Homewood, IL: Irwin.

Grant, R. M. 1998. *Contemporary strategy analysis*. Malden, MA: Blackwell.

Levin, R. C., A. K. Klevorick, R. R. Nelson, and S. G. Winter. 1987. Appropriating the returns from industrial research and development. Brookings Paper on Economic Activity.

McConnell, J. J., and C. J. Muscarella. 1985. Corporate capital expenditure decisions and the market value of the firm. *Journal of Financial Economics* 14:399–422.
Porter, M. E. 1980. *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.
Rappaport, A. 1998. *Creating shareholder value*. New York: Free Press.
Schipper, K., and A. Smith. 1983. Effects of recontracting on shareholder wealth: The case of voluntary spin-offs. *Journal of Financial Economics* 12:437–468.
Schipper, K., and A. Smith. 1986. A comparison of equity carve-outs and seasoned equity offerings: Share price effects and corporate restructuring. *Journal of Financial Economics* 15:153–186.
Shapiro, A. 1985. Corporate strategy and the capital budgeting decision. *Midland Corporate Finance Journal* 3:22–36.
Shapiro, A. 1989. *Modern corporate finance*. New York: Macmillan.
Stulz, R. 1996. Does the cost of capital differ across countries? An agency perspective. *European Financial Management* 2:11–22.
Weston, J. F., and T. E. Copeland. 1992. *Managerial finance*, 9th ed. Orlando, FL: Harcourt Brace Jovanovich.
Woolridge, R. 1993. Competitive decline and corporate restructuring. In *The new corporate finance*, ed. D. H. Chew Jr. New York: McGraw-Hill.

Chapter 32 Value Enhancement: Economic Value Added, Cash Flow Return on Investment, and Other Tools

Bernstein, R. 1997. *EVA and market returns*. Quantitative Viewpoint, Merrill Lynch, December 19, 1997.
Bernstein, R. 1997. *EVA and market returns*. Quantitative Viewpoint, Merrill Lynch, February 3, 1998.
Brickley, J., C. Smith, and J. Zimmerman. 1995. Transfer pricing and the control of internal corporate transactions. *Journal of Applied Corporate Finance* 8(2):60–67.
Damodaran, A. 1999. Value enhancement: Back to the future. *Contemporary Finance Digest* 3:2–47.
Ehrbar, A. 1998. *EVA: The real key to creating wealth*. New York: John Wiley & Sons.
Kramer, J. R., and G. Pushner. 1997. An empirical analysis of economic value added as a proxy for market value added. *Financial Practice and Education* 7:41–49.
Madden, B. L. 1998. *CFROI cash flow return on investment valuation: A total system approach to valuing a firm*. Woburn, MA: Butterworth-Heinemann.
O'Byrne, S. F. 1996. EVA and market value. *Journal of Applied Corporate Finance* 9(1):116–125.
O'Byrne, S. F., and S. D. Young. 2000. *EVA and value-based management*. New York: McGraw-Hill.
Stewart, G. B. 1991. *The quest for value*. New York: HarperBusiness.
Stulz, R. 1996. Rethinking risk management. *Journal of Applied Corporate Finance* 9(3):8–24.

Chapter 33 Valuing Bonds

Altman, E. I., and V. Kishore. 2000. The default experience of U.S. bonds. Working paper. Salomon Center, New York University.

Atkinson, T. R. 1967. *Trends in corporate bond quality.* Cambridge, MA: National Bureau of Economic Research.

Black, F., and M. Scholes. 1972. The valuation of option contracts and a test of market efficiencies. *Journal of Finance* 27:399–417.

Brennan, M. J., and E. S. Schwartz. 1977. Savings bonds, retractable bonds and callable bonds. *Journal of Financial Economics* 5:67–88.

Brennan, M. J., and E. S. Schwartz. 1980. Analyzing convertible bonds. *Journal of Financial and Quantitative Analysis* 15:907–929.

Briys, E., M. Crouhy, and R. Schobel. 1991. The pricing of default-free interest rate cap, floor and collar agreements. *Journal of Finance* 46:1879–1892.

Fabozzi, F. J. 1994. *Investment management*. Englewood Cliffs, NJ: Prentice Hall.

Fama, E. F. 1975. Short term interest rates as predictors of inflation. *American Economic Review* 65:269–282.

Figlewski, S., W. L. Silber, and M. G. Subrahmanyam, eds. 1990. *Financial options*. Homewood, IL: Business One Irwin.

Fraine, H. G., and R. H. Mills. 1961. Effect of defaults and credit deterioration on yields of corporate bonds. *Journal of Finance* 16:423–434.

Harvey, C. R. 1991. The term structure and world economic growth. *Journal of Fixed Income* 1:4–17.

Hempel, G. H. 1971. *The postwar quality of state and local debt*. Cambridge, MA: National Bureau of Economic Research.

Hickman, W. B. 1958. *Corporate bond quality and investor experience*. Cambridge, MA: National Bureau of Economic Research.

Hicks, J. R. 1946. *The value of capital*. New York: Oxford University Press.

Ho, T. S. Y., and S. B. Lee. 1989. Pricing of the call and sinking fund provisions on corporate bonds under interest rate risk: Empirical evidence. *International Journal of Finance* 2:1–17.

Ingersoll, J. 1977. An examination of corporate call policies on convertible securities. *Journal of Finance* 32:463–478.

Johnson, R. E. 1967. Term structures of corporate bond yields as a function of the risk of default. *Journal of Finance* 22:313–345.

McCulloch, J. H. 1975. An estimate of the liquidity premium. *Journal of Political Economy* 83:95–119.

Meiselman, D. 1962. *The term structure of interest rates*. Englewood Cliffs, NJ: Prentice Hall.

Park, S. Y., and M. G. Subrahmanyam. 1990. Option features of corporate securities. In *Financial Options*, ed. S. Figlewski et al. Homewood, IL: Business One Irwin.

Sarig, O., and A. Warga. 1989. Some empirical estimates of the term structure of interest rates. *Journal of Finance* 44:1351–1360.

Shiller, R. J. 1979. The volatility of long-term interest rates and expectations models of the term structure. *Journal of Political Economy* 87:1190–1219.

Stapleton, R. C., and M. G. Subrahmanyam. 1990. Interest rate caps and floors. In *Financial options*, ed. S. Figlewski et al. Homewood, IL: Business One Irwin.

Van Horne, J. C. 1965. Interest-rate risk and the term structure of interest rates. *Journal of Political Economy* 73:344–351.

Wood, J. H., and N. L. Wood. 1985. *Financial markets*. Orlando, FL: Harcourt Brace Jovanovich

Chapter 34 Valuing Futures and Forward Contracts

Houthaker, H. S. 1957. Can speculators forecast prices? *Review of Economics and Statistics* 39:73–87.

Hull, J. C. 1999. *Options, futures and derivative securities*. Upper Saddle River, NJ: Prentice Hall.

Telser, L. G. 1958. Futures trading and the storage of cotton and wheat. *Journal of Political Economy* 3:233–255.

Chapter 35 Overview and Conclusion

Damodaran, A. 2001. *Choosing the right valuation model*. Working paper. www.stern.nyu.edu/~adamodar/New_Home_Page/papers.html.