21

Framework for Structuring the Terms of Exchange: Finding the "Win-Win" Deal

INTRODUCTION

The *exchange ratio* in a share-for-share deal is the number of buyer shares offered per target share. Cash deals also have an exchange ratio: The *cash exchange ratio* is the number of dollars exchanged per target share. This chapter presents a framework for determining an exchange ratio in mergers and acquisitions.

In essence, the design of terms of exchange should be driven by an assessment of the gains or losses imposed on the two parties through any particular deal structure.

- *Cash deals.* With deals in which payment is in cash, this assessment is straightforward: For either party, one compares the cash payment to the intrinsic value of the asset. The question for each side in a *cash-for-stock deal* is whether the deal will create, or at least conserve, value.
- *Stock deals.* In *stock-for-stock deals*, the logic is the same, though the analysis is a bit more complicated. In stock deals, the crucial design feature that governs the wealth of the buyer and seller is the exchange ratio, the number of shares of the buyer's stock to be received for each share of the target firm's stock. In concept, the buyer does not want to give away more value (expressed in shares of its stock) than the target share is worth; and the target shareholder does not want to settle for less of the buyer's stock than the target is worth. Plainly, the adequacy of an exchange ratio (and the resulting determination of winners and losers) boils down to some notion about the worth of the buyer and target shares.

The focus on exchange ratio raises an important tool for assessing price and form of payment: the exchange ratio determination model. This chapter will present analytic models for critically assessing the exchange ratio in both stock-for-stock deals and cash-for-stock deals. The overarching implication of these models is that one must have a view about the value of the new firm ("Newco") arising from the deal. These models show, especially, the important effect of synergies on terms of exchange. The models also reveal that the choice of terms of exchange potentially creates winners and losers. Deal makers (especially buyers) who intend to participate in M&A transactions repeatedly will want to design transactions that are mu-

tually beneficial to both parties. The models presented here offer insights into the win-win terms of exchange: the "*sweet spot*" of M&A deal design.

A MODEL FOR CRITICALLY ASSESSING EXCHANGE RATIOS

Deal boundaries are the limits within which a mutually agreeable deal ("*win-win*" *deal*) deal is possible: Such a deal is above the minimum acceptable ratio for the seller and below the maximum acceptable ratio for the buyer. Larson and Gonedes (1969) derived these boundaries based on an analysis of *price-earnings ratios*—their derivation of these boundaries is given in Appendix 21.1. Yagil (1987) derived the boundaries based on the discounted dividend growth model. Drawing on Larson and Gonedes, I derived the share-exchange boundaries based on general discounted cash flow (DCF) estimates of value (see Appendix 21.2 for the derivation). I also derived the boundaries for the *cash* exchange (see Appendixes 21.3 and 21.4).

The key foundation for these models is the reasonable assumption that neither the buyer nor the seller wants to be poorer after the deal than before. This suggests that the buyer will set a *maximum exchange ratio* below which the buyer will be willing to acquire the target. Similarly, it suggests that the target shareholders will have a *minimum exchange ratio* above which it will be willing to be acquired. A deal rationally should be consummated somewhere in the range between the buyer's maximum and target's minimum. It should be simple enough to identify this range, except for one detail: The maximum and minimum depend on the estimated value of the new firm arising from the deal ("Newco"). Because the value of Newco is uncertain, the analyst needs to assess the minimum and maximum exchange ratios across a range of possible values for Newco. In the models that follow, this is accomplished in two ways: (1) by focusing on the likely price/earnings (P/E) ratio of Newco, and (2) more directly, by estimating the likely DCF value of equity of Newco.

The boundaries defining the value-creating and value-destroying deals are summarized in Exhibit 21.1. The terms in these equations are defined as follows—the subscript "1" indicates the buyer; the subscript "2" indicates the target; and subscript "12" indicates Newco:

ER_1 = Maximum acceptable exchange ratio (buyer shares per target share) from the buyer's viewpoint.
ER_2 = Minimum acceptable exchange ratio (buyer shares per target share) from the target's viewpoint.
P_1 = Price per share of the buyer today, before the transaction.
P_2 = Price per share of the target today.
S_1 = Number of buyer shares outstanding today, before the transaction.
S_2 = Number of target shares outstanding today.
E_1 = Net income of the buyer, next year,[1] stand-alone basis.
E_2 = Net income of the target, next year, stand-alone basis.
$E_{Synergies}$ = The change in net income of the combined firm arising from synergies.
DCF_{12} = Discounted cash flow value of the equity of the combined firm.
PE_{12} = Price/earnings ratio of the combined firm, based on leading estimates of earnings.

EXHIBIT 21.1 Formulas for the Deal Boundaries

	Buyer's Maximum Acceptable Exchange Ratio	Target's Minimum Acceptable Exchange Ratio
Shares for shares (P/E boundaries) (Larson and Gonedes 1969)	$ER_1 = \frac{S_1}{S_2} + \frac{E_1 + E_2 + E_{\text{Synergies}}}{P_1 S_2} PE_{12}$ (a)	$ER_2 = \frac{P_2 S_1}{PE_{12}(E_1 + E_2 + E_{\text{Synergies}}) - P_2 S_2}$ (b)
Shares for shares (DCF boundaries)	$ER_1 = \frac{DCF_{12} - P_1 S_1}{P_1 S_2}$ (c)	$ER_2 = \frac{P_2 S_1}{DCF_{12} - P_2 S_2}$ (d)
Cash for shares (P/E boundaries)	$ER_1 = \frac{\text{Cash}}{S_2} = \frac{PE_{12}(E_1 + E_2 + E_{\text{Synergies}}) - P_1 S_1}{S_2}$ (e)	$ER_2 = \frac{\text{Cash}}{S_2} = P_2$ (f)
Cash for shares (DCF boundaries)	$ER_1 = \frac{\text{Cash}}{S_2} = \frac{DCF_{12} - P_1 S_1}{S_2}$ (g)	$ER_2 = \frac{\text{Cash}}{S_2} = P_2$ (h)

USES OF THESE MODELS

Though seemingly complex, the exchange rate determination models have three simple but important potential applications:

1. *With an informed, rational view about the DCF value or the P/E ratio of Newco, one can identify a negotiation range and some likelihood of agreement.* Within these boundaries, one can proceed to define more specific boundaries of various possible deal outcomes: (1) a win-win outcome for acquirer and target, (2) lose-lose, and (3) one wins and the other loses.
2. *Given a proposed exchange ratio, one can identify P/E or DCF breakeven assumptions necessary to permit a mutually beneficial deal.* The formula is easily solved by trial and error (or with the "Data Table" function in Excel) for the P/E ratio or DCF value at which $ER_1 = ER_2$; this value identifies the minimum P/E or value of Newco necessary to achieve a win-win outcome. Having a good idea of whether one is in win-lose or win-win territory is indispensable for developing a negotiating strategy.
3. *Given both a proposed exchange ratio and view of DCF value or P/E of Newco, one can evaluate the adequacy of a proposal.* An offer (in cash or number of shares) can easily be compared to the maximum or minimum deal boundaries (depending on your side) as a basis for responding to an offer.

AN ILLUSTRATION

The spreadsheet model "Deal Boundaries.xls," which can be found on the CD-ROM, offers the following example. Consider a share-for-share exchange proposal with the parameters given in Exhibit 21.2; the most important assumptions are that Newco will have a P/E ratio of 20 and a DCF value of $12,000. Consistent with these assumptions, the maximum acceptable exchange ratio to the buyer is 0.83 buyer shares per target share based on the P/E model, and 0.83 shares based on the DCF model (see Exhibit 21.3). The minimum acceptable exchange ratio to the target is 0.57 shares based on the P/E model, and 0.57 shares based on the DCF model. A *zone of agreement* (or range of exchange ratios over which a mutually ac-

EXHIBIT 21.2 Assumptions Used in the Illustration of Deal Boundaries

	P/E Model Assumptions		DCF Model Assumptions	
Buyer's share price	P_1	$ 60	P_1	$ 60
Target's share price	P_2	$ 40	P_2	$ 40
Buyer's net income	E_1	$300		
Target's net income	E_2	$250		
Net Income from synergies	E_s	$ 1		
Buyer's share outstanding	S_1	100	S_1	100
Target's shares outstanding	S_2	100	S_2	100
Expected P/E ratio/DCF of Newco	PE_{12}	20	DCF_{12}	$12,000

EXHIBIT 21.3 Estimates of the Maximum and Minimum Exchange Ratios Used in the Example

Results Based on P/E of Newco			Results Based on Equity DCF Value of Newco		
PE_{12}	Maximum Acceptable ER_1	Minimum Acceptable ER_2	DCF_{12}	Maximum Acceptable ER_1	Minimum Acceptable ER_2
12.70	0.17	1.33	$ 7,000	0.17	1.33
14.52	0.33	1.00	$ 8,000	0.33	1.00
16.33	0.50	0.80	$ 9,000	0.50	0.80
18.15	0.67	0.67	$10,000	0.67	0.67
19.96	0.83	0.57	$11,000	0.83	0.57
21.78	1.00	0.50	$12,000	1.00	0.50
23.59	1.17	0.44	$13,000	1.17	0.44

ceptable deal might be struck) exists in this example—the target's minimum exchange ratio is well below the buyer's maximum.

The attractiveness of the deal depends to a large extent on the P/E ratio and/or DCF value for the buyer's shares expected to prevail after the transaction. To a large extent, the attractiveness of the deal depends on the P/E ratio and/or the DCF value expected from the future value of the buyer's shares, after the transaction. Some analysis of the deal boundaries is required in order to determine the sensitivity of the zone of agreement to the assumed posttransaction value. Using the Data Table function in Excel, one can readily generate the boundaries given different P/E and DCF values. Extending this example, the buyer's maximum (ER_1) and target's minimum (ER_2) acceptable exchange ratios are given in Exhibit 21.3. The exchange ratios in these tables offer an interesting insight: Over some ranges of P/E or DCF value, *there is no feasible deal for one or both parties.* A feasible deal for each side simply meets the requirement of not being poorer after the deal than before. There are, in fact, four possible states of the world:

1. ***Both win.*** This is the win-win outcome where an exchange ratio can be chosen that is below the buyer's maximum and above the target's minimum.
2. ***Target wins, buyer loses.*** Here, an exchange ratio is chosen that is above the target's minimum *and* above the buyer's maximum. In this outcome *the buyer has overpaid.*
3. ***Both lose.*** This outcome destroys value for both sides, the "deal from hell."
4. ***Buyer wins, target loses.*** Here, an exchange ratio is chosen that is below the target's minimum *and* below the buyer's maximum. In this outcome *the target has undersold.*

Graphing the results of the data tables reveals each of these four regions. Graphs of the P/E and DCF results are given in Exhibits 21.4 and 21.5. These graphs reveal that the minimum and maximum boundaries create "zones" of outcomes. Insights into the size and location of the zones are enormously useful in the identification of bargaining strategies.

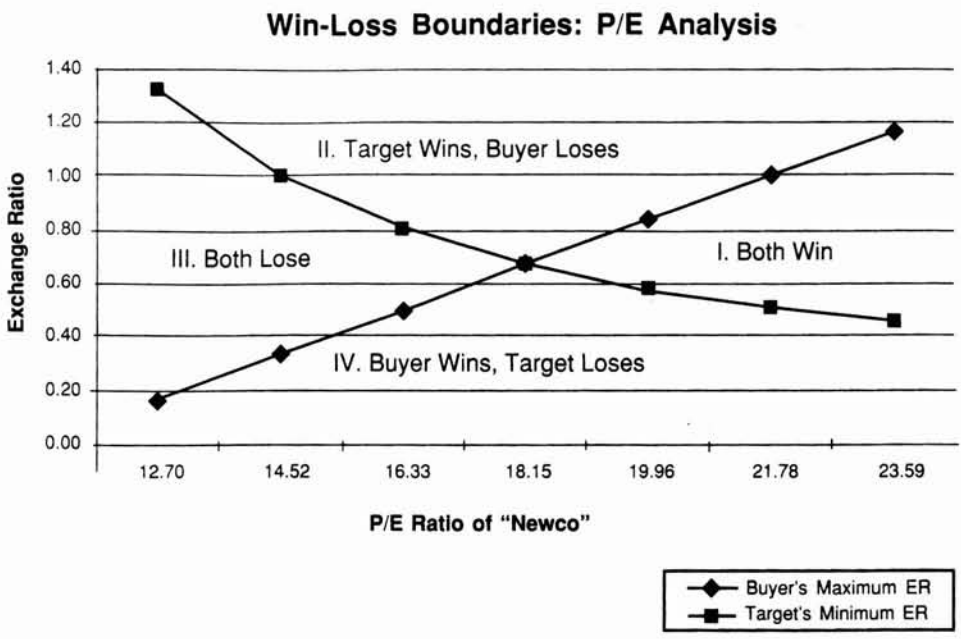

EXHIBIT 21.4 Estimated Deal Boundaries Based on Price/Earnings Ratios; Hypothetical Case Example: Share-for-Share Deal

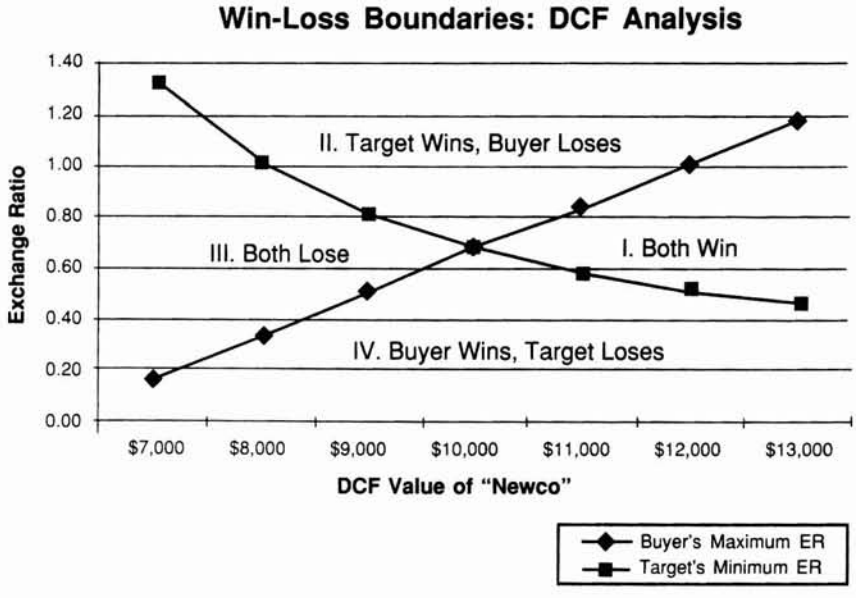

EXHIBIT 21.5 Estimated Deal Boundaries Based on Discounted Cash Flow; Hypothetical Case Example: Share-for-Share Deal

The first insight is the point of crossover between the target and buyer deal boundaries—the value at this point is the minimum P/E or DCF value necessary to permit a mutually agreeable deal. Knowing this minimum allows the deal designer to conduct a sensitivity analysis of valuation assumptions necessary to achieve this minimum value. Gaining insight into the breakeven values is the second potential application of this model.

The third application would simply be to position any particular offered exchange ratio on the diagram to see whether the bid was good, and for whom. For instance, if a postmerger P/E ratio for Newco were 23.6 times, an exchange ratio offer of 1:1 would be attractive to both buyer and seller.

EXTENSION TO CASH-FOR-STOCK DEALS

The logic of the stock-for-stock model can be extended easily to cash-for-stock deals (see Appendixes 21.3 and 21.4). Here, the exchange ratio is expressed literally in dollars per share of target stock. Unlike the stock-for-stock scenario, in cash deals the target's minimum is quite simple: To avoid destroying value, the target shareholders should not sell for less than the value per share before. This results in the same four zones. Exhibits 21.6 and 21.7 give the results for our example, but assuming a cash deal.

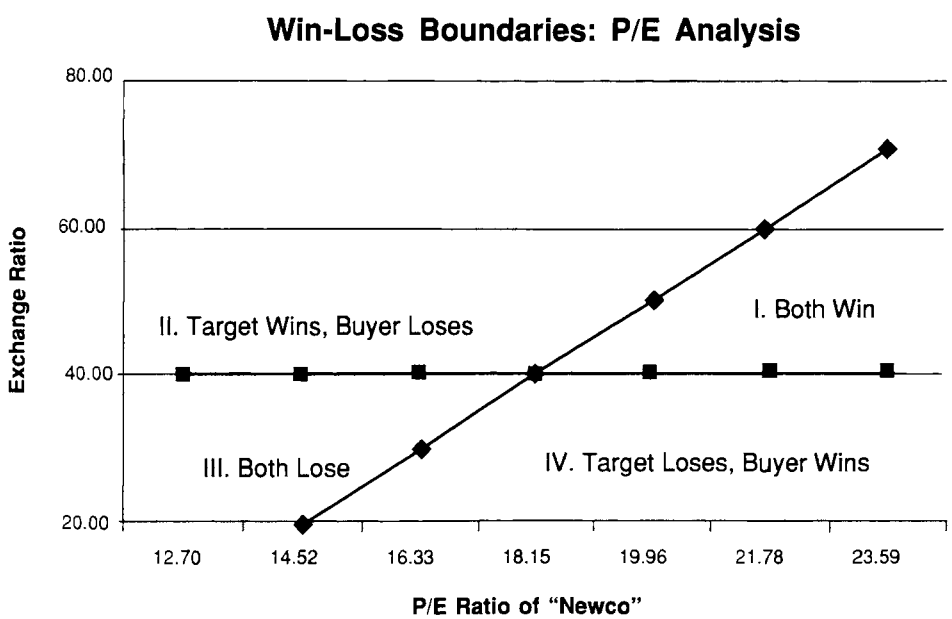

EXHIBIT 21.6 Estimated Deal Boundaries Based on Price/Earnings Ratios; Hypothetical Case Example: Cash-for-Share Deal

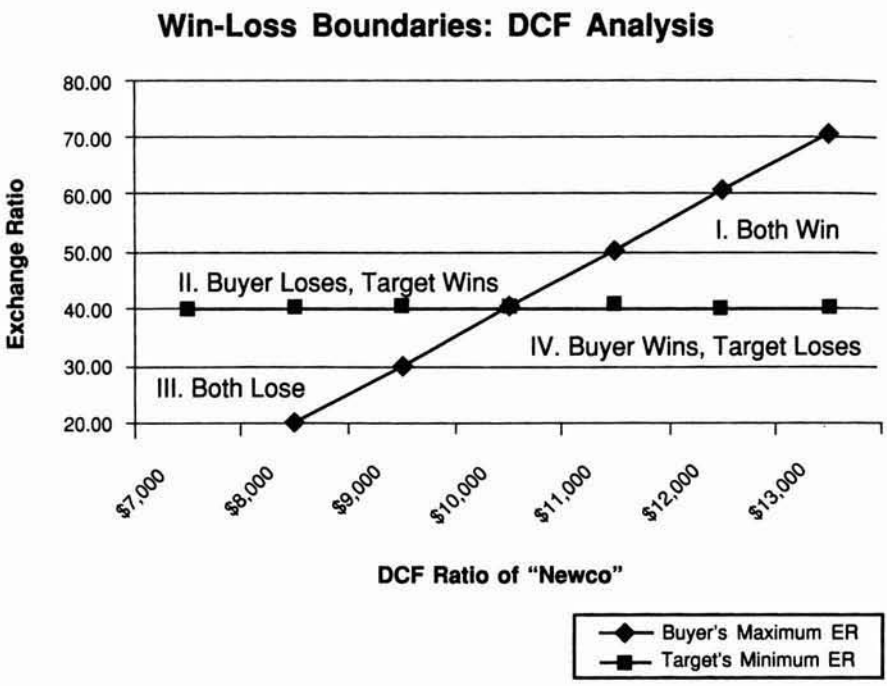

EXHIBIT 21.7 Estimated Deal Boundaries Based on Discounted Cash Flows; Hypothetical Case Example: Cash-for-Share Deal

CHOOSING EXCHANGE RATIO TARGETS IN THE WIN-WIN ZONE

Simply finding the boundaries of the win-win region can give negotiators and deal designers useful guidance on where *not* to wander. But in many situations, the range between the two boundaries will be large. How should one aim to carve up the middle ground? Three factors tend to determine the outcomes:

1. ***Bargaining power.*** One side may be exposed to more pain than the other, if negotiations fail. Negotiators may enter the discussions with different strength of reputation, credibility, charisma, influence, or mastery of negotiating tactics. Negotiated merger terms are what economists call a "bargaining solution," because there is no model that can dictate with certainty what the optimal outcome should be.
2. ***Control premium in comparable transactions.*** The cash equivalent of the shares offered in the exchange ratio will indicate the percentage premium that the buyer is offering to the seller. Most sellers will seek an exchange ratio that is consistent with control premiums offered in comparable transactions.
3. ***Focal points based on relative contribution of the two firms.*** Equitable exchange ratios would be those that reward the respective sides for their contributions to the value of Newco. There are many possible means of measuring the relative contribution of the two sides to Newco—it must be emphasized

that all measures of relative contribution are only signposts toward what is ultimately a matter of judgment, the contribution to the expected value of a firm that does not as yet exist. Thus, the task for the deal designer is to abstract an equitable exchange ratio from a variety of imperfect measures of contribution, such as:

- *Share prices of the two firms before the deal.* The buyer must offer the number of shares (S) at whose current share price (P) the total value is equal to the market capitalization of the target as shown in equation (1).

$$P_{\text{Target}} \times S_{\text{Target}} = P_{\text{Buyer}} \times \Delta S_{\text{Buyer}} \tag{1}$$

  Rewriting this equation to show the ratio of shares offered to target shares (which is the exchange ratio) is equal to the ratio of the price per target share to the buyer's share price.

$$ER = \frac{\Delta S_{\text{Buyer}}}{S_{\text{Target}}} = \frac{P_{\text{Target}}}{P_{\text{Buyer}}} \tag{2}$$

- *Other measures of contribution.* In negotiations between private firms, or where the current share prices might reflect temporary exuberance or depression in one side's share price, the negotiators should look toward more fundamental indicators of contribution to the value of the enterprise. Such indicators could include operating profits, assets, unit sales, revenues, or number of employees—these are only useful as proxies for the generation of shareholder value by the buyer relative to the target.

  Applying contribution analysis to the bargaining setting is relatively straightforward. First, one compares the relative contribution percentages on a variety of dimensions, and from them chooses a hypothetical contribution percentage. Second, the hypothetical contribution is converted into an exchange ratio using this formula, where S is the number of shares of the buyer or target before the deal and C is the hypothetical contribution percentage of the buyer:

$$ER = \frac{\frac{S_{\text{Buyer}}}{C} - S_{\text{Buyer}}}{S_{\text{Target}}} \tag{3}$$

  Note that the numerator in this formula represents the number of shares of Newco to be offered to the target firm that is consistent with the relative contributions of the two firms. See Appendix 21.5 for the derivation of equation (3).

To illustrate how one uses equations (2) and (3) to settle on a focal point for carving up the win-win zone, consider the merger of Fleet Financial Group and BankBoston Corporation in early 1999. Exhibit 21.8 gives a range of data for the two firms, and their contribution ratios—these data can be used with the equations to estimate exchange ratios:

- ***Focal point based on share prices.*** Exhibit 21.8 gives the ratios of the share prices of BankBoston and Fleet at various points in time from October 1998 to

EXHIBIT 21.8 Contribution Analysis for the Fleet Financial Group/BankBoston Merger

	Fleet Financial	BankBoston	Ratio of BKB/FLT	Ratio of BKB to BKB + FLT
Ticker symbol	FLT	BKB		
Assets	$104,382	$73,513	70%	41%
Deposits	$ 69,678	$48,500	70%	41%
Loans and lease financing	$ 67,844	$42,806	63%	39%
Equity (book value)	$ 9,409	$ 4,817	51%	34%
Net interest income	$ 3,869	$ 2,147	55%	36%
Net income	$ 1,532	$ 792	52%	34%
Dividends	$ 587	$ 350	60%	37%
Average common shares				
Basic	568,059	293,873	52%	34%
Fully diluted	587,769	296,663	50%	34%
Number of employees	35,481	24,519	69%	41%
Share prices				
2/26/99	$42.94	$40.44	94%	NM
1/29/99	$44.31	$36.94	83%	NM
12/31/98	$44.69	$38.94	87%	NM
11/30/98	$41.69	$41.63	100%	NM
10/30/98	$40.69	$36.81	90%	NM
Market value of equity				
2/26/99	$25,237	$11,996	48%	32%
1/29/99	$26,046	$10,958	42%	30%
12/31/98	$26,266	$11,551	44%	31%
11/30/98	$24,503	$12,349	50%	34%
10/30/98	$23,915	$10,921	46%	31%

Note: "NM" stands for not meaningful.
Sources of data: Company annual reports, and SEC filings and Bloomberg Financial Services.

February 1999. Consistent with equation (2), these would suggest an exchange ratio varying between 0.83 and 1.00. At prices as of the most recent date, the exchange ratio would be 0.94.

- ***Focal point based on contribution ratios.*** The right-hand column of Exhibit 21.8 gives the contribution ratios for BankBoston based on various measures (the comparable ratios for Fleet would simply be 100 percent minus the BankBoston ratio). These percentages could be inserted into equation (3), along with the Fleet shares outstanding (about 568 million) and the BankBoston shares outstanding (about 294 million) to produce a range of estimated exchange ratios. The resulting estimates vary from 1.36 (using a contribution percentage based on assets) to 0.99 (using a contribution percentage based on book value of equity); these two exchange ratio estimates are based on financial accounting estimates rather than on market values and therefore might be given somewhat less weight. Using a contribution

percentage based on market value of equity produces exchange ratios closely consistent with share prices.

The merger agreement between the two firms called for an exchange ratio of 1.1844 shares of Fleet to be given for each share of BankBoston—this implied a payment of $53 per BankBoston share, a premium of 31 percent over its price at the end of February 1999. This gave greater weight to BankBoston than suggested by the relative market values or share prices of the two firms. Backsolving equation (3) for the contribution ratio that produces an exchange ratio of 1.1844 reveals a BankBoston contribution ratio of 38 percent, within the range (but toward the higher end) of contribution ratios given in Exhibit 21.8.

SUMMARY AND IMPLICATIONS OF THE EXCHANGE RATIO FRAMEWORK

This chapter has presented a framework for considering cash and stock exchange ratios from the standpoints of both the buyer and seller in a merger transaction. The framework is founded on the straightforward idea that neither side wants to be poorer after the deal (than before). This implies the existence of deal boundaries for exchange ratios. These deal boundaries can form an extremely useful foundation for analysis of proposed terms and setting targets for negotiators.

Perhaps the most important implication of exchange ratio analysis is that the value of the combined firm (PE_{12} or DCF_{12}) has an immense influence on the flexibility or constraint under which the deal designer works. In addition, this analysis highlights the importance of fundamental valuation analysis as a driver for deal design. In this regard, the models reveal that *synergies create bargaining flexibility for the buyer and target deal designers.* Value creation through synergies has the effect of raising the buyer's maximum exchange ratio boundary and lowering the target's minimum. Thus, synergies increase the area of Zone I and thereby increase the probability of finding a mutually agreeable exchange ratio.

Exhibit 21.9 depicts the impact of synergies on the deal boundaries of the buyer and target. Looked at with P/E ratio on the horizontal axis, synergies widen the win-win zone. The key crossover point shifts lower, permitting a wider range of possible exchange ratios at any particular firm value. Exhibit 21.10 shows the effect of synergies on the deal boundaries when DCF of Newco is on the horizontal axis—here, synergies simply move the expected value of Newco further to the right on the axis, enlarging the negotiation window.

A second important implication is that the chance of consummating a value-destroying deal for one or both parties is not trivial, as shown by research summarized in Exhibit 21.11. Conn and Nielsen (1977) used the P/E model to test the distribution of share exchange deals that occurred in 131 mergers in the 1960s and 1970s. They found that 60 percent of transactions occurred in Zone I, the win-win region. This exhibit also presents summary data from a studies by Conn, Lahey, and Lahey (1991); by Cook, Gregory, and Pearson (1994) using observations from the United Kingdom; and by Bruner (2003) using transactions involving U.S. banks in the 1990s. Three important points emerge from these findings:

1. ***A high proportion of deals are unattractive to one or both sides.*** The high proportion of deals (40 to 51 percent) that occurred outside the region of mutual gains (i.e., outside Zone I) should caution deal designers about transaction analysis.
2. ***Buyers make more errors than targets.*** The transactions outside of the win-win zone fall disproportionately *against* buyers. For instance, at announcement, buyers destroy value in 36 to 48 percent of the cases (the sum of Zones II and III), while targets destroy value in 13 to 14 percent of the cases (Zones III and IV). This result is consistent with the survey of findings in Chapter 3. This asymmetry calls to mind the "winner's curse" described by Thaler (1992) and others—more about this is in Chapter 31.
3. ***Optimism dwindles.*** Over the weeks following announcement of the deals, the percentage of deals remaining in Zone I declines. This might be due to the use of overvalued equity by buyers. Conn and Nielsen speculated that this might be due to an initial gush of optimism about the deals. The difficulty of sustaining investor support for M&A transactions should caution deal designers about the importance of communications to investors, and the need to manage investor expectations.

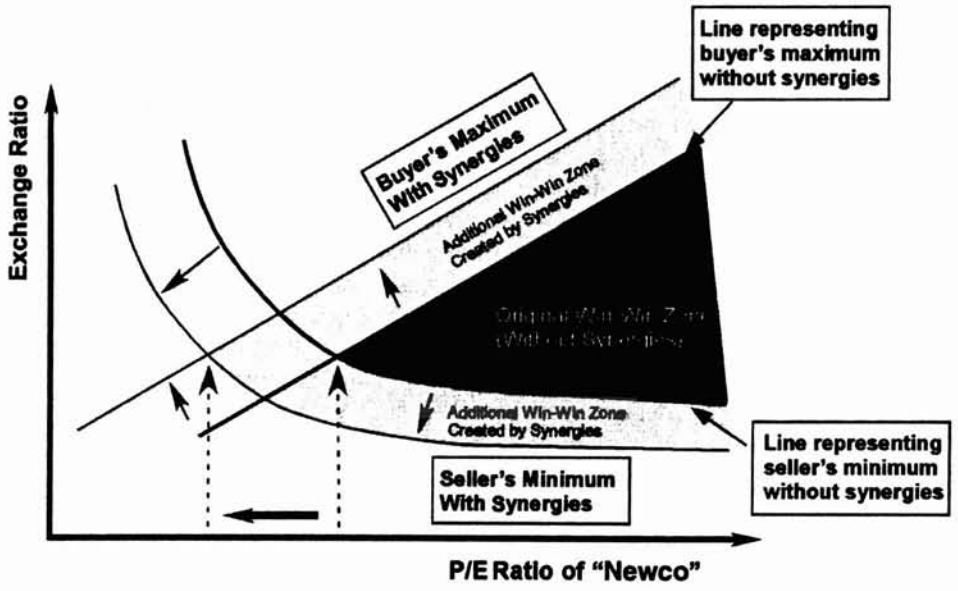

EXHIBIT 21.9 Effect of Synergies on Deal Boundaries: The P/E Approach

Note: The chart depicts the impact of earnings synergies on the deal boundaries of the buyer and target. The win-win zone increases in the presence of synergies. If the estimation of P/E remains the same but the earnings are higher due to synergies, both parties will be willing to adjust their maximum and minimum requirements, resulting in a wider range of possible exchange ratios.

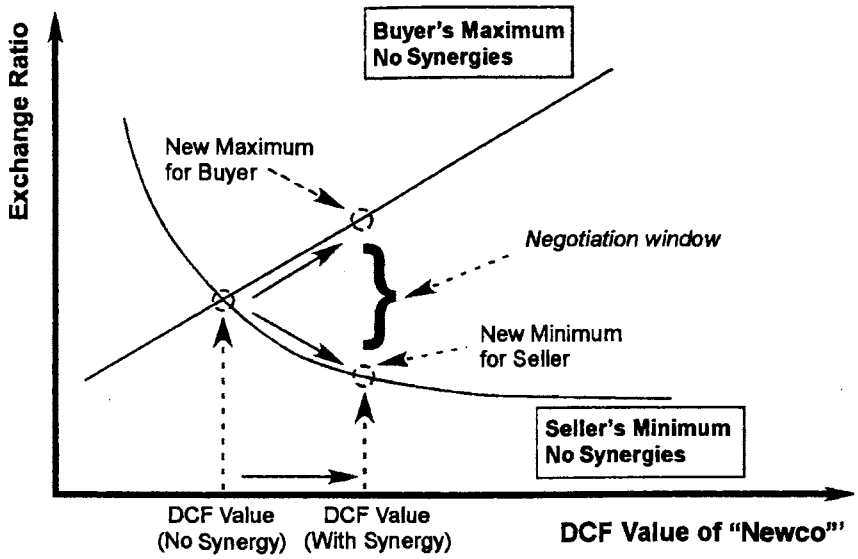

EXHIBIT 21.10 Effect of Synergies on Deal Boundaries: The DCF Approach
Note: The chart depicts the impact of synergies on the deal boundaries of the buyer and target. The DCF value of Newco increases, enabling both parties to move to the right along their respective lines—the seller reduces its minimum exchange ratio requirement, and the buyer raises the maximum exchange ratio it is willing to give. As a result, the negotiation window widens.

EXHIBIT 21.11 Percentage Distribution of Transactions by Deal Boundaries Zones as Found in Studies

	Conn and Nielsen (1977) (U.S. Firms, Various Industries, 1960s and 1970s)	Conn, Lahey, and Lahey (1991) (U.S. Firms, Various Industries, 1960–1979)	Cook, Gregory, and Pearson (1994) (U.K. Firms, Various Industries, 1980s)	Bruner (2003) (U.S. Commercial Banks, 1990s)
Zone I	60%	56%	49%	51%
Zone II	27%	32%	38%	35%
Zone III	9%	8%	10%	12%
Zone IV	4%	4%	3%	2%

Note: The results will vary somewhat by the point in time at which measurement was taken. The findings reported here were as of the announcement date of the merger. The studies report that, when measured at date of consummation or later, the percentage of observations in Zone I declines on the order of 5 percent.

APPENDIX 21.1
Derivation of the Exchange Rate Determination Model Based on the Price-Earnings Ratio Regarding Share-for-Share Exchanges (Larson-Gonedes Model)[2]

BUYER'S MAXIMUM ACCEPTABLE EXCHANGE RATIO (P/E MODEL)

From the buyer's point of view, the deal will be attractive as long as the value of the firm after the acquisition (P_{12}) is greater than the price per share today, before the deal (P_1).

$$P_{12} \geq P_1$$

To find the buyer's boundary of the *maximum acceptable exchange ratio*, focus on the equality of the two share prices (rather than the inequality). The share price of the combined firm is simply the EPS of the combined firm times a P/E for the combined firm.

$$P_{12} = (PE_{12})(EPS_{12})$$

Also, the EPS of the combined firm is simply the sum of the net incomes of the two firms (plus any synergy[3]) divided by the shares of the firm postmerger—these shares will be the sum of the preexisting number of shares plus any shares issued in an exchange offering.

$$EPS_{12} = \frac{E_1 + E_2 + E_{\text{Synergies}}}{S_1 + S_2 ER_1}$$

Inserting the equations for P_{12} and EPS_{12} into the first equation and setting the two sides equal gives a formula for the break-even condition:

$$P_1 = \frac{(PE_{12})(E_1 + E_2 + E_{\text{Synergies}})}{S_1 + S_2 (ER_1)}$$

Solving for ER_1 gives the formula cited earlier in the chapter (Exhibit 21.1) for the maximum acceptable exchange ratio of buyer's shares per target share above which the buyer's shareholders lose:

$$ER_1 = -\frac{S_1}{S_2} + \frac{E_1 + E_2 + E_{\text{Synergies}}}{P_1 S_2} PE_{12}$$

TARGET'S MINIMUM ACCEPTABLE EXCHANGE RATIO (P/E MODEL)

The target seeks to accept deals that preserve or create value for target investors. Thus,

$$P_{12} \geq \frac{P_2}{ER_2}$$

To find the target's boundary of the *minimum acceptable exchange ratio*, ER_2, focus on the equality of the two share prices (rather than the inequality). The share price of the combined firm is simply the EPS of the combined firm times a P/E for the combined firm.

$$P_{12} = (PE_{12})(EPS_{12}) = \frac{P_2}{ER_2}$$

Also, the EPS of the combined firm is simply the sum of the net incomes of the two firms (plus any synergy[4]) divided by the shares of the firm postmerger—these shares will be the sum of the preexisting number of shares plus any shares issued in an exchange offering.

$$EPS_{12} = \frac{E_1 + E_2 + E_{\text{Synergies}}}{S_1 + S_2 ER_2}$$

Inserting the equations for P_{12} and EPS_{12} into the first equation gives this expanded formula for the postmerger share price:

$$P_{12} = \frac{P_2}{ER_2} = \frac{(PE_{12})(E_1 + E_2 + E_{\text{Synergies}})}{S_1 + S_2(ER_2)}$$

Solving for ER_2 gives the formula cited earlier in the chapter (Exhibit 21.1) for the target's minimum acceptable exchange ratio of buyer's shares per target share:

$$ER_2 = \frac{P_2 S_1}{(PE_{12})(E_1 + E_2 + E_{\text{Synergies}}) - P_2 S_2}$$

APPENDIX 21.2
Derivation of the Exchange Rate Model Based on Discounted Cash Flow Regarding Share-for-Share Exchanges

BUYER'S MAXIMUM ACCEPTABLE EXCHANGE RATIO (DCF MODEL)

From the buyer's point of view, the deal will be attractive as long as the value of the firm after the acquisition (P_{12}) is greater than the price per share today, before the deal (P_1).

$$P_{12} \geq P_1$$

To find the buyer's boundary of the *maximum acceptable exchange ratio*, focus on the equality of the two share prices (rather than the inequality). Also, recognize that the value of the firm postmerger will simply be the DCF value of equity (DCF_{12})[5] divided by the shares of the firm postmerger—these shares will be the sum of the preexisting number of shares plus any shares issued in an exchange offering. Thus,

$$P_{12} = \frac{DCF_{12}}{S_1 + S_2(ER_1)} = P_1$$

Solving for ER_1 gives the formula cited earlier in the chapter (Exhibit 21.1) for the buyer's maximum acceptable exchange ratio of buyer's shares per target share:

$$ER_1 = \frac{DCF_{12} - P_1 S_1}{P_1 S_2}$$

TARGET'S MINIMUM ACCEPTABLE EXCHANGE RATIO

The target seeks to accept deals that preserve or create value for target investors. Thus,

$$P_{12} \geq \frac{P_2}{ER_2}$$

To find the target's boundary of the *minimum acceptable exchange ratio*, ER_2, focus on the equality of the two share prices (rather than the inequality). The share price of the combined firm is simply the DCF of equity of the combined firm divided by the number of shares of the combined firm.

$$P_{12} = \frac{P_2}{ER_2} = \frac{DCF_{12}}{S_1 + S_2(ER_2)}$$

Solving for ER_2 gives the formula cited earlier in the chapter for the target's minimum acceptable exchange ratio of buyer's shares per target share:

$$ER_2 = \frac{P_2 S_1}{DCF_{12} - P_2 S_2}$$

APPENDIX 21.3
Derivation of the Exchange Rate Determination Model Based on the Price/Earnings Ratio Regarding Cash-for-Share Exchanges

BUYER'S MAXIMUM ACCEPTABLE EXCHANGE RATIO (P/E MODEL)

From the buyer's point of view, the deal will be attractive as long as the value of the firm after the acquisition (P_{12}) is greater than the price per share today, before the deal (P_1).

$$P_{12} \geq P_1$$

To find the buyer's boundary of the *maximum acceptable exchange ratio*, focus on the equality of the two share prices (rather than the inequality). The share price of the combined firm is simply the EPS of the combined firm times a P/E for the combined firm.

$$P_{12} = (PE_{12})(EPS_{12})$$

Also, the EPS of the combined firm is simply the sum of the net incomes of the two firms (plus any synergy[6]) divided by the shares of the firm postmerger—these shares will be equal to the buyer's preexisting number of shares.

$$EPS_{12} = \frac{(E_1 + E_2 + E_{\text{Synergies}})}{S_1}$$

Inserting the equations for P_{12} and EPS_{12} into the first equation and setting the two sides equal gives a formula for the break-even condition:

$$P_1 = \frac{\text{(Newco equity value} - \text{Cash paid)}}{\text{Number of buyer's shares}}$$

$$P_1 = \frac{[PE_{12}(E_1 + E_2 + E_{\text{Synergies}})] - \left(\frac{\text{Cash}}{S_2} S_2\right)}{S_1}$$

Solving for ER_1 gives the formula cited earlier in the chapter (Exhibit 21.1) for the maximum acceptable exchange ratio of buyer's shares per target share above which the buyer's shareholders lose:

$$ER_1 = \frac{\text{Cash}}{S_2} = \frac{PE_{12}(E_1 + E_2 + E_{\text{Synergies}}) - P_1 S_1}{S_2}$$

TARGET'S MINIMUM ACCEPTABLE EXCHANGE RATIO (P/E MODEL)

The target seeks to accept deals that preserve or create value for target investors. Thus, the target's boundary of the *minimum acceptable cash exchange ratio* is:

$$\frac{\text{Cash}}{S_2} = P_2$$

The target's shareholders will be unwilling to accept any cash price per share less than the prevailing price in the market. Because they are not retaining an equity claim in Newco's equity, the target's minimum acceptable exchange ratio is unaffected by the P/E ratio expected to prevail after the transaction is consummated.

APPENDIX 21.4 Derivation of the Exchange Rate Model Based on Discounted Cash Flow Regarding Cash-for-Share Exchanges

BUYER'S MAXIMUM ACCEPTABLE EXCHANGE RATIO (DCF MODEL)

From the buyer's point of view, the deal will be attractive as long as the value of the firm after the acquisition (P_{12}) is greater than or equal to the buyer's price per share before the deal (P_1).

$$P_{12} \geq P_1$$

To find the buyer's boundary of the *maximum acceptable exchange ratio*, focus on the equality of the two share prices (rather than the inequality). Also, recognize that the value of the firm postmerger will simply be the DCF value of equity (DCF_{12})[7] divided by the shares of the firm postmerger—these shares will be the preexisting number of buyer's shares. Thus,

$$P_{12} = \frac{DCF_{12} - \left(\dfrac{\text{Cash}}{S_2} S_2\right)}{S_1} = P_1$$

Solving for ER_1 gives the formula cited earlier in the chapter (Exhibit 21.1) for the buyer's maximum acceptable exchange ratio of buyer's shares per target share:

$$ER_1 = \frac{\text{Cash}}{S_2} = \frac{DCF_{12} - P_1 S_1}{S_2}$$

TARGET'S MINIMUM ACCEPTABLE EXCHANGE RATIO

The target seeks to accept deals that preserve or create value for target investors. Thus, the target's boundary of the *minimum acceptable cash exchange ratio* is:

$$\frac{\text{Cash}}{S_2} = P_2$$

The target's shareholders will be unwilling to accept any cash price per share less than the prevailing price in the market. Because they are not retaining an equity claim in Newco's equity, the target's minimum acceptable exchange ratio is unaffected by the P/E ratio expected to prevail after the transaction is consummated.

APPENDIX 21.5
Derivation of Equation (3) Exchange Ratio Consistent with Buyer's Percentage Contribution to Newco

The buyer's percentage claim (C) on Newco is initially expressed as the number of shares held by the buyer's shareholders (S_{Buyer}), divided by the total number of shares of Newco:

$$C = \frac{S_{\text{Buyer}}}{S_{\text{Buyer}} + (ER \times S_{\text{Target}})}$$

Whereas the *ex ante* number of shares of the buyer and target are known, the exchange ratio, ER, is to be negotiated. But with a simplifying assumption, it should be possible to solve for ER: Assume that shares are distributed, C, proportional to the real economic contribution of the buyer to Newco. We could use the DCF values of the buyer, target, and Newco to compute C, or we could use proxies,[8] such as those mentioned in the text of the chapter, including revenues, assets, and so on. Thus, given a proxy for C, we can rearrange the contribution equation to solve for ER:

$$S_{\text{Buyer}} + (ER \times S_{\text{Target}}) = \frac{S_{\text{Buyer}}}{C}$$

$$(ER \times S_{\text{Target}}) = \frac{S_{\text{Buyer}}}{C} - S_{\text{Buyer}}$$

$$ER = \frac{\dfrac{S_{\text{Buyer}}}{C} - S_{\text{Buyer}}}{S_{\text{Target}}} \qquad \text{[Equation (3) in the text.]}$$

NOTES

1. The theory would dictate that the next year's earnings be used, consistent with the general notion that security prices are the present value of expected future cash flows. This would suggest that the P/E ratio be used on leading, rather than trailing, earnings. Some practitioners would use the most recent year's earnings (and a trailing P/E) for both companies either for simplicity or in the belief that the future is unknowable. Either way, it is important that the P/E and net income for buyer and target be consistent.
2. As summarized from J. Fred Weston and Thomas Copeland, *Corporate Financial Theory and Policy*, 2d edition, Reading, MA: Addison-Wesley, 1983, pages 623–627.
3. The synergy term was not contained in the original Larson-Gonedes derivation. It is inserted here by the author for clarity.
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5. Presumably DCF_{12} reflects any synergies created in the merger.
6. The synergy term was not contained in the original Larson-Gonedes derivation. It is inserted here by the author for clarity.
7. Presumably DCF_{12} reflects any synergies created in the merger.
8. Proxies are always noisy and imperfect—and those based on accounting data can be even more imperfect. But in the absence of other measures of economic contribution, they may be the best alternative for estimating *ER*.

CONCLUSION: PROPOSING AND NEGOTIATING EARNOUTS AND OTHER CONTINGENT PAYMENTS

This chapter has argued that contingent forms of payment are highly useful to deal designers. They allocate risk to those most willing to bear it and provide incentives to retain and motivate managers. Yet contingent payments are complex to structure and challenging to value. The key idea to doing both is to remember that *earnouts are options*. As discussed in Chapters 10, 14, 15, and 23, the option framework offers a powerful conceptual approach to deal structuring. The option analogy highlights two important design aspects that are worth careful attention by the negotiators: the time period and triggers (exercise prices) for the earnout. Longer terms and lower triggers imply more value in the earnout instrument; shorter terms and higher triggers imply less value. Exactly how time period and trigger values trade off in the resulting earnout value is a matter for an analyst to determine. Thus, a great deal hinges upon the ability to assess the value of an earnout instrument rigorously and quickly. The technique described in this chapter affords perhaps the best route for the analyst.

The complexity of these schemes probably explains why they are not seen in more deals. A well-designed earnout must take into consideration a wide range of issues and concerns for each party involved. There are three paramount considerations when designing an earnout proposal.

1. ***Keep it simple.*** Whether or not an earnout becomes part of the final deal, negotiating a *simple* earnout structure is the most productive use of time. If negotiations shift toward a nonearnout transaction, the effort to develop complex formulas will have been wasted. If the earnout formula is retained, the seller will want it to be clearly defined, mutually understood, and easily measurable.
2. ***Focus on key issues.*** Many earnout negotiations fail because both sides press their positions on all points. Each party should save its design efforts for its performance value issues.
3. ***Be realistic.*** To maximize the earnout's chance of success, the seller must be realistic and have a detailed understanding of how the target will operate within the buyer. Performance several years into the future is always difficult to forecast, and it is useful to consider both upside and downside scenarios. The main focus of discussion should be on near-term performance since it is the most predictable.

Given an earnout's inherent complexity, attention to detail is required by both parties to avoid future disputes. Although the parties will never be able to foresee every future issue, the written earnout agreements must address at a minimum the issues discussed in this chapter. Despite the potential headaches, a successful earnout can bring parties together on value, provide incentives for management, and generally create a win-win situation for the parties involved.

NOTES

1. Matthew Ball, "Equity Tailored to Suit the Strategy," *Corporate Finance*, October 1996, page 20.

2. Quoted in *ibid.* See also Esty et al. (1998) for a detailed discussion of the use of tracking stock in this deal.
3. Obviously, in a zero-sum world one party's gain must come at the expense of another. The joint satisfaction is probably temporary, as suggested by the operative phrase here, "at the time when the transaction is consummated."
4. The earnout ratio is defined as the percentage of the total maximum payout that is attributed to the earnout rather than the fixed portion of the purchase price.
5. In theory, the risk-free rate of return (the yield on a U.S. Treasury bond of a term equal to the life of the earnout) is the appropriate discount rate because risk has been already recognized in the probability distributions of the forecast assumptions. One does not want to double-compensate for risk. But the practitioner should be warned that simply using the risk-free rate assumes that *all* risk has been accounted for in the analysis. This assumption should be scrutinized carefully since uncertainty permeates business forecasts and may be difficult to reflect completely in the probability distributions of the forecast assumptions.
6. This case example draws upon Bruner and Opitz (1988).
7. The analysis derives from field research and forecasts provided with the cooperation of Eli Lilly & Company. Some of the simulation parameters, such as the variance of growth rates and margins, are assumed from general knowledge rather than estimated from detailed analysis.
8. Generally one needs to reflect on whether indeed all of the risks in the cash flows have been modeled with uncertain distributions. If not, it is necessary to include a risk premium in the discount rate that would account for these remaining unaccounted risks.
9. See, for instance, Burton and Rundle (1995).