CHAPTER 7

Estimating the Value of Control

In their control premium study, Houlihan Lokey Howard and Zukin define a control premium as the additional consideration that an investor would pay over a marketable minority equity value (i.e., the *Wall Street Journal* price) in order to own a controlling interest in the common stock of a company.[1] The authors further state:

> *A controlling interest is considered to have a greater value than a minority interest because of the purchaser's ability to effect changes in the overall business structure and to influence business policies. Control premiums can vary greatly. Factors affecting the magnitude of a given control premium include:*
>
> 1. *The nature and magnitude of non-operating assets.*
> 2. *The nature and magnitude of discretionary expenses.*
> 3. *The perceived quality of existing management.*
> 4. *The nature and magnitude of business opportunities, which are not currently being exploited.*
> 5. *The ability to integrate the acquiree into the acquirer's business or distribution channels.*

This definition raises several important and immediate questions about the size of the control premium and how to estimate it when valuing a private firm. This chapter addresses these and related issues. We set the stage for this discussion by reviewing research that deals with the acquisitions of private firms, and we compare the characteristics of these acquisitions with those of the public firm takeover market. The differences between private firm and public firm acquisitions are striking, particularly as they relate to the size of the takeover premiums. We extend our discussion by addressing the takeover premiums associated with family-owned businesses. We then move ahead to the more crucial issue of how to estimate the premium under

two sets of circumstances: The first is measuring the value of control when the buyers and competitive sellers are known with some certainty. The second is when buyers have not declared themselves, and the valuation analyst is forced to value the firm under the assumption of a hypothetical buyer.

THE TAKEOVER MARKET FOR PRIVATELY HELD FIRMS

The volume of acquisitions involving privately held firms has increased significantly and has recently surpassed the number of publicly traded firms that have been acquired. Table 7.1 is from a study conducted by James Ang and Ninon Kohers.[2] The data indicate that between 1984 and 1996, more than 22,000 acquisitions involving privately held firms have occurred, whereas less than 9,000 mergers and acquisitions have involved public firm targets.

Table 7.1 shows the characteristics of these transactions across a number of dimensions. For acquisitions of privately held targets, cash offers predominate, with 3,973 cases compared with stock offers and mixed (stock and cash) offers, which are about equal. For public targets, cash offers are also the most prevalent; however, unlike private firm targets, mixed offers are more frequent than cash offers. The percentage of total acquisitions that are stock offers has risen in both the public and private markets, as can be seen in Table 7.1. The average size of the acquirer is larger for public targets than for private targets by at least a factor of 2, no matter how the deal was financed. Also, the size of the transactions relative to the size of the acquirer is larger for public targets than for private targets. Cross-industry deals as a percentage of transactions done are high for both private and public targets, with public targets exceeding their private target counterparts across all financing types. For example, the percentage of private deals financed with cross-industry stock is 35.62 percent, while for public targets it is 26.05 percent. Private targets are also more likely to be purchased by foreign acquirers than by domestic acquirers. For example, in 21.12 percent of the private firm acquisitions financed with cash, the acquirer was a foreign firm. The equivalent percentage for public targets is 16.15 percent. This means that foreign firms play a larger role in the private market than in the public market. As one would expect, private deals are smaller than their public firm counterparts. As an example of this size difference, the mean value of mixed financed acquisitions in the private market is $55 million, whereas for public targets the mean value is $456 million.

The acquisition premium is measured as transaction value paid for the target divided by the target's book value of equity. The authors of the study argue that this measure is used because the market value of equity prior to the transaction is not known. Of course, the problem with using this mea-

TABLE 7.1 Takeovers

Method of Payment	Private Target Takeovers			Public Target Takeovers		
	Stock	Cash	Mixed	Stock	Cash	Mixed
Total number of mergers	1,530	3,973	1,567	856	3,103	1,343
All combined			7,070			5,302
Total merger value (in $ million)	49,056.10	165,620.50	85,106.40	301,328.60	513,765.10	603,497.30
Value all combined (in $ million)			299,783			1,418,621.00
Mean acquirer market value (in $ millions)	1,032.75 ($n = 979$)	1,145.97 ($n = 1,525$)	519.49 ($n = 804$)	2,109.04 ($n = 644$)	4,193.93 ($n = 623$)	2,594.07 ($n = 347$)
Mean merger size relative to acquirer (%)	8.14	5.88	12.42	13.22	9.06	17.62
% of cross-industry	35.62	49.89	47.1	26.05	71.45	69.99
% of mergers with foreign acquirers	3.14	21.12	12.19	2.1	16.15	9.38
Mean transaction value (in $ million)	$32.06	$41.70	$55.12	$352.96	$165.08	$455.81
Media offer price/ BV premium	2.3 ($n = 379$)	2.2 ($n = 283$)	4 ($n = 317$)	2 ($n = 737$)	1.9 ($n = 2,277$)	1.85 ($n = 1,042$)
Mean target total assets (in $ million)	$128.66 ($n = 583$)	$160.60 ($n = 530$)	$95.67 ($n = 477$)	$1,782.06 ($n = 789$)	$961.85 ($n = 2,560$)	$1,395.67 ($n = 1,174$)
Mean acquirer total assets (in $ million)	$4,658.93 ($n = 509$)	$5,320.04 ($n = 499$)	$2,260.18 ($n = 417$)	$10,645.46 ($n = 654$)	$8,939.07 ($n = 633$)	$6,980.96 ($n = 349$)
Mean acquirer *q*	1.47 ($n = 141$)	1.04 ($n = 363$)	1.05 ($n = 157$)	1.57 ($n = 125$)	1.01 ($n = 298$)	1.15 ($n = 126$)
Mean two-day CAR for acquirers (%)	1.32* ($n = 979$)	1.83* ($n = 1,525$)	1.99* ($n = 804$)	–1.26* ($n = 644$)	0.06 ($n = 623$)	0.14 ($n = 347$)

Different data items are provided for a sample of privately held target takeovers and a sample of publicly traded target takeovers, classified by the method of payment, over the period from January 1984 to June 1996. All value-based variables are adjusted for inflation using 1995 as the base year. Stock offers are defined as transactions made solely in stock, whereas cash offers are transactions made solely in cash, or cash and debt. Mixed offers include offers consisting of both cash and stock and/or convertibles. The market values for acquiring firms are measured 11 days before the merger announcement day. The mean merger size relative to acquirer's market value and the total transaction value. The percent of cross-industry mergers refers to the percentage of all mergers in that method of payment category that involve an acquirer and a target with different two-digit SIC codes. Likewise, the percent of mergers with foreign acquirers provides the percentage of mergers, in a particular method of payment group, involving acquirers from outside the United States. The offer price/BV premium is the total transaction value paid for the target divided by the private target's book value of equity. The acquirer *q* is based on the Chung and Pruitt (1994) estimation. Also, the acquirer's two-day cumulative abnormal return (CAR) is measured on days 0 and 1, where day 0 is the takeover announcement day. An asterisk (*) beside the acquirer's CAR denotes significance at the 1 percent level. The numbers in parentheses reflect those cases for which a particular data item was variable. Values shown were generated from information provided by Securities Data Company and from CRSP data.

sure is that owners of private firms have quite legitimate ways to reduce the size of reported earnings and thereby lower reported book value equity. As we know, in private firms it is common for control owners to compensate themselves and family member employees well above what they could command in the market for doing the same job. High levels of discretionary expenses also characterize many private firms. These two expense categories taken together could result in significant underreporting of earnings, which means that the resulting reported book value of equity is artificially low. The authors carried out several statistical tests that indicated that a bias was not present. Hence the median premiums reported appear to represent real differences between premiums paid for public and private targets. The most striking result is that private mixed deals have a median premium, 4, that is twice as great as the premium, 1.85, for mixed public transactions. In fact, for both cash and stock, the median private premium is greater than the premium paid for public targets.

Let us review these differences in more detail. The merger premiums for both private and public firms' targets are shown in Figure 7.1. Prior to 1989, the premium differences were not significant, which supports the earlier conclusion that the premium measure used is not biased upward for private firms. However, beginning in 1989, the premiums for private firms were consistently higher than for public firms, often by a wide margin. The question is, what does this tell us? The answer might be that private firms were significantly undervalued relative to public firms' targets. Hence public firm acquirers were willing to pay more money to get access to their assets. One way to shed light on this issue is to study the stock price of acquiring firms when they announce an acquisition.

Returning to Table 7.1, the two-day CAR for acquirers of private firms is significantly positive for stock, cash, and mixed deals.[3] This indicates that even though the premiums paid for private targets are relatively higher than for public targets, public firm investors believed that the acquisitions were still positive net present value investments. Indeed, if the mean two-day CAR for private stock transactions (1.32 percent) is divided by the mean merger size relative to the acquirer for stock deals (8.14 percent), then shareholders of public bidding firms, on average, earn a 16 percent gain over the price paid for the acquisition. This is not the case for public firm acquirers that purchased public firm targets. In fact in these cases the CARs are negative and significant for stock deals and statistically insignificant for cash and mixed deals. This latter result is consistent with the voluminous research on shareholder wealth and acquisitions, which concludes that shareholders of public acquiring firms do not earn abnormal returns from public firm acquisitions.

Finally, what are the factors that appear to influence the size of the pre-

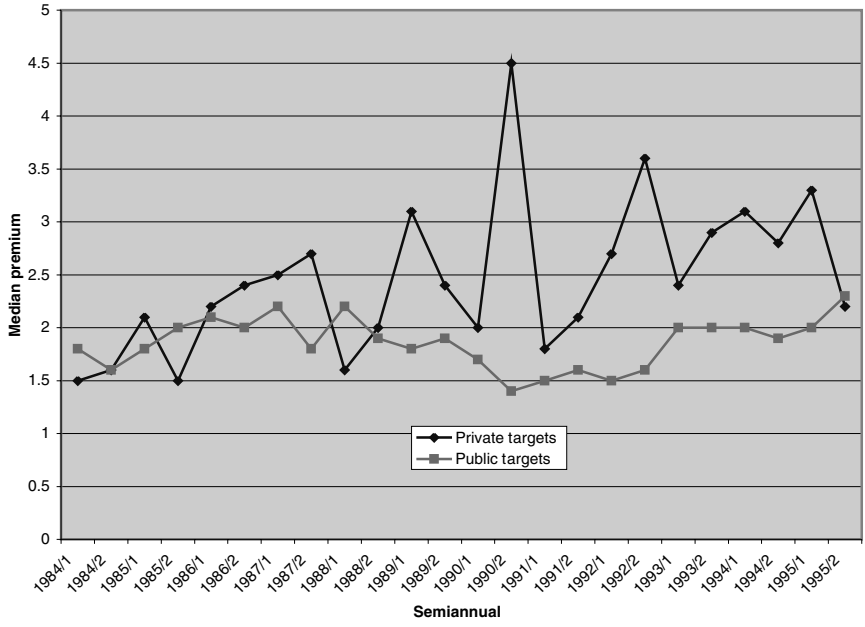

FIGURE 7.1 Private and Public Target Premiums

mium paid? Ang and Kohers estimated a regression model that attempts to isolate the various factors that influence the premium paid. The results of their analysis and the definition of the regressors are shown in Table 7.2.

Although the explanatory power of their model is low, the results are nevertheless informative. First, the FOCUS variable, which measures within industry acquisitions, is not statistically significant. This means that acquiring firms will not pay above-average premiums for private targets just because they are in the same industry. The EXCH variable indicates that the private firm premium is likely to be lower if the acquirer's stock is trading on the New York or American exchanges rather than in the Nasdaq or OTC markets. This is an important result, since it suggests that the control premium will be higher, in fact a good deal higher, if the acquirer were a private firm rather than a public firm. Why might this be the case? In many private firm transactions, the seller retains some relationship with the buyer, post-transaction. This may take the form of stock, earnout, seller loan, or an employment contract for control owners and family members. Firms that have stock trading on the NYSE are larger and less risky than firms whose equity trades on less liquid exchanges.

Therefore, sellers may be willing to accept a lower purchase price in

TABLE 7.2 Cross-Sectional Regressions: Factors Explaining the Premium for Privately Held Targets and the Market Response for Bidders

Dependent Var.	Premium Model 1		Bidder CAR Model 2		Premium Model 3		Bidder CAR Model 4	
Variables	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	–0.511	(–0.06)	0.145*	(3.24)	10.93†	(1.74)	0.022	(0.748)
MV	0.682‡	(2.14)	–0.006‡	(–2.23)				
RELSIZE					0.485	(0.17)	0.098‡	(3.23)
HITEK	6.316*	(5.33)	–0.015‡	(–2.12)	5.966*	(4.93)	–0.017‡	(–2.27)
VOLUME	0.384	(0.69)	0.072‡	(2.18)	0.508	(0.94)	0.787*	(2.44)
STOCK	–0.761	(–0.66)	–0.022*	(–2.89)	–0.283	(–0.26)	–0.028*	(–4.18)
MIX	2.162†	(1.75)	–0.025*	(–3.1)	1.901	(1.59)	–0.031*	(–3.7)
FOCUS	–0.862	(–0.8)	–0.025*	(–3.58)	–0.564	(–0.54)	–0.025*	(–3.66)
EXCH	–2.365	(–2.41)	0.037*	(4.90)	–1.445†	(–1.65)	0.029*	(4.85)
ECON	–7.131	(–1.1)	0.001	(0.13)	–6.667	(–1.07)	0.024	(0.79)
F-statistic	7.53*		11.35*		6.85*		13.711*	
Obs.	677		677		677		677	
Adj. R^2	7.15%		10.88%		6.47%		13.05	

*Significant at the 0.01 level.
†Significant at the 0.10 level.
‡Significant at the 0.05 level.

The coefficients for independent variables used to explain the offer price-to-book value ratio for 677 privately held targets are provided in Models 1 and 3. In addition, the same pricing variables are used to explain the two-day cumulative abnormal returns for 677 acquirers purchasing privately held targets in Models 2 and 4. The t-values are corrected for heteroscelasticity using White's consistent estimates of the standard errors for the coefficients. The F-statistics for the overall regression models are reported as well. The offer price-to-book value, the dependent variable in Models 1 and 3, is defined as the total transaction value of a deal divided by the target's book value of equity.

In Models 2 and 4, the dependent variable is the two-day cumulative abnormal return (on day 0 and day +1) for acquirers, where day 0 is the day of announcement. The independent variables are defined as follows: MV is the log of the acquirer's market value of equity, measured 11 days prior to the takeover announcement. RELSIZE is the total transaction value divided by the sum of the acquirer's market value of equity and the transaction value. HITEK is equal to 1 for acquisitions in high-tech industries, and 0 otherwise. VOLUME refers to the total number of private target takeovers occurring in the same quarter as the private target takeover. STOCK is an indicator variable for offers financed solely with stock, while MIX is an indicator variable for mixed offers, including stock and cash and/or convertibles. FOCUS is set to 1 for takeovers in which the acquirer and target have the same two-digit SIC code. EXCH is 1 for acquiring firms trading on the NYSE or AMEX, and is 0 for Nasdaq acquiring firms. As a control variable for the economic environment at the time of the takeover, ECON is set to 1 during expansions and to 0 during recessionary periods.

exchange for contracting with a less risky buyer. Hence, under the condition that the seller is affiliated with the buying firm in some posttransaction capacity, the control premium is likely to be larger when the firm is private rather than public. The private acquiring firm will be willing to pay a higher premium because the acquiring firm believes that by agreeing to a relationship posttransaction, the seller is signaling that any inside information divulged to the buyer during the due diligence process is accurate, and therefore the business is less risky as a result.

THE TAKEOVER MARKET FOR FAMILY-OWNED BUSINESSES

To understand this issue in somewhat more detail, we now consider the motivations that owners of closely held firms have for selling. Kimberly Gleason, Anita Pennathur, and David Reeb have studied the economics of acquiring family-owned businesses.[4] The data they have compiled includes both private and public firms, and although their data set does not match the data used by Ang, family-owned public firms are likely to be far closer in structure and managerial motivation to private firms than are public firms that are not dominated by family members. Thus, this data set, despite the fact that it includes both private and public firms, can shed light on the motivation to sell closely held firms. Table 7.3 shows the characteristics of target firms in the Gleason sample, Panel A, and the selling motives for those firms for which this information was available, Panel B. Panel C provides details on the CEO's relationship to the founder for 149 firms for which such information is obtainable. Panel D provides detail on the subsequent role of the founding family in the acquired entity.

Approximately 60 percent of the sample of family-owned firms had family member ownership that was 50 percent or greater. Hence, family members controlled the bulk of the firms in the sample. Panel B shows the motives for selling. Three factors immediately stand out: (1) succession issues (17 percent), (2) growth objectives beyond the scope of the family (27 percent), and (3) desire for shareholders to diversify stake.

Panel D supports the notion that owners tend to remain with the acquired entity posttransaction in one capacity or another. In more than 40 percent of the firms in the sample, founders remain either in an executive capacity or as a board member. If this is true for a larger sample of firms, and particularly where the firms in question are private, then one would expect premiums to be larger, all else equal, for these firms than equivalent public firms.

Let us now summarize our findings and their implications for the size of the control premium. Premiums paid for private firms are greater than

TABLE 7.3 Target Characteristics

Panel A: Panel A provides details on levels of family ownership for 191 target firms for which ownership data were obtainable. Targets are both public and private firms.

Ownership Distribution	Number of Firms	% of Firms
20–29%	34	17.8
30–39%	23	12.04
40–49%	17	8.9
50–59%	37	19.37
60–69%	14	7.33
70–79%	12	6.28
80–89%	8	4.19
90–99%	5	2.62
100%	41	21.47
Total	191	100%

Panel B: Panel B provides details on motives for the sale of the family business for 123 firms where such information is obtainable. Targets are both public and private firms.

Motives for Selling Business	Number of Firms	% of Firms
Family disputes	12	9.76
Succession issues	21	17.07
Access to capital	4	3.25
Distress	17	13.82
Growth objectives beyond the scope of the family	33	26.83
Desire of shareholders to diversify stake	16	13.01
Estate taxes	4	3.25
Good deal financially	12	9.76
Career enhancement	4	3.25
Total	123	100%

Panel C: Panel C provides details on CEO's relationship to the founder for 149 firms for which such information is obtainable. Targets are both public and private firms.

Relationship to Founder	Number of Firms	% of Firms
Founder	61	40.94
Child	45	30.2
Grandchild	28	18.79
Subsequent	15	10.07
Total	149	100%

(continued)

TABLE 7.3 (Continued)

Panel D: Panel D provides detail on the subsequent role of the founding family for the 126 firms for which such information is available. Targets are both public and private firms.

Subsequent Role of Founding Family	Number of Firms	% of Firms
New executive role	35	27.78
Board member	17	13.49
Consultant	12	9.52
No role	10	7.94
Old management remains in place	36	28.57
Total	126	100%

premiums paid for equivalent public firms irrespective of how the acquisition is financed.

- Private firm premiums can be 100 percent greater than premiums paid for equivalent public firms. For example, premiums paid for private firms that were cash-financed were four times book value equity; for cash-financed acquisitions of public firms, the mean premium was twice book value.
- Acquiring public firms will on average pay less for a private firm acquisition than an acquiring private firm. This is due to the risk aversion of the seller, who is willing to accept a lower premium from a public firm that the seller views as less risky than a competitive acquiring firm that is private.
- Private firm acquirers appear to be willing to pay a higher premium than public firm acquirers when the selling control owner has a financial interest in the success of the new firm.

ESTIMATING THE CONTROL PREMIUM

Private firms are often valued for nontransaction purposes. Nontransaction valuations include valuing shares of private firms for estate planning purposes, estate tax calculations, marital dissolution, and charitable gifting. In these cases, the valuation analyst needs to estimate the size of the control premium.[5] When the buyers and sellers are known, analysts generally have sufficient information to estimate the size of the control premium with some degree of certainty. Because there is no organized market for private firms and transactions occur sporadically, it is often difficult for a valuation analyst to identify potential buyers. In these circumstances, the valuation analyst often uses the most recent mean or median from published control

premium studies as the best estimate, since the information needed to obtain a more informed estimate, namely, who the buyers are, may not be available. However, as we show subsequently, defaulting to using the median control premium is likely to be inappropriate and, in general, will overstate the size of the control premium and hence the estimated control value of the private firm. In these cases, we show that the value of *pure control,* the incremental value a buyer will pay to run the firm in the same way as the seller, can be estimated using an option-pricing framework. This value will be lower than the value of control that includes an estimate of the synergy that a known buyer expects to create, posttransaction. This latter value can be estimated only if the buyers and/or their buying motivations are known with some degree of certainty. When this is not the case, there is no basis for estimating the synergy value, and, in general, a control premium that includes it will overstate the value of control in these circumstances.

The Control Premium Puzzle

In the beginning of this chapter we quoted a statement by Houlihan, Lokey, Howard, and Zukin about the factors that determine a control premium.[6] We repeat the quote here to place the issues involved in estimating the control premium in perspective:

> *A controlling interest is considered to have a greater value than a minority interest because of the purchaser's ability to effect changes in the overall business structure and to influence business policies. Control premiums can vary greatly. Factors affecting the magnitude of a given control premium include:*
>
> 1. *The nature and magnitude of non-operating assets.*
> 2. *The nature and magnitude of discretionary expenses.*
> 3. *The perceived quality of existing management.*
> 4. *The nature and magnitude of business opportunities, which are not currently being exploited.*
> 5. *The ability to integrate the acquiree into the acquirer's business or distribution channels.*

These factors fall into two broad categories:

1. Managing the cash flows and associated assets of a target business on a business-as-usual basis (items 1 to 3).
2. Putting additional assets in place to take advantage of perceived business growth opportunities that are not being exploited (items 4 and 5).

Business as usual means that management expects to run the firm in the future as it has in the past. Category 1 is distinguished from category 2 in that the former is a function of the risks and opportunities of the business only as it is currently configured. In contrast, category 2 requires the purchase of new assets to take advantage of new perceived business opportunities that have risk and opportunity profiles that are substantively different than the risks and opportunities inherent in the business-as-usual strategy. Category 2 requires new investment to take advantage of these opportunities, which emerge only if the target is acquired. Moreover, one can assess category 2 factors only if the acquiring firms and their strategies are known with some acceptable level of certainty. By contrast, category 1 risks and opportunities are known, because they are a function only of the target firm's in-place business strategies. To see the difference between the valuation implications of category 1 and category 2 factors, consider the value distribution curves in Figure 7.2.

Category 1 factors determine the shape of the distribution of possible valuation outcomes, curve *A,* with V_1 the median of the distribution of outcomes. For purely exposition purposes, we assume the value distribution is normal. The curve shows that a business-as-usual strategy can give rise to a multitude of valuation outcomes, although the range of outcomes is bounded. For example, the chances of a business-as-usual strategy creating a value as large as V_2* is zero. However, V_2* becomes possible if the value distribution were curve *B* rather than curve *A*. However, curve *B* is possible only when category 2 factors are in play. That is, category 2 factors are different in that they are a function of buyer's capacity to alter the shape and/or

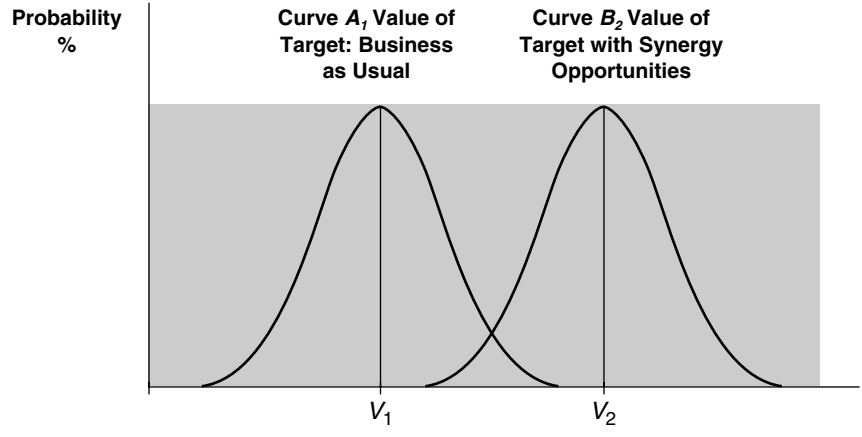

FIGURE 7.2 Target Firm Value Distribution Curves

position of the target firm's distribution of valuation outcomes. Here, the probabilities associated with different valuation outcomes are known only when both buyers declare themselves and provide sufficient data to allow one to make a judgment about various valuation outcomes. Category 2–related outcomes are not possible when the target adopts a business-as-usual strategy. They emerge only when the assets of the target and the buying firm are joined, creating the potential for new possibilities. We refer to this cojoining of assets as *synergy options*. Based on this articulation, we assert that a control premium is made up of two components: the value of pure control and the value of synergy options.

This assertion provides the logic, and as we show subsequently, the mathematics for establishing a theoretical range for the control premium. For example, if the market of buyers is made up of those who will generally manage the business in much the same way as it has been managed, then one would conclude that the control premium paid should not exceed the value of pure control. As a practical matter, market conditions at the time of the transaction will dictate whether the winning bid will include a control premium that is above or below the value of pure control. However, we would expect the average of these deviations to be zero across a sufficient number of nonsynergy transactions. We would also expect a similar outcome when the buyers have synergy options. Thus, we argue that the expected value of any control premium is equal to the expected value of pure control plus the expected value of the synergy option. Although acquirers will pay premiums outside this range, deviations should be limited by the gravitational pull of any established control premium range.

The control option-pricing framework offers several important insights into the control premium puzzle. First, the value of pure control implies that even if a buyer plans to continue a business-as-usual strategy and manages the assets in the same way as the current owner, the buyer would be willing to pay a premium over the present value of cash flows. Why? The answer is that there is always a chance that circumstances will emerge in which the value of a firm's assets will be further down the right-hand side of the value distribution. The premium paid is the cost incurred for the right to be able to capture this benefit if it occurs. Hence, one can think of a two-stage transaction process. In the first, the acquirer buys a pure control option from the seller with an exercise price equal to the minority value of the firm. The buyer retains the right to exercise the option for some predetermined period. During stage 2, the buyer decides whether to exercise or not. If the buyer exercises, then the price paid for the firm is equal to the firm's minority value, the present value of expected cash flows plus the price of the control option.

The second implication is that the value of pure control can be deter-

mined without knowing who the buyer happens to be since its value depends only on the risks and opportunities inherent in the business as usual activities of the selling firm. Third, as a practical matter, many private firm valuations are done where the buyers are not known or where their motives for purchasing are not well understood by the valuation analyst. This occurs because private firm transactions are discontinuous, and information required to understand the motives of buyers is not publicly available. Hence, the cost of acquiring this information is prohibitive. In this circumstance, any control value applied by the analyst should reflect only the value of pure control.

This last point has very practical implications for how controlling and minority interests are valued. It is quite common that when a valuation analyst is valuing a controlled transaction, the explicit premium applied is an average or the median of control values from a current control premium study.[6] Often, the valuation analyst looks for guidance from past court decisions, or perhaps the IRS has opined on an allowable control premium range. However, reliance on these sources should not provide the valuation analyst with a sense of comfort since the logic embedded in such solutions are not, except by chance, consistent with what the premium would in fact be if a transaction took place. Buyers and sellers establish these premiums based on the unique characteristics of the assets being transacted and what the buyer plans to do with the assets once owned. Hence, any estimate of what the proper control premium ought to be should be the result of quantitatively linking the risks and opportunities inherent in the transaction to the size of the expected premium paid. Defaulting to applying a median control value does not meet this standard.

The Value of Pure Control: Setting the Stage

Let us consider the case of the purchase of a local veterinary practice by a firm whose strategy is to roll up veterinary practices. The roll-up strategy is designed to create value by introducing professional management, reducing overhead costs, and significantly lowering prices for supplies when they are purchased in bulk. Finally, by having a network of veterinary practices covering a wide geographic area, customers can more easily be retained by the network even when they are lost to the local practice. Hence, revenue retention is greater and the cost of obtaining new customers for any one practice in the network is necessarily lower. Based on these facts, perhaps the value of control is worth about 20 percent or more over any reasonable estimate of the present value of the target's cash flows.

What happens if the strategic buyer decides not to buy any more practices and there are no other similar strategic buyers willing to commit funds

around the valuation date? Does this mean that a veterinary practice that just comes on the market should command no control premium? The answer is that the firm's value should reflect a control premium but not the value assigned by the strategic buyer. The reason is that the owner of the firm has decided to deploy the assets of the firm in a certain way in order to achieve the firm's current cash flow status. The control owner has the right to change the way the firm's assets are deployed and can do this at his or her discretion. This is what is meant by *control:* having the right to change the way the assets of the firm are used and/or financed. This right has value no matter who the potential buyer is.

To see these points more clearly, let us consider the following hypothetical. Let us assume the control owner has a portfolio that is made up of the value of the cash flows from current assets and a control option on these assets. The owner desires to sell the business and the buyer indicates she is willing to purchase it at a price equal to the sum of the present value of the expected cash flows, although the buyer needs some additional time to evaluate whether the firm has additional cash flow potential that is not reflected in the selling price. The seller indicates that he will sell the buyer a call option on the firm with an exercise price equal to the present value of expected cash flows. The option can be exercised at any time over the course of the next 12 months. The buyer agrees and subsequently exercises the option and purchases the firm. The purchase price, which is the firm's control value, is then equal to the present value of the expected cash flows plus the price of the call option. In this setting, the present value of expected cash flows is equivalent to a firm's minority value since this is what a rational investor would pay for these cash flows. The call option is exercised when the buyer believes that current owner will not be able to deliver the expected cash flows that are the basis for determining the firm's minority value. Thus, the call price reflects the value the buyer places on control. The seller, on the other hand, receives incremental cash equal to the price of the control option prior to the sale of the firm.

Before we turn to the issue of how much above the pure control value a potential buyer might be willing to pay (i.e., the value we term the *synergy option*), let us consider the issue of pure control from another perspective. Let us assume that a recent veterinary school graduate desired to purchase only the cash flow of the veterinary practice. The current owner retained control and agreed to remain and carry on his veterinarian duties in return for receiving a market wage. In return for a one-time payment of $100, the owner agreed to distribute the cash flow of the practice to the veterinary graduate in perpetuity. This arrangement is certainly a cheaper alternative than buying a call option and then exercising it, since this strategy would cost $100 plus the price of the call. But is it? What if one day the control

owner decided to increase his salary such that there was no cash flow to distribute to the recent graduate? What recourse would the graduate have? The answer is clearly none. Hence, the recent graduate who wanted to purchase the veterinary practice would pay more than $100 for the practice to ensure that she has sufficient control of the firm's assets and the cash flows they generate. The value of pure control is equivalent to an insurance policy that pays off when the control owner fails to deliver the promised cash flows. The seller would accept $100 today and a promise to deliver future cash flows to the buyer or to charge the buyer an increment over the $100 that would convert this promise to a contractual guarantee to turn control over to the buyer if the seller directed cash flow payments to himself that violated specific agreed-upon guidelines. A rational seller would certainly charge the buyer something for this guarantee, and a rational buyer would pay it.

The Synergy Control Option

The synergy control option emerges when a potential control buyer expects to deploy the assets of the target firm in a way that attempts to exploit new business opportunities and/or integrate the target's assets with those of the acquirer to obtain cash flow benefits that were not possible in the absence of the combination. This incremental cash flow results in a greater value for the control buyer, and thus she is willing to pay a premium above the value of pure control because the expected value possibilities are now far greater than they were when the business was a stand-alone operation.

To see why this is so, let us return to the veterinary practice example and assume that a strategic buyer who owns several upscale veterinary practices that are advertised as "dog hotels" is interested in purchasing the practice. The current owner houses and cares for dogs in the traditional way. The buyer believes that by combining the target practice with those that the strategic buyer already owns will enable her to reduce the costs of operating the target practice as well as raise prices for additional services offered by the dog hotel. The cost synergies emerge because redundant costs can be removed when the firms are combined that could not be when the target was a stand-alone. Such cost savings include administrative costs and purchasing necessary supplies at lower unit prices due to the fact that a larger entity can purchase in bulk and receive discounts that a smaller operation cannot. The cost of capital will also likely be lower because a larger firm is likely to be a better credit risk than a smaller firm. In addition, creating a more upscale image will allow the strategic owner to raise prices for traditional services, which will be produced at lower costs. Profit margins will expand, and expected cash flows will increase. Aggregating the benefits of the combination, the synergy buyer believes that the firm with expected

synergies could be worth as much as $200. Remember that the present value of the veterinary practice's cash flows under current management is worth only $100. To generate as much as an additional $100, the new buyer estimates that an additional $50 of investment would be required. As we show next, this synergy investment can be valued as a call option on additional firm assets.

For argument's sake, let us assume that the synergy and pure control options are worth $14 and $11, respectively. What is the minimum control value the target will accept and the maximum control value the strategic buyer would be willing to pay? The minimum control value is the value of the pure control option: $11. The maximum control value is $25, of which $11 is the value of pure control and $14 is the value of the synergy option. As a practical matter, how much the strategic buyer will actually pay depends on the acquirer's bargaining power relative to the bargaining power of the target. What we know from recent studies of private firm acquisitions by public firms is that private firm targets generally have less bargaining power than their public firm acquirers.[7] This means that private firms appear to be receiving less then they might and public firms are retaining more of the expected wealth creation that occurs as a result of the acquisition.

The Option Pricing Model

In this section, we use the non-dividend-paying version of the Black-Scholes option pricing model to value each of the components of the control premium. Equation 7.1 shows the basic equations.

$$\begin{aligned} \text{TCP} &= \text{CP}_p + \text{CP}_s \\ \text{CP}_j &= V_0 \times N(d_1) - X \times e^{-rT} \times N(d_2) \\ j &= p,s \\ d_1 &= (\ln(V_0/X) + (r + \sigma^2/2) \times T)/\sigma \times T^{0.5} \\ d_2 &= d_1 - \sigma \times T^{0.5} \\ N(d_i) &= (1/(2\pi^{0.5})) \int_{-\infty}^{d_i} e^{-X^2/2}\, dX,\ i = 1,2 \end{aligned} \tag{7.1}$$

where TCP = the total value of control
CP_p = the value of pure control
CP_s = the value of the synergy control option, or the value of a call option on additional assets needed to execute the acquirer's strategy
V_0 = the value of the target firm's cash flows as a stand-alone entity

T = time to expiration of the option (which varies with the type of option being considered)
r = the risk-free interest rate with a duration equal to T
e^{-rT} = the discount factor based on continuous compounding
X = the exercise price (for CP_p it is equal to V_0; for CP_s it is equal to the investment required to create the synergy value)
σ = the standard deviation of returns (for CP_p it is equal to the standard deviation of returns on firm equity prior to the acquisition; for CP_s it is equal to the standard deviation of returns on equivalent synergy investments)
$N(d_i)$, $i = 1,2$ is the cumulative probability density function

Valuing the Pure Control Option As we demonstrate here, the value of an option increases with time to expiration and volatility of returns on the underlying assets. The reasoning is as follows: The longer the time to expiration of the option, the more time there is for the value of the underlying assets to exceed the purchase, or exercise, price. The greater the volatility of the returns on the firm's assets, the greater the potential of asset returns being high, resulting in the market value of the underlying assets exceeding the exercise price. Since volatility is symmetric, the market value can also be below the exercise price. However, in this case the option would not be exercised, and the transaction would not take place.

The time to expiration defines the life of the option. In the case of the pure control option, one can think of time to expiration as the due diligence period at the end of which the prospective buyer either exercises the option and buys the firm or not. Due diligence time frames vary, but they generally do not take longer than six months, although there are cases where they extend beyond a year. Table 7.4 assumes that the maximum life of a pure

TABLE 7.4 Value of Pure Control Premium Expressed as a Percent of the Stock Price Prior to the Acquisition Announcement

Assumptions: **Exercise price and market value are $100; risk-free rate = 2%.**

Time to Expiration: Months	Standard Deviations of Returns			
	25%	50%	75%	100%
3	5.19%	10.10%	14.98%	19.81%
6	7.46	14.36	21.16	27.81
9	9.25	17.64	25.85	33.78
12	10.79	20.41	29.74	38.66

control option is 12 months. The measure of volatility required by option pricing models is the standard deviation of asset returns. An approximation to calculating the volatility of private firm returns is described in Appendix 7A.

Table 7.4 shows that the value of the option increases with time. Option value also increases with volatility. What is the intuition here? Paying more for risk does not seem to make sense . . . but it does when you consider what a pure control option is. It is insurance against making a mistake. The greater the degree of uncertainty about receiving the promised cash flows from the control owner, the more one is willing to pay for insurance to find out whether entering into the bargain with the seller makes sense. If one were certain about receiving the promised cash flows, then there would be no reason to pay a premium for them. Thus, the value of pure control should be greater for a risky firm than for a less risky firm with the same exercise price.

Valuing the Synergy Option A synergy option emerges when a buyer has an alternative strategy for the use of the firm's assets. That is, the strategic buyer believes his or her actions can produce more upside valuation possibilities relative to what is possible under the current regime. Since upside valuation possibilities increase, the strategic buyer can afford to pay an increment above the pure value of control. Let us return to our earlier example of the sale of the veterinary practice to a strategic buyer who desires to create the dog hotel. The present value of the veterinary practice cash flows is still $100. Based on the buyer's experience, it will take $50 of investment to create as much as $50 of additional value. If this strategic investment were initiated today, it would have a net present value of zero. But this traditional analysis does not consider the fact that there is potentially significant upside value to this strategic investment, perhaps as much as an incremental $100, instead of $50, in value. Moreover, the buyer knows that the $50 investment can be postponed to a later time, so more of the uncertainty surrounding the possibility of achieving the $100 upside could be resolved. The fact that the strategic investment can be postponed if conditions are not right has value. Like the pure control option, the value of the strategic option is based on the volatility of return and the time to expiration.

Based on past experience and other factors, the buyer expects the synergy strategy to have a volatility of 25 percent. Keep in mind that this volatility is not the return volatility associated with veterinary practice under old management, but rather the volatility of asset returns associated with the investment created by the "dog hotel" strategy. The volatilities will not necessarily be the same because the risk profiles of the cash flows from the business-as-usual strategy may be very different than the incremental cash flows produced by the dog hotel strategy. For example, if the acquiring

firm management has been successful in implementing similar synergistic strategies in the past, then the return volatility will likely be lower than if the firm were implementing the strategy for the first time. But this does mean that the option is worth less, since a lower risk profile may mean that the value of expected cash flows is greater relative to the investment, and thus the investment has intrinsic value.[8] Again, these considerations are a function of a known buyer's characteristics and track record.

The final parameter is the time to expiration. Since this is a strategic option, it can be exercised anytime, and hence from this perspective alone it is quite valuable. In finance, the period over which the firm is expected to earn rates of return above its cost of capital is called the *competitive advantage period*. Given that a strategic option is being considered, the time to expiration should coincide with the length of time of the competitive advantage period. As a practical matter, the length of time of the competitive advantage varies depending on a multitude of factors, although it is often taken to be five years.[9] Based on an exercise price of $50, expected present value of cash flows of $50, volatility of 25 percent, and a five-year risk-free rate of return of 3 percent, the Black-Scholes model indicates that the strategic option is worth approximately $14.

Putting It All Together Using Equation 7.1, let us assume that the pure control premium has 12 months to expiration and a volatility of 25 percent. Therefore, the value of pure control is about $11 and the value of the synergy option is $14. Thus, the value of the total control premium is $25. In this example, the buyer of the veterinary practice would be willing to pay no more than $125 for the practice, or $25 above the present value of the veterinary practice's stand-alone cash flows. Clearly, if the buyer has significant negotiating leverage, the premium paid will be lower than 25 percent. As noted earlier, it appears that in such cases public firms purchase private firm targets. Alternatively, if the seller has leverage and the buyer believes that its future is compromised without purchase of the target, then payment in excess of 25 percent may well be possible. In this case, however, the parameters used to calculate the synergy option would be different and presumably give rise to a larger premium.

A PRELIMINARY TEST OF THE MODEL

This section reports preliminary results of testing whether there is a relationship between the value of pure control and actual control premiums paid. This test takes two forms. First, our theory suggests that the value of pure control should be no greater than the reported control premium. Hence, we want to test this hypothesis. Second, we want to test whether there is a significant correlation between the estimated values of pure

control and the control premiums actually paid. If so, this would indicate, although not prove, that an option pricing model is a useful first step in estimating the proper size of the control premium in the presence of nonstrategic buyers.

The initial sample included 86 firms that were acquired between 1998 and 2001. The data comes from Mergerstat/Shannon Pratt's Control Premium Study.[10] Of the thousands of transactions reported in this study, we randomly selected 86 acquisitions. For each firm in the sample, we collected end-of-month stock price data for 60 months prior to the two-month date from which the acquisition premium was calculated. From this data we calculated each stock's volatility as the variance of its monthly returns. The risk-free rate was the yield on a government security rate prevailing at the end of the month prior to the two-month window, with a maturity equal to the life of the option. The exercise price was set at the month-end price prior to the two-month acquisition window. For each firm the pure control premium was calculated assuming a one-year life. The value of the synergy option was calculated as the difference between the reported control premium and the estimated value of the pure control option. Appendix 7B contains all the data in this study. Table 7.5 summarizes the basic results for the total sample and two subsamples.

The first subsample removes firms with reported negative control premiums. A negative control premium means that the firm was bought for less than the value of its expected cash flows. Without having any additional information about the transaction, this result makes little economic sense. Therefore, we removed these firms from our sample. Sample 3, the second subsample, removes firms that had negative synergy option values. Sixteen firms fell into this category. Negative synergy option values can arise for at least two reasons. The first reason is that the pure control premium was estimated with sufficient error such that its value exceeded the reported control premium. The error can emerge for a number of reasons. These include the option life being too long (e.g., 12 months instead of 6) and the estimated volatility being too large. Another reason is that since the acquirer purchased the firm at a discount to the firm's intrinsic value, a negative synergy value implies that the acquiring firm paid less than the value of pure control. Put differently, the seller left money on the table. At this juncture, we have no way of measuring whether the negative difference is due to measurement error or inefficient pricing. However, the fact that these negative differences occur for only 16 firms, or about 20 percent of the firms in sample 2, we expect that they are not the result of measurement error, but, rather, arise because of shrewd bargaining on the part of the buyers. Nevertheless, a more intensive analysis needs to be undertaken before any definitive conclusions can be reached on this point.

TABLE 7.5 Control Premium, Value of Pure Control, and Value of Synergy as a Percent of Preannouncement Stock Price

	Sample 1 Original Sample: 86 Firms			Sample 2 Sample 1 Less Firms with Negative Control Premiums: 74 Firms in Sample			Sample 3 Sample 2 Less Firms with Negative Estimated Synergy Value: 58 Firms in Sample		
	Average	Median	SD	Average	Median	SD	Average	Median	SD
Reported control premium	47	36	66	56	44	65	66	50	70
Pure control premium	22	16	18	21	15	19	17	15	13
Estimated synergy	26	18	66	36	24	64	49	34	65

SD = standard deviation.

The results shown in Table 7.5 are interesting, the aforementioned drawbacks notwithstanding.

First, the value of pure control is less than the reported control premium for 78 percent of sample 2 (58/74).

Second, the value of pure control is generally far smaller than the value of the synergy option. In 42 out of 58 cases, the synergy option value exceeds the pure control option value, and this result is significantly different than the result obtained by pure chance. In only four cases do the differences exceed 10 percent and, of these, only two exceed 20 percent. This means that in relatively few cases the pure control option value exceeds the value of the synergy option.

This result is consistent with what one would expect. The reason is that acquisitions are generally carried out for strategic reasons, irrespective of whether the combination makes economic sense to stock market investors, and not because the acquirer simply wants to operate the target in the same way in the future as it has been run in the past. Even in cases where the chief motivation for the acquisition is to end noneconomic activities carried out by current management, one would not expect the pure control option to be worth more than the synergy option, the option to end specified activities. Indeed, during the 1980s there were a number of well-publicized takeover attempts whose primary purpose was to change management precisely because it would not respond to stock market pressures to end activities that were wasting corporate resources.[12]

Overall, Table 7.5 indicates that, on average, the value of pure control is less than the synergy option value. The relative importance of the pure control option declines as we move from sample 1 to sample 3. Sample 3 indicates that, on average, the value of pure control is 17 percent of the preacquisition announcement price, which is about 26 percent of the acquisition premium. Although not shown, the coefficient of variation for both the pure control and synergy options was calculated. This metric, measured as the ratio of the standard deviation to the average, indicates that the value of the pure control option varies far less relative to its average than does the value of the synergy option. This is true for all samples, and this result is what one would expect. The reason is that the risks associated with synergy activities are likely to be far greater than running a stand-alone business, and the exercise period for implementing the synergy option will certainly be far greater than time to expiration of a pure control option. Where both factors are in play, the synergy option will generally represent the greatest percentage of the reported control premium.

Finally, we estimated a model where the reported control premium is the dependent variable and the pure control option is the independent variable. This exercise was carried out for sample 3 firms only. Table 7.6 shows the results of this analysis.

TABLE 7.6 Relationship between Reported Control Premium and the Pure Control Option

Multiple *R*	0.479427062				
R squared	0.229850308				
Adjusted *R* squared	0.216097634				
Standard error	0.622338539				
Observations	58				
ANOVA					
	df	SS	MS	F	Significance F
Regression	1	6.473085778	6.473086	16.71314	0.00014028
Residual	56	21.68909442	0.387305		
Total	57	28.16218019			
Variables	**Coefficients**	**Standard Error**	**t-Stat**	**P-value**	**Lower 95%**
Constant term	0.219780239	0.135031015	1.627628	0.109218	–0.05071921
Pure control option	2.626734985	0.642520922	4.08817	0.00014	1.339611768

The regression model indicates that there is a significant relationship between the values of the pure control option and reported control premiums. The adjusted R^2 is 22 percent, and the coefficient of the pure control option, 2.63, is statistically significant. While these results are promising and support the use of the option pricing framework when estimating the size of a control premium, much additional research needs to be done. However, these results do lend support to the view that control owners have control options that are valuable apart from the expected cash flows of their firms.

SUMMARY

This chapter reviewed research that analyzed acquisition (control) premium paid for private firms relative to those paid for public firms. In general, the results suggest that private firm control premiums are greater than those of public firms by a wide margin. The results also suggest that the private firm increment should be higher, indicating that prices paid for private firms may be too low.

The chapter then developed a control premium model based on option pricing theory. Most private firm transactions reflect a purchase by a business-as-usual buyer as opposed to a strategic acquirer. In these cases, the control value should reflect only the value of pure control. Implicitly including a synergistic component, for example, by using the median value from published control studies, creates a significant bias in the firm's control value. Second, the value of control is not represented in the expected cash flows of the stand-alone firm. While these expected cash flows represent the expected exercise of control owner options, the value of pure control represents control options not yet exercised. Hence, the pure control option has a value in excess of the firm's expected cash flows that is independent of the value that a buyer hopes to create based on expectations of combinatorial synergies. The chapter also presented some preliminary test results that indicate the value of pure control is correlated with and lower than the reported control premium. This result is consistent with the option pricing theory of control.

APPENDIX 7A: ESTIMATING PRIVATE FIRM VOLATILITY

Employing the option pricing model to estimate control premiums requires a measure of return volatility. For private firms, this volatility can be approximated using a principle result from the CAPM shown in Equation 7A.1.

$$\sigma_i^2 = b_i^2 \times \sigma_m^2 + \sigma_{ie}^2 \tag{7A.1}$$

where σ^2 = the variance of the volatility of returns for firm i and the market portfolio m, respectively.
σ_{ie}^2 = nonsystematic risk that can be diversified away through portfolio diversification
b_i = the single-factor CAPM beta for firm i

The expected return for firm i can be estimated from the buildup method shown in Equation 7A.2.

$$k_i = k_f + \text{beta}_i \times \text{RP}_m + \text{SP}_i + \text{FSP}_i \tag{7A.2}$$

where k_f = the expected return on the risk-free asset.
RP_i, SP_i, and FSP_i = risk premiums that reflect market risk, size risk, and firm-specific risk, respectively.
beta_i = the CAPM beta adjusted for size and firm-specific risk (this beta is defined as $(k_i - k_f)/\text{RP}_m$)

Equation 7A.2 can now be solved for beta_i, as shown in Equation 7A.3.

$$\text{beta}_i = (k_i - k_f)/\text{RP}_m - \text{SP}_i/\text{RP}_m - \text{FSP}_i/\text{RP}_m \tag{7A.3}$$

The beta calculated using Equation 7A.3 is the unlevered beta adjusted for nonsystematic risk factors. If the private firm has an optimal capital structure that includes debt, the beta calculated using Equation 7A.3 must be further adjusted to reflect this risk using the well-known Hamada relationship described in Chapter 5. By substituting beta_i for b_i in Equation 7A.1, we can now approximate σ_i^2 under the assumption that σ_{ie}^2 is small or close to zero. Since the two critical nonsystematic risk factors determining a firm's risk are now incorporated into the adjusted beta, it is reasonable to assume that diversifiable risk is relatively low.

APPENDIX 7B: THE DATA

TABLE 7B.1 The Data

Target Ticker Symbol	Two-Month Premium	Date Announced	Days Prior	Stock Price	Exercise Price (Stock Price)	Volatility (Standard Deviation of Return)	Risk-Free Rate	Time Until Option Expiration (in Years)	Option Value	Option Value/ Stock Price
PDM	0.059	2/1/02	60	31.82	31.82	0.23884339	0.0216	1	3.34	0.105
LEVL	0.811	3/4/99	60	37.4375	37.4375	0.49455878	0.047	1	8.04	0.215
WLL	0.755	11/13/00	60	27.68	27.68	0.24003401	0.0609	1	3.47	0.125
RRI	0.338	7/12/99	60	16.87	16.87	0.16251598	0.0503	1	1.53	0.091
FFWD	0.411	12/17/98	60	13.75	13.75	0.40399322	0.0452	1	2.47	0.180
HOVB	–0.039	1/26/00	60	15.16666	15.16666	0.16063547	0.0612	1	1.46	0.096
DEX	0.188	7/9/00	60				0.0608	1	#DIV/0!	#DIV/0!
HRBC	–0.146	4/5/00	60	22.4375	22.4375	0.92696737	0.0615	1	8.46	0.377
JPR	0.147	3/4/02	60	22.76	22.76	0.16387286	0.0223	1	1.73	0.076
FCNB	0.853	7/27/00	60	13.3125	13.3125	0.29839351	0.0608	1	1.96	0.147
GNCI	0.471	7/5/99	60	17.75	17.75	0.55828964	0.0503	1	4.26	0.240
IHC	0.518	5/2/02	60	31.9375	31.9375	0.10073903	0.0248	1	1.70	0.053
DI	–0.270	2/26/98	60	41.4375	41.4375	0.17801075	0.0531	1	4.06	0.098
BLCA	0.603	6/28/01	60	23.3	23.3	0.18765806	0.0358	1	2.15	0.092
FSVC	–0.072	8/17/99	60	4.3125	4.3125	0.27786143	0.052	1	0.58	0.135
AQM	1.083	6/14/99	60	3	3	0.32180806	0.051	1	0.45	0.151
GPM	0.290	11/2/00	60	3.5	3.5	0.31779238	0.0609	1	0.54	0.154
DDDP	0.907	1/16/03	60	3.08	3.08	0.1629972	0.0136	1	0.22	0.072
LJLB	0.516	6/8/00	60	8.75	8.75	1.92345225	0.0617	1	5.90	0.674
CBG	0.362	11/13/00	60	11.87	11.87	0.97908969	0.0609	1	4.68	0.395
AXPH	0.146	6/13/01	60	2.76	2.76	0.73686678	0.0358	1	0.83	0.300
CSRV	0.194	9/8/97	60				0.0552	1	#DIV/0!	#DIV/0!
CTYA	0.592	3/5/99	60	31.1875	31.1875	1.09712883	0.0478	1	13.43	0.431

EACO	0.194	7/24/01	60	1.29	1.29	0.3427552	0.0362	1	0.20	0.152
FSA	0.545	3/14/00	60	49.18	49.18	0.20692364	0.0622	1	5.59	0.114
MTRA	0.499	6/7/99	60	1.25	1.25	0.19860663	0.051	1	0.13	0.105
RATL	1.448	12/6/02	60	5.8	5.8	2.96669103	0.0145	1	5.01	0.863
EXEC	0.413	1/6/99	60	11	11	0.11174124	0.0451	1	0.76	0.069
KSTN	0.363	5/17/00	60	17.75	17.75	0.26845225	0.0633	1	2.43	0.137
OK	0.346	11/20/00	60	0.8875	0.8875	0.67249848	0.0609	1	0.25	0.286
BKC	0.414	7/19/01	60	22.35	22.35	0.2726488	0.0362	1	2.80	0.125
NEWZ	1.018	8/7/01	60	1.17	1.17	0.40310732	0.0347	1	0.20	0.175
CTG	0.063	6/30/99	60	24.06	24.06	0.0756089	0.051	1	1.46	0.061
LUSA	0.711	5/17/99	60	12.125	12.125	0.34272183	0.0485	1	1.91	0.158
NRC	0.170	2/16/99	60	47.625	47.625	0.15963353	0.047	1	4.18	0.088
PATH	0.684	12/9/02	60	13.01	13.01	0.82039827	0.0145	1	4.21	0.323
RELY	0.140	8/30/99	60	29	29	0.32318868	0.052	1	4.41	0.152
PRFC	0.295	6/14/01	60				0.0358	1	#DIV/0!	#DIV/0!
MWFD	0.430	11/12/97	60	21.75	21.75	0.35261924	0.0546	1	3.58	0.164
VLP	0.217	8/29/97	60	13.125	13.125	0.57958798	0.0556	1	3.28	0.250
NEWI	0.048	7/14/98	60				0.0536	1	#DIV/0!	#DIV/0!
RCHY	0.400	10/1/98	60	6.75	6.75	0.40532011	0.0471	1	1.22	0.181
CMSS	1.386	1/30/01	60	2.25	2.25	0.51928943	0.0481	1	0.50	0.224
EFS	–0.024	11/14/00	60	14.37	14.37	0.40927142	0.0609	1	2.71	0.189
IPSW	0.550	2/27/02	60	13	13	0.54406892	0.0223	1	2.90	0.223
QHGI	0.241	10/19/00	60	12.62	12.62	0.35905307	0.0601	1	2.14	0.169
SBRG	1.006	11/19/01	60	2.435	2.435	0.86088897	0.0218	1	0.83	0.340
ANI	0.441	6/8/98	60				0.0541	1	#DIV/0!	#DIV/0!
OHSL	0.469	8/3/99	60	15	15	0.16731963	0.052	1	1.40	0.093
UWR	0.637	8/23/99	60	21.6875	21.6875	0.15000739	0.052	1	1.89	0.087
RCA	–0.191	2/18/97	60				0.0553	1	#DIV/0!	#DIV/0!
DS	–0.239	1/29/01	60	29.62	29.62	0.45564328	0.0481	1	5.94	0.200
SFAM	0.248	8/12/02	60	4.45	4.45	0.91635736	0.0176	1	1.60	0.359
IFRS	0.957	4/15/02	60	0.69	0.69	0.52754077	0.0248	1	0.15	0.218
PBSC	0.236	7/16/01	60	6.5	6.5	0.09126505	0.0362	1	0.37	0.056
IHF	0.457	6/23/00	60	14.5625	14.5625	16.5652361	0.0617	1	14.56	1.000

(continued)

TABLE 7B.1 (Continued)

Target Ticker Symbol	Two-Month Premium	Date Announced	Days Prior	Stock Price	Exercise Price (Stock Price)	Volatility (Standard Deviation of Return)	Risk-Free Rate	Time Until Option Expiration (in Years)	Option Value	Option Value/ Stock Price
CLMT	1.042	4/9/98	60	13.125	13.125	0.15582329	0.0538	1	1.18	0.090
FBCG	0.020	12/15/99	60	19.5	19.5	0.36568767	0.0584	1	3.34	0.171
QDEK	0.040	10/15/98	60	0.40625	0.40625	3.25058746	0.0412	1	0.36	0.898
COHB	0.228	11/24/00	60	17.12	17.12	0.15398899	0.0609	1	1.60	0.094
ASTX	–0.217	10/2/00	60	17.625	17.625	1.05084938	0.0613	1	7.39	0.419
EFBI	0.792	9/25/98	60	28.25	28.25	0.4146943	0.0471	1	5.21	0.185
BKTI	0.578	8/31/01	60	19.125	19.125	0.16801242	0.0347	1	1.61	0.084
GLBN	–0.357	6/15/01	60	3.544653	3.544653	1.21826585	0.0358	1	1.66	0.467
FMY	0.316	10/19/98	60	40.375	40.375	0.52161512	0.0412	1	8.98	0.222
HSTC	0.410	5/1/02	60				0.0248	1	#DIV/0!	#DIV/0!
EFIC	0.455	3/20/00	60	1	1	0.43917208	0.0622	1	0.20	0.200
FFOH	0.363	8/16/99	60	12	12	0.31768193	0.052	1	1.80	0.150
AVEI	0.504	11/30/98	60	36	36	1.62545249	0.0453	1	21.35	0.593
ILRN	3.339	1/31/01	60				0.0481	1	#DIV/0!	#DIV/0!
DEPO	0.475	10/19/98	60	1.3125	1.3125	0.33522031	0.0412	1	0.20	0.152
NRL	0.110	3/25/99	60	17.25	17.25	0.55650696	0.0478	1	4.11	0.238
DEFI	0.357	1/8/99	60	6.625	6.625	0.17234235	0.0451	1	0.61	0.091
PZL	0.600	3/25/02	60	13.75	13.75	0.3723601	0.0257	1	2.18	0.159
OEI	–0.455	11/25/98	60	14.37	14.37	1.07519989	0.0453	1	6.07	0.423
SNAP	0.152	11/21/02	60	4.98	4.98	0.31386731	0.0149	1	0.65	0.131
FCBH	5.188	5/22/01	60	0.11	0.11	1.40662754	0.0378	1	0.06	0.527
XLSW	0.300	8/18/99	60	27.75	27.75	0.3547328	0.052	1	4.55	0.164
FFA	0.073	3/30/01	60	22.65	22.65	0.11860251	0.043	1	1.59	0.070
SPYG	0.035	3/26/00	60	37.25	37.25	0.79229181	0.0622	1	12.28	0.330
CKC	0.067	1/12/01	60	10.3	10.3	0.33338745	0.0481	1	1.59	0.154
MBNY	0.301	9/6/00	60	17	17	0.40144052	0.0613	1	3.16	0.186
IGTI	1.590	6/1/00	60	0.625	0.625	0.14718605	0.0633	1	0.06	0.093