
MANAGEMENT OPTIONS, CONTROL AND LIQUIDITY

Once you have valued the equity in a firm, it may appear to be a relatively simple exercise to estimate the value per share. All it seems you need to do is divide the value of the equity by the number of shares outstanding. But, in the case of technology firms, even this simple exercise can become complicated by the presence of management and employee options. In this chapter, you begin by considering the magnitude of this option overhang on valuation and then consider ways of incorporating the effect into the value per share.

You also consider two other issues that may be of relevance, especially when valuing smaller technology firms or private businesses. The first is the concentration of shares in the hands of the owner/managers of these firms and the consequences for stockholder power and control. This effect is accentuated when a firm has shares with different voting rights. The second is the effect of illiquidity. When investors in a firm's stock or equity cannot easily liquidate their positions, the lack of liquidity can affect value. This can become an issue, not only when valuing private firms, but also when valuing small publicly traded firms with relatively few shares traded.

Management and Employee Options

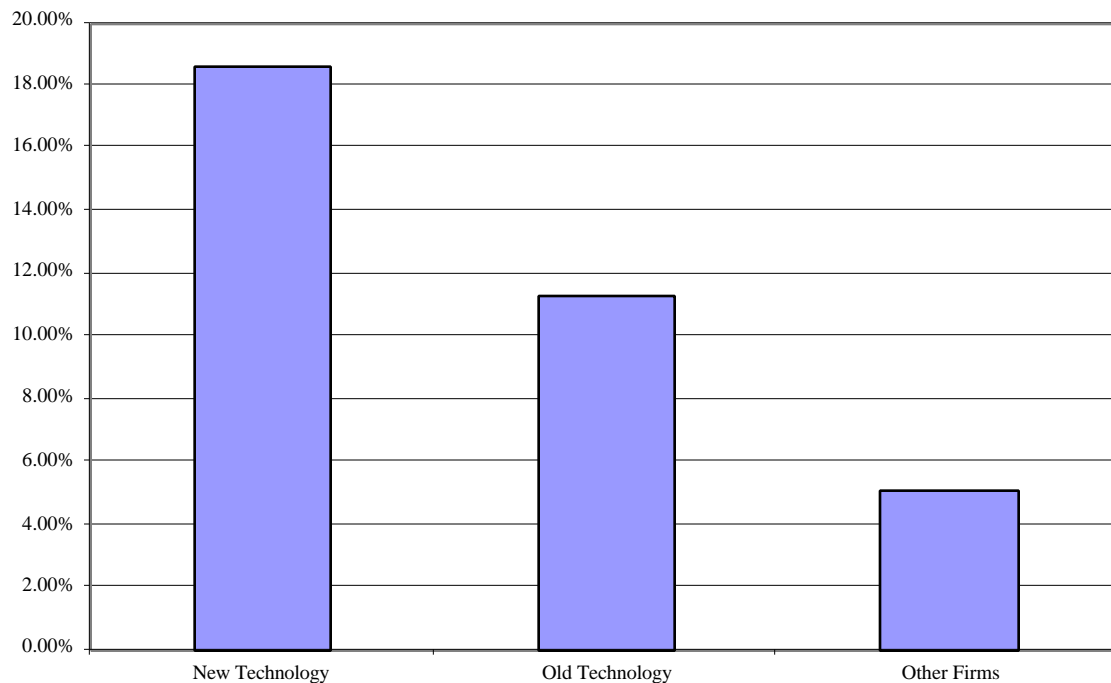
Firms use options to reward managers as well as other employees. There are two effects that these options have on value per share. One is created by options that have already been granted. These options, most of which have exercise prices well below the stock price, reduce the value of equity per share, since a portion of the existing equity in the firm has to be set aside to meet these eventual option exercises. The other is the likelihood that these firms will use options on a continuing basis to reward employees or to compensate them. These expected option grants reduce the portion of the expected future cash flows that accrue to existing stockholders.

The Magnitude of the Option Overhang

The use of options in management compensation packages is not new to technology firms. Many firms in the 1970s and 1980s initiated option-based compensation packages to induce top managers to think like stockholders in their decision making. What is different about technology firms? One is that management contracts at these firms are much more heavily weighted towards options than are those at other firms. The second is that the paucity of cash at these firms has meant that options are granted not just to top managers but to employees all through the organization, making the total option grants much larger. The third is that some of the smaller firms have used options to meet operating expenses and pay for supplies.

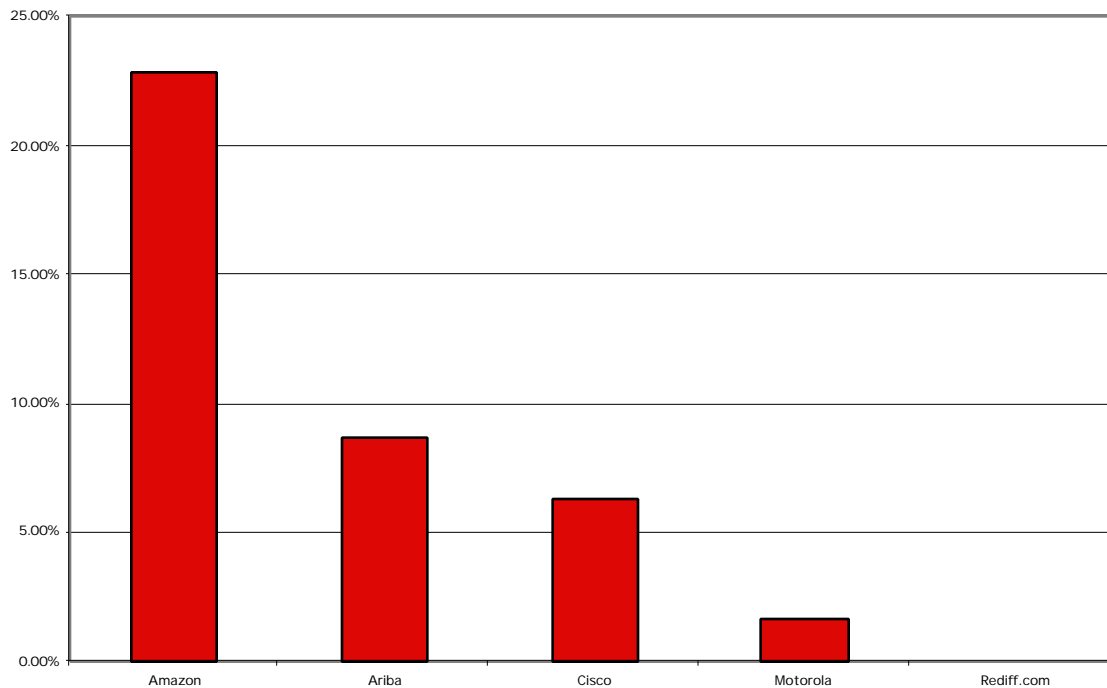
Figure 7.1 summarizes the number of options outstanding as a percent of outstanding stock at technology firms and compares them to options outstanding at non-technology firms.

Figure 7.1: Options as % of outstanding stock



As Figure 7.1 makes clear, the overhang is larger for younger new technology firms. In Figure 7.2, the number of options as a percent of outstanding stock at Cisco, Motorola, Amazon, Ariba and Rediff.com are reported:

Figure 7.2: Options outstanding as % of shares outstanding



Rediff.com has no options outstanding but the other four firms have options outstanding. Amazon, in particular, has options on 80.34 million shares, representing more than 22% of the actual shares outstanding at the firm (351.77 million). Motorola, reflecting its status as an older and more mature firm, has far fewer options outstanding, relative to the number of outstanding shares.

Characteristics of Option Grants

Firms that use employee options usually restrict when and whether these options can be exercised. It is standard, for instance, that the options granted to an employee cannot be exercised until they are vested. For this to occur, the employee usually has to remain for a period that is specified with the contract. While firms do this to keep employee turnover low, it also has implications for option valuation that are examined later. Firms that issue options do not face any tax consequences in the year in which they make the issue. When the options are exercised, however, they are allowed to treat the difference between the stock

price and the exercise price as an employee expense. This tax deductibility also has implications for option value.

Illustration 7.1: Options Outstanding

In table 7.3, the number of options outstanding at each of the firm firms that you are valuing, with the average exercise price and maturity of the options, as well as the percent of the options that are vested in each firm are summarized:

Table 7.3: Options Outstanding

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Number of options outstanding	80.34	20.675	439.00	36.98	0
Average Exercise Price	\$ 27.76	\$ 6.77	\$22.52	\$46.00	NA
Average Maturity	9.00	9.31	6.80	6.20	NA
% Vested	58%	61%	71%	75%	NA

While Amazon has far more options outstanding as a percent of the outstanding stock, Ariba's options have a much lower exercise price, on average. In fact, Ariba's stock price of \$ 75 at the time of this analysis was almost eight times the average exercise price of \$ 6.77. The average maturity of the options at all of these firms is also in excess of six years for Cisco and Motorola, and in excess of nine years for Amazon and Ariba. The combination of a low exercise price and long maturity make the options issued by these firms very valuable. Fewer of Amazon and Ariba's options are vested, reflecting the fact that these are younger firms which have these granted more of these options recently.

Options in Existence

Given the large number of options outstanding at many technology firms, your first task is to consider ways in which you can incorporate their effect into value per share. The section begins by presenting the argument for why these outstanding options matter when computing value per share, and then considering four ways in which you can incorporate their effect on value.

Why they affect value per share?

Why do existing options affect value per share? Note that not all options do. In fact, options issued and listed by the options exchanges have no effect on the value per share of the firms on which they are issued. The options issued by firms do have an effect on value per share, since there is a chance that they will be exercised in the near or far future. Given that these options offer the right to individuals to buy stock at a fixed price, they will be exercised only if the stock price rises above that exercise price. When they are exercised, the firm has two choices, both of which have negative consequences for existing stockholders. It can issue additional shares to cover the option exercise. But this increases the number of shares outstanding and reduces the value per share to existing stockholders.¹ Alternatively, it can use cashflows from operations to buy back shares in the open market and use these shares to meet the option exercise. This reduces the cash flows available to current equity investors in future periods, and makes their equity less valuable today.

Ways of Incorporating existing options into value

There are four approaches that are used to incorporate that effect of options that are already outstanding into the value per share. However, the first three approaches can lead to misleading estimates of value.

1. Use fully diluted number of shares to estimate per-share value

The simplest way to incorporate the effect of outstanding options on value per share is to divide the value of equity by the number of shares that will be outstanding if all options

¹ This would be dilution in the true sense of the word, rather than the term that is used to describe any increase in the number of shares outstanding. The reason there is dilution is because the additional shares are issued only to the option holders at a price below the current price. In contrast, the dilution that occurs in a rights issue where every stockholder gets the right to buy additional shares at a lower price is value neutral. The shares will trade at a lower price but everyone will have more shares outstanding.

are exercised today – the fully diluted number of shares. While this approach has the virtue of simplicity, it will lead to too low of an estimate of value per share for two reasons:

- It considers all options outstanding, not just ones that are in the money and vested. To be fair, there are variants of this approach where the shares outstanding are adjusted to reflect only in-the-money and vested options.
- It does not incorporate the expected proceeds from exercise, which will comprise a cash inflow to the firm.

Finally, this approach does not build in the time premium on the options into the valuation either.

Illustration 7.2: Fully Diluted Approach to estimating Value per Share

To apply the fully diluted approach to estimate the per share value, the equity values estimated for each firm in chapter 6 are used, in conjunction with the number of shares outstanding inclusive of those underlying the options. Table 7.3 summarizes the value per share using this approach:

Table 7.3: Fully Diluted Approach to Estimating Value per Share

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Value of Equity	\$ 13,589	\$ 17,941	\$ 318,336	\$ 69,957	\$ 474
Primary Shares	351.77	235.8	6890	2152	24.9
Fully Diluted Shares	432.11	256.475	7329	2188.98	24.9
Value per share (Primary)	\$ 38.63	\$ 76.08	\$ 46.20	\$ 32.51	\$ 19.05
Value per share (fully diluted)	\$ 31.45	\$ 69.95	\$ 43.44	\$ 31.96	\$ 19.05

The value per share, using the fully diluted approach, is significantly lower than the value per share, using the primary shares outstanding. This value, however, ignores both the proceeds from the exercise of the options as well as the time value inherent in the options.

II. Estimate expected option exercises in the future and build in expected dilution

In this approach, you forecast when in the future options will be exercised and build in the expected cash outflows associated with the exercise, by assuming that the firm will go out and buy back stock to cover the exercise. The biggest limitation of this approach is that it requires estimates of what the stock price will be in the future and when options will be exercised on the stock. Given that your objective is to examine whether the price today is correct, forecasting future prices seem to estimate the current value per share seems circular. In general, this approach is neither practical nor is it particularly useful in coming up with reasonable estimates of value.

III. Treasury Stock Approach

This approach is a variant of the fully diluted approach. Here, the number of shares is adjusted to reflect options that are outstanding, but the expected proceeds from the exercise (exercise price * number of options) are added to the value of equity. The limitations of this approach are that, like the fully diluted approach, it does not consider the time premium on the options and there is no effective way of dealing with vesting. Generally, this approach, by under estimating the value of options granted, will over estimate the value of equity per share.

The biggest advantage of this approach is that it does not require a value per share (or stock price) to incorporate the option value into per-share value. As you will see with the last (and recommended) approach, there is a circularity that is created when the stock price is inputted into estimating value per share.

Illustration 7.3: Treasury Stock Approach

In Table 7.4, the value per share is estimated using the treasury stock approach for Amazon, Ariba, Cisco, Motorola and Rediff.com:

Table 7.4: Value of Equity per Share: Treasury Stock Approach

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Number of options outstanding	80.34	20.675	439	36.98	0
Average exercise price	\$27.76	\$6.77	\$22.52	\$46.00	\$0.00
Proceeds from Exercise	\$2,229.84	\$139.97	\$9,886.28	\$1,701.08	\$0.00

Value of Equity	\$13,588.61	\$17,940.64	\$318,335.78	\$69,956.97	\$474.37
+ Proceeds from Exercise	\$2,229.84	\$139.97	\$9,886.28	\$1,701.08	\$0.00
Total Value	\$15,818.45	\$18,080.61	\$328,222.06	\$71,658.05	\$474.37
Fully Diluted number of shares	432.11	256.475	7329	2188.98	24.9
Value per share	\$36.61	\$70.50	\$44.78	\$32.74	\$19.05

Note that the value per share using this approach is higher than the value per share using the fully diluted approach for each of the companies with options outstanding. The difference is greatest for Amazon because the options have a higher exercise price, relative to the current stock price. The estimated value per share still ignores the time value of the options.

IV. Value Options using option pricing model

The correct approach to dealing with options is to estimate the value of the options today, given today's value per share and the time premium on the option. Once this value has been estimated, it is subtracted from the equity value, and divided by the number of shares outstanding to arrive at value per share.

Value of Equity per share = (Value of Equity – Value of Options outstanding)/ Primary number of shares outstanding

In valuing these options, however, there are four measurement issues that you have to confront. One relates to the fact that not all of the options outstanding are vested, and that some of the non-vested options might never be vested. The second relates to the stock price to use in valuing these options. As the description in the last paragraph makes clear, the value per share is an input to the process as well as the output. The third issue is taxation. Since firms are allowed to deduct a portion of the expense associated with option exercises, there may be a potential tax saving when the options are exercised. The final issue relates to private firms or firms on the verge of a public offering, like Rediff.com. Key inputs to the option pricing model, including the stock price and the variance, cannot be obtained for these firms, but the options have to be valued nevertheless.

Dealing with Vesting

As noted earlier in the chapter, firms granting employee options usually require that the employee receiving the options stay with the firm for a specified period, for the option to be vested. Consequently, when you examine the options outstanding at a firm, you are looking at a mix of vested and non-vested options. The non-vested options should be worth less than the vested options, but the probability of vesting will depend upon how in-the-money the options are and the period left for an employee to vest. While there have been attempts² to develop option pricing models that allow for the possibility that employees may leave a firm before vesting and forfeit the value of their options, the likelihood of such an occurrence when a manager's holdings are substantial should be small. Carpenter (1998) developed a simple extension of the standard option pricing model to allow for early exercise and forfeiture, and used it to value executive options.

Which stock price?

The answer to this question may seem obvious. Since the stock is traded, and you can obtain a stock price, it would seem that you should be using the current stock price to value options. However, you are valuing these options to arrive at a value per share that you will then compare to the market price to decide whether a stock is under or over valued. Thus, using the current market price to arrive at the value of the options and then using this option value to estimate an entirely different value per share seems inconsistent.

There is a solution. You can value the options using the estimated value per share. This creates circular reasoning in your valuation. In other words, you need the option value to estimate value per share and value per share to estimate the option value. You would

² Cuny and Jorion (1995) examine the valuation of options when there is the possibility of forfeiture.

recommend that the value per share be initially estimated using the treasury stock approach, and that you then converge on the proper value per share by iterating.³

There is another related issue. When options are exercised, they increase the number of shares outstanding, and by doing so, there can have an effect on the stock price. In conventional option pricing models, the exercise of the option does not affect the stock price. These models have to be adapted to allow for the dilutive effect of option exercise. Appendix 2 provides a summary of the option pricing models adapted for dilution.

Taxation

When options are exercised, the firm can deduct the difference between the stock price at the time and the exercise price as an employee expense, for tax purposes. This potential tax benefit reduces the drain on value created by having options outstanding. One way in which you could estimate the tax benefit is to multiply the difference between the stock price today and the exercise price by the tax rate; clearly, this would make sense only if the options are in-the-money. While this does not allow for the expected price appreciation over time, it has the benefit of simplicity. An alternative way of estimating the tax benefit is to compute the after-tax value of the options:

After-tax Value of Options = Value from option pricing model (1- tax rate)

This approach is also straightforward and allows you to consider the tax benefits from option exercise in valuation. One of the advantages of this approach is that it can be used to consider the potential tax benefit even when options are out of the money.

Non-traded Firms

A couple of key inputs to the option pricing model – the current price per share and the variance in stock prices – cannot be obtained if a firm is not publicly traded. There are

³ The value per share, obtained using the treasury stock approach, will become the stock price in the option pricing model. The option value that results from using this price is used to compute a new value per share which is fed back into the option pricing model and so on.

two choices in this scenario. One is to revert to the treasury stock approach to estimate the value of the options outstanding and abandon the option pricing models. The other is to stay with the option pricing models and to estimate the value per share, from the discounted cash flow model. The variance of similar firms that are publicly traded can be used to estimate the value of the options. *Illustration 7.4: Option Value Approach*

In Table 7.5, you begin by estimating the value of the options outstanding, using an option pricing model that allows for dilution. To estimate the value of the options, you first estimate the standard deviation in stock prices⁴ over the previous 2 years. Weekly returns are used to make this estimate, and this estimate is annualized⁵. All options, vested as well as non-vested, are valued and there is no adjustment for non-vesting.

Table 7.5: Estimated Value of Options Outstanding

<i>Option Pricing Model</i>	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Number of Options Outstanding	80.34	20.675	439	36.98	0
Average Exercise Price	\$27.76	\$6.77	\$22.52	\$46.00	\$0.00
Estimated Standard Deviation (Volatility)	85%	80%	40%	34%	80%
Stock Price at time of analysis	\$49.00	\$75.63	\$64.88	\$34.25	\$10.00
Value per option	\$42.44	\$72.92	\$50.13	\$11.75	\$8.68
Value of options outstanding	\$3,409.67	\$1,508	\$22,008	\$435	\$0.00
Tax Rate	35.00%	35.00%	35.00%	35.00%	38.50%
After-tax Value of options outstanding	\$2,216	\$980	\$14,305	\$283	\$0

⁴ The variance estimate is actually on the natural log of the stock prices. This allows you to cling to at least the possibility of a normal distribution. Neither stock prices nor stock returns can be normally distributed since prices cannot fall below zero and returns cannot be lower than –100%.

⁵ All of the inputs to the Black Scholes model have to be in annual terms. To annualize a weekly variance, you multiply by 52.

In estimating the after-tax value of the options at Amazon and Ariba, you have used their prospective marginal tax rate of 35%. If the options are exercised prior to these firms reaching their marginal tax rates, the tax benefit is lower since the expenses are carried forward and offset against income in future periods.

The value per share can now be computed by subtracting the value of the options outstanding from the value of equity and dividing by the primary number of shares outstanding:

Table 7.6: Value of Equity per Share

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Value of Equity	\$13,588.61	\$17,940.64	\$318,335.78	\$69,956.97	\$474.37
- Value of Options outstanding	\$2,216	\$980	\$14,305	\$283	\$0
Value of Equity in shares outstanding	\$11,372.32	\$16,960.71	\$304,030.58	\$69,674.46	\$474.37
Primary shares outstanding	351.77	235.8	6890	2152	24.9
Value per Share	\$32.33	\$71.93	\$44.13	\$32.38	\$19.05

The inconsistency averred to earlier is clear when you compare the value per share that you have estimated in this table to the price per share that you used in the previous one to estimate the value of the options. For instance, Amazon's value per share is \$32.33, whereas the price per share used in the option valuation is \$ 49. If you choose to iterate, you would revalue the options using the estimated value of \$32.33, which would lower the value of the options and increase the value per share, leading to a second iteration and a third one and so on. The values converge to yield a consistent estimate. The consistent estimates of value are provided in table 7.7:

Table 7.7: Consistent Estimates of Value per Share

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff.com</i>
Value of Options (with current stock price)	\$2,216	\$980	\$14,305	\$282.51	\$0
Value per share	\$32.33	\$71.93	\$44.13	\$32.38	\$19.05
Value of Options (with iterated value)	\$1,500	\$933	\$8,861	\$282.51	\$0
Value per share	\$34.37	\$ 72.13	\$44.92	\$32.38	\$19.05

For Motorola and Ariba, the difference in value from iterating is negligible, since the value per share that you estimated for the firms is close to the current stock price. For Cisco, the value of the options drops by almost 40% but the overall effect on value is muted because the number of options outstanding as a percent of outstanding stock is small. The difference in values is greatest at Amazon for two reasons. First, the value per share was significantly lower than the current price, at the time of the valuation. Second, Amazon had the highest value for options outstanding as a percent of stock outstanding.

Future Option Grants

While incorporating options that are already outstanding is fairly straightforward, incorporating the effects of future option grants is much more complicated. In this section, the argument for why these option issues affect value is presented, and how to incorporate these effects into value.

Why future options issues affect value

Just as options outstanding currently represent potential dilution or cash outflows to existing equity investors, expected option grants in the future will affect value per share by increasing the number of shares outstanding in future periods. The simplest way of thinking about this expected dilution is to consider the terminal value in the discounted cash flow model. As constructed in the last chapter, the terminal value is discounted to the present and divided by the shares outstanding today to arrive at the value per share. However, expected option issues in the future will increase the number of shares outstanding in the terminal year, and therefore reduce the portion of the terminal value that belongs to existing equity investors.

Ways of Incorporating Effect into Value per Share

It is much more difficult to incorporate the effect of expected option issues into value than existing options outstanding. This is because you have to forecast not only how many options will be issued by a firm in future periods, but also what the terms of these

options will be. While this may be possible for a couple of periods with proprietary information (the firm lets you know how much it plans to issue and at what terms), it will become more difficult in circumstances beyond that point. You will consider a way in which you can obtain an estimate of the option value, and look at two ways of dealing with this estimate, once obtained.

Estimate option value as an operating or capital expense

You can estimate the value of options that will be granted in future periods as a percentage of revenues or operating income. By doing so, you can avoid having to estimate the number and terms of future option issues. Estimation will also become easier since you can draw on the firm's own history (by looking at the value of option grants in previous years as a proportion of firm value) and the experiences of more mature firms in the sector. Generally, as firms become larger, the value of options granted as a percent of revenues should become smaller.

Having estimated the value of expected future option issues, you are left with another choice. You can consider this value each period as an operating expense and compute the operating income, after the expense. You are assuming, then, that option issues form part of annual compensation. Alternatively, you can treat it as a capital expense and amortize it over multiple periods. While the cash flow in the current period is unaffected by this distinction, it has consequences for the return on capital and reinvestment rates that you measure for a firm.

It is important that you do not double count future option issues. The current operating expenses of the firm already include the expenses associated with option exercises in the current period. The operating margins and returns on capital that you might derive by looking at industry averages reflect the effects of option exercise in the current period for the firms in the industry. If the effect on operating income of option exercise in the current period is less than the expected value of new option issues, you have to allow for an additional expense associated with option issues. Conversely, if a disproportionately large

number of options were exercised in the last period, you have to reduce the operating expenses to allow for the fact that the expected effect of option issues in future periods will be smaller.

Illustration 7.5: Valuing with expected option issues

In all of the valuations you have seen so far, the current operating income and the industry averages were key inputs. The current operating income was used to compute the current return on capital, margin and reinvestment rate for the firm. The industry average margins or returns on capital were used to estimate the stable growth inputs.

The current operating income reflects the effects of options exercised over the last period but not the effect of new options issued. To the extent that the latter is greater (or lower) than the former, the operating income, margins and returns on capital have been overstated (or understated). To illustrate the adjustment, you consider the number of options issued and the number exercised at Amazon and Cisco during the last year are summarized in Table 7.8, and the exercise prices of each:

Table 7.8: Options Issued and Exercised: Amazon and Cisco

	<i>Amazon</i>			<i>Cisco</i>		
	<i>Number</i>	<i>Exercise Price</i>	<i>Value</i>	<i>Number</i>	<i>Exercise Price</i>	<i>Value</i>
Options granted	31.739	\$ 63.60	\$ 1,273	107	\$ 49.58	\$4,589
Options canceled	11.281	\$ 3.86	\$ -	10	\$ 24.66	\$0
Options exercised	16.125	\$ 19.70	\$ 472	93	\$ 6.85	\$5,396
Effect on Operating Income			- \$809			+\$807

The values of the option grants are estimated using the option pricing model⁶, whereas the value of the options exercised is the exercise value – the difference between the stock price and the exercise price. For Amazon, the value of the options granted was significantly higher than the value of the exercised options. Consequently, its operating loss would have been even greater (by \$809 million) than was estimated in chapter 4 if the difference between the exercise value and the new options granted is considered an additional employee expense. For Cisco, on the other hand, the value of the options exercised exceeded the value of the options granted. The difference between the two (of \$807 million) should be added to operating income to arrive at the corrected operating income. Similar adjustments can be made to the operating income at Ariba and Motorola; Ariba's operating income would have been \$ 246 billion lower with the adjustment while Motorola's would have increased by \$ 14 million.

The industry average returns on capital and margins are more difficult to adjust. You would have to make the adjustment described above, to every firm in the industry and compute returns on capital and margins after the adjustment. For simplicity, the value of options exercised is assumed to be equal to the value of options issued in the current period for the industry.

Table 7.9 reports on the adjustment to current operating income and the final values per share that emerge as a result of this adjustment.

Table 7.9: Values per Share with Option Adjustment to Current Operating Income

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>
Unadjusted Operating Income	\$ (276.00)	\$ (163.70)	\$ 3,455	\$ 3,216
Value (no option adjustment)	\$ 32.33	\$ 71.93	\$ 44.13	\$ 32.38
Adjusted Operating Income	\$ (1,076.29)	\$ (409)	\$4,262	\$3,230


⁶ To value these options, the standard deviations reported earlier and ten year lives are used. The maturities of the options granted were obtained from the 10-Ks.

Value(option grant adjustment)	\$ 26.62	\$ 58.80	\$53.04	\$32.48
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The effect of the adjustment is trivial at Motorola. The value per share is lower than the original estimates at Amazon and Ariba, reflecting the drain on value per share that options will continue to be in future years. The value per share is higher at Cisco because of the increase in operating income created by the adjustment.

Estimate expected stock price dilution from option issues

The other way of dealing with expected option grants in the future is to build in the expected dilution that will result from these option issues. To do so, you have to make a simplifying assumption. For instance, you could assume that options issued will represent a fixed percent of the outstanding stock each period, and base this estimate on the firm's history or on the experience of more mature firms in the sector. Generally, this approach is more complicated than the first one and it does not lead to a more precise estimate of value. Clearly, it would be inappropriate to do both – show option issues as an expense and allow for the dilution that will occur from the issue. That double counts the same cost.

 *warrants.xls*: This spreadsheet allows you to value the options outstanding in a firm, allowing for the dilution effect.

Value of Control

When you divide the value of the equity by the number of shares outstanding, you assume that the shares all have the same voting rights. If different classes of shares have different voting rights, the value of equity per share has to reflect these differences, with the shares with more voting rights having higher value. Note, though, that the total value of equity is still unchanged. To illustrate, assume that the value of equity in a firm is \$ 500 million and that there are 50 million shares outstanding; 25 million of these shares have

voting rights and 25 million do not. Furthermore, assume that the voting shares will have a value 10% higher than the non-voting shares. To estimate the value per share:

$$\begin{aligned}\text{Value per non-voting share} &= \$ 500 \text{ million} / (25 \text{ million} * 1.10 + 25 \text{ million}) \\ &= \$ 500 \text{ million} / 52.5 \text{ million} = \$ 9.52\end{aligned}$$

$$\text{Value per voting share} = \$ 9.52 (1.10) = \$ 10.48$$

The key issue that you face in valuation then is in coming up with the discount to apply for non-voting shares or alternatively, the premium to attach to voting shares.

Voting Shares versus Non-voting Shares

What premium should be assigned to the voting shares? You have two choices. One is to look at studies that empirically examine the size of the premium for voting rights and to assign this premium to all voting shares. Lease, McConnell and Mikkelsen(1983) examined 26 firms that had two classes of common stock outstanding, and they concluded that the voting shares traded at a premium relative to non-voting shares.⁷ The premium, on average, amounted to 5.44%, and the voting shares sold at a higher price in 88% of the months for which data were available. In four firms that also had voting preferred stock, however, the voting common stock traded at a discount of about 1.17% relative to non-voting shares.

The other option is to be more discriminating and vary the premium depending upon the firm. Voting rights have value because they give shareholders a say in the management of the firm. To the extent that voting shares can make a difference — by removing incumbent management, forcing management to change policy, or selling to a hostile bidder in a takeover — their price will reflect the possibility of a change in the way the firm is run.⁸ Non-voting shareholders, on the other hand, do not participate in these decisions.

⁷ The two classes of stock received the same dividend.

⁸In some cases, the rights of non-voting stockholders are protected in the specific instance of a takeover by

Valuing Control

If the value of control arises from the capacity to change the way a firm is run, it should be a function of how well or badly the firm is run. If the firm is well run, the potential gain from restructuring is negligible, and the difference in values between voting and non-voting shares should be as well. If the firm is managed badly, the potential gain from restructuring is significant, and voting shares should sell at a significant premium over non-voting shares.

One way to value control is to value the firm under existing management and policies and then revalue it, assuming that the firm is optimally run. The difference between the two values is the value of control:

$$\text{Value of control} = \text{Value of firm optimally run} - \text{Status Quo valuation of firm}$$

The key to estimating this value is to come up with the parameters that you would use to value the firm, optimally run. This issue is revisited in chapter 12.

Control in Private Businesses

The issue of control also comes up when valuing private businesses, especially when the stake in the business that is being valued is less than a controlling one. For instance, a 49% stake in a private business may sell at a considerable discount on a 51% stake, because the latter provides control while the former does not. You can estimate the discount, using the same approach that you developed for valuing control, by valuing the private business under the status quo and then again as an optimally managed business. The discount should be larger with a 49% stake in a poorly managed private business than it would be with a well-managed one.

Value of Liquidity

forcing the bidder to buy the non-voting shares as well.

Once a firm has been valued should there be a discount for illiquidity if the stake in the firm, whether it takes the form of shares or a partnership that cannot be easily sold? Illiquidity falls in a continuum, and even publicly traded firms vary in terms of how liquid their holdings are. The illiquidity discount tends to be most significant when private businesses are up for sale. In practice, the estimation of liquidity discounts seems arbitrary, with discounts of 25 to 30% being most commonly used in practice.

Determinants of Illiquidity Discount

The illiquidity discount should vary from firm to firm and should depend upon:

1. *Size of the Business*: As a percent of value, the discount should be smaller for larger firms; a 30% discount may be reasonable for a million-dollar firm, but not for a billion-dollar firm.
2. *Type of Assets Owned by the Firm*: Firms with more liquid assets should be assigned lower liquidity discounts, since assets can be sold to raise cash. Thus, the discount should be lower for a private business with real estate and marketable securities as assets than for one with factories and equipment.
3. *Health and Cash Flows of the Business*: Stable businesses that generate large annual cash flows should see their value discounted less than high-growth businesses where operating cash flows are either low or negative.

Quantifying the Liquidity Discount

There are two ways of quantifying the liquidity discount. One is to use the results of studies that have looked at restricted stock. Restricted securities are securities issued by a company, but not registered with the SEC, that can be sold through private placements to investors. These securities cannot be sold for a two-year holding period, and limited amounts can be sold after that. These restricted stocks trade at discounts ranging from 25% to 40%, because they cannot be traded. Silber, in 1991, related the discount to observable characteristics of the firms issuing the stock:

$\text{Ln}(\text{Price of Restrictd Stock/Price of Unrestricted Stock}) = 4.33 + 0.036 \text{ Ln}(\text{Revenues} - \text{in millions}) - 0.142 (\text{Restricted Block as a percent of total stock outstanding}) + 0.174 (\text{DERN}) + 0.332 (\text{DCUST})$

where

DERN = 1 if earnings were positive and zero if not, and

DCUST = 1 if the investor with whom the stock was placed had a customer relationship with the firm and zero if not.

The other, and potentially more promising route, is to extend the research on the magnitude of the bid-ask spread. Note that the spread, which measures the difference between the price at which one can buy a stock or sell it, in an instant, is a measure of the liquidity discount for publicly traded stocks. Studies of the spread have noted that it tends to be larger for smaller, more volatile and lower-priced stocks.

While you would expect the illiquidity discounts to be larger at privately owned technology firms, the discounts will be tempered by the option that these firms have to go to the market. In 1999 and early 2000, for instance, when investors were attaching huge market values to internet based firms, investors in privately held online ventures may have been willing to settle for little or no discount because of this potential.

Liquidity Discounts at Publicly Traded Firms

Some publicly traded stocks are lightly traded and the number of shares available for trade (often referred to as the float) is small relative to the total number of shares outstanding⁹. Investors who want to sell their stock quickly in these companies often have a price impact when they sell and the impact will increase with the size of the holding.

Investors with longer time horizons and a lesser need to convert their holdings into cash quickly have a smaller problem associated with illiquidity than investors with shorter

⁹ The float is estimated by subtracting out from the shares outstanding, shares that are owned by insiders, 5% owners and rule 144 shares. (Rule 144 refers to restricted stock which cannot be traded)

time horizons and a greater need for cash. Investors should consider the possibility that they will need to convert their holdings quickly into cash when they look at lightly traded stocks as potential investments and require much larger discounts on value before they take large positions. Assume, for instance, that an investor is looking at Rediff.com, a stock that was valued at \$19.05 per share. The stock would be under priced if it were trading at \$17, but it might not be under priced enough for a short term investor to take a large position in it. In contrast, a long-term investor may find the stock an attractive buy at that price.

Illustration 7.6: Float and Bid-Ask Spreads

In table 7.10, the trading volume, float and bid-ask spreads are reported for Amazon, Ariba, Cisco, Motorola and Rediff.com:

Table 7.10: Liquidity Measures: Amazon, Ariba, Cisco, Motorola and Rediff

	<i>Amazon</i>	<i>Ariba</i>	<i>Cisco</i>	<i>Motorola</i>	<i>Rediff</i>
Number of shares	351.77	235.80	6,890.00	2,152.00	24.90
Trading Volume	8.22	6.19	42.87	14.1	NA
Float	138.80	134.70	6880.00	1940.00	4.60
Bid-Ask Spread	\$ 0.0625	\$ 0.1250	0.0625	0.0625	0.125

While the bid-ask spreads are between 1/16 and 1/8 for all of the firms, the spread is a much larger percentage of the stock price for Rediff, which is trading at about \$10 per share than it is for Cisco or Ariba. In addition, only about 20% of the shares outstanding are available for trading at Rediff and only about a third of the shares at Amazon are traded.

Summary

The existence of options and the possibility of future option grants makes getting from equity value to value per share a complicated exercise. To deal with options outstanding at the time of the valuation, there are four approaches. The simplest is to estimate the value per share by dividing the value of equity by the fully diluted number of shares outstanding. This approach ignores both the expected proceeds from exercising the

options and the time value of the options. The second approach of forecasting expected option exercises in the future and estimating the effect on value per share is not only tedious but unlikely to work. In the treasury stock approach, you add the expected proceeds from option exercise to the value of equity and then divide by the fully diluted number of shares outstanding. While this approach does consider the expected proceeds from exercise, it still ignores the option time premium. In the final and preferred approach, the options are valued using an option pricing model and the value is subtracted from the value of equity. The resulting estimate is divided by the primary shares outstanding to arrive at the value of equity per share. While the current price of the stock is usually used in option pricing models, the value per share estimated from the discounted cash flow valuation can be substituted to arrive at a more consistent estimate. To deal with expected option grants in the future, the current operating income has to be dissected to consider how much of an effect option exercises in the current period had on operating expenses. If the options granted during the period had more value than the option expense resulting from exercise of options granted in prior periods, the current operating income has to be adjusted down to reflect the difference. Industry average margins and returns on capital will also have to be adjusted for the same reason.

Once the value per share of equity has been estimated, that value may need to be adjusted for differences in voting rights. Shares with disproportionately high voting rights will sell at a premium relative to shares with low or no voting rights. The difference will be larger for firms that are badly managed and smaller for well-managed firms. When valuing a private firm, the estimated value of equity may also need to be discounted to reflect the lack of liquidity in the shares. In fact, even publicly traded firms can face a discount if the shares that are traded are illiquid.