CHAPTER 12

WINDING DOWN: DECLINING COMPANIES

In chapter 9, we examined firms at the earliest stages in the life cycle and wrestled with how best to build in the reality that most young, idea firms do not survive to become healthy business. In chapter 10, we moved forward in the life cycle to look at growth firms, and our biggest challenge became estimating growth rates, as firms became larger and competition entered the business. In chapter 11, we continued further up the life cycle to look at mature companies, a grouping that most growth companies seek to avoid but inevitably join, and evaluated the valuation consequences of acquisitions and management changes. In this chapter, we will turn to the final phase of the life cycle, which is decline and examine the key questions that drive the value of firms that enter this phase.

While many issues related to decline will be examined in this chapter, an overriding problem that most analysts face with valuing companies in decline is a psychological one. As human beings, we are hard wired for optimism and reflect that with positive growth rates and higher cash flows in the future for the companies that we value. When valuing declining firms, we have to go against the grain and estimate cash flows for the future that may be lower than cash flows today. We will examine the process of estimating cash flows for declining firms in the first part of the chapter and spend the second half looking at one possible consequence of decline, which is distress and how best to build in its likelihood into value.

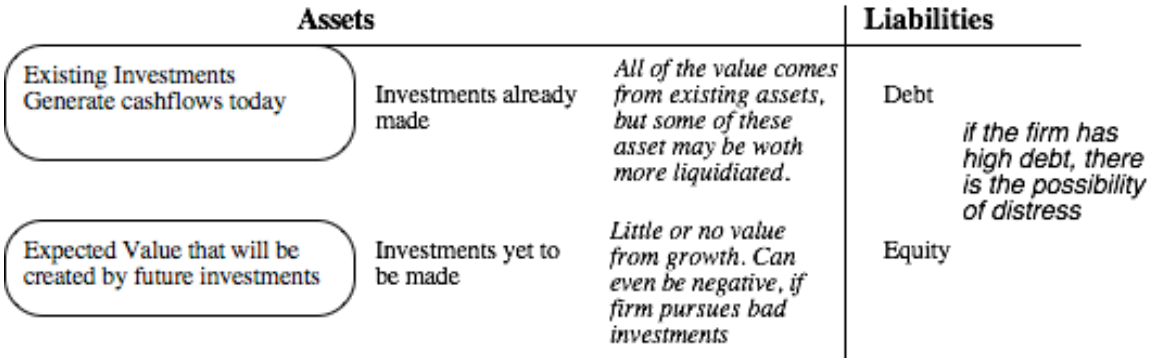
Declining Companies in the economy

In every economy, there are companies whose best days are behind them. They tend to be clustered in a few sectors and some of these firms can be large companies that account for a significant share of economic output and employment. In the US, for instance, the automobile and steel companies, which at one time represented the heart of the economy, have been in decline for decades, but still employ large numbers and account for a significant portion of the overall economy.

A Life Cycle View of Declining Companies

As we noted in the chapter on mature companies, growth companies do not want to become mature companies and mature companies constantly try to rediscover their growth roots. By the same token, no mature company wants to go into decline, with the accompanying loss of earnings and value. So, how do would we differentiate between mature firms and firms in decline? We will use the financial balance sheet, as we did in the earlier chapters in figure 12.1, to illustrate the difference:

Figure 12.1: A Financial Balance Sheet for a Declining Business



There are two key areas where mature companies are different from companies in decline. The first is on the asset side of the balance sheet. If mature companies get the bulk of their value from existing assets and less from growth assets, declining companies get none (or close to none) of their value from growth assets. In fact, it is not uncommon for declining companies to actually lose value from growth investments, especially if they decide to reinvest at rates well below their cost of capital. Existing assets not only represent all of the value of declining firms but some firms may actually get more from liquidating or divesting these assets than from continuing operations. On the liability side, declining firms face much more dire consequences from being over levered, since they cannot count on higher earnings in the future to cover debt obligation. In other words, decline and distress often go hand in hand.

Characteristics of Declining Companies

In this section, we will look at characteristics that declining companies tend to share, with an eye towards the problems that they create for analysts trying to value these firms. Note again that not every declining company possesses all of these characteristics but they do share enough of them to make these generalizations.

1. Stagnant or declining revenues: Perhaps the most telling sign of a company in decline is the inability to increase revenues over extended periods, even when times are good. Flat revenues or revenues that grow at less than the inflation rate is an indicator of operating weakness. It is even more telling if these patterns in revenues apply not only to the company being analyzed but to the overall sector, thus eliminating the explanation that the revenue weakness is due to poor management (and can thus be fixed by bringing in a new management team).
2. Shrinking or negative margins: The stagnant revenues at declining firms are often accompanied by shrinking operating margins, partly because firms are losing pricing power and partly because they are dropping prices to keep revenues from falling further. This combination results in deteriorating or negative operating income at these firms, with occasional spurts in profits generated by asset sales or one time profits.
3. Asset divestitures: If one of the features of a declining firm is that existing assets are sometimes worth more to others, who intend to put them to different and better uses, it stands to reason that asset divestitures will be more frequent at declining firms than at firms earlier in the life cycle. If the declining firm has substantial debt obligations, the need to divest will become stronger, driven by the desire to avoid default or to pay down debt.
4. Big payouts – dividends and stock buybacks: Declining firms have few or any growth investments that generate value, existing assets that may be generating positive cashflows and asset divestitures that result in cash inflows. If the firm does not have enough debt for distress to be a concern, it stands to reason that declining firms not only pay out large dividends, sometimes exceeding their earnings, but also buy back stock.
5. Financial leverage – the downside: If debt is a double-edged sword, declining firms often are exposed to the wrong edge. With stagnant and declining earnings from existing assets and little potential for earnings growth, it is not surprising that many declining firms face debt burdens that are overwhelming. Note that much of this debt was probably acquired when the firm was in a healthier phase of the life cycle and at

terms that cannot be matched today. In addition to difficulties these firms face in meeting the obligations that they have committed to meet, they will face additional trouble in refinancing the debt, since lenders will demand more stringent terms.

Valuation Issues

The issues that we face in valuing declining companies come from their common characteristics. Most of the valuation techniques we use for businesses, whether intrinsic or relative, are built for healthy firms with positive growth and they sometimes break down when a firm is expected to shrink over time or if distress is imminent.

Intrinsic (DCF) Valuation

The intrinsic value of a company is the present value of the expected cashflows of the company over its lifetime. While that principle does not change with declining firms, there are practical problems that can impede valuations.

Existing Assets

When valuing the existing assets of the firm, we estimate the expected cash flows from these assets and discount them back at a risk-adjusted discount rate. While this is standard valuation practice in most valuations, there are two aspects of declining companies that may throw a wrench in the process.

- Earning less than cost of capital: In many declining firms, existing assets, even if profitable, earn less than the cost of capital. The natural consequence is that discounting the cash flows back at the cost of capital yields a value that is less than the capital invested in the firm. From a valuation perspective, this is neither surprising nor unexpected: assets that generate sub-par returns can be value destroying.
- Divestiture effects: If existing assets earn less than the cost of capital, the logical response is to sell or divest these assets and hope that the best buyer will pay a high price for them. From a valuation perspective, divestitures of assets create discontinuities in past data and make forecasts more difficult to make. To see how divestitures can affect past numbers, consider a firm that divested a significant portion of its assets midway through last year. All of the operating numbers from last year – revenues, margins and reinvestment – will be affected by the divestiture, but the numbers for the year will reflect the operating results from the portion of the year prior to the divestiture. Similarly, risk parameters such as betas, where we use past

prices or returns, can be skewed by divestitures of assets midway through the time period. For the forecasting consequences, try estimating the revenues and earnings numbers for a firm that is expected to divest a large portion of its assets over the next few years. Not only do we have to pinpoint the assets that will be divested and the effects of the divestiture on operating revenues and earnings, but we also have to estimate the proceeds from the divestitures. Put another way, a divestiture, by itself, does not affect value, but what we expect to receive in comparison for the divested assets can affect value.

Thus, what makes the valuation of existing assets of a declining firm difficult is that the value you derive from these assets in cash flows may be lower than that value you obtain from divesting the assets.

Growth Assets

Declining firms derive little from growth assets, and the valuation of these assets should therefore not have a significant impact on value. While this is generally true, we have to leave open the possibility that some declining firms are in denial about their status and continue to invest in new assets, as it they had growth potential. If these assets earn less than the cost of capital, the value of adding new assets will be negative and reinvestment will lower the value of the firm.

We can actually go further. If we viewed divestitures as reductions in capital invested, the reinvestment rate for a declining firm can be negative in future years, which will lead to negative growth rates, at least for the foreseeable future. Analysts who have learned their valuation fundamentals at healthier companies often are uncomfortable with the notion of negative earnings growth rates and cash flows that exceed earnings, but that combination will characterize many declining firms.

Discount Rates

If the cost of capital is a weighted average of the costs of debt and equity, what is it about declining firms that makes it difficult to estimate these numbers? First, the large dividends and buybacks that characterize declining firms can have an effect on the overall value of equity and on the debt ratios that we use in the computation. In particular, returning large amounts of cash to stockholders will reduce the market value of equity, through the market price, with dividends, and the number of shares, with stock

buybacks. If debt is not repaid proportionately, the debt ratio will increase, which will then affects of costs of debt, equity and capital.

Second, the presence of distress can have significant effects on both the cost of equity and debt. The cost of debt will increase as default risk increases and some rated firms will see their ratings drop to junk status – BB, B or lower. If operating earnings drop below interest expenses, the tax benefits of debt will also dissipate, leading to further pressure upwards on the after-tax cost of debt. As debt to equity ratios climb, the cost of equity should also increase, as equity investors will see much more volatility in earnings. From a measurement standpoint, analysts who use regression betas, which reflect changes in equity risk on a lagged basis, may find themselves facing the unusual scenario of a cost of equity that is lower than the pre-tax cost of debt.[1]

Terminal Value

The standard procedures for estimating terminal value have been examined in detail in prior chapters. We first estimate a growth rate that a firm can sustain forever, with the caveat that the growth cannot exceed the growth rate of the economy, with the riskfree rate acting as a proxy. We follow up by making reasonable assumptions about what a firm can generate as excess returns in perpetuity and use this number to forecast a reinvestment rate for the firm. We complete the process by estimating a discount rate for the terminal value computation, with the qualifier that the risk parameters used should reflect the fact that the company will be a more stable one.

At each stage of this process, declining and distressed firms pose special challenges. At the first stage, we have to consider the possibility, which will be significant, that the firm being valued will not make it to stable growth; many distressed firms will default and go out of business or be liquidated. Even if a firm is expected to survive to reach steady state, the expected growth rate in perpetuity will not only be well below the growth rate of the economy and inflation, but in some cases, it can even be

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[1] There are two reasons why regression betas may not adequately capture the risk in the equity of a firm in financial distress. The first is that they are computed using a long period of historical returns; to the extent that the firm was healthy (or healthier than it is today) over some of that period, the regression beta will understate the true beta. The second is that during periods of distress, the stock prices of companies tend to be volatile but often with no relation to the market; they may move up an down as a function of debt restructuring talks or rumors of impending bankruptcy. Since the regression beta captures how a stock moves with the market, it may actually decrease during periods of financial distress.

negative. Essentially, the firm will continue to exist but get progressively smaller over time, as its market shrinks. At the second step, the biggest estimation issues we face will arise with declining firms that are earning well below their cost of capital currently, with no reason for optimism about the future. In effect, the most reasonable assumption to make about this firm may be that it will continue to earn a return on its capital that is below the cost of capital in perpetuity. This will have consequences for both reinvestment and the terminal value. Finally, the problems that we mentioned in the previous section relating to discount rates can spill over into the terminal value computation. In other words, a distressed firm can have sky-high costs of equity and debt at the moment and leaving these numbers at or even close to current levels can cause terminal values to implode.

From Operating Assets to Equity Value per share

While the process of getting from operating assets to equity value per share follows the standard script – add cash and other non-operating assets, subtract debt outstanding and the value of any equity options granted by the firm (either in financing or to management) and divide by the number of shares outstanding – there are two problems that we face, especially with the distressed sub-set of declining firms.

The first is a familiar problem that we have run into with firms earlier in the life cycle that are losing money, which is that the cash balance of a firm today may bear little resemblance to the cash balance reported in the balance sheet. Declining firms with negative earnings can very quickly deplete cash balances and failing to account for this will result in an over valuation of equity.

The second is that the market value of debt in distressed firms will trade (or be valued) at a discount to the book value. This is not surprising, since the debt was borrowed and recorded in past periods, when the firm was healthy, and now that default risk has risen, that debt will have a lower value. Note that this is true, even if the firm has no corporate bonds, but has only bank loans outstanding; the difference is that the drop in value will be visible with bonds, since they are traded, and implicit with bank loans, which are not. So what are the consequences for valuing equity? Consider a simple example, where you have valued the operating assets of a firm at $ 800 million, and assume that the firm has debt outstanding, with a book value of $ 1 billion but a market

value of only $ 500 million. In discounted cash flow valuation, the notion of a going concern requires us to stick with market value, both for computing debt ratios in the cost of capital and for subtracting out from firm value to get to the value of equity. However, with the just cited example, this does put us in the uncomfortable position of attaching a value of $ 300 million for equity (Firm value – Market value of debt), simply because the market perceives a high chance of default in the firm. The tenuous nature of this solution can be illustrated by re-estimating the value of equity in this firm, if the firm is acquired by a healthy suitor, who also assumes the debt. Since the acquirer is perceived as having less default risk, the value of the debt will rise towards the book value, which holding firm value constant, will very quickly reduce or even eliminate the value of equity.

The third troublesome component in estimating equity value is that the line between debt and equity in a distressed firm is a gray one. Not only does distressed debt take on the characteristics of equity on its own, but lenders often demand and get equity stakes either in the form of equity options or as privileges to convert to equity. These equity options have to be valued and netted out from overall equity value to arrive at the value of common stock. In fact, debt renegotiation talks at distressed firms can alter the debt, equity option and common stock numbers in the firm overnight. When a large lender agrees to accept shares in the company in exchange for the debt, the consequences for the value of equity per share are unpredictable.

Relative Valuation

Analysts who fall back on relative valuation as a solution to the problems of valuing declining or distressed firms, using intrinsic valuation, will find themselves confronting the estimation issues that we listed in the earlier sections either explicitly or implicitly when they use multiples and comparables.

a. Scaling Variable: All multiples have to be scaled to common variables, which can be broadly categorized into revenues, earnings, book value or sector specific measures. With distressed companies, earnings and book values can become inoperative very quickly, the former because many firms in decline have negative earnings and the latter because repeated losses can drive the book value of equity down and into negative territory. We can scale value to revenues, but we are then

implicitly assuming that the firm will be able to turn its operations around and deliver positive earnings.

b. Comparable firms: There are two possible scenarios that we can face when valuing declining firms. One is when we are valuing a declining firm in a business where the remaining firms are all healthy and growing. Since markets value declining firms very differently from healthy firms, the challenge in this case is working out how much of a discount the declining firm should trade at, relative to the values being attached to healthy firms. We face the second scenario when we are valuing a declining/distressed firm in a sector where many or even all of the firms share the same characteristic. In this case, not only do our choices of what multiple to use become more limited, but we have to consider how best to adjust for the degree of decline in a firm. For instance, in early 2009, Ford, GM and Chrysler all showed signs of distress but GM was in the worst shape, followed by Chrysler and Ford.

c. Incorporating Distress: While analysts often come up with creative solutions to the first two problems – using multiples of future earnings and controlling for differences in decline, for instance – the presence of distress puts a wild card in the comparison. Put another way, when firms are not only in decline but are viewed as distressed, we should expect those firms that have a higher likelihood of distress to trade at lower values (and hence at lower multiples) than firms that are more likely to make it. Unless we explicitly control for distress, we will find ourselves concluding, based on relative valuation, that the first group of firms are under valued and the second growth over valued.

By now, the message should be clear. Any issues that skew intrinsic valuations also skew relative valuations. The symptoms of decline – negative growth rates, poor or negative margins, flat revenues- and the potential for failure – caused by too much debt and declining earnings – will not disappear as issues just because we base our value on a revenue multiple.

The Dark Side of Valuation

Analysts, who value declining and distressed firms, often find that the tools and approaches that served them adequately with healthy companies fail them. This problem

is worse when a sector with a history of financial health becomes troubled, since analysts are slow to let go of old rules of thumb and metrics. In this section, we will consider some of the resulting problems in valuing declining and distressed companies.

Auto-pilot optimism

At the start of this chapter, we argued that one of the biggest problems that analysts face in valuing declining companies is that they have to fight the optimism that is inherent in valuation. There are three places that this optimism manifests itself in the valuation of distressed companies:

a. Growth rates: Analysts hold on to their standard practice of estimating positive growth rates, not only for the short term, but also in perpetuity for most firms. Thus, it is not unusual to see a declining company being valued, with current earnings growing at positive rates in the future, simply because that is the way it is for most companies. However, this view of the future is at war with reality, since flat revenues and declining margins are incompatible with positive earnings growth in the future. The consequence of using positive growth rates for distressed companies is that we will over estimate future earnings and cash flows, and in the process, over value these companies.

b. Discount Rates: Many distressed company valuations are based upon the assumption that the company in question will move to its target debt, instantaneously in many cases, and replace its distressed debt and risky equity with much safer alternatives. In effect, the firms are valued using the cost of capital of healthy firms in their sector. The assumption is that no matter what the current problems that are causing distortions in the discount rate, they will go away quickly.

c. Excess Returns and Margins: In addition to estimating positive growth rates in earnings, analysts also build in the assumption that the firm being valued will revert to historic averages in terms of margins and excess returns, if not immediately, at least over time. While this may be possible for some declining companies, it may be unlikely for others and completely infeasible for some companies.

Combining positive growth rates in revenues with improving margins and healthy company discount rates will lead to the obvious conclusion that most declining and distressed companies are under valued.

Illustration 12.1: Valuing Sears – An Over Optimistic Valuation in September 2008

Sears, a retailer with a long and distinguished history, has seen its fortunes fade over the last 10 years, as its core customer base has abandoned it to go to more upscale retailers like Target, at one end of the spectrum, and to discount retailers like Walmart, at the other end. In the fiscal year ending in February 2008, Sears reported revenues of $50.7 billion, just 3.2% higher than its revenues in 2006, and operating income of $1.54 billion, about 17.7% lower than operating income in 2006. During the 2008 fiscal year, Sears reduce the number of stores it operated and bought back almost $2.9 billion of its own stock. Finally, Sears generated a return on capital of 4.99% on its retail operations for the year, well below its cost of capital of 7.50%. In summary, Sears has all the hallmarks of a company in decline.

For an over optimistic valuation of Sears, we could make the following assumptions:

a. Revenues will grow at 6% a year for the next 5 years and then drop back to a stable growth rate of 4%. Over the period, the pre-tax operating margins will revert back to the 5% level that the firm used to command when it was healthy.
b. The cost of capital for the firm will drop to the industry average of 7.13% immediately and remain at that level forever. (In September 2008, the treasury bond rate was 4.09% and the equity risk premium was 4.5%)
c. The return on capital for the firm will jump back to 12%, which is the retail industry average, for new investments made by Sears and this will be the return on capital in perpetuity.

With these assumptions in place, we first estimate the cash flows for the first 5 years in Table 12.1, and discount these cash flows back at the cost of capital of 7.13%.

Table 12.1: Expected Free Cash Flow to the Firm: Next 5 years

	Current	1	2	3	4	5
Revenue Growth rate		6%	6%	6%	6%	6%
Revenues	$50,703	$53,745	$56,970	$60,388	$64,011	$67,852
Operating margin	3.05%	3.44%	3.83%	4.22%	4.61%	5%

EBIT	$1,548	$1,850	$2,183	$2,549	$2,951	$3,393
EBIT * (1 - tax rate)		$1,147	$1,353	$1,580	$1,830	$2,103
- Reinvestment		$574	$677	$790	$915	$1,052
Free Cashflow to Firm		$574	$677	$790	$915	$1,052
Present Value		$535	$590	$643	$695	$745

* Tax rate = 38%

Note that as revenues grow and pre-tax operating margins increase from 3.05% (current) to the target of 5% (in linear increments), operating income grows substantially. The reinvestment during the five-year period is estimating to be 50% of after-tax operating income, based upon the revenue growth rate of 6% and the return on capital of 12%. At the end of year 5, we put the firm into stable growth, using a 4% growth rate forever, and estimating the reinvestment rate from the return on capital of 12%.

$$\text{Reinvestment rate} = \frac{g_{stable}}{ROC_{stable}} = \frac{4\%}{12\%} = 33.33\%$$

$$\text{Terminal Value} = \frac{\text{After - tax Operating Income}_5 (1 + g_{stable})(1 - \text{Reinvestement Rate})}{(\text{Cost of capital}_{stable} - g_{stable})}$$

$$= \frac{2103\ (1.04)(1 - .333)}{(.0713 - .04)} = \$45,797$$

Discounting the terminal value back and adding it to the present value of the cash flows generates a value for the operating assets of $35,663 million.

$$\text{Value of operating assets} = \$535 + \$590 + \$643 + \$695 + \$745 + \frac{\$45,797}{1.0713^5} = \$35,663$$

Adding cash ($1,622 m) and subtracting out debt ($7.728 m) yields a value of equity per share of $223.90, significantly higher than the stock price of $76.25 at the time of the analysis.

$$\text{Value per share} = \frac{35,663 + 1,622 - 7728}{132.01} = \$223.90/\text{share}$$

Discount Rate Contortions

In the last section, we noted that optimists who value declining and distressed companies replace the current risk parameters of the company with those of healthier companies in the business. These analysts, though, are on more solid ground than those who use today's debt numbers, estimate parameters for the company from historical data

(book interest rates for debt and regressions for betas) and then lock these numbers up in perpetuity for the following reasons:

- Many declining and distressed companies have debt ratios that are vastly higher than the industry average and are not sustainable in the long term or compatible with a going concern. Thus, the valuation of an airline that uses a market debt to capital ratio of 90% and leaves it at that value, while assuming that the airline will return to financial health is being internally inconsistent.
- Following the standard practice for estimating the cost of debt, which is to look at the current market interest rate on a firm's bonds, can result in extremely high costs of debt. In January 2009, for instance, the yield to maturity on bonds issued by many firms with substantial default risk was in excess of 20%. If analysts estimate the cost of equity from a regression beta, they can find themselves facing a quandary, where the cost of equity is well below the pre-tax cost of debt. To overcome this problem, analysts try creative solutions but many of these solutions have no basis in either theory or evidence. One is to use the book interest rate, obtained by dividing the interest expense by the book value of debt. Since much of the debt on the books was acquired when the firm was healthier, the book interest rate will yield numbers for the cost of debt that seem more reasonable. The other is to arbitrarily hike up the cost of equity above the pre-tax cost of debt, using the logic that equity is riskier than debt. While the logic is impeccable, the arbitrary nature of the adjustment is not.
- It is true that interest expenses are tax deductible and that the after-tax cost of debt for most firms is much lower than the pre-tax cost of debt; we capture the benefit by multiplying the pre-tax cost by (1- tax rate). Analysts who follow this practice with declining or distressed firms are missing a key part of the tax benefit argument. For interest expenses to deliver tax benefits, we need operating income that is sufficient to cover these interest expenses. To the extent that the firm has lost money, is losing money right now and is expected to keep losing money, we may get no tax benefits from debt for extended periods.

In summary, the discount rates for distressed companies should reflect their distress and change over time to be consistent with our assumptions about future profitability and financial health.

Illustration 12.2: Discount Rate contortions: Las Vegas Sands

Las Vegas Sands owns and operates the Venetian Casino and Sands Convention Center in Las Vegas and the Sands Macau Casino in Macau, China. While the firm does not fit the classic profile of a declining company – its revenues increased from $1.75 billion in 2005 to $4.39 billion in 2008 and it had two other casinos in development – it ran into significant financial trouble in the last quarter of 2008. Fears about whether the firm would be able to meet its debt obligations pushed down both stock prices (almost 90%) and bond prices (about 40%) in 2008.

By January 2009, the firm was operating under the threat of defaulting on its debt and both its debt and equity prices reflected that fear:

- The debt was rated B2 by Moody's (and B+ by S&P) and a bond issued by Las Vegas Sands, expiring in 2015, was trading at a yield to maturity of 19.82%. The firm did report an operating income of $ 164 million for 2009, but the net loss for the year was $229 million, primarily due to interest expenses that amounted to $422 million during the course of the year. Thus, while the marginal tax rate is 38%, the firm was able to get only a portion of the tax benefits on interest expenses:

  $$\text{Tax Benefit (Rate)} = \text{Marginal tax rate} * \frac{(\text{Interest expenses} - \text{Net loss})}{\text{Interest Expenses}}$$

  $$= = 38\%\left[\frac{(422-229)}{422}\right] = 17.37\%$$

- The regression beta, estimated using two years of weekly returns from January 2007 to January 2009 was 2.78. Using a riskfree rate of 3% (the ten-year bond rate at the time of the analysis) and an equity risk premium of 6%, we derive a cost of equity of 19.03% for the firm.

  Cost of equity = 3% + 2.78 (6%) = 19.68%

- The market value of equity for the firm in January 2009 was $2.727 billion, higher than the book value of equity of $2.28 billion. The book value of debt was $10.47 billion, well below the market value of $ 7.57 billion, reflecting the increase in default risk since the debt was issued. The weights based upon market values are:

  Debt/ (Debt + Equity) = 7.57/(7.57+2.727) = 73.57%

- If we take these numbers at face value, we arrive at a cost of capital o 17.25%.

Cost of capital = Cost of equity (E/(D+E)) + After-tax cost of debt (D/(D+E))

=19.68% (0.2643) + 19.82% (1-.1737) (0.7357) = 17.25%

In addition to being much higher than the industry average cost of capital of 9% for the casino business, this estimate has a couple of unsettling characteristics. The first is that the pre-tax cost of debt is higher than the cost of equity and the second is that the debt ratio at 74% is too high for a healthy firm.

To overcome the problems in the estimate, the analyst valuing the company decides to replace the conventional measures with more "reasonable" numbers.

- Rather than use the current cost of borrowing, a "book interest rate" is computed by dividing the total interest expense by the book value of debt. Using the interest expense of $422 million in 2008 and the book value of debt of $10,470 million at the end of 2008, we arrive a book cost of debt of 4.03%. Assuming that the tax benefits will be derived at some point in time, we estimate an after-tax cost of debt of 2.50%, based upon a marginal tax rate of 38%.

  After-tax cost of debt = Pre-tax book interest rate (1- marginal tax rate)

  = (422/10470) (1-.38) = 2.50%

- To estimate the cost of equity, we use the sector beta of 1.78, estimated by averaging regression betas across all publicly traded casino companies to estimate a cost of equity of 13.68%.

  Cost of equity = 3% + 1.78 (6%) = 13.68%

- To estimate the weights, the market values) are replaced with book values for debt and equity, resulting in a debt ratio of 39.8%:

  Debt Ratio = Book value of Debt/(Book value of Debt + Book value of equity)

  = 10.47/(10.47+2.28) = 82.1%

- With these numbers in place, the cost of capital for Las Vegas Sands is only 8.11%, much closer to the industry average.

  Cost of capital = Cost of equity (E/(D+E)) + After-tax cost of debt (D/(D+E))

  =13.68% (0.179) + 2.50% (0.821) = 4.50%

This estimate of the cost of capital bears no resemblance to reality. Las Vegas Sands is a company in significant trouble and the original estimate of 17.25% for the cost of capital is reflective of the perils it faces.

Divestiture Follies

Declining and distressed firms often have divested assets in the past and can be expected to divest more assets in the future. These divestitures will generate cash flows for the firm but incorporating these cash flows into a valuation requires us to be both realistic and consistent.

When divestitures of assets are expected in the future, analysts valuing the firm are often dependent upon managers telling them both which assets they plan to divest and what they expect to get in return. If analysts take them at their word on both dimensions, there is the real danger that managers may be over estimating what they will able to get in asset sales from buyers. In distressed scenarios, where firms have to sell assets to meet urgent cash flow needs, their bargaining positions are weak and it is unlikely that they will be able to extract fair value, let alone a premium. As a general rule, the greater the proportion of a firm's assets that have to be divested and the more dependent the firm is on the divestitures to meet its obligations, the more conservative we have to be about estimating divestiture proceeds.

The other point about divestitures is an obvious one but needs to be made anyway. When a firm divests an asset or division, it can no longer keep the earnings and cash flows from that division. In far too many valuations, analysts seem to count on eating their cake and having it too, by counting the cash proceeds from the divestiture in the early years while not reflecting the loss of earnings in their forecasts in subsequent years.

Book Capital

A tactic that is common in valuations of declining or distressed firms is to assume that the firms will be liquidated and estimating a liquidation value, as an alternative or a supplement to discounted cash flow valuation. While this is a legitimate tactic, it is sullied by the dependence upon book value for the assets as a proxy for liquidation value; by this reasoning any firm that trades at a market value less than the book value is under valued, at least relative to its liquidation value. As justification, analysts argue that the liquidation value is difficult to obtain and that the book value does reflect what the firm has invested in the assets. Even if we accept the latter part of the argument, that does not imply that book value is a good measure of liquidation value. The reason lies in the

nature of the firms that we are valuing. As we noted towards the beginning of this chapter, declining and distressed firms often have existing asset bases that earn well below their costs of capital, and that shortfall cannot be attributed entirely to poor management. If this is the case, the fair or intrinsic value of these assets should be well below the book value.

The dependence upon book value can also show up in a different place in the valuation, which is in the computation of debt and equity weights for computing the cost of capital. There are many who use book value weights for debt and equity, arguing that they are more stable and dependable, especially in periods of market turmoil. With distressed companies, these analysts will sometimes be faced with the absurdity of this argument, since the book value of equity can become negative at a firm after a period of extended losses. Using this book equity will result in a debt to capital ratio that exceeds 100% and yield a meaningless cost of capital.

Dealing with Distress

Distress is a constant undercurrent in some declining companies and the analysts valuing these companies cannot but be aware of the rumors and news items attesting to the worry. However, the way they deal with the possibility of distress does not seem to reflect this concern:

a. Denial: Earlier in this chapter, we noted that many valuations of declining and distressed companies use excessively optimistic assumptions about growth (that it will be positive), discount rates (that they will resemble those of healthy companies) and profitability (that margins and returns will revert back to pre-distress days). In this fairy tale universe, there is always a happy ending (a large terminal value) and no company is ever forced into default.
b. Discount rate excuses: Analysts who use the current costs of equity and debt, both of which are likely to be elevated for distressed companies, argue that their valuations already reflect distress. There are two reasons to be skeptical. The first is that the cost of capital is not very responsive to distress in many firms. In other words, changing the costs of debt and equity even by large amounts, often does

not show up as a dramatically higher cost of capital.[2] The second is that the risk parameters we estimate for cost of capital – betas and default spreads – are designed to capture risk in going concerns; they reflect uncertainty about future cash flows. The risk of distress is a truncation risk, i.e, that this firm may not be in existence six months from now and much more difficult to capture in the discount rate. We will return to examine this theme later in the chapter.

c. Post-valuation story telling: In many valuations, distress is brought into the picture after the valuation is complete and either takes the form of an arbitrary discount (reduce the value by 20-30%) or a cautionary note (the stock looks under valued, but don't buy it because there is a chance of distress).

Relative Valuation

There are two tactics that are used in the valuation of distressed companies. The first is to stay with current values for operations (revenues, earnings, book value) and to try and scale market value to those variables that are still viable (revenues and book value). The second is to use estimated revenues or earnings in a future year and to compute a forward multiple, which is then compared across companies.

Consider the use of current revenues and book value multiples to analyze declining companies. If these companies are outliers in their sectors, i.e., they are declining companies in sectors with primarily healthy companies, the results of this relative valuation will be predictable. The declining company will look cheap, since it will trade at lower multiples than the rest of the sector. To make a legitimate comparison, we have to examine differences in risk, revenue growth and expected profitability over time.

With forward numbers, the problems shift to the distress issue. To see why, assume that you are valuing a firm that is in severe financial trouble, with stagnant revenues, negative earnings and substantial debt obligations. You forecast a turnaround in the firm's fortunes and predict that the EBITDA in five years will be $ 150 million and that the firm will be a healthy firm, trading at roughly the same multiple of EBITDA that other healthy firms in the sector are trading at right now (6 times EBITDA). The forward

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[2] Part of the reason is that these higher costs of debt and equity are accompanied by higher debt ratios. Since debt is cheaper than equity, it pushes down the cost of the capital.

estimate of value for this company is $900 million, but there is a catch. This works only if you assume that good health is guaranteed and that there is no chance of default. To the extent that there is a significant chance of bad things happening to the firm over the next 5 years, we would have to reduce the estimated value.

The Light Side of Valuation

If the key issues that drive declining and distressed companies are dealing with negative growth (and making consistent assumptions) and distress, we have to develop better ways of dealing with both in practice. In this section, we will begin by establishing a framework for analyzing declining firms and then examining the details of valuing these firms.

A framework for dealing with decline and distress

We will build our analysis of declining firms around two key questions. The first is whether the decline that we are observing in a firm's operations is reversible or permanent. In some cases, a firm may be in a tailspin but can pull out of it, with a new management team in place. The second relates to whether the firm faces a significant possibility of distress; not all declining firms are distressed.

To assess the question of reversibility, we can look at a firm's own history as well as the state of other companies in the sector. A firm that has gone through cycles of good and bad times, as is often the case with cyclical and commodity companies, is more likely to be able to move back to health than a firm that has not been subject to these cycles. Similarly, it can be argued that a firm that is doing badly in a sector filled with healthy firms has problems that are more attributable to poor management than to fundamentals; with better management, the firm may be able to revert back to health, if not growth. In contrast, a firm that is doing badly in a sector filled with poorly performing firms, with no obvious macro economic reasons for the problems, has problems that will not be remedied by changing managers.

To evaluate distress, the place to start is the debt load that the firm may have accumulated over time. Declining firms with significant debt obligations are more likely to face default, resulting in cessation of operations and liquidation by creditors. If the firm is rated by a bond ratings agency, we would expect to see a low credit rating, generally below investment grade. Declining firms that do not face these fixed

obligations should be able to survive even with poor earnings and no or even negative growth. The way we estimate value will be different, depending upon the combination of reversibility and decline that we observe in a given firm. We will consider four possible combinations below:

1. Reversible decline, Low distress: If a firm has flat revenues and declining margins, but the problems are fixable, we would follow the framework we developed in chapter 11 for valuing control. We would first value the firm, run by existing management, with continuing decline in operations; the resulting status quo value will be low. We would then revalue the firm, assuming that better management is in place and that the decline is reversed; this optimal value should be much higher. Finally, we would estimate a probability of management changing and compute an expected value, based up the status quo and optimal values.

   Expected Value = Status Quo Value (1 – Probability of Management Change)
   + Optimal Value (Probability of Management Change)

2. Irreversible decline, Low distress: If a firm's poor performance cannot be attributed to poor management and is not easily fixable, we cannot revalue the firm with operating improvements. However, the assets that are deployed by the firm may be put to better use by others (in other businesses) and thus be worth more in a divestiture. Since the firm is under no pressure to sell its assets to meet fixed obligations, it can liquidate the assets in an orderly manner, waiting for both the best time and the highest bidder for each asset. The expected proceeds from this orderly liquidation will provide an alternate estimate of value for the firm. The final value that we would attach to the firm would be the higher of the two numbers.[3]

   Expected Value = Maximum (Status Quo Value, Orderly Liquidation Value)

3. Reversible decline, High distress: For firms where there is a high probability of distress, we will consider two courses of action. In the first one, we will try to bring in the probability of distress into the expected cash flows and discount rates, and derive distress-adjusted values. In the second one, we will compute the expected values just

[3] We are assuming that since managers in this firm will take the right action and liquidate, if that is the course that will deliver higher value. If they don't, we will have to estimate probabilities, just as we did for firms with management deficiencies.

as we did in the low distress scenario and then estimate the probability of distress separately. Following up this with an estimate of the proceeds that we can expect to receive in a distress sale will yield the distress-adjusted value of the firm. The fact that decline is reversible, though, may give equity investors in this firm the possibility of large payoffs, if distress is avoided and the firm recovers its bearings, that has the characteristics of an option and can add to equity value.

4. Irreversible decline, High distress: When decline is inevitable and is overlaid with distress, we have a toxic combination for value. As with the previous case, we have to adjust expected values for distress, by either changing the inputs to discounted cash flow or by adjusting the expected no-distress value for the probability of distress. There are two significant differences, from the reversible decline scenario, that will depress value. The first is that, if distress occurs, the proceeds from a distress sale with irreversible decline will be lower, both because the pool of buyers is thin (if most firms in the sector are troubled) and because buyers don't see much potential upside. The second is that equity investors have less to gain from the option to liquidate, since the best case value is constrained by the poor quality of the assets.

We summarize the four scenarios in table 12.2 below.

Table 12.2: A framework for dealing with decline and/or distress

	No or low Distress (Not much debt, investment grade rating)	High Distress (High debt commitments, low rating)
Irreversible (Sector in trouble)	1. Value the firm with existing management and expected decline (Going concern value) 2. Value the firm, assuming orderly liquidation of all of its assets. 3. Expected Value = Maximum (Going concern value, Orderly liquidation value)	1. Start with the expected value (irreversible, no distress) 2. Estimate the probability of distress and proceeds from forced liquidation of firm. 3. Re-compute the expected value, adjusting for distress.
Reversible (Firm outlier n healthy sector)	a. Value the firm with existing management and expected decline. b. Value the firm with better management and recovery. c. Expected Value = Status Quo Value (Probability of no management change) + Optimum Value (Probability of management change)	1. Start with the expected value (reversible, no distress) 2. Estimate the probability of distress and proceeds from distress sale of firm. 3. Re-compute the expected value, adjusting for distress. 4. If equity investors run the firm, value the option to liquidate.

I. Irreversible Decline, Low distress

With some firms, the symptoms of operating decline – flat revenues and declining margins –have deep roots that cannot be easily remedied for three reasons. The first is

that the overall market for the firm's products and services is shrinking and is expected to keep doing so over time. The second is that all of the firms in the sector share some or many of the same symptoms as the firm being valued. The third is that there is no macroeconomic factor that can be pointed to as the reason for the decline, as is the case with an economic recession for a cyclical firm or the price cycle for a commodity company. A good example would the airline business in much of the developed world since deregulation; in this business, the healthy company has been the exception, rather than the rule, and most companies seem to teeter on the edge of bankruptcy, even in good economic times.

The first step in valuing such companies is to estimate the value as going concerns, notwithstanding the fact that the assets, as invested currently, may be earning less than the cost of capital. In effect, we are valuing the businesses on the assumption that they will continue to be operated, while destroying value for existing investors. This status quo value may be well below the book value of the firm but that is not surprising given the negative excess returns that we are projecting on existing assets. The value will be depressed further, if management insists on adding to its asset base with new investments in the same business.

The second step is to consider a logical alternative to continuing in business. If the assets deployed by the firm can be used elsewhere (in other businesses or by other firms) to generate higher returns, we can consider divesting these assets and liquidating the business over time. Since distress is not a concern, the firm can wait until the right time and the right bidder, and extract the maximum value from divestiture; hence, we will term this an orderly liquidation, which can occur over many years. As for estimating what the divestiture proceeds will be, the answer will vary across sectors and for different assets, but there are a few general propositions that we can develop. The first is that the expected proceeds should be higher than the present value of the cash flows that would have been generated by the assets in the existing use; if this is not the case, the divestiture would not make sense in the first place. Thus, if the asset is expected to generate $ 50 million in perpetuity, in its existing use, with a risk-adjusted discount rate of 10%, the divestiture proceeds should exceed $ 500 million. The second is that there should be little

or no illiquidity discount applied to the divestiture value, since there is no urgency associated with the sale.

Once we have both values in had – the value of the firm as a going concern and the value from an orderly liquidation of the firm over time – we would expect the firm to trade at the higher of the two values. In fact, there is an intermediate solution, where a portion of the firm, composed of assets that are more valuable to others, is liquidated, but the rest of the firm continues as a going concern.

Illustration 12.3: Valuing a company in irreversible decline: Sears in September 2008

We will revisit the valuation of Sears in illustration 12.1, where we used over optimistic assumptions and derived a value of $223 a share. Rather than assuming that Sears will be able to move quickly back to growth and financial health, we will assume that the firm, while not under any significant threat of default, will shut down less profitable stores over time, liquidating some of its real estate holdings in the process, and become a smaller firm, with higher quality assets.

- Revenues will decrease 5% a year, each year for the next 5 years, from the current level of $50.7 billion to $39.2 billion in the fifth year, as the firm shuts down stores. After year 5, we will assume that the shrinkage will stop and that revenues will grow 2% a year forever.
- The pre-tax operating margin will improve from 3.05% to 4%, in linear increments over the next five years, reflecting both the cost savings from shutting down unprofitable stores and a reversal back to health at the other stores. The tax rate is assumed to remain unchanged at 38%.
- For the first five years, we will use the current cost of capital for Sears, which we estimate to be 7.50%. To arrive at this number, we used a beta of 1.22 for the stock, based upon the unlevered beta for retailers and the debt to equity ratio for Sears (which is higher than the industry average), and a pre-tax cost of borrowing of 7.74%, based upon a synthetic rating of BB and a default spread of 3.65%. (The treasury bond rate was 4.09% and the equity risk premium was assumed to be 4.5%, at the time of this analysis.)

  Cost of equity = 4.09% + 1.22 (4.5%) = 9.58%

  After-tax cost of debt = 7.74% (1-.38) = 4.80%

Debt ratio[4] = 7725/(7725+10,066) = 43.42%

Cost of capital = 9.58% (1-.4342) + 4.80% (.4342) = 7.50%

- During the five-year period, as stores are being closed and assets divested, Sears will be reducing its capital invested and collecting proceeds from the divestitures. To estimate the proceeds, we first assumed that the return on capital at Sears will increase from the current level of 4.99% to 7.50%, in linear increments, over the next 5 years, and then backed out the capital invested based upon the after-tax operating income and the return on capital estimate. Using the change in book capital each year as the basis, we then estimated the divestiture proceeds as a proportion of the book value. Table 12.3 reports the numbers by year:

Table 12.3: Divestiture Proceeds by year

	Current	1	2	3	4	5
Growth rate		-5%	-5%	-5%	-5%	-5%
Revenues	$50,703	$48,168	$45,759	$43,471	$41,298	$39,233
Operating margin	3.05%	3.24%	3.43%	3.62%	3.81%	4.00%
EBIT	$1,548	$1,562	$1,570	$1,574	$1,574	$1,569
EBIT * (1 - tax rate)	$960	$968	$974	$976	$976	$973
Return on capital	4.99%	5.50%	6.00%	6.50%	7.00%	7.50%
Capital Invested	$19,234	$17,606	$16,227	$15,015	$13,939	$12,973
Change in book capital		-$1,628	-$1,379	-$1,212	-$1,077	-$965
Divestiture Proceeds/ Capital		54.08%	58.9%	61.9%	64.7%	67.2%
Divestiture Proceeds ($)		$880	$811	$751	$697	$649

Since we are assuming that the most unprofitable stores will be closed first, we also assume that the divestitures proceeds, as a percentage of book value, will be lower in the earlier years and increase over time. Note, though, that we receive well below 100% of capital invested in every year, ranging from 54% of capital in year 1 to 67% of capital in year 5, reflecting the fact that the investments being sold are delivering poor returns.[5]

- To apply closure in the valuation, we assume that the divestitures end in year 5 and that Sears will revert back to a more traditional stable growth firm after year 5. In

[4] Included in the debt is the estimated market value of interest bearing debt ($3,084 million) and the present value of future lease commitments ($4,644 million). The market value of equity was based upon the stock price of $76.25 at the time of the analysis.

[5] It is possible that we are being too conservative in this estimate, since the buyers of these assets may have no intention of preserving them as retail stores.

keeping with this assumption, the cost of capital after year drops to 7.13% and the return on capital will stay at 7.50% in perpetuity. Finally, we assume that the after-tax operating income will grow 2% a year in perpetuity, thus allowing us to estimate a reinvestment rate and terminal value.

$$\text{Reinvestment rate} = \frac{g_{stable}}{ROC_{stable}} = \frac{2\%}{7.5\%} = 26.7\%$$

$$\text{Terminal Value} = \frac{\text{After - tax Operating Income}_5\ (1+g_{stable})(1-\text{Reinvestement Rate})}{(\text{Cost of capital}_{stable} - g_{stable})}$$

$$= \frac{973\ (1.02)(1-.267)}{(.0713-.02)} = \$14{,}187$$

Table 12.4 summarizes the cash flows for the next 5 years and the terminal value at the end of the fifth year and the present values of these cash flows (discounted back at the cost of capital of 7.50%).

Table 12.4: Expected Cash flows and Value Today

	Current	1	2	3	4	5	Terminal year
EBIT * (1 - tax rate)	$960	$968	$974	$976	$976	$973	$992
- Reinvestment		-$880	-$811	-$751	-$697	-$649	$265
Free Cashflow to Firm		$1,849	$1,785	$1,727	$1,673	$1,622	$728
Terminal Value						$14,187	
Present Value		$1,720	$1,545	$1,390	$1,252	$11,012	
Cost of capital		7.50%	7.50%	7.50%	7.50%	7.50%	7.13%

Summing up the present values over time yields a value of $16,918 million for the operating assets. Adding cash ($1,622 million), subtracting out debt ($7,728 million) and dividing by the number of shares outstanding (132.01) yields a value per share of $81.91, about 10% higher than the prevailing market price ($76.25).

$$\text{Value per share} = \frac{16{,}918 + 1{,}622 - 7728}{132.01} = \$81.91/\text{share}$$

II. Reversible Decline, Low distress

The history of the corporate world has its share of rebirths, where firms that were viewed as in decline reversed the process and returned to growth or mature status. One example was Harley Davidson, the manufacturer of a cult classic motorcycle. The firm saw sales slip to 32,400 motorcycles in 1982 and reported a loss of about $ 30 million in that year. While many analysts were writing its epitaph,, a new management team

devised a strategy built around an loyal customer base and an iconic brand and Harley rebounded to profitability and financial health.

It is worth noting, however, that most troubled firms never turn around and that righting the ship is not easy. Consequently, we should be realistic in our assessments of when decline is reversible and when it is not. Decline is more likely to be reversible if one or more of the following conditions hold:

- The company being analyzed has a history of operating ups and downs, and has come back from decline before. Cycles in revenue growth and margins may then be part of the company's make up and should be considered when valuing it.
- The sector or industry to which the company belongs is, for the most part, healthy and the firm being analyzed is more the exception than the rule. When most of a firm's competitors are growing and making reasonable returns, and the firm is not, it seems reasonable to conclude that decline is the result of choices made by the firm, and that new management could conceivably turn the company around.
- The company is in a business that can benefit from macro economic trends. Even declining companies in a very cyclical business can see their operating results improve if the economy booms.

Note that while we may conclude that decline is likely to be reversed, there are no guarantees.

The first step in valuing declining companies, where reversal is possible, is to estimate a value with existing policies and strategies, notwithstanding past failures. Since we are assuming continuing decline, it is entirely possible that the firm's revenues will stay flat, margins will decrease over time and the returns on capital invested on both existing assets and new investments will be less than the cost of capital, i.e., are value destroying. In effect, we are valuing the firm under the status quo, assuming that it is unable to turn itself around.

The second step is to assume that the firm's fortunes can be turned around either by new management/ownership or existing management changing its policies. Assuming that the firm will revert back to financial health, if not immediately, but in the near future, we can re-estimate the firm's value, with the operating improvements built into the cash flows. If the rest of the sector is healthy, we could assume that the firm's margins and

returns on invested capital will revert to industry averages. If not, we can look at the company's own history to get a sense of what it will look like, if it reverts back to health. With these improvements in place, we should derive a higher value for the firm, under new or optimal management, than we did with the status quo.

The third step is estimating a probability of change occurring, using some of the techniques that we described in chapter 11. Using a mix of subjective judgment and quantitative techniques, we can compute the likelihood that management will change. This estimate, though, will change as a function of the external environment, with the entrance of an activist investor into the mix changing the assessment. The expected value for the firm will then reflect the weighted average of the status quo and optimal values, based upon the probability of change.

III. Distress

Not all declining firms are distressed, nor all distressed firms in decline, but distress and decline seem to go together. We will begin this section by arguing that distress occurs frequently and has serious consequences for value. We will then examine ways in which we can bring distress into discounted cash flow valuations, as well as examine the notion that equity investors may be able derive value from the option to liquidate the firm. We will close the section by looking at how best to adapt relative valuation approaches to deal with distress.

The Possibility and Consequences of Financial Distress

Growth is not inevitable and firms may not remain as going concerns. In fact, even large publicly traded firms sometimes become distressed for one reason or the other and the consequences for value can be serious. In this section, we will consider first how often firms become distressed and follow up by looking at the costs they face as a consequence. We will close the section by examining why, given the frequency with which firms face distress, that we have historically not paid attention to distress in valuation.

The Possibility of Distress

Financial distress is far more common in the real world that most of us assume it to be. In fact, even casual empirical observation suggests that a very large number of firms do not survive and go out of business. Some will fail because they borrow money to

fund their operations and then are unable to make these debt payments. Other will fail because they do not have the cash to cover their operating needs.

To get a measure at the probability of distress, we have to begin by defining distress. If we define it as companies that enter chapter 11, relatively few publicly traded firms at any point in time can be considered distressed. If we define it more broadly as firms that are having trouble making interest payments and meeting other contractual commitments, distress is much more common. Kahl (2001) examined all publicly traded firms in the US between 1980 and 1983 and found that 1346 firms had trouble making their interest expenses from operating income in at least one year and that 151 firms could be considered distressed, in the sense that they were renegotiating with lenders to restructure debt.[6] Following up on these firms, he finds that while less than a half of these firms declare chapter 11, only a third of these firms survive as independent companies and that the rest either get either acquired or liquidated.

The Consequences of Distress

What are the consequences of financial failure? Firms that are unable to make their debt payments have to liquidate their assets, often at bargain basement prices, and use the cash to pay off debt. If there is any cash left over, which is highly unlikely, it will be paid out to equity investors. Firms that are unable to make their operating payments also have to offer themselves to the highest bidder, and the proceeds will be distributed to the equity investors. In effect, these "liquidation costs" can be considered the direct costs of bankruptcy.

In fact, the costs of distress stretch far beyond the conventional costs of bankruptcy and liquidation. The perception of distress can do serious damage to a firm's operations, as employees, customers, suppliers and lenders react. Firms that are viewed as distressed lose customers (and sales), have higher employee turnover and have to accept much tighter restrictions from suppliers than healthy firms. These indirect bankruptcy costs can be catastrophic for many firms and essentially make the perception of distress

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[6] Kahl, M., 2001, Financial Distress as a Selection Mechanism, SSRN Working Paper.

into a reality. The magnitude of these costs has been examined in studies and can range from 10-25% of firm value.[7]

In summary, then, the possibility and costs of distress are far to substantial to be ignored in valuation. The question then becomes not whether we should adjust firm value for the potential for distress but how best to make this adjustment.

Distress in Discounted Cashflow Valuation

Consider how we value a firm in a discounted cash flow world. We begin by projecting expected cash flows for a period, we estimate a terminal value at the end of the period that captures what we believe the firm will be worth at that point in time and we then discount the cash flows back at a discount rate that reflects the riskiness of the firm's cash flows. This approach is an extraordinarily flexible one and can be stretched to value firms ranging from those with predictable earnings and little growth to those in high growth with negative earnings and cash flows. Implicit in this approach, though, is the assumption that a firm is a going concern, with potentially an infinite life. The terminal value is usually estimated by assuming that earnings grow at a constant rate forever (a perpetual growth rate). Even when the terminal value is estimated using a multiple of revenues or earnings, this multiple is derived by looking at publicly traded firms (usually healthy ones).

Given the likelihood and consequences of distress, it seems foolhardy to assume that we can ignore this possibility when valuing a firm, and particularly so, when we are valuing firms in poor health and with substantial debt obligations. So, what you might wonder, are the arguments offered by proponents of discounted cash flow valuation for not explicitly considering the possibility of firms failing? We will consider five reasons often provided by for this oversight. The first two reasons are offered by analysts who believe that there is no need to consider distress explicitly in valuation, and the last three by those who believe that discounted cashflow valuations already incorporate the effect of distress.

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[7] For an examination of the theory behind indirect bankruptcy costs, see Opler, T. and S. Titman, 1994, Financial Distress and Corporate Performance. Journal of Finance 49, 1015-1040. For an estimate on how large these indirect bankruptcy costs are in the real world, see Andrade, G. and S. Kaplan, 1998, How Costly is Financial (not Economic) Distress? Evidence from Highly Leveraged Transactions that Become Distressed. Journal of Finance. 53, 1443-1493. They look at highly levered transactions that subsequently became distressed snd conclude that the magnitude of these costs ranges from 10% to 23% of firm value.

1. We value only large, publicly traded firms and distress is very unlikely for these firms.

It is true that the likelihood of distress is lower for larger, more established firms, but experience suggests that even these firms can become distressed. The last few months of 2008 saw the demise of several large publicly traded firms across the globe. At the end of 2008, analysts were openly discussing the possibility that GM and Ford would be unable to make their debt payments and may have to declare bankruptcy. The other problem with this argument, even if we accept the premise, is that smaller, high growth firms are traded and need to be valued just as much as larger firms. In fact, we could argue that the need for valuation is greater for smaller firms, where the uncertainty and the possibility of pricing errors are greater. With these firms, it clearly is foolhardy to ignore the potential for distress.

2. We assume that access to capital is unconstrained

In valuation, as in much of corporate finance, we assume that a firm with good investments has access to capital markets and can raise the funds it needs to meet its financing and investment needs. Thus, firms with great growth potential will never be forced out of business because they will be able to raise capital (more likely equity than debt) to keep going. In buoyant and developed financial markets, this assumption is not outlandish. Consider, for instance, the ease with which new economy companies with negative earnings and few if any assets were able to raise new equity in the late 1990s. However, even in a market as open and accessible as the United States, access to capital can dry up during market crisis; in the last quarter of 2008, even GE had trouble rolling over its commercial paper. In summary, then, we may have been able to get away with the assumption that firms with valuable assets will not be forced into a distress sale in 1998 and 1999, but that assumption would have been untenable in 2009.

3. We adjust the discount rate for the possibility of distress

The discount rate is the vehicle we use to adjust for risk in discounted cash flow valuation. Riskier firms have higher costs of equity, higher costs of debt and usually have higher costs of capital than safer firms. A reasonable extension of this argument would be that a firm with a greater possibility of distress should have a higher cost of capital and thus a lower firm value. The argument has merit up to a point. The cost of capital for a distressed firm, estimated correctly, should be higher than the cost of capital for a safer

firm. If the distress is caused by high financial leverage, the cost of equity should be much higher. Since the cost of debt is based upon current borrowing rates, it should also climb as the firm becomes more exposed to the risk of bankruptcy and the effect will be exacerbated if the tax advantage of borrowing also dissipates (as a result of operating losses). Ultimately though, the adjustment to value that results from using a higher discount rate is only a partial one. The firm is still assumed to generate cash flows in perpetuity, though the present value is lower. A significant portion of the firm's current value still comes from the terminal value. In other words, the biggest risk of distress that is the loss of all future cash flows is not adequately captured in value.

4. We adjust the expected cash flows for the possibility of distress

To better understand this adjustment, it is worth reviewing what the expected cash flows in a discounted cash flow valuation are supposed to measure. The expected cash flow in a year should be the probability-weighted estimate of the cash flows under all scenarios for the firm, ranging from the best to the worst case. In other words, if there is a 30% chance that a firm will not survive the next year, the expected cash flow should reflect both this probability and the resulting cash flow. In practice, we tend to be far sloppier in our estimation of expected cash flows. In fact, it is not uncommon to use an exogenous estimate of the expected growth rate (from analyst estimates) on the current year's earnings or revenues to generate future values. Alternatively, we often map out an optimistic path to profitability for unprofitable firms and use this path as the basis for estimating expected cash flows. We could estimate the expected cash flows under all scenarios and use the expected values in our valuation. Thus, the expected cash flows would be much lower for a firm with a significant probability of distress. Note, though, that contrary to conventional wisdom, this is not a risk adjustment. We are doing what we should have been doing in the first place and estimating the expected cash flows correctly. If we wanted to risk-adjust the cash flows, we would have to adjust the expected cash flows even further downwards using a certainty equivalent.[8] If we do this, though, the discount rate used would have to be the riskfree rate and not the risk-adjusted

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[8] A certainty equivalent cashflow replaces an uncertain cash flow with an equivalent riskless cashflow. Thus, an expected cashflow of $ 125 million will be replaced by a riskless cashflow of $ 100 million. The more uncertain the cash flow, the greater the downward adjustment.

cost of capital. As a practical matter, it is very difficult to adjust expected cash flows for the possibility of distress. Not only do we need to estimate the probability of distress each year, we have to keep track of the cumulative probability of distress as well. This is because a firm that becomes distressed in year 3 loses its cash flows not just in that year but also in all subsequent years.

5. We assume that even in distress, the firm will be able to receive the present value of expected cash flows from its assets as proceeds from the sale.

The problem with distress, from a DCF standpoint, is not that the firm ceases to exist but that all cash flows beyond that point in time are lost. Thus, a firm with great products and potentially a huge market may never see this promise converted into cash flows because it goes bankrupt early in its life. If we assume that this firm can sell itself to the highest bidder for a distress sale value that is equal to the present value of expected future cash flows, however, distress does not have to be considered explicitly. This is a daunting assumption because we are not only assuming that a firm in distress has the bargaining power to demand fair market value for its assets, but we are also assuming that it can do this not only with assets in place (investments it has already made and products that it has produced) but with growth assets (products that it may have been able to produce in the future).

In summary, the failure to explicitly consider distress in discounted cash flow valuation will not have a material impact in value if any the following conditions hold:

1. There is no possibility of bankruptcy, either because of the firm's size and standing or because of a government guarantee.
2. Easy access to capital markets allows firms with good investments to raise debt or equity capital to sustain themselves through bad times, thus ensuring that these firms will never be forced into a distress sale.
3. We use expected cash flows that incorporate the likelihood of distress and a discount rate that is adjusted for the higher risk associated with distress. In addition, we have to assume that the firm will receive sale proceeds that are equal to the present value of expected future cash flows as a going concern in the event of a distress sale.

If these conditions do not hold, and it is easy to make an argument that they will not for some firms at some points in time, discounted cash flow valuations will overstate firm value.

Discounted Cash flow Valuation

When will the failure to consider distress in discounted cash flow valuation have a material impact on value? If the likelihood of distress is high, access to capital is constrained (by internal or external factors) and distress sale proceeds are significantly lower than going concern values, discounted cash flow valuations will overstate firm and equity value for distressed firms, even if the cash flows and the discount rates are correctly estimated. In this section, we will consider several ways of incorporating the effects of distress into the estimated value.

Simulations

In traditional valuation, we estimate the expected values for each of the input variables. For instance, in valuing a firm, we may assume an expected growth rate in revenues of 30% a year and that the expected operating margin will be 10%. In reality, each of these variables has a distribution of possible values, which we condense into an expected value. In chapter 3, we noted that simulations use the information in the entire distribution, rather than just the expected value, and by doing so, provide us with an opportunity to deal explicitly with distress.

Before we begin running the simulations, we have to decide the circumstances which will constitute distress and what will happen in the event of distress. For example, we may determine that cumulative operating losses of more than $ 1 billion over three years will push the firm into distress and that it will sell its assets for 25% of book value in that event. The parameters for distress will vary not only across firms, based upon size and asset characteristics, but also on the state of financial markets and the overall economy. A firm that has three bad years in a row in a healthy economy with rising equity markets may be less exposed to default than a similar firm in the middle of a recession.

The simulations follow the standard steps described in chapter 3. We choose the variables that we want to assign distributions to – some of these such as revenue growth and margins will be specific to the firm and some such as interest rates will relate to the

overall economy – and we estimate the probability distributions for these variables. In each simulation, we draw one outcome from each distribution (revenue growth rate, margin and interest rate) and estimate the earnings and cash flows for the firm. If the distress constraint, specified in the last paragraph, is triggered, we assume that the firm will become distressed and estimate a distress sale value. If distress is not triggered, we value the firm as a going concern. The average across all simulated values will be the value of the firm. We should also be able to assess the probability of default from the simulation and the effect of distress on value. The primary limitation of simulation analysis is the information that is required for it to work. In practice, it is difficult to choose the right distribution to describe a variable and the parameters of that distribution. When these choices are made carelessly or randomly, the output from the simulation may look impressive but actually conveys no valuable information.

Modified Discounted Cash flow Valuation

We can adapt discounted cash flow valuation to reflect some or most of the effects of distress on value. To do this, we will to bring in the effects of distress into both expected cash flows and discount rates.

1. Estimating Expected Cash flows: To build in the effects of distress into a discounted cash flow valuation, we have to incorporate the probability that a firm will not survive into the expected cash flows. In its most complete form, this would require that we consider all possible scenarios, ranging from the most optimistic to the most pessimistic, assign probabilities to each scenario and cash flows under each scenario, and estimate the expected cash flows each year.

$$\text{Expected cash flow} = \sum_{j=1}^{j=n} \pi_{jt} (\text{Cashflow}_{jt})$$

where π_{jt} is the probability of scenario j in period t and Cashflow_{jt} is the cashflow under that scenario and in that period. These inputs have to be estimated each year, since the probabilities and the cash flows are likely to change from year to year. Note that the adjustment for distress is a cumulative one and will have a greater impact on the expected cash flows in the later year. Thus, if the probability of distress is 10% in year 1, the expected cash flows in all subsequent years have to reflect the fact that if the firm ceases to exist in year 1, there will be no cash flows later. If the probability of distress in year 2

is 10% again, there is now only an 81% chance that the firm will have cash flows in year 3.[9]

2. Estimating Discount Rates: In an earlier section, we noted the problems with estimating costs of capital for distressed firms; regression betas often lag distress, since they are estimated over long time periods and the cost of debt can be skewed upwards (if we use the market interest rate on bonds issued by the company) or downwards (if we stick with book interest rates). To estimate discount rates that truly reflect the distress risk of the firm, we have to look past the standard approaches.

a. To estimate the cost of equity, we have two options that provide more reasonable estimates than regression betas. Instead of using regression betas, we could use the bottom-up unlevered beta and the current market debt to equity ratio of the firm. Since distressed firms often have high debt to equity ratios, brought about largely as a consequence of dropping stock prices, this will lead to levered betas that are significantly higher than regression betas[10]. If we couple this with the reality that most distressed firms are in no position to get any tax advantages from debt, the levered beta will become even higher.

Levered beta = Bottom-up Unlevered beta (1 + (1- tax rate) (Debt to Equity ratio))

Note, though, that it is reasonable to re-estimate debt to equity ratios and tax rates for future years based upon our expectations for the firm and adjust the beta to reflect these changes.[11] The other choice is to estimate the cost of equity, using a beta more reflective of a healthy firm in the business, and then adding an additional premium to reflect distress.

Cost of equity = Riskfree Rate + $\text{Beta}_{\text{Healthy}}$(Equity Risk Premium)+Distress Premium

We compute the distress premium by either looking at historical data on returns earned by investing in the equity of distressed firms or by comparing the company's own pre-tax cost of debt to the industry average cost of debt. Thus, if the industry average cost of debt

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[9] Probability of surviving into year 3 = (1-.10) (1-.10) = 0.81

[10] For more on bottom-up betas, refer to Damodaran (2000).

[11] There are other variations on this leverage adjustment. Some analysts, for instance, prefer a more complete version that allows debt to carry systematic risk and have a beta. Others prefer to eliminate the tax adjustment. Still others argue for other ways of adjusting betas for distress risk.

is 8% and a company has a pre-tax cost of debt of 16%, we would add 8% to the conventional cost of equity estimate.

b. To estimate the cost of debt for a distressed firm, we would recommend using a default spread based upon the firm's bond rating.

Pre-tax cost of debt = Riskfree rate + Default spread based upon bond rating

If the firm is not rated, we would estimate a synthetic rating for it. While this will still yield a high cost of debt, it will be more reasonable than the yield to maturity when default is viewed as imminent.[12]

c. To compute the cost of capital, we need to estimate the weights on debt on equity. In the initial year, we should use the current market debt to capital ratio (which may be very high for a distressed firm). As we make our forecasts for future years and build in our expectations of improvements in profitability, we should adjust the debt ratio towards more reasonable levels. The conventional practice of using target debt ratios for the entire valuation period (which reflect industry averages or the optimal mix) can lead to misleading estimates of value for firms that are significantly over levered.

The biggest roadblock to using this approach is that even in its limited form, it is difficult to estimate the cumulative probabilities of distress (and survival) each year for the forecast period. Consequently, the expected cash flows may not incorporate the effects of distress completely. In addition, it is difficult to bring both the going concern and the distressed firm assumptions into the same model. We attempt to do so using probabilities, but the two approaches make different and sometimes contradictory assumptions about how markets operate and how distressed firms evolve over time.

Dealing with Distress Separately

An alternative to the modified discounted cash flow model presented in the last section is to separate the going concern assumptions and the value that emerges from it from the effects of distress. To value the effects of distress, we estimate the cumulative probability that the firm will become distressed over the forecast period, and the proceeds

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[12] The yields to maturity on bonds issued by companies where there is a significant probability of distress will be stratospheric, because they are based upon the promised cash flows on the bond, rather than expected cashflows.

that we estimate we will get from the distress sale. The value of the firm can then be written as:

Firm Value = Going concern value * (1-$\pi_{Distress}$)+ Distress sale value * $\pi_{Distress}$

where $\pi_{distress}$ is the cumulative probability of distress over the valuation period. In addition to making valuation simpler, it also allows us to make consistent assumptions within each valuation.

You may wonder about the differences between this approach and the far more conventional one of estimating liquidation value for deeply distressed firms. You can consider the distress sale value to be a version of liquidation value, and if you assume that the probability of distress is one, the firm value will, in fact, converge on liquidation value. The advantage of this approach is that it allows us to consider the possibility that even distressed firms have a chance of becoming going concerns.

Going Concern DCF

To value a firm as a going concern, we consider only those scenarios where the firm survives. The expected cash flow is estimated only across these scenarios and thus should be higher than the expected cash flow estimated in the modified discounted cash flow model. When estimating discount rates, we make the assumption that debt ratios will, in fact, decrease over time, if the firm is over levered, and that the firm will derive tax benefits from debt as it turns the corner on profitability. This is consistent with the assumption that the firm will remain a going concern. Most discounted cash flow valuations that we observe in practice are going concern valuations, though they may not come with the tag attached.

A less precise albeit easier alternative is to value the company as if it were a healthy company today. This would require estimating the cashflows that the firm would have generated if it were a healthy firm, a task most easily accomplished by replacing the firm's operating margin by the average operating margin of healthy firms in the business. The cost of capital for the distressed firm can be set to the average cost of capital for the industry and the value of the firm can be computed. The danger with this approach is that it will overstate firm value by assuming that the return to financial health is both painless and imminent.

Estimating the Probability of Distress

A key input to this approach is the estimate of the cumulative probability of distress over the valuation period. In this section, we will consider three ways in which we can estimate this probability. The first is a statistical approach, where we relate the probability of distress to a firm's observable characteristics – firm size, leverage and profitability, for instance – by contrasting firms that have gone bankrupt in prior years with firms that did not. The second is a less data intensive approach, where we use the bond rating for a firm, and the empirical default rates of firms in that rating class to estimate the probability of distress. The third is to use the prices of corporate bonds issued by the firm to back out the probability of distress.

a. Statistical Approaches: The fact that hundreds of firms go bankrupt every year provides us with a rich database that can be examined to evaluate both why bankruptcy occurs and how to predict the likelihood of future bankruptcy. One of the earliest studies that used this approach was by Altman (1968), where he used linear discriminant analysis to arrive at a measure that he called the Z score. In this first paper, that he has since updated several times, the Z score was a function of five ratios:

Z = 0.012 (Working capital/ Total Assets) + 0.014 (Retained Earnings/ Total Assets) + 0.033 (EBIT/ Total Assets) + 0.006 (Market value of equity/ Book value of total liabilities) + 0.999 (Sales/ Total Assets)

Altman argued that we could compute the Z scores for firms and use them to forecast which firms would go bankrupt, and he provided evidence to back up his claim. Since his study, both academics and practitioners have developed their own versions of these credit scores.[13] Notwithstanding its usefulness in predicting bankruptcy, linear discriminant analysis does not provide a probability of bankruptcy. To arrive at such an estimate, we use a close variant – a probit. In a probit, we begin with the same data that was used in linear discriminant analysis, a sample of firms that survived a specific period and firms

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[13] Altman, E.I., 1968, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," Journal of Finance; For a more updated version of the Altman Z-score and its relationship to default probabilities take a look at Altman, E.I., 1993, Corporate Financial Distress and Bankruptcy, 2nd ed., John Wiley & Sons, New York.

that did not. We develop an indicator variable that takes on a value of zero or one, as follows:

Distress Dummy = 0 for any firm that survived the period

= 1 for any firm that went bankrupt during the period

We then consider information that would have been available at the beginning of the period that may have allowed us to separate the firms that went bankrupt from the firms that did not. For instance, we could look at the debt to capital ratios, cash balances and operating margins of all of the firms in the sample at the start of the period – we would expect firms with high debt to capital ratios, low cash balances and negative margins to be more likely to go bankrupt. Finally, using the dummy variable as our dependent variable and the financial ratios (debt to capital and operating margin) as independent variables, we look for a relationship:

Distress Dummy = a + b (Debt to Capital) + c (Cash Balance/ Value) + d (Operating Margin)

If the relationship is statistically and economically significant, we have the basis for estimating probabilities of bankruptcy.[14] One advantage of this approach is that it can be extended to cover the likelihood of distress at firms without significant debt. For instance, we could relate the likelihood of distress at young, technology firms to the cash-burn ratio, which measures how much cash a firm has on hand relative to its operating cash needs.[15]

b. Based upon Bond Rating: Many firms, especially in the United States, have bonds that are rated for default risk by the ratings agencies. These bond ratings not only convey information about default risk (or at least the ratings agency's perception of default risk) but they come with a rich history. Since bonds have been rated for decades, we can look at the default experience of bonds in each ratings class. Assuming that the ratings agencies have not significantly altered their ratings standards, we can use these default probabilities as inputs into discounted cash flow valuation models. Altman (2007) has estimated the cumulative probabilities of default for bonds in different ratings classes

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[14] This looks like a multiple regression. In fact, a probit is a more sophisticated version of this regression with constraints built in ensuring that the probabilities do not exceed one or become negative.

[15] Cash Burn Ratio = Cash Balance/ EBITDA. With negative EBITDA, this yields a measure of the time that it will take the firm to burn through its cash balance.

over five and ten-year periods, following issuance, and the estimates are reproduced in table 12.5 below[16]:

Table 12.5: Bond Rating and Probability of Default – 1971 - 2007

Rating	Cumulative Probability of Distress	
	5 years	10 years
AAA	0.04%	0.07%
AA	0.44%	0.51%
A+	0.47%	0.57%
A	0.20%	0.66%
A-	3.00%	5.00%
BBB	6.44%	7.54%
BB	11.9%	19.63%
B+	19.25%	28.25%
B	27.50%	36.80%
B-	31.10%	42.12%
CCC	46.26%	59.02%
CC	54.15%	66.6%
C+	65.15%	75.16%
C	72.15%	81.03%
C-	80.00%	87.16%

As elaboration, the cumulative default probability for a bond rated BB at the start of the period is 19.63% over the next 10 years.[17] What are the limitations of this approach? The first is that we are delegating the responsibility of estimating default probabilities to the ratings agencies and we assume that they do it well. The second is that we are assuming that the ratings standards do not shift over time. The third is that table 12.5 measures the likelihood of default on a bond, but it does not indicate whether the defaulting firm goes out of business. Many firms continue to operate as going concerns after default. We can illustrate the use of this approach with Delta Airlines and Las Vegas Sands, two operating companies with significant probability of default at the start of 2009:

Company	Bond Rating	Estimated probability of distress
Delta Airlines	BBB-	13.58%
Las Vegas Sands	B+	28.25%

c. Based upon Bond Price: The conventional approach to valuing bonds discounts promised cash flows back at a cost of debt that incorporates a default spread to come up

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[16] Altman, E.I.[19]

with a price. Consider an alternative approach. We could discount the expected cash flows on the bond, which would be lower than the promised cash flows because of the possibility of default, at the riskfree rate to price the bond. If we assume that a constant annual probability of default, we can write the bond price as follows for a bond with fixed coupon maturing in N years.

$$\text{Bond Price} = \sum_{t=1}^{t=N} \frac{\text{Coupon } (1-\pi_{Distress})^t}{(1+\text{Riskfree Rate})^t} + \frac{\text{Face Value of Bond}(1-\pi_{Distress})^N}{(1+\text{Riskfree Rate})^N}$$

This equation can now be used, in conjunction with the price on a traded corporate bond to back out the probability of default. We are solving for an annualized probability of default over the life of the bond, and ignoring the reality that the annualized probability of default will be higher in the earlier years and decline in the later years. While this approach has the attraction of being a simple one, we would hasten to add the following caveats in using it. First, note that we not only need to find a straight bond issued by the company – special features such as convertibility will render the approach unusable – but the bond price has to be available. If the corporate bond issue is privately placed, this will not be feasible. Second, the probabilities that are estimated may be different for different bonds issued by the same firm. Some of these differences can be traced to the assumption we have made that the annual probability of default remains constant and others can be traced to the mispricing of bonds. Third, as with the previous approach, failure to make debt payments does not always result in the cessation of operations. Finally, we are assuming that the coupon is either fully paid or not at all; if there is a partial payment of either the coupon or the face value in default, we will over estimate the probabilities of default using this approach.

Illustration 12.4: Estimating the probability of bankruptcy using bond price: Las Vegas Sands

In January 2009, Las Vegas Sands had a 6.375% coupon bond, maturing in February 2015, trading at $ 529. To estimate the probability of default (with a treasury bond rate of 3% used as the riskfree rate):

$$529 = \sum_{t=1}^{t=7} \frac{63.75(1-\pi_{Distress})^t}{(1.03)^t} + \frac{1000(1-\pi_{Distress})^7}{(1.03)^7}$$

Solving for the probability of bankruptcy[18], we get

$\pi_{Distress}$ = Annual probability of default = 13.54%

To estimate the cumulative probability of distress over 10 years:

Cumulative probability of surviving 10 years = $(1 - .1354)^{10}$ = 23.34%

Cumulative probability of distress over 10 years = 1 - .2334 = .7666 or 76.66%

Estimating Distress Sale Proceeds

Once we have estimated the probability that the firm will be unable to make its debt payments and cease to exist, we have to consider the logical follow-up question. What happens then? As noted earlier in the chapter, it is not distress per se that is the problem but the fact that firms in distress have to sell their assets for less than the present value of the expected future cash flows from existing assets and expected future investments. Often, they may be unable to claim even the present value of the cash flows generated even by existing investments. Consequently, a key input that we need to estimate is the expected proceeds in the event of a distress sale. We have three choices:

a. Estimate the present value of the expected cash flows in a discounted cash flow model, and assume that the distress sale will generate only a percentage (less than 100%) of this value. Thus, if the discounted cash flow valuation yields $ 5 billion as the value of the assets, we may assume that the value will only be $ 3 billion in the event of a distress sale.
b. Estimate the present value of expected cash flows only from existing investments as the distress sale value. Essentially, we are assuming that a buyer will not pay for future investments in a distress sale. In practical terms, we would estimate the distress sale value by considering the cash flows from assets in place as a perpetuity (with no growth).
c. The most practical way of estimating distress sale proceeds is to consider the distress sale proceeds as a percent of book value of assets, based upon the experience of other distressed firms.

Note that many of the issues that come up when estimating distress sale proceeds – the need to sell at below fair value, the urgency of the need to sell – are issues that are relevant when estimating liquidation value.

Illustration 12.5: Estimating Distress Sale Proceeds in January 2009: Las Vegas Sands

To estimate the expected proceeds in the event of a distress sale, we considered several factors. First, the poor state of the economy in January 2009 and the ongoing credit crisis clearly did not bode well for any firm trying to liquidate its assets in a hurry. Second, Las Vegas Sands assets are primarily real estate and that segment of the economy was in ever worse shape than the rest of the market. To estimate the proceeds in a distress sale, we considered two alternatives:

a. Using the average operating income of $401.91 million, estimated using four years of data from 2005 to 2008 for Las Vegas Sands, as a reasonable measure of earnings from existing assets, we used a corporate tax rate of 38% and the cost of capital of 9% of healthier casino companies, to estimate the value of existing assets:

$$\text{Value of existing assets} = \frac{\text{EBIT}(1-t)}{\text{Cost of Capital}} = \frac{401.91(1-.38)}{.09} = \$2{,}769 \text{ million}$$

Note that we have assumed no growth and that any depreciation charges accrued will be ploughed back into the firm to preserve earning power. A healthy casino firm should be willing to pay $2.769 billion to buy the existing assets.

b. The book value of Las Vegas Sands' fixed assets at the end of 2008 was $11.275 billion and represents the company's investments in both its ongoing assets (Venetian and Sands Macau Casinos and the Last Vegas convention center) and its new developments. Since this book value represents real estate prices at the time of the original investment, we made two adjustments. First, we reduced the value by 40% to reflect the drop in real estate prices reported for Las Vegas between 2007 and 2008.[19] Second, we estimated a relatively modest illiquidity discount of 10%, resulting in a distress sale value of

Distress Sale value = Book Value (1- Price depreciation) (1- Illiquidity Discount)

= 11,275 (1-.40) (1-.10) = $6,089 million

To both estimates of distress sale proceeds, we would add the current cash balance of $3.04 billion to arrive at the total proceeds. Since the firm had debt outstanding with a face value of $10.47 billion, the equity investors would receive nothing in the event of a distress sale.

While the two approaches yield very different estimates of distress sale value, we are wary of the book-value based estimate. While it is true that the bulk of the company's

investments are in real estate, it is also true that any buyer of this real estate would have to continue to operate the properties primarily as casinos. Consequently, the earnings power approach, which yields the lower value of $2.769 billion is the one that we would trust more in our analysis.

The Shifting Debt Load

In addition to having a substantial amount of debt, distressed firms often have very complicated debt structures. Not only do they owe money to a number of different creditors, but the debt itself often is usually complex – convertible, callable and filled with special features demanded by the creditors for their own protection. In addition, distressed firms are often in the process of negotiating with debt holders, trying to convince them to change the terms of the debt and, in some cases, convert their debt into equity. Consequently, the value of the debt can change dramatically from day to day, thus affecting the value of equity, even if the enterprise value does not.

When estimating the value of debt in a distressed firm, we should consider doing the following:

- Rather than relying on the last available financial statements for the available debt, we should try to obtain an updated estimate of the outstanding debt. This may be difficult to do when the debt negotiations are private (between the distressed firm and the lenders.
- We should update the estimated market value of debt frequently, since the default risk of distressed firms can change substantially from period to period. Even if the debt is not traded, it is never appropriate with distressed firms to use the book value of debt as a proxy for the market value of debt. Instead, we should estimate the market value of debt, treating book debt like a corporate bond.
- When confronted with convertible debt, we should strip the conversion option from the debt and treat it as equity. Again, a simple way to do this is to value the convertible debt as if it were straight debt – this will yield the debt portion of the convertible debt – and consider the difference between the market value of the convertible debt and the straight debt portion as equity.

In general, valuing a distressed firm is far easier than valuing equity in the same firm, largely because the debt outstanding will vary over time.

Illustration 12.6: Valuing Las Vegas Sands with Distress valued separately

To value Las Vegas Sands with distress valued separately, we began with a going concern valuation of Las Vegas Sands, assuming that the firm survives and reverts back to financial health.

- For the fiscal year ended December 2008, Las Vegas Sands reported revenues of $4,390 million and pre-tax operating income of $209 million, yielding pre-tax operating margin of 4.76%.[20] The capital invested in the company at the start of the year was $9,832 million, yielding an abysmal after-tax return on capital of 1.44% (assuming the firm's effective tax rate of 26%)

  $$\text{Return on capital} = \frac{209(1-.26)}{8975} = 1.72\%$$

- To map out a path to recovery, we have to first estimate what we believe to be reasonable profitability measures, if Las Vegas Sands can turn things around. To make these estimates, we first looked at the operating margins and returns on capital reported by the firm over the last 5 years in table 12.6:

Table 12.6: Revenues, Margins and Return on Capital: LVS 2003-2008

Year	Revenues	Operating Income	Pre-tax Margin	Capital invested	ROC
2004	1197	233	19.47%	1575	9.17%
2005	1741	491	28.20%	1810	16.82%
2006	2237	577	25.79%	2791	12.82%
2007	2951	331	11.22%	2049	10.02%
2008	4390	209	4.76%	8974	1.44%

  Both the margins and returns earned in 2008 represent a break from a generally profitable past for Las Vegas Sands. We followed by estimating the average pre-tax operating margin (16.96%) and after-tax return on capital (approximately 10%) for casino firms in the United States at the start of 2009. Based on these numbers, we will assume that Las Vegas Sands, assuming it makes it as a healthy firm, will have a pre-tax operating margin of 17% and earn an after-tax return on capital of 10%.

- To project operating results into the future, we will assume that revenues will grow only 1% next year and 2% the year after, we will assume that the revenue growth rate

[20] The reported operating income of $ 163 million was after an impairment charge for disposal of assets of $46 million. The adjusted operating income is $ 209 million.

will pick up, especially as two new casinos in development come online, picking up to 20% in years 3-5, before dropping back to 5% a year from years 6-10. We will also assume that the recovery to the targeted margin will occur gradually over the next 10 years; with pre-tax operating margins improving to 10% by year 5 and then posting a further increase to 17% by year 10; the changes in each period occur in linear increments. Table 12.7 summarizes our forecasts of revenues, margins and operating income each year for the next 10 years; we used a 26% effective tax rate to estimate the after-tax operating income for the first 5 years but gradually move that number up to the marginal tax rate of 38% by year 10.

Table 12.7: Expected Revenues and Operating Income – LVS

Year	Revenue growth	Revenues	Operating Margin	Operating Income	Tax rate	After-tax Operating Income
Current		$4,390	4.76%	$209	26.00%	$155
1	1%	$4,434	5.81%	$258	26.00%	$191
2	2%	$4,523	6.86%	$310	26.00%	$229
3	20%	$5,427	7.90%	$429	26.00%	$317
4	20%	$6,513	8.95%	$583	26.00%	$431
5	20%	$7,815	10.00%	$782	26.00%	$578
6	5%	$8,206	11.40%	$935	28.40%	$670
7	5%	$8,616	12.80%	$1,103	30.80%	$763
8	5%	$9,047	14.20%	$1,285	33.20%	$858
9	5%	$9,499	15.60%	$1,482	35.60%	$954
10	5%	$9,974	17.00%	$1,696	38.00%	$1,051

- Since much of the capital for the new casinos has already been invested, we will hold capital expenditures down for much of the high growth period; in effect, the company is living off past investments.[21] As a consequence, the reinvestment rate will be negative for the next two years, since there will be significant cash inflows from depreciation charges, before increasing in the rest of the high growth period.[22] Table 12.8 lists the free cash flows to the firm each year for the next 10 years:

Table 12.8: Expected Free Cash flow to Firm – LVS

Year	After-tax Operating Income	Reinvestment Rate	Reinvestment	FCFF

[21] LVS had invested almost $3 billion in new developments in January 2009 that had still not commenced operations.

[23] Since the cost of capital changes over time, we have to compute a cumulated cost. For instance, the cost of capital in year 7 = $1.0988^5*1.979*1.0950=1.9261$

1	$191	-10.00%	-$19	$210
2	$229	-5.00%	-$11	$241
3	$317	0.00%	$0	$317
4	$431	5.00%	$22	$410
5	$578	10.00%	$58	$520
6	$670	10.00%	$67	$603
7	$763	20.00%	$153	$611
8	$858	25.00%	$215	$644
9	$954	30.00%	$286	$668
10	$1,051	33.30%	$350	$701

- We will begin the valuation with a cost of capital for Las Vegas Sands that reflects its tenuous hold on going concern status. We used the unlevered beta of 1.15 for casino companies as a starting point, and compute the levered beta, based on the company's existing debt to equity ratio of 277.34%, computed based upon the estimated market value of equity and debt at the time of the analysis. The market value of equity, based upon the prevailing stock price of $4.25 and the 641.839 million shares outstanding, is $2.728 billion. To estimate the market value of debt, we first estimated the cost of debt, by adding a default spread of 6% (based upon its rating of B+, from S&P) to the riskfree rate of 3%, and then used the current interest expenses ($422 million) and face value of debt ($10.47 billion) to arrive at a present value for the debt of $7.57 billion:

$$\text{Estimated market value of debt} = \text{Interest Expense}\left[\frac{1-\frac{1}{(1+r)^n}}{r}\right] + \frac{\text{Face Value of Debt}}{(1+r)^n}$$

$$= 422\left[\frac{1-\frac{1}{(1.09)^{8.1}}}{.09}\right] + \frac{10,470}{(1.09)^{8.1}} = \$7,565m$$

Market Debt/Equity Ratio = 7565/2728 = 277.34%

Market Debt/Capital Ratio = 7565/ (7565+2728) = 73.5%

Levered Beta = 1.15 (1+ (1-.38) (2.7734)) = 3.14

Cost of equity = Riskfree Rate + Beta (Equity Risk Premium)

= 3% + 3.14 (6%) = 21.82%

Since the firm has positive operating income still and is expected to recover, we will assume that it will be able to get the full tax benefits of debt (based upon the marginal tax rate of 38%).

Pre-tax cost of debt = Riskfree Rate + Default Spread = 3% + 6% = 9%

After-tax cost of debt = 9% (1-.38)= 5.58%

Using the current debt ratio of 73.50%, we estimate a cost of capital of 9.88% for Las Vegas Sands:

Cost of capital = Cost of equity (1- Debt ratio) + After-tax cost of debt (Debt ratio)

= 21.82% (.265) + 5.58% (.735) = 9.88%

However, we will assume that as the firm becomes healthier, its debt ratio will converge on the casino industry average of 50% and that its cost of capital will also move down to 7.43% to reflect the return to financial health. Table 12.9 lists the resulting numbers:

Table 12.9: Costs of equity, debt and capital –LVS

Year	Beta	Cost of equity	Pre-tax Cost of debt	Debt Ratio	Cost of capital
1	3.14	21.82%	9.00%	73.50%	9.88%
2	3.14	21.82%	9.00%	73.50%	9.88%
3	3.14	21.82%	9.00%	73.50%	9.88%
4	3.14	21.82%	9.00%	73.50%	9.88%
5	3.14	21.82%	9.00%	73.50%	9.88%
6	2.75	19.50%	8.70%	68.80%	9.79%
7	2.36	17.17%	8.40%	64.10%	9.50%
8	1.97	14.85%	8.10%	59.40%	9.01%
9	1.59	12.52%	7.80%	54.70%	8.32%
10	1.20	10.20%	7.50%	50.00%	7.43%

- As operating margins improve, we will keep track of the return on capital in the firm, by computing the capital invested each year (based on the reinvestment) and check to make sure that we are moving towards our targeted return on capital of 10% over time. Table 12.10 summarizes the year-by-year estimates of capital invested and after-tax return on capital for Las Vegas Sands:

Table 12.10: Capital Invested and Return on Capital – LVS

Year	After-tax Operating Income	Reinvestment	Capital Invested	Return on capital
Current	$155		8975	1.72%
1	$191	-$19	$8,956	2.13%

2	$229	-$11	$8,944	2.57%
3	$317	$0	$8,944	3.55%
4	$431	$22	$8,966	4.81%
5	$578	$58	$9,024	6.41%
6	$670	$67	$9,091	7.37%
7	$763	$153	$9,243	8.26%
8	$858	$215	$9,458	9.07%
9	$954	$286	$9,744	9.79%
10	$1,051	$350	$10,094	10.41%

Capital invested in year n= Capital invested year n-1+ Reinvestment in year n

Note that the return on capital in year 10 is 10.41%, close to the target return on capital of 10%.

- To complete the valuation, we will assume that Las Vegas Sands will be in stable growth after year 10, growing at 3% a year (set equal to the riskfree rate cap) forever. We will also assume that the return on capital will be 10% in perpetuity and that the stable period cost of capital is 7.43% (from table 12.9). The terminal value can then be computed.

$$\text{Reinvestment rate} = \frac{g_{stable}}{ROC_{stable}} = \frac{3\%}{10\%} = 30\%$$

$$\text{Terminal Value} = \frac{\text{After - tax Operating Income}_5\ (1+g_{stable})(1-\text{Reinvestement Rate})}{(\text{Cost of capital}_{stable} - g_{stable})}$$

$$= \frac{1051\ (1.03)(1-.30)}{(.0743-.03)} = \$17{,}129$$

Bringing together the free cash flows from table 12.8, the terminal value above and the cost of capital from table 12.9, we can compute the value of the operating assets in table 12.11:[23]

Table 12.11: Value of operating assets – LVS

Year	FCFF	Terminal value	Cost of capital	Cumulated cost of capital	PV
1	$210		9.88%	1.0988	$190.79
2	$241		9.88%	1.2075	$199.54
3	$317		9.88%	1.3268	$239.25
4	$410		9.88%	1.4579	$281.12
5	$520		9.88%	1.6021	$324.88
6	$603		9.79%	1.7590	$342.71
7	$611		9.50%	1.9261	$316.98
8	$644		9.01%	2.0997	$306.52
9	$668		8.32%	2.2744	$293.72
10	$701	$17,129.27	7.43%	2.4433	$7,297.83

			Value of operating assets =	$9,793.34

Adding cash ($3,040 million), subtracting out the market value of debt ($7,565 million) and dividing by the number of shares outstanding (641.839 million) yields a value per share of $8.21.

$$\text{Value per share} = \frac{9793 + 3040 - 7565}{641.839} = \$8.21/\text{share}$$

Note that the market value of debt is significantly lower than the face value of almost $ 10.47 billion. However, it is consistent with our assumption that LVS will make it as a going concern.

We can now bring in the probability of distress and the consequences into our final estimate of equity value. In illustration 12.4, we estimated the probability of distress from the bond market to be 76.66% and in illustration 12.5, we concluded that the distress sale value of the assets would be lower than the debt outstanding (making equity worthless). The expected value of equity per share in LVS can then be computed:

> Expected Value per share = Value per share as going concern (1- Probability of distress) + Value per share in distress (Probability of distress) = $8.21 (1-.2334) + $0.00 (.2334) = $2.12

If we adjust for the possibility of distress, the value per share s only $1.92, about half the stock price of $4.25 in February 2009. However, using the probability of distress, based upon the B+ rating, of 28.25% yields a value per share of $5.89 per share, about 40% higher than the stock price. The question of whether Las Vegas Sands is under or over valued therefore becomes one of assessing the likelihood of distress at the firm.

Adjusted Present Value (APV)

In the adjusted present value (APV) approach, described more fully in chapter 11, we begin with the value of the firm without debt. As we add debt to the firm, we consider the net effect on value by considering both the benefits and the costs of borrowing. To do this, we assume that the primary benefit of borrowing is a tax benefit and that the most significant cost of borrowing is the added risk of bankruptcy. With distressed firms, the advantage of separating the value impact of debt from the value of the operating assets is that more attention can be paid to the cost and probability of distress.

Reviewing the steps in the APV approach, we estimate the value of the firm in three steps. We begin by estimating the value of the firm with no leverage, by discounting the expected free cash flow to the firm at the unlevered cost of equity. In the special case where cash flows grow at a constant rate in perpetuity, the value of the firm is easily computed.

Value of Unlevered Firm = $\frac{FCFF_0(1+g)}{\rho_u - g}$

where $FCFF_0$ is the current after-tax operating cash flow to the firm, ρ_u is the unlevered cost of equity and g is the expected growth rate. In the more general case, we can value the firm using any set of growth assumptions we believe are reasonable for the firm.

We then consider the present value of the interest tax savings generated by borrowing a given amount of money. This tax benefit is a function of the tax rate of the firm and is discounted at the cost of debt to reflect the riskiness of this cash flow. If the tax savings are viewed as a perpetuity,

$$\text{Value of Tax Benefits} = \frac{(\text{Tax Rate})(\text{Cost of Debt})(\text{Debt})}{\text{Cost of Debt}} = (\text{Tax Rate})(\text{Debt}) = t_c D$$

For a distressed firm, this value will be depressed if the firm has substantial operating losses and does not expect to get tax benefits for the foreseeable future.

The third step is to evaluate the effect of the given level of debt on the default risk of the firm and on expected bankruptcy costs. This requires the estimation of the probability of default with the additional debt and the direct and indirect cost of bankruptcy. If π_a is the probability of default after the additional debt and BC is the present value of the bankruptcy cost, the present value of expected bankruptcy cost can be estimated.

$$\text{PV of Expected Bankruptcy cost} = (\text{Probability of Bankruptcy})(\text{PV of Bankruptcy Cost}) = \pi_a BC$$

We can use the approaches described in the last section to arrive at an estimate of the probability of bankruptcy. We can also consider the difference between the value of a firm as a going concern and the distress sale value as the cost of bankruptcy. Thus, if the present value of expected cash flows is $ 5 billion – the going concern value – and the

distress sale proceeds is expected to be only 25% of the book value of $ 4 billion, the bankruptcy cost is $ 4 billion.

Expected bankruptcy cost = $ 5 billion - .25 (4 billion) = $ 4 billion

Again, with distressed firms, the present value of expected bankruptcy costs is likely to be a large number. The combination of low tax benefits and large bankruptcy costs is likely to reduce firm value.

Almeida and Philippon (2005) suggest a variation of the adjusted present value model, arguing that the conventional measure of distress costs understates its magnitude because it does not factor in the reality that distress costs are often systematic (market and economy driven).[24] They present two ways of adjusting distress cost value to reflect this systematic risk. In the first, they derive probabilities of default from corporate bond spreads, akin to what we did earlier in illustration 12.4. In the second, they derive the risk adjustment from historical data on distress probabilities and asset-pricing models. They conclude that the expected bankruptcy costs are substantial and have a large impact on value.

Illustration 12.7: Valuing Las Vegas Sands: Adjusted Present Value

To value Las Vegas Sands on an adjusted present value basis, we would first need to value the firm as an unlevered entity. We can do this by using the unlevered cost of equity as the cost of capital.

Unlevered beta for Las Vegas Sands = 1.1535

Using the riskfree rate of 3% and the market risk premium of 6%,

Unlevered cost of equity for Las Vegas Sands = 3% + 1.1535 (6%) = 9.92%

We use this cost of equity as the cost of capital and discount the expected free cashflows to the firm shown earlier in table 12.8. Table 12.12 summarizes the present value of the cashflows at the unlevered cost of equity. (Note that the terminal value is left unchanged. We will continue to assume that the firm will earn its cost of capital on investments after year 10)

Table 12.12: Present Value of FCFF at Unlevered Cost of Equity

Year	FCFF	Terminal value	Present value

[27] We use the market value of debt to capture the possibility that tax benefits will be lost if the firm defaults on its debt.

1	$210		$191
2	$241		$199
3	$317		$239
4	$410		$281
5	$520		$324
6	$603		$342
7	$611		$315
8	$644		$302
9	$668		$285
10	$701	$10,952	$4,525
Terminal year	$758		
Unlevered value of operating assets =			$7,003

The unlevered value for the operating assets is $7,003 million. To this we should add the expected tax benefits of debt, computed by taking 38% of the debt outstanding ($7,565 million).[27] To estimate the bankruptcy cost, we consider the difference between the going concern value of $7,003 million and the distress sale estimate of $2,769 million (estimated in illustration 17.2) to be the bankruptcy cost. Multiplying this by the probability of bankruptcy (76.66%) estimated in illustration 17.1 yields the expected cost of bankruptcy:

Adjusted Present Value of LVS's assets = Unlevered firm value + Present value of tax benefits – Expected bankruptcy costs = 7,003 + 0.38*7,565– 0.7666 (7003 – 2,769) = $ 6,632 million

Adding back the cash and marketable securities and subtracting out debt yields a value of equity for Las Vegas Sands:

APV of LVS Assets =		$ 6,632 million
+ Cash & Marketable Securities =		$ 3,040 million
- Market value of Debt	=	$ 7,565 million
Value of Equity	=	$ 2,107 million

Value per share = $2,107 million/ 355.27 = $3.28

This value is already distress adjusted and can be compared to the market price of $4.25 a share.

Equity as an Option

In most publicly traded firms, equity has two features. The first is that the equity investors run the firm and can choose to liquidate its assets and pay off other claim

holders at any time. The second is that the liability of equity investors in some private firms and almost all publicly traded firms is restricted to their equity investments in these firms. This combination of the option to liquidate and limited liability allows equity to have the features of a call option. In firms with substantial debt and a significant potential for bankruptcy, the option value of equity may be in excess of the discounted cash flow value of equity.

The Payoff on Equity as an Option

The equity in a firm is a residual claim, that is, equity holders lay claim to all cash flows left after other financial claimholders (debt, preferred stock, etc.) have been satisfied. If a firm is liquidated, the same principle applies; equity investors receive the cash that is left in the firm after all outstanding debt and other financial claims have been paid off. With limited liability, if the value of the firm is less than the value of the outstanding debt, equity investors cannot lose more than their investment in the firm. The payoff to equity investors on liquidation can therefore be written as:

Payoff to equity on liquidation	= V - D	if V > D
	= 0	if V ≤ D

where

V = Liquidation Value of the firm

D = Face Value of the outstanding debt and other external claims

Equity can thus be viewed as a call option on the firm, where exercising the option requires that the firm be liquidated and the face value of the debt (which corresponds to the exercise price) be paid off. The firm is the underlying asset and the option expires when the debt comes due. The payoffs are shown in Figure 12.2.

Figure 12.2: Payoff on Equity as Option on a Firm

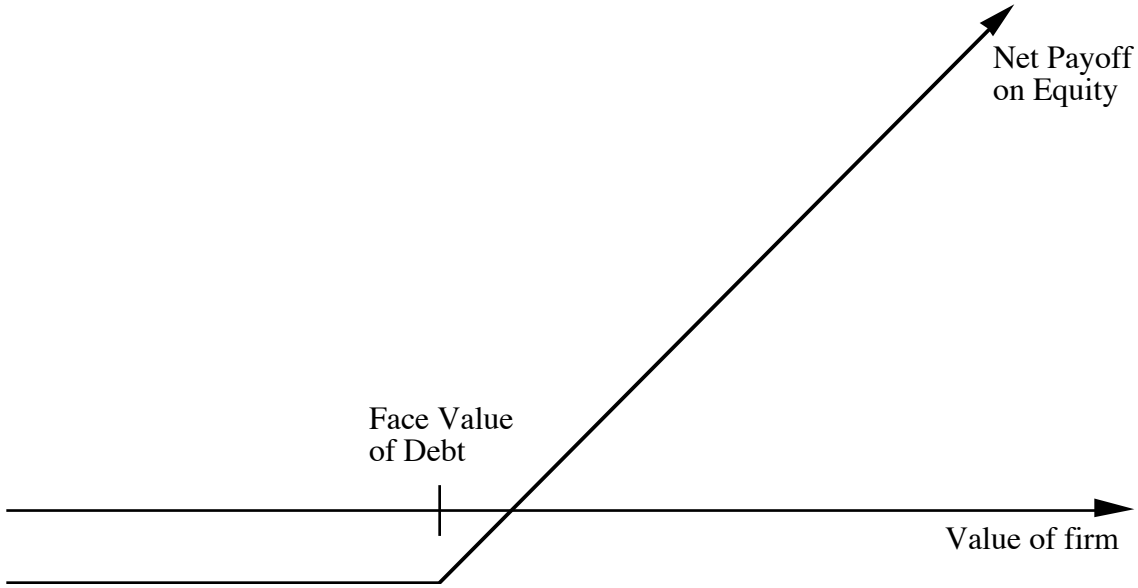


Illustration 12.8: Valuing Equity as an Option

Assume that we are valuing the equity in a firm whose assets are currently valued at $100 million; the standard deviation in this asset value is 40%. The face value of debt is $80 million (it is zero coupon debt with 10 years left to maturity). The 10-year treasury bond rate is 10%. We can value equity as a call option on the firm, using the following inputs for the option pricing model.

Value of the underlying asset = S = Value of the firm = $ 100 million

Exercise price = K = Face Value of outstanding debt = $ 80 million

Life of the option = t = Life of zero-coupon debt = 10 years

Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16

Riskless rate = r = Treasury bond rate corresponding to option life = 10%

Based upon these inputs, the Black-Scholes model provides the following value for the call.

$d_1 = 1.5994$ $N(d_1) = 0.9451$

$d_2 = 0.3345$ $N(d_2) = 0.6310$

Value of the call = $100 (.9451) – 80 e^{-(.10)(10)} (.6310) = $75.94 million

Since the call value represents the value of equity and the firm value is $100 million, the estimated value of the outstanding debt can be calculated.

Value of the outstanding debt = $100 - $75.94 = $24.06 million

Since the debt is a 10-year zero coupon bond, the market interest rate on the bond can be calculated.

$$\text{Interest rate on debt} = \left(\frac{\$80}{\$24.06}\right)^{\frac{1}{10}} - 1 = 12.77\%$$

Thus, the default spread on this bond should be 2.77%.

Implications of viewing Equity as an Option

When the equity in a firm takes on the characteristics of a call option, we have to change the way we think about its value and what determines its value. In this section, we will consider a number of potential implications for equity investors and bondholders in the firm.

When will equity be worthless?

In discounted cash flow valuation, we argue that equity is worthless if what we own (the value of the firm) is less than what we owe. The first implication of viewing equity as a call option is that equity will have value, even if the value of the firm falls well below the face value of the outstanding debt. While the firm will be viewed as troubled by investors, accountants and analysts, its equity is not worthless. In fact, just as deep out-of-the-money traded call options command value because of the possibility that the value of the underlying asset may increase above the strike price in the remaining lifetime of the option, equity commands value because of the time premium on the option (the time until the bonds mature and come due) and the possibility that the value of the assets may increase above the face value of the bonds before they come due.

Illustration 12.9: Firm Value and Equity Value

Revisiting the preceding example, assume that the value of the firm drops to $50 million, below the face value of the outstanding debt ($80 million). Assume that all the other inputs remain unchanged. The parameters of equity as a call option are as follows:

Value of the underlying asset = S = Value of the firm = $ 50 million

Exercise price = K = Face Value of outstanding debt = $ 80 million

Life of the option = t = Life of zero-coupon debt = 10 years

Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16

Riskless rate = r = Treasury bond rate corresponding to option life = 10%

Based upon these inputs, the Black-Scholes model provides the following value for the call.

$d_1 = 1.0515$ $N(d_1) = 0.8534$

$d_2 = -0.2135$ $N(d_2) = 0.4155$

Value of the call (equity) = 50 (0.8534) - 80 $\exp^{(-0.10)(10)}$ (0.4155) = \$30.44 million

Value of the bond= \$50 - \$30.44 = \$19.56 million

As we can see, the equity in this firm retains value, because of the option characteristics of equity. In fact, equity continues to have value in this example even if the firm value drops to \$10 million or below.

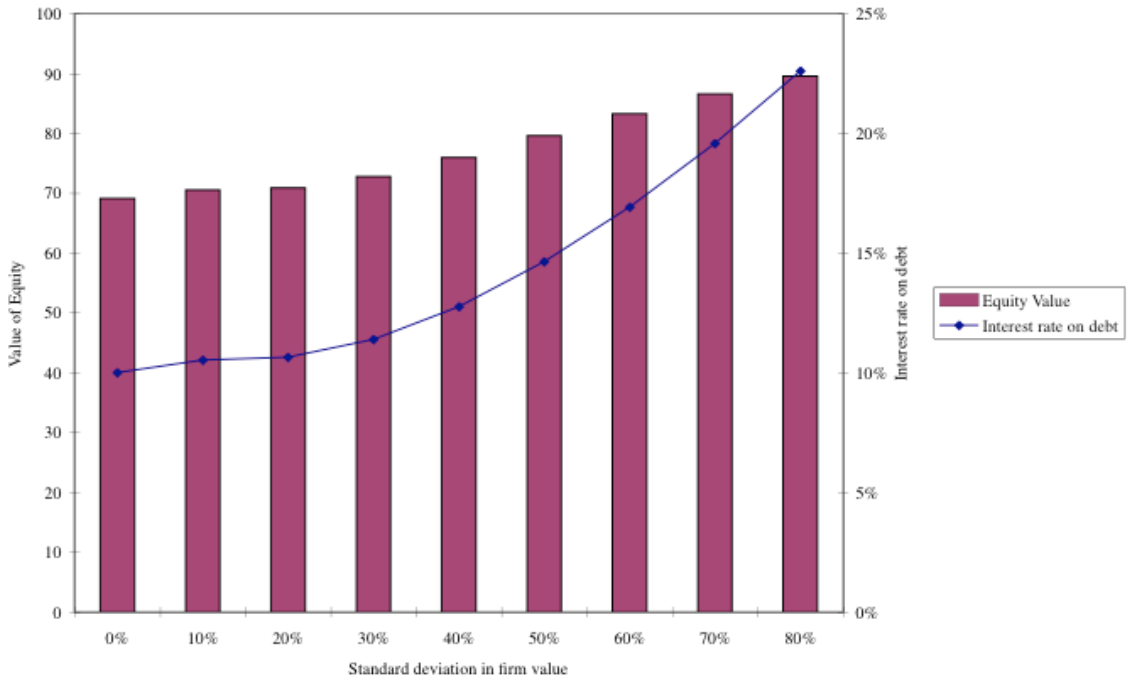
Increasing Risk can increase Equity Value

In traditional discounted cash flow valuation, higher risk almost always translates into lower value for equity investors. When equity takes on the characteristics of a call option, we should not expect this relationship to continue to hold. Risk can become our ally, when we are equity investors in a troubled firm. In essence, we have little to lose and much to gain from swings in firm value.

Illustration 12.10: Equity Value and Volatility

Let us revisit the valuation in Illustration 12.8. The value of the equity is a function of the variance in firm value, which we assumed to be 40%. If we change this variance, holding all else constant, the value of the equity will change as evidenced in Figure 12.4.

Figure 17.3: Equity Value and Standard Deviation in Firm Value



Note that the value of equity increases, if we hold firm value constant, as the standard deviation increases. The interest rate on debt also increases as the standard deviation increases.

Probability of Default and Default Spreads

One of the more interesting pieces of output from the option pricing model is the risk-neutral probability of default that we can obtain for the firm. In the Black-Scholes model, we can estimate this value from N(d2), which is the risk-neutral probability that S>K, which in this model is the probability that the value of the firm's asset will exceed the face value of the debt.

$$\text{Risk-neutral probability of default} = 1 - N(d2)$$

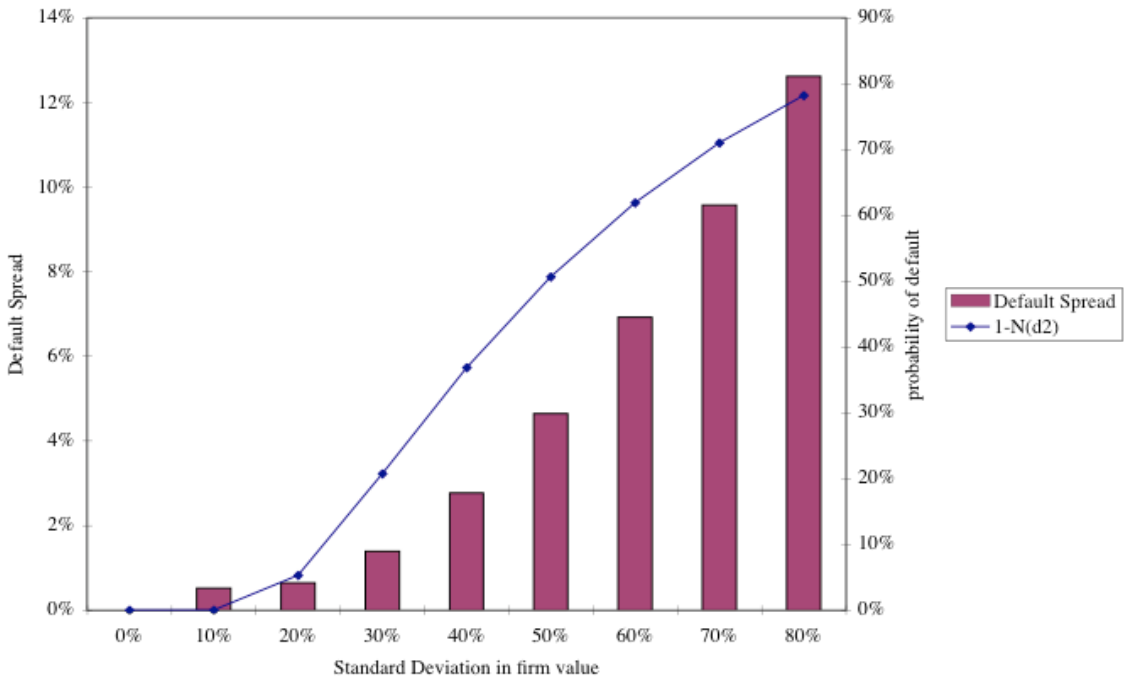
In addition, the interest rate from the debt allows us to estimate the appropriate default spread to charge on bonds.

You can see the potential in applying this model to bank loan portfolios to extract both the probability of default and to measure whether you are charging an interest rate that is high enough on the debt. In fact, there are commercial services that use fairly sophisticated option-pricing models to estimate both values for firms.

Illustration 12.11: Probabilities of default and Default Spreads

We return to Illustration 12.8 and estimate the probability of default as N(d2) and the default spread, measured as the difference between the interest rate on a firm's debt and the riskfree rate, as a function of the variance. These values are graphed in Figure 12.5.

Figure 17.4: Risk Neutral Probability of default and Default spreads



Note that the probability of default climbs very quickly as the standard deviation in firm value increases and the default spread follows it along.

Estimating the Value of Equity as an Option

The examples we have used thus far to illustrate the application of option pricing to value equity have included some simplifying assumptions. Among them are the following.

1. There are only two claimholders in the firm - debt and equity.
2. There is only one issue of debt outstanding and it can be retired at face value.
3. The debt has a zero coupon and no special features (convertibility, put clauses, etc.)
4. The value of the firm and the variance in that value can be estimated.

Each of these assumptions is made for a reason. First, by restricting the claimholders to just debt and equity, we make the problem more tractable; introducing other claimholders

such as preferred stock makes it more difficult to arrive at a result, albeit not impossible. Second, by assuming only one zero-coupon debt issue that can be retired at face value any time prior to maturity, we align the features of the debt more closely to the features of the strike price on a standard option. Third, if the debt is coupon debt, or more than one debt issue is outstanding, the equity investors can be forced to exercise (liquidate the firm) at these earlier coupon dates if they do not have the cash flows to meet their coupon obligations.

Finally, knowing the value of the firm and the variance in that value makes the option pricing possible, but it also raises an interesting question about the usefulness of option pricing in equity valuation. If the bonds of the firm are publicly traded, the market value of the debt can be subtracted from the value of the firm to obtain the value of equity much more directly. The option pricing approach does have its advantages, however. Specifically, when the debt of a firm is not publicly traded, option pricing theory can provide an estimate of value for the equity in the firm. Even when the debt is publicly traded, the bonds may not be correctly valued and the option pricing framework can be useful in evaluating the values of debt and equity. Finally, relating the values of debt and equity to the variance in firm value provides some insight into the redistributive effects of actions taken by the firm.

Inputs for Valuing Equity as an Option

Since most firms do not fall into the neat framework developed above (such as having only one zero-coupon bond outstanding), we have to make some compromises to use this model in valuation.

Value of the Firm

We can obtain the value of the firm in one of four ways. In the first, we cumulate the market values of outstanding debt and equity, assuming that all debt and equity are traded, to obtain firm value. The option pricing model then reallocates the firm value between debt and equity. This approach, while simple, is internally inconsistent. We start with one set of market values for debt and equity and, using the option pricing model, end up with entirely different values for each.

In the second, we estimate the market values of the assets of the firm by discounting expected cash flows at the cost of capital. The one consideration that we need

to keep in mind is that the value of the firm in an option pricing model should be the value obtained on liquidation. This may be less than the total firm value, which includes expected future investments and it may also be reduced to reflect the cost of liquidation. If we estimate the firm value using a discounted cash flow model, then this would suggest that only existing investments[28] should be considered while estimating firm value. The biggest problem with this approach is that financial distress can affect operating income and thus the value that we obtain by using current operating income may be too low.

In the third approach, we estimate a multiple of revenues by looking at healthy firms in the same business and apply this multiple to the revenues of the firm we are valuing. Implicitly, we are assuming that a potential buyer, in the event of liquidation, will pay this value.

We can use the fourth approach for firms that have separable assets that are individually traded. Here, we cumulate the value of the market values of the assets to arrive at firm value. For example, we can value a troubled real estate firm that owns five properties by valuing each property separately and then aggregating the values.

Variance in Firm value

We can obtain the variance in firm value directly if both stocks and bonds in the firm are traded. Defining σ_e^2 as the variance in the stock price and σ_d^2 as the variance in the bond price, w_e as the market-value weight of equity and w_d as the market-value weight of debt, we can write the variance in firm value as:[29]

$$\sigma^2_{firm} = w_e^2\sigma_e^2 + w_d^2\sigma_d^2 + 2w_e w_d \rho_{ed}\sigma_e\sigma_d$$

where ρ_{ed} is the correlation between the stock and the bond prices. When the bonds of the firm are not traded, we can use the variance of similarly rated bonds as the estimate of σ_d^2 and the correlation between similarly rated bonds and the firm's stock as the estimate of ρ_{ed}.

When companies get into financial trouble, this approach can yield misleading results as both its stock prices and its bond prices become more volatile. An alternative

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[30] Earlier we used the weighted average maturity of this debt of 8.1 years to compute the market value of debt. The duration of debt is lower than its maturity, because of the interest payments in earlier years.

that often yields more reliable estimates is to use the average variance in firm value for other firms in the sector. Thus, the value of equity in a deeply troubled steel company can be estimated using the average variance in firm value of all traded steel companies.

Maturity of the Debt

Most firms have more than one debt issue on their books and much of the debt comes with coupons. Since the option pricing model allows for only one input for the time to expiration, we have to convert these multiple bonds issues and coupon payments into one equivalent zero-coupon bond.

- One solution, which takes into account both the coupon payments and the maturity of the bonds, is to estimate the duration of each debt issue and calculate a face-value-weighted average of the durations of the different issues. This value-weighted duration is then used as a measure of the time to expiration of the option.
- An approximation is to use the face-value weighted maturity of the debt converted to the maturity of the zero-coupon bond in the option pricing model.

Face Value of Debt

When a distressed firm has multiple debt issues outstanding, we have three choices when it comes to what we use as the face value of debt:

- We could add up the principal due on all of the debt of the firm and consider it to be the face value of the hypothetical zero coupon bond that we assume that the firm has issued. The limitation of this approach is that it will understate what the firm will truly have to pay out over the life of the debt, since there will be coupon payments and interest payments during the period.
- At the other extreme, we could add the expected interest and coupon payments that will come due on the debt to the principal payments to come up with a cumulated face value of debt. Since the interest payments occur in the near years and the principal payments are due only when the debt comes due, we are mixing cash flows up at different points in time when we do this. This is, however, the simplest approach of dealing with intermediate interest payments coming due.
- We can consider only the principal due on the debt as the face value of the debt and the interest payments each year, specified as a percent of firm value, can take

the place of the dividend yield in the option pricing model. In effect, each year that the firm remains in existence, we would expect to see the value of the firm decline by the expected payments on the debt.

Illustration 12.12: Valuing Equity as an option – Las Vegas Sands in January 2008

In illustration 12.6, we estimated the value of Las Vegas Sands as a going concern and arrived at a value for the firm of $9,793 million for the operating assets of the firm. For the variance in this value, we used the casino industry average of 31%, computing using returns from 2007 and 2008. The firm has debt outstanding, with a face value of almost $10.47 billion and a market value of $7.57 billion. Much of the debt is long-term debt, with a weighted average duration of 5.4 years.[30] In summary, the inputs to the option pricing model are as follows:

Value of the underlying asset = S = Value of the firm = $9,793 million

Exercise price = K = Face Value of outstanding debt = $10,470 million

Life of the option = t = Weighted average duration of debt = 5.4 years

Variance in the value of the underlying asset = σ^2 = Variance in firm value = $(0.31)^2$

Riskless rate = r = 5-year treasury bond rate corresponding to option life = 2.5%

Based upon these inputs, we estimate the following value for the call:

$d_1 = 0.4548$ $N(d_1) = 0.6754$

$d_2 = -0.2655$ $N(d_2) = 0.3953$

$$\text{Value of the call} = 9,793(0.6754) - 10,470e^{(-0.025)(5.4)}(0.3953) = \$2,998 \text{ million}$$

If we treat this as the value of equity, it yields a value per share of $4.67 a share, which is higher than the going concern estimate of value of $1.92 per share that we estimated in illustration 12.6; the actual stock price of $4.25 is close to this price.

The option pricing framework, in addition to yielding a value for LVS equity, yields some valuable insight into the drivers of value for this equity. While it is certainly important that the firm try to bring costs under control and increase operating margins, the two most critical variables determining equity value are the duration of the debt and the variance in firm value. Any action that increases (decreases) the debt duration will have a positive (negative) effect on equity value. Thus, the results of debt renegotiation talks that were ongoing at the time of this analysis could have a significant effect on value.

Relative Valuation

Most valuations in practice, including those of distressed firms, are relative valuations. In particular, firms are valued using multiples and groups of comparable firms. An open question then becomes whether the effects of distress are reflected in relative valuations and, if not, how best to do so.

Distress in Relative Valuation

It is not clear how distress is incorporated into an estimate of relative value. Consider how relative valuation is most often done. We choose a group of firms that we believe are comparable to the firm that we are valuing. Usually, we pick firms in the same business that our firm is in. We then standardize prices by computing a multiple – price earnings, price to book, enterprise value to sales or enterprise value to EBITDA. Finally, we examine how our firm measures up on this multiple, relative to the comparable firms. While this time honored approach is used for distressed firms as well, the issues listed below generally are unique to distressed firms:

1. Revenue and EBITDA multiples are used more often to value distressed firms than healthy firms. The reasons are pragmatic. Multiple such as price earnings or price to book value often cannot even be computed for a distressed firm. Analysts therefore move up the income statement looking for a positive number. For firms that make heavy infrastructure investments, where depreciation and amortization is a significant charge against operating income and there are substantial interest expenses, the EBITDA is often positive while net income is negative. For some firms, even EBITDA is negative and revenue multiples are only multiples that yield positive values.

2. Analysts who are aware of the possibility of distress often consider them subjectively when they compare the multiple for the firm they are analyzing to the industry average. For example, assume that the average telecomm firm trades at 2 times revenues and that the firm we are analyzing trades at 1.25 times revenues. Assume also that the firm has substantially higher default risk than the average telecomm firm. We may conclude that the firm is not undervalued even though it trades at a significant discount on the average, because of the potential for default. The perils of subjective adjustment are obvious. Barring the most egregious misvaluations, analysts will find a way to justify their prior biases about firms.

Adapting Relative Valuation to Distress

Is there a way in which relative valuation can be adapted to cover distressed firms? We believe so, though the adjustments tend to be much more approximate than those described in the discounted cash flow section. We consider two ways of building distress explicitly into relative valuations. In the first, we compare a distressed company's valuation to the valuations of other distressed companies. In the second, we use healthy companies as comparable companies, but find a way to adjust for the distress that the firm we are valuing is facing.

Choosing the Comparables

To value a distressed firm, we can find a group of distressed firms in the same business and look at how much the market is willing to pay for them. For instance, we could value a troubled telecomm firm by looking at the enterprise value to sales (or book capital) multiples at which other troubled telecomm firms trade. While there is promise in this approach, it works only if a large number of firms in a sector slip into financial trouble at the same time. In addition, by categorizing firms as distressed or not distressed firms, we run the risk of lumping together firms that are distressed to different degrees.

One possible way to expand this approach is to look at distressed firms across the whole market, rather than just the sector in which the firm operates. This will allow for a larger sample though there is the possible disadvantage that a troubled grocery store may be in a better position (in terms of generating distress sale proceeds) than a troubled technology company.

Illustration 12.13: Choosing distressed comparables

To value Las Vegas Sands, we considered only casino firms with high financial leverage (market debt to capital ratios that exceed 60%). Our objective was to arrive at a sample of casino firms that have a significant likelihood of distress. We used the EBITDA in the most recent trailing 12 months and computed the enterprise value by adding the market value of equity to the book value of debt and subtracting out cash. Table 12.13 summarizes the resulting EV/EBITDA ratios for these firms:

Table 12.13: Distressed Casino Firms

Company	Market Cap	Total Debt	Cash	EV	EBITDA	EV/EBITDA
Codere, S.A.	516.6	1072.8	144.1	1445.3	295.2	4.90
Ameristar Casinos Inc.	561.1	1615.7	68.2	2108.6	289.4	7.29

Las Vegas Sands Corp.	2729	10470	1276	11628.9	812.5	14.31
Groupe Partouche SA	139.1	675	146.9	667.2	178.2	3.74
Boyd Gaming Corp.	431.2	2624.1	123.6	2931.7	372.5	7.87
MGM Mirage (NYSE:MGM)	1548.4	13288.3	250.1	14586.6	1959.6	7.44
Wynn Resorts Ltd.	2747	4917.7	1713.7	5951	714.4	8.33
				Average across firms =		7.70
				Average (without LVS) =		6.60

The average EV/EBITDA multiple, not including LVS, across these firms is 6.60 and Las Vegas Sands looks clearly over valued, relative to the rest of the group. There are, however, a couple of caveats that we would offer. The first is that the use of book value of debt clearly overstates the enterprise value computations, and more so for companies that are more distressed. For instance, using the estimated market value of debt of $7.57 billion instead of the book value would lower LVS's multiple to about 10 times EBITDA.

Considering the Possibility of Distress Explicitly

One of the adaptations that we suggested for discounted cash flow valuation was an explicit assessment of default risk and a firm value that was a weighted estimate of a going concern value and a distress sale value. For a distressed firm in a sector where the average firm is healthy, this approach offers promise. We can estimate the value of the distressed firm using the comparable firms and consider it the going concern value. For instance, if healthy firms in the business trade at 2 times revenues, we would multiple the firm's revenues by 2 to arrive at the going concern value. We could then estimate the firm value as follows:

Firm Value = Going concern relative value * $(1-\pi_{Distress})$ + Distress sale value * $\pi_{Distress}$

The probability of distress and the distress sale value would be estimated just as they were in the last section. This approach makes the most sense when valuing a firm that is distressed in a sector containing mostly healthy firms, since the prior two approaches could not be used here.

In some cases, we may have to use forecasted values for revenues and operating income to arrive at the going concern value, especially if current revenues and operating income are adversely impacted by the overhang of distress.

Illustration 12.14: Forward Multiples and Distress

Consider the forecasts of revenues and EBIT made in table 12.7 for Las Vegas Sands. While the firm is not generating a large operating income currently, we are

anticipating an improvement in margins and growth in revenues, resulting in an expected operating income of $1,696 million in year 10; adding the expected depreciation charge of $572 million to this value yields an expected EBITDA of 2,268 million.[31] Using the average enterprise value/EBITDA multiple of 8.25 at which healthy casino firms trade, we can estimate an expected enterprise value in year 10.[33]

Expected Enterprise value in year 10 = $EBITDA_{10}$ * EV/ $EBITDA_{\text{Current for healthy casino firms}}$

= 2,268 * 8.25 = $18,711 million

We can estimate the present value of this estimated value by discounting back at Las Vegas Sand's cumulated cost of capital, computed earlier in illustration 12.6 to be 2.4433.

Enterprise value today = 18,711/2.4433 = $7,658 million

This, of course, is based upon the assumption that Las Vegas Sands will become a healthy firm. Using the probability of survival (23.34%) and distress (76.66%) estimated earlier, we can value LVS's operating assets today:

Estimated Enterprise Value

= Going Concern Value ($\pi_{\text{Going Concern}}$) + Distress Sale Value (1 - $\pi_{\text{Going Concern}}$)

= 7,658(.2334) + 2769 (.7666) = $ 3,910 million

Note that the estimate of the distress sale value of $2,769 million was made earlier in illustration 17.2. By ignoring the cash flows over the next 10 years, we are also significantly understating the value of LVS, as a going concern.[34] Adding back the cash balance of the firm ($ 3,040 million) and subtracting out debt ($ 7.565 million) yields a value for the equity:

Enterprise Value	= $ 3,910 million
+ Cash & Marketable Securities	= $ 3,040 million
- Debt	= $7,565 million
Value of Equity	= -$ 605 million

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[31] While we have not explicitly forecast depreciation, the depreciation in the current year is $ 509 million and the book capital invested in year 10 is about 25% higher than today's book capital. We scaled up depreciation by the same proportion.

[33] We defined healthy casino firms as those with market debt ratios lower than 50%.

[34] We could always add back the present value of cash flows, but if we do, we are mixing up intrinsic and relative valuations.

Effectively, the value per share would be zero. It is only if we use the lower probability of distress, estimated from the bond rating, that we get a positive value for equity.

Conclusion

Looking across the life cycle, it is the firms at either end of the life cycle that seem to pose the most valuation challenges, and sometimes for the same reasons. If the question with young firms is whether they will survive to become profitable businesses, a key issue with declining firms is whether they will survive deteriorating operations and large debt obligations and emerge as going concerns.

In this chapter, we looked at the interplay between decline and distress to develop a framework for valuing declining companies. When decline is irreversible, but distress is not imminent, we argued for valuing the firm twice, once as a going concern and once in an orderly liquidation, and using the higher of the two numbers. When the decline is attributable to poor management and thus reversible, and no distress overhanging the firm, we again argued for two valuations, once with existing management and once with better management, and estimated an expected value, based upon the probability of management change.

When distress is a distinct possibility, we have three choices. In the first, we can develop probability distributions for key variables and run simulations, with distress built into the process. In the second, we can try to adjust the expected cash flows and discount rates in a valuation to reflect the probability of distress occurring and the resulting cash flows. In the third, we value the firm as a going concern and then adjust for the likelihood of distress separately. The contrast here between reversible and irreversible decline shows up in two places with distressed firms. One is that the proceeds from a distress sale are likely to be higher for the first group, where buyers see a potential for turnaround for the assets, than for the second group. The other is that equity in distressed firms with the potential for a turnaround can have option characteristics.