Chapter Three

Yes, Virginia, Every Asset Has an Intrinsic Value

Determining Intrinsic Value

IMAGINE YOU ARE AN INVESTOR LOOKING to invest in a share of 3M (MMM), a firm that delivers a wide range of products that cater to the office and business market. Based upon the information that you have on the company right now, you could estimate the expected cash flows you would get from this investment and assess the

risk in those cash flows. Converting these expectations into an estimate of the value of 3M is the focus of this chapter.

Value the Business or Just the Equity?

In discounted cash flow valuation, you discount expected cash flows back at a risk-adjusted rate. When applied in the context of valuing a company, one approach is to value the entire business, with both existing investments and growth assets; this is often termed *firm or enterprise valuation*. The other approach is to focus on valuing just the equity in the business. Table 3.1 frames the two approaches in terms of the financial balance items introduced in Chapter 2.

Table 3.1 Valuation Choices

	Measure	Explanation
	Assets in place	
+	Growth assets	
=	Value of business	To value the entire business, discount the cash flows before debt payments (cash flow to the firm) by overall cost of financing, including both debt and equity (cost of capital).
–	Debt	From the value of the business, subtract out debt to get to equity.
=	Value of equity	To value equity directly, discount the cash flows left over after debt payments (cash flows to equity) at the cost of equity.

Put in the context of the question of whether you should buy shares in 3M, here are your choices. You can value 3M as a business and subtract out the debt the company owes to get to the value of its shares. Or, you can value the equity in the company directly, by focusing on the cash flows 3M has left over after debt payments and adjusting for the risk in the stock. Done right, both approaches should yield similar estimates of value per share.

Inputs to Intrinsic Valuation

There are four basic inputs that we need for a value estimate: cash flows from existing assets (net of reinvestment needs and taxes); expected growth in these cash flows for a forecast period; the cost of financing the assets; and an estimate of what the firm will be worth at the end of the forecast period. Each of these inputs can be defined either from the perspective of the firm or just from the perspective of the equity investors. We will use 3M to illustrate each measure, using information from September 2008.

Cash Flows

The simplest and most direct measure of the cash flow you get from the company for buying its shares is dividends paid; 3M paid $1.38 billion in dividends in 2007.

One limitation of focusing on dividends is that many companies have shifted from dividends to stock buybacks as their mechanism for returning cash to stockholders. One simple way of adjusting for this is to *augment the dividend* with stock buybacks and look at the cumulative cash returned to stockholders.

Augmented dividends = Dividends + Stock buybacks

Unlike dividends, stock buybacks can spike in some years and may need to be averaged across a few years to arrive at more reasonable annualized numbers. In 2007, 3M bought back $3.24 billion in stock; adding this amount to the dividend of $1.38 billion results in augmented dividends of $4.62 billion.

With both dividends and augmented dividends, we are trusting managers at publicly traded firms to pay out to stockholders any excess cash left over after meeting operating and reinvestment needs. However, we do know that managers do not always follow this practice, as evidenced by the large cash balances that you see at most publicly traded firms. To estimate what managers could have returned to equity investors, we develop a measure of potential dividends that we term the *free cash flow to equity*. Intuitively, the free cash flow to equity measures the cash left over after taxes, reinvestment needs, and

debt cash flows have been met. Its measurement is laid out in Table 3.2.

To measure reinvestment, we will first subtract depreciation from capital expenditures; the resulting *net capital expenditure* represents investment in long-term assets. To measure what a firm is reinvesting in its short-term assets (inventory, accounts receivable, etc.), we look at the

Table 3.2 From Net Income to Potential Dividend (or Free Cash Flow to Equity)

	Measure	Explanation
	Net income	Earnings to equity investors, after taxes and interest expenses.
+	Depreciation	Accounting expense (reduced earnings), but not a cash expense.
–	Capital expenditures	Not an accounting expense, but still a cash outflow.
–	Change in non-cash working capital	Increases in inventory and accounts receivable reduce cash flows, and increases in accounts payable increase cash flows. If working capital increases, cash flow decreases.
–	(Principal repaid – New debt issues)	Principal repayments are cash outflows but new debt generates cash inflows. The net change affects cash flows to equity.
=	Potential dividend, or FCFE	This is the cash left over after all needs are met. If it is positive, it represents a potential dividend. If it is negative, it is a cash shortfall that has to be covered with new equity infusions.

change in noncash working capital. Adding the net capital expenditures to the *change in non-cash working capital* yields the *total reinvestment*. This reinvestment reduces cash flow to equity investors, but it provides a payoff in terms of future growth. For 3M, in 2007, the potential dividend, or Free Cash Flow to Equity (FCFE), can be computed as follows:

	Net income	=	$ 4,010 million
−	Net capital expenditures	=	$ 889 million
−	Change in working capital	=	$ 243 million
+	New debt issued	=	$ 1,222 million
=	FCFE	=	$ 4,100 million

3M reinvested $1,132 million ($889 + $243) in 2007, and the potential dividend is $4.1 billion. A more conservative version of cash flows to equity, which Warren Buffett calls "owners' earnings," ignores the net cash flow from debt. For 3M, the owner's earnings in 2007 would have been $2,878 million.

The cash flow to the firm is the cash left over after taxes and after all reinvestment needs have been met, but before interest and principal payments on debt. To get to cash flow to the firm, you start with operating earnings, instead of net income, and subtract out taxes paid and

reinvestment, defined exactly the same way it was to get to free cash flow to equity:

Free cash flow to firm (FCFF) = After-tax operating income − (Net Capital expenditures + Change in non-cash working capital)

Using our earlier definition of reinvestment, we can also write the FCFF as follows:

$$\text{Reinvestment rate} = \frac{(\text{Net Capital expenditure} + \text{Change in non-cash working capital})}{\text{After-tax operating income}}$$

Free cash flow to the firm = After-tax operating income (1 − Reinvestment rate)

The reinvestment rate can exceed 100 percent,* if the firm is reinvesting more than it is earning, or it can also be less than zero, for firms that are divesting assets and shrinking capital. Both FCFE and FCFF are after taxes and reinvestment and both can be negative, either because a firm has negative earnings or because it has reinvestment needs that exceed income. The key difference is that the FCFE is after debt cash flows and the

*In practical terms, this firm will have to raise either new debt or new equity to cover the excess reinvestment.

FCFF is before. 3M's FCFF in 2007 is computed as follows:

	Operating income after taxes	=	$3,586 million
−	Net capital expenditures	=	$ 889 million
−	Change in working capital	=	$ 243 million
=	FCFF	=	$2,454 million

This represents cash flows from operations for 3M in 2007.

Risk

Cash flows that are riskier should be assessed a lower value than more stable cash flows. In conventional discounted cash flow valuation models, we use higher discount rates on riskier cash flows and lower discount rates on safer cash flows. The definition of risk will depend upon whether you are valuing the business or just the equity. When valuing the business, you look at the risk in a firm's operations. When valuing equity, you look at the risk in the equity investment in this business, which is partly determined by the risk of the business the firm is in and partly by its choice on how much debt to use to fund that business. The equity in a safe business can become risky,

if the firm uses enough debt to fund that business. In discount rate terms, the risk in the equity in a business is measured with the cost of equity, whereas the risk in the business is captured in the cost of capital. The latter will be a weighted average of the cost of equity and the cost of debt, with the weights reflecting the proportional use of each source of funding.

There are three inputs needed to estimate a cost of equity: a risk-free rate and a price for risk (equity risk premium) to use across all investments, as well as a measure of relative risk (beta) in individual investments.

- *Risk-free rate:* Since only entities that cannot default can issue risk-free securities, we generally use 10- or 30-year government bonds rates as risk-free rates, implicitly assuming that governments don't default.
- *Equity risk premium (ERP):* This is the premium investors demand on an annual basis for investing in stocks instead of a risk-free investment, and it should be a function of how much risk they perceive in stocks and how concerned they are about that risk. To estimate this number, analysts often look at the past; between 1928 and 2010, for instance, stocks generated 4.31 percent more, on an annual basis, than treasury bonds. An alternative is to back out a forward-looking premium (called an implied equity

risk premium) from current stock price levels and expected future cash flows. In January 2011, the implied equity risk premium in the United States was approximately 5 percent.

- *Relative risk or beta:* To estimate the beta, we generally look at how much a stock has moved in the past, relative to the market: In statistical terms, it is the slope of a regression of returns on the stock (say, 3M) against a market index (such as the S&P 500). As a consequence, the beta estimates that we obtain will always be backward looking (since they are derived from past data) and noisy (since they are estimated with error). One solution is to replace the regression beta with a sector-average beta, if the firm operates in only one business or a weighted average of many sector betas if the firm operates in many businesses. The sector beta is more precise than an individual regression beta because averaging across many betas results in averaging out your mistakes.

In September 2008, the risk-free rate was set to the 10-year Treasury bond rate of 3.72 percent, the equity risk premium (ERP) was estimated to be 4 percent, and the beta for 3M was obtained by looking at the businesses in which 3M operated, as shown in Table 3.3.

Table 3.3 Estimating a Beta for 3M

Business	Estimated Value to 3M	Proportion of Firm	Sector Beta
Industrial & Transportation	$8,265	27.42%	0.82
Health Care	$7,261	24.09%	1.40
Display & Graphics	$6,344	21.04%	1.97
Consumer & Office	$2,654	8.80%	0.99
Safety, Security, & Protection	$3,346	11.10%	1.16
Electro & Communications	$2,276	7.55%	1.32
3M as a firm	$30,146	100.00%	1.29

The value of each of 3M's businesses is estimated from the revenues that 3M reported for that business in 2007, and multiples of those revenues are estimated by looking at what other firms in the business trade at. The resulting beta is 1.29 and the cost of equity is 9.16 percent:

$$\text{Cost of equity} = \text{Risk-free rate} + \text{Beta} * \text{ERP}$$
$$= 3.72\% + 1.29 * 4\% = 9.16\%$$

While equity investors receive residual cash flows and bear the risk in those cash flows, lenders to the firm face the risk that they will not receive their promised payments—interest expenses and principal repayments. It is to cover this default risk that lenders add a *default spread* to the riskless rate when they lend money to firms; the greater the perceived risk of default, the greater the default spread and the cost of debt. To estimate this default spread, you

can use a bond rating for the company, if one exists, from a ratings agency such as S&P or Moody's. If there is no published bond rating, you can estimate a "synthetic" rating for the firm, based on the ratio of operating income to interest expenses (interest coverage ratio); higher interest coverage ratios will yield higher ratings and lower interest coverage ratios. Once you have a bond rating, you can estimate a default spread by looking at publicly traded bonds with that rating. In September 2008, we computed an interest coverage ratio of 23.63 for 3M:

$$\text{Interest coverage ratio} = \frac{\text{Operating income}}{\text{Interest expenses}} = \frac{\$5,361}{\$227} = 23.63$$

With this coverage ratio, we see little default risk in the company and give it a rating of AAA, translating into a default spread of 0.75 percent in September 2008.

The final input needed to estimate the cost of debt is the tax rate. Since interest expenses save you taxes at the margin (on your last dollars of income), the tax rate that is relevant for this calculation is the tax rate that applies to those last dollars or the marginal tax rate. In the United States, where the federal corporate tax rate is 35 percent and state and local taxes add to this, the marginal tax rate for corporations in 2008 was close to 40 percent. Bringing

together the risk-free rate (3.72 percent), the default spread (0.75 percent), and the marginal tax rate of 40 percent, we estimate an after-tax cost of debt of 2.91 percent for 3M:

$$\begin{aligned}\text{After-tax cost of debt} &= (\text{Risk-free rate} + \text{Default spread}) \\ &\times (1 - \text{Marginal tax rate}) \\ &= (3.72\% + 0.75\%)\,(1 - .40) = 2.91\%\end{aligned}$$

Once you have estimated the costs of debt and equity, you estimate the weights for each, based on market values (rather than book value). For publicly traded firms, multiplying the share price by the number of shares outstanding will yield market value of equity. Estimating the market value of debt is usually a more difficult exercise, since most firms have some debt that is not traded and many practitioners fall back on using book value of debt. Using 3M again as our illustrative example, the market values of equity ($57 billion) and debt ($5.3 billion), and our earlier estimates of cost of equity (9.16 percent) and after-tax cost of debt (2.91 percent), result in a cost of capital for the firm of 8.63 percent.

$$\begin{aligned}\text{Cost of capital} &= 9.16\%\ (57/(57+5.3)) + 2.91\%\ (5.3/(57+5.3)) \\ &= 8.63\%\end{aligned}$$

When valuing firms, we have a follow up judgment to make in terms of whether these weights will change or remain stable. If we assume that they will change, we have

to specify both what the target mix for the firm will be and how soon the change will occur.

Growth Rates

When confronted with the task of estimating growth, it is not surprising that analysts turn to the past, using growth in revenues or earnings in the recent past as a predictor of growth in the future. However, the historical growth rates for the same company can vary, depending upon computational choices: how far back to go, which measure of earnings (net income, earnings per share, operating income) to use, and how to compute the average (arithmetic or geometric). With 3M, for instance, the historical growth rates range from 6 percent to 12 percent, depending upon the time period (1, 5, or 10 years) and earnings measure (earnings per share, net income, or operating income) used. Worse still, studies indicate that the relationship between past and future growth for most companies is a very weak one, with growth dropping off significantly as companies grow and revealing significant volatility from period to period.

Alternatively, you can draw on "experts" who know the firm better than you do—equity research analysts who have tracked the firm for years, or the managers in the firm—and use their estimates of growth. On the plus side, these forecasters should have access to better information than

most investors do. On the minus side, neither managers nor equity research analysts can be objective about the future; managers are likely to overestimate their capacity to generate growth and analysts have their own biases. Studies indicate that analyst and management estimates of future growth, especially for the long term, seem just as flawed as historical growth rates.

If historical growth and analyst estimates are of little value, what is the solution? Ultimately, for a firm to grow, it has to either manage its existing investments better (efficiency growth) or make new investments (new investment growth). To capture efficiency growth, you want to measure the potential for cost cutting and improved profitability. It can generate substantial growth in the near term, especially for poorly run mature firms, but not forever. To measure the growth rate from new investments, you should look at how much of its earnings a firm is reinvesting back in the business and the return on these investments. While reinvestment and return on investment are generic terms, the way in which we define them will depend upon whether we are looking at equity earnings or operating income. With equity earnings, we measure reinvestment as the portion of net income not paid out as dividends (retention ratio) and use the return on equity to measure the quality of investment. With operating income, we measure reinvestment as the reinvestment rate and use the return on capital

to measure investment quality. In Table 3.4, we estimate the fundamental growth for 3M in September 2008.

The fundamental growth rate of 7.5 percent, estimated for 3M, reflects expectations about how much and how well the firm will reinvest in the future. We estimate the expected cash flows to 3M for the next five years in Table 3.5, using a 7.5 percent growth rate in operating income and a reinvestment rate of 30 percent.

Terminal Value

Publicly traded firms can, at least in theory, last forever. Since we cannot estimate cash flows forever, we generally

Table 3.4 Estimating Fundamental Growth for 3M

Growth in earnings	=	Proportion invested	×	Return on investment
Operating income 7.5%	=	Reinvestment rate 30%	×	Return on capital 25%
Net income 7.5%	=	Retention ratio 25%	×	Return on equity (ROE) 30%

Table 3.5 Expected Free Cash Flow to Firm for 3M

		Current	Year 1	Year 2	Year 3	Year 4	Year 5
	After-tax operating income	$3,586	$3,854	$4,144	$4,454	$4,788	$5,147
−	Reinvestment (30% of income)		$1,156	$1,243	$1,336	$1,437	$1,544
=	FCFF		$2,698	$2,900	$3,118	$3,352	$3,603

impose closure in valuation models by stopping our estimation of cash flows sometime in the future and then computing a terminal value that reflects estimated value at that point. The two legitimate ways of estimating terminal value are to estimate a liquidation value for the assets of the firm, assuming that the assets are sold in the terminal year, or to estimate a going concern value, assuming that the firm's operations continue.

If we assume that the business will be ended in the terminal year and that its assets will be liquidated at that time, we can estimate the proceeds from the liquidation, using a combination of market-based numbers (for assets such as real estate that have ready markets) and estimates. For firms that have finite lives and marketable assets, this represents a fairly conservative way of estimating terminal value.

If we treat the firm as a going concern at the end of the estimation period, we can estimate the value of that concern by assuming that cash flows will grow at a constant rate forever afterwards. This perpetual growth model draws on a simple present value equation to arrive at terminal value:

$$\text{Terminal value in year } n = \frac{\text{Cash flow in year } (n+1)}{\text{Discount rate} - \text{Perpetual growth rate}}$$

The definitions of cash flow and growth rate have to be consistent with whether we are valuing dividends, cash

flows to equity, or cash flows to the firm; the discount rate will be the cost of equity for the first two and the cost of capital for the last. Since the terminal value equation is sensitive to small changes and thus ripe for abuse, there are three key constraints that should be imposed on its estimation: First, no firm can grow forever at a rate higher than the growth rate of the economy in which it operates. In fact, a simple rule of thumb on the stable growth rate is that it should not exceed the risk-free rate used in the valuation; the risk-free rate is composed of expected inflation and a real interest rate, which should equate to the nominal growth rate of the economy in the long term. Second, as firms move from high growth to stable growth, we need to give them the characteristics of stable growth firms; as a general rule, their risk levels should move towards the market (beta of one) and debt ratios should increase to industry norms. Third, a stable growth firm should reinvest enough to sustain the assumed growth rate. Given the relationship between growth, reinvestment rate, and returns that we established in the section on expected growth rates, we can estimate this reinvestment rate:

$$\text{Reinvestment Rate} = \frac{\text{Expected growth rate in operating (net income)}}{\text{Return on capital (equity)}}$$

Thus, the effect on the terminal value of increasing the growth rate will be partially or completely offset by

the loss in cash flows because of the higher reinvestment rate. Whether value increases or decreases as the stable growth rate increases will entirely depend upon what you assume about the return on investment. If the return on capital (equity) is higher than the cost of capital (equity) in the stable growth period, increasing the stable growth rate will increase value. *If the return on capital is equal to the stable period cost of capital, increasing the stable growth rate will have no effect on value.* The key assumption in the terminal value computation is not what growth rate you use in the valuation, but what excess returns accompany that growth rate. There are some analysts who believe that zero excess return is the only sustainable assumption for stable growth, since no firm can maintain competitive advantages forever. In practice, though, firms with strong and sustainable competitive advantages can maintain excess returns, though at fairly modest levels, for very long time periods.

Using 3M, we assumed that the firm would be in stable growth after the fifth year and grow 3 percent a year forever (set at the risk-free rate). As the growth declines after year five, the beta is adjusted towards one and the debt ratio is raised to the industry average of 20 percent to reflect the overall stability of the company. Since the cost of debt is relatively low, we leave it unchanged, resulting in a drop in the cost of capital to 6.76 percent.

The reinvestment rate in stable growth is changed to reflect the assumption that there will be no excess returns in stable growth (return on capital = cost of capital = 6.76%).

$$\text{Reinvestment Rate in stable growth} = \frac{3\%}{6.76\%} = 44.40\%$$

The resulting terminal value at the end of year five is $78,464 million. (The after-tax operating income in year 6 is obtained by growing the income in year 5 by 3 percent.)

$$\frac{\text{After tax operating income in year 6 } (1 - \text{Reinvestment rate})}{\text{Cost of capital} - \text{Expected growth rate}}$$

$$= \frac{5{,}147(1.03)(1-.444)}{.0676-.03} = \$78{,}464$$

Discounting this terminal value and the cash flows from Table 3.3 at the cost of capital of 8.63 percent yields a value of $64,291 million for operating assets:

$$\frac{2698}{1.0863} + \frac{2900}{1.0863^2} + \frac{3118}{1.0863^3} + \frac{3352}{1.0863^4} + \frac{(3603+78464)}{1.0863^5} = \$64{,}291$$

Tying Up Loose Ends

Discounting cash flows at the risk-adjusted rates gives an estimate of value, but how do you get to value per share?

If you discounted dividends or free cash flows to equity on a per-share basis at the cost of equity, you have your estimate of value per share. If you discounted cash flows to the firm, you have four adjustments to make to get to value per share:

1. *Add back the cash balance of the firm:* Since free cash flow to the firm is based upon operating income, you have not considered the income from cash or incorporated it into value.
2. *Adjust for cross holdings:* Add back the values of small (minority) holdings that you have in other companies; the income from these holdings was not included in your cash flow. If you have a majority stake in another company, the requirement that you consolidate and report 100 percent of the subsidiary's operating income as your own will create *minority interests*, the accounting estimate of the portion of the subsidiary that does not belong to you. You have to subtract out the estimated market value of the minority interest from your consolidated firm value.
3. *Subtract other potential liabilities:* If you have underfunded pension or health care obligations or ongoing lawsuits that may generate large liabilities, you have to estimate a value and subtract it out.

4. *Subtract the value of management options:* When companies give options to employees, analysts often use short cuts (such as adjusting the number of shares for dilution) to deal with these options. The right approach is to value the options (using option pricing models), reduce the value of equity by the option value, and then divide by the actual number of shares outstanding.

With 3M, we add the cash balance to, and subtract out the debt and the estimated value of management options from the value of the operating assets to generate a value of equity for 3M of $60,776 million.

$$\text{Value of 3M equity} = \text{Value of operating assets} + \text{Cash} - \text{Debt} - \text{Management options}$$
$$= \$64{,}291 + \$3{,}253 - \$5{,}297 - \$1{,}216 = \$60{,}776 \text{ million}$$

If you divide by 699 million—the number of shares outstanding at the time—the result is a value of $86.95 per share.

What Do These Models Tell Us?

What if the intrinsic value that you derive, from your estimates of cash flows and risk, is very different from the market price? There are three possible explanations.

One is that you have made erroneous or unrealistic assumptions about a company's future growth potential or riskiness. A second and related explanation is that you have made incorrect assessments of risk premiums for the entire market. A third is that the market price is wrong and that you are right in your value assessment. Even in the last scenario, there is no guarantee that you can make money from your valuations. For that to occur, markets have to correct their mistakes and that may not happen in the near future. In fact, you can buy stocks that you believe are undervalued and find them become more undervalued over time. That is why a long time horizon is almost a prerequisite for using intrinsic valuation models. Giving the market more time (say three to five years) to fix its mistakes provides better odds than hoping that it will happen in the next quarter or the next six months.

The intrinsic value per share of $86.95 that we derived for 3M in September 2008 was higher than the stock price of $80 at the time. While the stock looks undervalued, the degree of undervaluation (less than 10 percent) is well within the margin of error in the valuation. Hence, I did not feel the urge to buy at the time. A few months later, I revalued the firm at $72, when the stock was trading at $54, and did buy its stock.

It's All in the Intrinsic Value!

The intrinsic value of a company reflects its fundamentals. Estimates of cash flows, growth, and risk are all embedded in that value, and it should have baked into it all of the other qualitative factors that are often linked to high value, such as a great management team, superior technology, and a long-standing brand name. There is no need for garnishing in a well-done intrinsic valuation.

Chapter Four

It's All Relative!

Determining Relative Value

IF DELL (DELL) IS TRADING AT 17 TIMES EARNINGS, Apple (AAPL) has a PE ratio of 21, and Microsoft (MSFT) is priced at 11 times earnings, which stock offers the best deal? Is Dell cheaper than Apple? Is Microsoft a bargain compared to both Apple and Dell? Are they even similar companies? Relative valuation is all about comparing how the market prices different companies, with the intent of finding bargains.

In relative valuation, you value an asset based on how similar assets are priced in the market. A prospective