SHOOTING STARS? GROWTH COMPANIES

In the last chapter, we looked at the estimation challenges associated with valuing young and idea companies. One of the issues that we confronted was the question of survival, since many young companies fail early in their lives. But what about those firms that make it through the test of competition and become successful businesses? In this chapter, we will look at a sub-set of these firms that become growth companies. A few of these firms stay private, but many of them enter public markets, partly because of their need for capital and partly to allow owners to cash in on their success.

In this chapter, we will examine the issues that we face when valuing growth companies. Many of the concerns that we had with young companies – short and volatile operating histories, uncertainty about future growth and changing risk profiles – remain problems when we value growth companies, especially in their initial phases, though the data and tools that we have to deal with them do become better. They will be joined by new concerns about how growth rates may change, as companies get larger, and how access and exposure to public capital markets will change financing and investment decisions at the firm.

Growth companies

Companies at every stage of the life cycle aspire to be growth companies. The young idea businesses in the last chapter hope to make it through the rigors of the market place to become growth companies and mature firms keep trying to reinvent themselves as growth companies. In this section, we look at the reason for this appeal and the role that growth companies play in the economy and in public markets.

A Life cycle view of growth companies

While investors and managers often talk about growth and mature companies as distinct groups, the differences are hazier in the real world. So, what is a growth company? There are many definitions for growth companies used in practice but they all tend to be both subjective and have significant flaws.
a. **Sector based measures**: Many analysts categorize companies as growth companies or mature companies, based upon the sector that they operate in. Thus, technology companies in the United States are treated as growth companies, whereas steel companies are considered mature. This definition clearly misses the vast differences in growth prospects across companies within any given sector. Technology companies like Intel and Microsoft may be more mature businesses than growth businesses, at this stage of their corporate evolution.

b. **Analyst Growth Estimates/ Growth history**: A second categorization of companies into growth and mature companies is based upon expected growth in future earnings, based usually on forecasts by equity research analysts. In the absence of forecasted growth, some services use past growth in earnings as the growth measure. In both cases, firms that have high growth rates are considered growth companies; how high is both a matter of judgment and overall market growth. For instance, if earnings for the entire market are growing at 10% a year, companies may need to deliver 25% growth to be considered growth companies. With market earnings growth of only 5%, a 15% growth rate in earnings may qualify a company as a growth company. The limits of this approach are that it is circumscribed by its focus on earnings, as opposed to revenues or units sold. After all, there are many young high growth companies that may have exponential growth in revenues, while losing money. Similarly, mature companies can post healthy earnings increases with improved efficiency and relatively little operating unit growth.

c. **Market based measures**: Morningstar, as part of its mutual fund tracking service, categorizes mutual funds into those investing in growth stocks and those investing in mature companies. They base their categorization on the market multiples that companies trade at, arguing that companies that are perceived to be growth companies will trade at higher multiples of earnings, revenues and book value than mature companies. Given that our focus in valuation is to make the judgment on whether markets are pricing stocks correctly, this process seems to work backwards, by implicitly assuming that the market is right.
All three definitions – industry groupings, earnings growth and market multiples – will lead to miscategorization. While we do not have a perfect alternative, we would suggest using the financial balance sheet that we introduced in the earlier chapters to make this judgment. In figure 10.1, we focus on the asset side of the financial balance sheet, where assets are broken down into existing investments and growth assets.

**Figure 10.1: A Financial Balance Sheet for a Business**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Investments</td>
<td>Mature companies get most of their value from existing assets.</td>
</tr>
<tr>
<td>Generate cashflows today</td>
<td>Debt</td>
</tr>
<tr>
<td>Investments already made</td>
<td></td>
</tr>
<tr>
<td>Expected Value that will be created by future investments</td>
<td>Growth companies derive a significant proportion of their value from growth assets.</td>
</tr>
<tr>
<td>Investments yet to be made</td>
<td>Equity</td>
</tr>
</tbody>
</table>

Growth firms get a significant portion of their value from growth assets, i.e., investments that they expect to make in the future. While this may seem like a restatement of the growth categorization described earlier, where firms with high growth rates are treated as growth companies, there is an important difference. As we noted in chapter 2, the value of growth assets is a function of not only how much growth is anticipated but also the excess returns that accompany that growth. Specifically, growth investments have no value if the firm earns a return on capital equal to the cost of capital on these investments. The problem with this categorization is that it can be made only after you value a company, since you need to assess the fundamentals of a company (prospective returns on new investments and cost of capital) to make the judgment.

No matter how we decide to categorize companies into growth and mature businesses, we still think about growth in terms of the life cycle of a firm. Chapter 9 was our attempt to value firms in their infancy, at the earliest stages of the life cycle. The firms in this chapter have made it through perhaps the most difficult part of the lifecycle, and are reaping some of the benefits of surviving the early phase. Since the growth phase can extend over many years, the companies that we will consider in this chapter will be diverse. Some will be small and risky and bear resemblances to the young firms that we
analyzed in chapter 9. Others will be further along the growth cycle and share more in common with mature firms that we will be valuing in chapter 11 than young firms.

Growth companies play a key role in any economy, with an impact that is often larger than their economic output. Growth companies collectively may account for a smaller portion of the real economy (output and employment) than mature companies, but they are the engines for economic growth because they account for a much larger proportion of changes in the real economy over time. In the United States, for instance, where traditional manufacturing has retreated from its central role, much of the growth in employment and economic output the last two decades has come from technology and health care businesses, many of which would be categorized as growth companies.

Finally, if we look at publicly traded companies, the proportion of overall market value that is accounted for growth companies will be much higher than the proportion of the real economy that they account for. The disparity between market value and current operating assets will depend upon a number of factors including the level of interest rates, risk premiums and optimism about future economic growth. In early 2000, at the peak of the technology boom, technology companies represented almost 35% of the overall market capitalization of S&P 500. One year later, after the collapse in the sector, technology stocks accounted for only 17% of the overall index.

Characteristics of growth companies

Growth companies are diverse in size, growth prospects and can be spread out over very different businesses but they share some common characteristics that make an impact on how we value them. In this section, we will look at some of these shared features:

1. Dynamic financials: Much of the information that we use to value companies comes from their financial statements (income statements, balance sheets and statements of cash flows). One feature shared by growth companies is that the numbers in these statements are in a state of flux. Not only can the numbers for the latest year be very different from numbers in the prior year, but can change dramatically even over shorter time periods. For many smaller, high growth firms, for instance, the revenues and earnings from the most recent four quarters can be
dramatically different from the revenues and earnings in the most recent fiscal year (which may have ended only a few months ago).

2. **Private and Public Equity:** It is accepted as conventional wisdom that the natural path for a young company that succeeds at the earliest stages is to go public and tap capital markets for new funds. There are three reasons why this transition is neither as orderly nor as predictable in practice. The first is that the private to public transition will vary across different economies, depending upon both institutional considerations and the development of capital markets. Historically, growth companies in the United States have entered public markets earlier in the life cycle than growth companies in Europe, partly because this is the preferred exit path for many venture capitalists in the US. The second is that even within any given market, access to capital markets for new companies can vary across time, as markets ebb and flow. In the United States, for instance, initial public offerings increase in buoyant markets and drop in depressed markets; during the market collapse in the last quarter of 2008, initial public offerings came to a standstill. The third is that the pathway to going public varies across sectors, with companies in some sectors like technology and biotechnology getting access to public markets much earlier in the life cycle than firms in other sectors such as manufacturing or retailing. The net effect is that the growth companies that we cover in chapter will draw on a mix of private equity (venture capital) and public equity for their equity capital. Put another way, some growth companies will be private businesses and some will be publicly traded; many of the latter group will still have venture capitalists and founders as large holders of equity.

3. **Size disconnect:** The contrast we drew in chapter 1 between accounting and financial balance sheets, with the former focused primarily on existing investments and the latter incorporating growth assets into the mix is stark in growth companies. The market values of these companies, if they are publicly traded, are often much higher than the accounting (or book) values, since the former incorporate the value of growth assets and the latter often do not. In addition, the market values can seem discordant with the operating numbers for the firm – revenues and earnings. Many growth firms that have market values in
the hundreds of millions or even in the billions can have small revenues and negative earnings. Again, the reason lies in the fact that the operating numbers reflect the existing investments of the firm and these investments may represent a very small portion of the overall value of the firm.

4. **Use of debt:** While the usage of debt can vary across sectors, the growth firms in any business will tend to carry less debt, relative to their value (intrinsic or market), than more stable firms in the same business, simply because they do not have the cash flows from existing assets to support more debt. In some sectors, such as technology, even more mature growth firms with large positive earnings and cash flows are reluctant to borrow money. In other sectors, such as telecommunications, where debt is a preferred financing mode, growth companies will generally have lower debt ratios than mature companies.

5. **Market history is short and shifting:** We are dependent upon market price inputs for several key components of valuation and especially so for estimating risk parameters (such as betas). Even if growth companies are publicly traded, they tend to have short and shifting histories. For example, an analyst looking at Google in early 2009 would have been able to draw on about 4 years of market history (a short period) but even those 4 years of data may not be particularly useful or relevant because the company changed dramatically over that period – from revenues in millions to revenues in billions, operating losses to operating profits and from a small market capitalization to a large one.

While the degree to which these factors affect growth firms can vary across firms, they are prevalent in almost every growth firm.

**Valuation Issues**

The shared characteristics of growth firms – dynamic financials, a mix of public and private equity, disconnects between market value and operating data, a dependence on equity funding and a short and volatile market history – have consequences for both intrinsic and relative valuations.
Intrinsic (DCF) Valuation

If the intrinsic value of a company comes from its cash flows and risk characteristics, there are problems that we will run into while valuing growth companies that can be traced back to where they are in the life cycle. In this section, we will break down the valuation issues specific to growth companies by the key components of intrinsic value – existing asset value, growth asset value, risk (discount rates), terminal value and equity value per share.

Existing Assets

To value existing assets, we start with the cash flows generated by these assets and discount back at an appropriate risk-adjusted rate. There are two considerations that come into play that can make this measurement complicated.

1. **Poorly measured earnings**: With growth firms, existing assets tend to be a small part of overall value and can be easily swamped by what a firm expends to sustain and nurture its growth assets. Consider, for instance, the standard assumption that we make in discounted cash flow valuation that the existing operating income can be attributed to existing assets and thus be the basis for valuing those assets. With any company, the existing operating income (or loss) will be after selling, advertising and other administrative expenses. While we assume that these expenses are associated with existing assets, that assumption may not hold up in a growth company. After all, the sales force in a growth company may be less interested in pushing existing products and more focused on cultivating a customer base for future products. By treating all sales expenses as operating expenses, we are understating the earnings from and consequently the value of existing assets.

2. **Shifting profitability**: If one of the key inputs into value is the measure of the future profitability of the firm, the fact that margins and returns at growth firms change significantly over time can make it difficult to make forecasts. Unlike mature firms, where margins usually move within a narrow range and returns are stable, using past margins and returns to forecast future values for a growth firm may not yield reasonable numbers.
**Growth Assets**

The bulk of a value for a growth company obviously comes from growth assets, making it imperative that we assess the value right. The challenges we face in attaching a reasonable value to growth assets in a growth company can also be daunting:

1. **The scaling effect on growth**: One of the biggest questions that we have to answer about expected growth rates for a company is how they will be affected by the changing size of the company. Consider, for instance, a company that has posted a growth rate of 80% over the last 5 years. The company today is obviously much larger (by a factor of 18) than it was five years ago.\(^1\) It is extremely unlikely that it will be able to maintain an 80% growth rate for the next year, given its larger size. In general, delivering a given growth rate will become more difficult as a company gets bigger.

2. **Success attracts competition**: A small company can operate under the radar and sometimes show exceptional profitability. As the company grows, though, its success will attract attention from larger and more predatory competitors, often possessing more significant resources. This competition, in turn, will result in lower profitability and value for growth.

3. **Macro economic effects**: While all companies are susceptible to macro economic shocks, small companies are more exposed to economic downturns because their products are often niche products that are discretionary. While customers may be inclined to buy them in good book economic times, they are likely to hold back during recessions or economic slowdowns.

Questions about how quickly growth rates will scale down, how profitability will survive competitive assaults and the effects of overall economic growth will have to be answered if we intend to attach a value to growth assets.

---

\(^1\) Applying a compounded growth rate of 80% for five years to $1 results in an end value of almost $19, an overall increase of 1800% over five years.
**Discount Rates**

The two key determinants of discount rates are the risk in the underlying investments of a business and the mix of debt and equity used to fund the business. On both dimensions, growth companies pose a challenge in valuation.

1. **Risk of existing assets versus risk of growth assets**: Since growth companies derive significant value from both growth assets and existing assets, delineating the risk in each category can make a big difference in how we value them. In other words, if growth assets are riskier than existing assets, we should be using higher discount rates for expected cash flows from the former and lower discount rates for cash flows from the latter. However, it is difficult to make this judgment on risk from the historical information, especially using stock price data, since it is for the consolidated firm (and not for existing or growth assets as individual groupings).

2. **Market value versus Book value ratios & volatile market value**: The conventional practice in estimating the weights to use for debt and equity in the cost of capital computation is to use market values for both. With growth firms, we should follow the same practice but the volatility in stock prices can result in weights that are change with the prices. In particular, a drop in the stock price can lead to a much higher debt ratio and potentially a lower cost of capital for a firm; this will strike some as counter intuitive.

3. **Changing risk for the firm over time**: If computing the current risk parameters and debt ratio for a growth firm is difficult, the task is complicated further by a simple fact. On both dimensions, growth firms can be expected to change over time, leading to discount rates that vary across the years. To be more specific, as a firm become larger over time (as it will in future periods, with growth), we should expect existing assets to become a larger proportion of overall value and risk measures to change to reflect the increasing (and more stable) earnings of the firm. Concurrently, the firm’s capacity to borrow money will increase and if it exploits this capacity, its debt ratio will change as well. Generally speaking, the discount rates used to value growth firms should be higher in the earlier periods and decrease in later periods towards mature company levels.
**Terminal Value**

Two key questions that overhang the valuation of any firm relate to when the firm will become a stable growth firm and the characteristics that it will possess in this phase. The answer to the first question will determine the length of the high growth period, with the terminal value being computed on the assumption that growth beyond that point will be sustained forever. The answers to the second question, especially on risk and the returns generated on new investments, will influence the value that we assign to the firm, for any given level of growth. Again while these are estimation issues that arise in any valuation, they can be more problematic for growth companies for the following reasons:

a. **Terminal value is a bigger proportion of value:** Since growth companies generate relatively low cash flows from existing assets, the terminal value will comprise a much larger proportion of their overall value. Thus, the assumptions we make about terminal value will matter more in any assessment of current value for a growth firm than at a mature firm.

b. **More uncertainty about terminal value assumptions:** Concurrent with the terminal value being a larger proportion of the value of a growth company than for a mature firm comes the fact that there is significantly more uncertainty about assessing that value for two reasons. First, we are looking at a young and often untested firm and making our assessments of not only how quickly it will continue to grow but also how it will respond to more aggressive competition. Second, the fact that the firm is evolving makes it difficult to evaluate what market it is aspiring to be in or even who its direct competitors are.

c. **Terminal value characteristics:** Earlier in this section we noted the difficulties we face in arriving at the current cash flows, returns and discount rates for a growth firm. We will be called upon to estimate all of these numbers again, when we put the firm into stable growth, in ten or fifteen years. If we cannot estimate the current cost of capital for a growth firm, it seems unreasonable to believe that we can estimate this and other numbers for the same firm ten or fifteen years in the future.

The irony of terminal value estimation for growth firms is that it is both more important that we get it right and that we have far less basis for making the estimate in the first
place. The way we resolve this contradiction will play a key role in whether the value we arrive at for a growth firm is a reasonable one.

Value of equity per share

To get from the value of the operating assets to the value of equity per share, we generally add the value of cash and cross holdings, subtract out debt and non-equity claims and then divide by the number of shares in the firm. While these steps stay intact for growth companies, there are issues that we will face at each step:

1. **Cash balances and cash burn ratios**: In most firm valuations, we get information on cash balances from financial statements (usually the most recent balance sheet). For growth firms, especially early in the growth phase where reinvestment needs can be substantial, cash balances can be dissipated very quickly. The pace of cash usage, generally termed the “cash burn” rate, can result in a cash balance today (which is when we are valuing the company) that is very different than cash balance on the most recent fiscal statement.

2. **Convertible debt and preferred stock**: When growth firms raise funds from non-equity investors, they seldom use conventional debt – bank loans and straight bonds. More common is the use of the convertible debt, either in the form of bank loans with equity sweeteners or convertible bonds. The key advantage of using hybrids such as these is that interest payments are kept low, in return for providing equity options to lenders. Since it is only debt that should be subtracted out to get to equity values, we should break convertible debt into debt and equity components, with the equity options going into the latter.

3. **Voting and non-voting shares**: Voting and non-voting shares are not unique to growth firms, but they are much more common in these companies than in mature firms. This is largely because these firms are young, and the founders are still not only significantly stockholders but also value being able to control the firms that they have created. One way to maintain control, while raising equity from the general public, is to create two classes of share and to preserve a hold on the company by retaining the voting shares. When estimating the value of equity per share, we will therefore have to determine how (if at all) we will differentiate
between shares with higher voting rights from shares without (or with lower) voting rights.

In summary, getting from the value of operating assets to the value of equity per share can pose a series of roadblocks and diversions with growth firms.

**Relative Valuation**

Many analysts, when confronted with the problems with intrinsic valuation outlined in the earlier section, decide that relative valuation is a much easier path to follow with growth companies. The issues that make discounted cash flow valuation difficult also crop up, not surprisingly, when we do relative valuation.

1. **Comparable firms**: The conventional practice of using other publicly traded companies in the same sector can be dangerous with relative valuation for a few reasons. The first is that a growth company in a mature sector will (and should) bear little or no resemblance on either fundamentals or pricing multiples to the rest of the firms in the sector. The second is that even if every firm in the sector has growth potential, growth firms can vary widely in terms of risk and growth characteristics, thus making it difficult to generalize from industry averages.

2. **Base year values and choice of multiples**: Most multiples are stated as a function of base year values for revenues, earnings and book value. To estimate the PE ratio, for instance, we divide the stock price today by the earnings per share in the most recent fiscal year or four quarters. If a firm is a young firm, the current values for these numbers will bear little resemblance to the future potential for the firm. Using PE ratios to illustrate this point, this can lead to either very high PE ratios (since current earnings per share will be small relative to stock prices today) or not meaningful values (because earnings currently are negative and PE ratios cannot be computed), for many growth companies. Moving up the income statement to EBITDA or revenues offers little solace, since the values for these items will also be low, relative to future potential.

3. **Controlling for growth differences**: Since growth potential is the key dimension on which these firms vary, it becomes critical that we control for growth when comparing firms or extrapolating from industry averages. Unfortunately, the
relationship between growth and value is too complex to lend itself to the simplistic generalizations that make relative valuation so attractive to both analysts and investors. Not only does the level of growth make a difference to value, but so does the length of the growth period and the excess returns that accompany that growth rate. Put another way, two companies with the same expected growth rate in earnings can trade at very different multiples of these earnings, because they vary on other dimensions.

4. **Controlling for risk differences:** Growth and risk are twin variables, with higher values for one generally going with higher values for the other. Determining how the net trade off will affect value is difficult to do in any valuation but becomes doubly so in relative valuation, where many companies have both high growth and high risk. Furthermore, as risk and growth characteristics change over time, as they inevitably will for any growth company, the multiple that we will apply to the company’s operating numbers should also change.

Analysts who use multiples and comparables to value growth firms may feel a false sense of security about their valuations, since their assumptions are often implicit rather than explicit. The reality, though, is that relative valuations yield valuations that are just as subject to error as discounted cash flow valuations.

**The Dark Side of Valuation**

Given the many estimation issues that face us when valuing growth companies, it is not surprising that the dark side of valuation manifests itself in many ways, when analysts value these firms. In this section, we will consider the ways in which valuations of growth firms can be skewed by unrealistic or unreasonable assumptions about the future, first in the context of discounted cash flow valuation and then in relative valuation.

**In discounted cash flow valuation**

The estimation issues with valuing growth companies, outlined earlier in the chapter, generate heartburn among analysts, who then look for short cuts, often devised from their valuation experiences with more mature firms, to get to a valuation.
**Using current numbers as a base**

Most valuations start with a set of base year numbers, and in most cases, those base year numbers come from the current financial statements. Analysts who follow this process with young companies will be building valuations on a shifting and unreliable foundation for several reasons. The first is that the numbers can be very small for growth firms earlier in the life cycle and not very meaningful. Many growth companies that have small revenues report operating losses and extrapolating from either number can be dangerous. The second is the hazy lines between operating and capital expenses at young companies can skew both earnings and reinvestment (capital expenditures) numbers; for instance, if much of selling expenses are really for generating future growth and they are treated as operating expenses, both income and capital expenditures will be understated. The third is that the volatility in the numbers can cause big changes from year to year in items like operating margin and return on capital that are fundamental inputs into any valuation.

**Scaling issues**

In the earlier sections, we pointed out our concerns about the sustainability of growth, i.e., how quickly the growth rates at growth firms will decrease as the firm becomes larger, both because of the scaling effect and due to competition. Analysts who use historical growth rates as forecasts of future growth are susceptible to over valuing their firms, since they are extrapolating growth rates posted by the firm when it was much smaller, to a much larger firm. In fact, this over optimism about growth manifests itself in two ways: a higher growth rate for the growth period than can be sustained by the firm and a much longer growth period than is likely. In fact, it is not uncommon to see growth companies valued with growth rates of 25% or higher, for 10 years or longer.

**Illustration 10.1: Growth and Scale – Under Armour and Evergreen Solar**

To illustrate the effect of using high growth rates as firms become larger, we will use two companies that we will be valuing in detail later in this chapter – Under Armour, a company with a very successful line of microfiber apparel for athletes and Evergreen Solar, a company that manufactures solar panels and cells, which benefited from high oil prices from 2004 to 2008.
Under Armour was founded by Kevin Plank in 1996, is headquartered in Baltimore, and capitalized on its success by going public in 2006. Revenues at the firm tripled from $205 million in 2004 to $607 million in 2007; over the three-year period, the company had a compounded growth rate in revenues of 44% a year. If we assume that the firm will continue to grow at a compounded rate of 44% a year for the next five years, we expected revenues to increase to $3,758 million in 2012. While that may be possible under the best scenarios, it is also unlikely to occur. To see why, we have compared the revenues at the largest firms in the apparel business in the United States, based upon 2008 revenues, to Under Armour, using both revenues in the most recent twelve month period (ending September 2008) and the forecasted revenue in 2012.

*Figure 10.2: Under Armour versus Apparel Firms*

<table>
<thead>
<tr>
<th>Company</th>
<th>Annual Revenues (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nike Inc. (NYSE:NKE)</td>
<td>20.0</td>
</tr>
<tr>
<td>Kimberly-Clark Corporation</td>
<td>17.0</td>
</tr>
<tr>
<td>Avon Products Inc. (NYSE:AVP)</td>
<td>13.0</td>
</tr>
<tr>
<td>VF Corp. (NYSE:VFC)</td>
<td>11.0</td>
</tr>
<tr>
<td>Polo Ralph Lauren Corp. (NYSE:RL)</td>
<td>9.0</td>
</tr>
<tr>
<td>Liz Claiborne Inc. (NYSE:LIZ)</td>
<td>6.0</td>
</tr>
<tr>
<td>Hanesbrands Inc. (NYSE:HBI)</td>
<td>5.0</td>
</tr>
<tr>
<td>Cintas Corp. (NasdaqGS:CTAS)</td>
<td>3.0</td>
</tr>
<tr>
<td>Under Armour (projected 2019)</td>
<td>3.0</td>
</tr>
<tr>
<td>Evergreen Solar (projected 2019)</td>
<td>2.0</td>
</tr>
<tr>
<td>Jones Apparel Group, Inc. (NYSE:JNY)</td>
<td>2.0</td>
</tr>
<tr>
<td>Phillips-Van Heusen Corp. (NYSE:PVH)</td>
<td>2.0</td>
</tr>
<tr>
<td>Quiksilver Inc. (NYSE:ZQK)</td>
<td>2.0</td>
</tr>
<tr>
<td>Under Armour (2008)</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Note that with our forecasts, Under Armour will become the ninth largest apparel firm in the United States in five years, a difficult, albeit not impossible, task in a very competitive business.

Evergreen Solar, a manufacturer of solar power cells was founded in 2003 and is a Massachusetts-based company. Revenues at the firm increased from $24 million in 2004 to $70 million in 2007, yielding a compounded growth rate of 43% a year. With
Evergreen Solar, we feel comfortable allowing the growth rate to continue to be about 40% a year at least for the next 5 years, for two reasons. The first is that the total revenue in the most recent period for the company is only $70 million, much lower than revenues at Under Armour. Allowing this revenue to grow at a 40% compounded rate will result in revenues that are still less than $500 million in five years. The second is that the potential market for energy products (of which solar cells is one component) is huge. Even with a high growth rate over the next 5 years, Evergreen will remain a very small firm in a business dominated by behemoths.

**Growth, reinvestment and excess returns**

The focus on growth rates in revenues and earnings at growth firms often takes attention away from a variable that is just as critical in determining value and that is the reinvestment that the firm will have to make to deliver this growth. In the chapter on intrinsic value, we made the case that growth without excess returns (returns over and above the cost of equity and capital) add no value to the firm. When valuing growth firms, it becomes critical that we pay heed to the excess returns that accompany a specified growth rate.

In many discounted cash flow valuations, this lack of care in estimating (or even thinking about) excess returns manifests itself as inconsistencies between two key inputs into the valuation – the growth rate used and the reinvestment to deliver that growth rate. Given that the potential for efficiency growth (from improving returns on existing assets) is small at growth firms, it is extremely unlikely that a firm can deliver double-digit growth for extended periods without having to make substantial investments in the business. Any growth company valuation that combines high growth rates in revenues and operating income with little or no reinvestment will over value the firm.

In some cases, the error cuts in the opposite direction, where analysts assume low growth rates in conjunction with high reinvestment and come up with values that are understated. This is usually the case when analysts base future reinvestment numbers on current value for companies that are reinvesting significant amounts in the hopes of delivering high growth. If analysts then follow the earlier dictum of lowering growth rates as the firm gets larger, but leave the reinvestment policy of the firm unchanged at
current levels, they are saddling the firm with the investment outflows of a high growth firm, without the benefits of that high growth in earnings.

Illustration 10.2: Reinvestment, Growth and Value – Effects of inconsistencies

In this example, we will look at the valuations of two growth companies, where inconsistent assumptions are made about growth and reinvestment and consider the consequences for value.

In the first example, assume that an analyst is valuing a growth company with $10 million in after-tax operating income in the current year, and a reinvestment of $1 million in that year. Also assume that the analyst is forecasting a growth rate of 20% a year for the next 5 years and 4% thereafter and using a cost of capital of 10% in perpetuity. If the firm’s current reinvestment rate is used to make forecasts of future cash flows, we arrive at the numbers is table 10.1:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>After-tax Operating Income</td>
<td>$12.00</td>
<td>$14.40</td>
<td>$17.28</td>
<td>$20.74</td>
<td>$24.88</td>
</tr>
<tr>
<td>- Reinvestment</td>
<td>$1.20</td>
<td>$1.44</td>
<td>$1.73</td>
<td>$2.07</td>
<td>$2.49</td>
</tr>
<tr>
<td>FCFF</td>
<td>$10.80</td>
<td>$12.96</td>
<td>$15.55</td>
<td>$18.66</td>
<td>$22.39</td>
</tr>
<tr>
<td>Terminal value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$388.18</td>
</tr>
<tr>
<td>PV</td>
<td>$9.82</td>
<td>$10.71</td>
<td>$11.68</td>
<td>$12.75</td>
<td>$254.93</td>
</tr>
<tr>
<td>Value of firm today =</td>
<td>$299.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note that the cash flow used to estimate the terminal value is the cash flow in year 5, grown out one year at 4%, not a good practice but a common one.

\[
\text{Terminal value} = \frac{\text{FCFF}_5(1 + g_{\text{stable}})}{(r - g)} = \frac{22.39(1.04)}{(.10 - .04)} = $388.18
\]

The value of the firm, based on these numbers, is $299.89 million, which vastly overstates the true value because the analyst has under estimated the reinvestment needs of the firm. How do we know? Using the growth rates and reinvestment rates estimated each year, we can back out the return on capital that the firm must make to justify these assumptions, on a year-by-year basis in table 10.2.

---

2 There are several reasons why reinvestment may be low in a given year for a high growth firm. One is that reinvestment is lumpy – the firm may have reinvested a very large amount in the previous year and is taking a break this year. The other is that the accounting number for capital expenditure may not capture what the firm is reinvesting to generate growth, either because the reinvestment is embedded in an operating expense (selling expenses) or misclassified as an operating expense (R&D).
Table 10.2: Implied Return on Capital

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinvestment Rate</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Expected growth rate</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Implied return on capital</td>
<td>200.00%</td>
<td>200.00%</td>
<td>200.00%</td>
<td>200.00%</td>
<td>200.00%</td>
<td>40.00%</td>
</tr>
</tbody>
</table>

While some of the higher growth in the early years may be justified using the “higher efficiency” argument, the fact that existing assets are small relative to growth investments undercuts this claim.

In the second example, consider an analyst valuing a growth company with $10 million in after-tax operating income and a reinvestment of $8 million in the most recent year. Assume that the analyst uses the same parameters for growth and cost of capital as in the first example – 20% growth rate for the next 5 years followed by a growth rate of 4%, and a cost of capital of 10%. Again, assuming that the current reinvestment rate remains unchanged, we estimate the cash flows in table 10.3:

Table 10.3: Expected Free Cash Flow to the Firm

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Terminal value</th>
</tr>
</thead>
<tbody>
<tr>
<td>After-tax Operating Income</td>
<td>$12.00</td>
<td>$14.40</td>
<td>$17.28</td>
<td>$20.74</td>
<td>$24.88</td>
<td>$86.26</td>
</tr>
<tr>
<td>- Reinvestment</td>
<td>$9.60</td>
<td>$11.52</td>
<td>$13.82</td>
<td>$16.59</td>
<td>$19.91</td>
<td></td>
</tr>
<tr>
<td>FCFF</td>
<td>$2.40</td>
<td>$2.88</td>
<td>$3.46</td>
<td>$4.15</td>
<td>$4.98</td>
<td></td>
</tr>
<tr>
<td>Terminal value</td>
<td>$2.18</td>
<td>$2.38</td>
<td>$2.60</td>
<td>$2.83</td>
<td>$56.65</td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>$2.18</td>
<td>$2.38</td>
<td>$2.60</td>
<td>$2.83</td>
<td>$56.65</td>
<td></td>
</tr>
<tr>
<td>Value of firm today =</td>
<td>$66.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Again, the terminal value was estimated by growing the cash flow in year 5 by 4%.

Terminal value = \( \frac{\text{FCFF}_5(1 + g_{stable})}{(r - g)} \)

\( r = 0.10 \), \( g = 0.04 \)

\( \text{Terminal value} = \frac{4.98(1.04)}{0.06} = $86.26 \)

The value of the firm today is $66.64, which will understate the true value because the analyst has locked into a reinvestment rate, which while reasonable for the high growth phase, is much too high for stable growth. Again, this can be seen when we back out the return on capital implied by the reinvestment rate and growth rates in table 10.4:

Table 10.4: Implied Return on Capital

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Terminal year (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinvestment Rate</td>
<td>80.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>80.00%</td>
</tr>
<tr>
<td>Expected growth rate</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>20.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Implied return on capital</td>
<td>25.00%</td>
<td>25.00%</td>
<td>25.00%</td>
<td>25.00%</td>
<td>25.00%</td>
<td>5.00%</td>
</tr>
</tbody>
</table>
Note that the return on capital assumed for the high growth phase is 25%, high but not unreasonable for a firm with investment opportunities. However, the return on capital built into the terminal value is 5%, well below the cost of capital. Unless there is a clear reason to believe that the managers of this firm are hell bent on destroying value in the long term, this is clearly an unrealistic assumption.

The bottom line is that estimating the cash flow for the terminal value computation by growing the prior year’s computation one extra year is always a dangerous practice, but it becomes doubly so with growth companies.

**Growth and risk**

Just as growth and reinvestment are linked by our estimates of excess returns, risk and growth tend to move together. As we move through the forecast period, lowering the expected growth rate as the company gets larger and more stable, we should expect to see the risk of the business decrease. In too many growth company valuations, the cost of capital is estimated up front for the entire valuation and remains unchanged as the firm makes its transition from high growth to mature company. Holding all else equal, this will result in growth companies being under valued. In effect, as we reduce growth, we are giving the company all of the negatives of being a mature company without any of the positives.

**Trusting market-based risk measures**

Risk parameters in valuations, including betas and costs of equity, are often estimated using historical data. For instance, we estimate the beta of a firm by regressing the returns on the stock against return on a market index. With growth firms, this practice can lead to misleading estimates for two reasons: (1) the stock has been listed only a short period and the estimate that emerges from the data has a large error estimate and (2) the company’s characteristics have changed over the listing period, thus rendering the historical beta estimate useless as an estimate of the beta for the future.

Consider the beta estimate for Under Armour, using historical returns on the stock from January 2007 to January 2009, reported in figure 10.3:
The regression beta is 1.44, but the standard error on the estimate is 0.24. Furthermore, the beta reflects risk in 2007 and 2008, during which period the firm doubled revenues and operating income. Using this beta to estimate the cost of equity for future years puts us at risk of not only using a regression estimate that has substantial standard error associated with it, but also that the number will not reflect the changes in the company’s fundamentals over time.

**Short cuts for dealing with convertibles and voting shares**

In the section outlining the estimation issues associated with valuing growth companies, we noted that these firms are far more likely to issue convertible debt than straight debt, when borrowing, and have different classes of shares, when it comes to voting rights. Analysts valuing growth companies look for simplifying assumptions, when dealing with both phenomena. They tend to treat convertible debt as all debt, until it gets converted, at which point it becomes all equity. At best, they make the assumption
that convertible bonds will get converted to shares and use the resulting total number (fully diluted) as the basis for computing value per share,

With voting and non-voting shares, the practice is often either benign neglect, where the differences in voting rights are just overlooked or viewed as worthless, or the use of simple rules of thumb, where voting shares are assumed to command a fixed premium (say 5%).

**The Market must know something that I do not – The market price magnet**

When valuing publicly traded firms, it is difficult not to be aware of the market price of the stock and how far or close our estimate of value is from that number. In fact, there is a feedback mechanism, where a big difference between the price and the value leads an analyst to revisit the assumptions used in the valuation, with the inevitable narrowing of the difference. With growth companies, this feedback loop can take on a life of its own, partly because analysts are so uncertain about their future estimates. Thus, an analyst who makes what she thinks are reasonable assumptions about growth, cash flows and risk and arrives at a value that is one quarter of the market price will be tempted to go back and increase growth rates and returns, and lower the discount rate, to arrive at a value closer to the stock price.

**In relative valuation**

At the risk of generalizing, analysts who go down the relative valuation path are looking for even more simplistic ways of dealing with growth than the analysts who wrestle with discounted cash flow valuation. Not surprisingly, the errors that we see in the relative valuations of growth companies reflect the errors of these time saving assumptions.

**Sector based comparables**

Much of relative valuation in practice is built around the practice of building comparable firms out of other firms in the sector. Thus, software firms are compared to other software firms and energy firms to other energy firms. Adopting this practice when valuing growth companies can be dangerous, especially in sectors with diverse growth characteristics. Take the software business, as an example. While there are high growth
firms in this segment, they co-exist with firms like Microsoft that are more mature firm. Using industry average multiple to value individual software firms will lead to poor estimates of values.

**Sector specific multiples**

One of the problems that we face with valuing some growth firms, using multiples, is the absence of an operating variable of any substance that can be used to scale value. Many growth firms, early in the growth cycle, have negative net income, operating income an EBITDA, making it impossible to apply any earnings-based multiple. Rather than fall back on revenues, the only operating variable that cannot be negative, some analysts fall back on multiples of operating measures that are specific to the sector. In the late 1990s, with nascent internet companies, analysts estimated value as a multiple of website visitors. With cable and telecom companies, value was computed as a multiple of the subscribers in the company.

While the push towards sector specific multiples can be justified using the argument that the operating variables for the company fall short, it does expose you to some significant valuation problems. The first is that few of us have a sense of what is high, low or reasonable for a sector specific multiple. Put another way, while we may hold back from paying 100 times revenues for a company (since we know that this is a high value), we may not hold back from paying $3,000 per subscriber, partly because we have little or no sense of what a reasonable value per subscriber is. The second is that assessing what fundamentals if any we should be controlling for becomes more difficult to do with a sector specific multiples. Thus, while we know the variables that cause PE ratios to vary across companies (see chapter 4), we have little sense of the key factors that cause the value per subscriber to vary across firms.

**Unrealistic growth/value relationships**

Most analysts valuing growth companies are aware that growth affects multiples, i.e. higher growth companies should trade at higher multiples of earnings, revenues or any other operating variable than lower growth companies. At the same time, they want to stick with the simplicity of multiples and not deal with the complexity of analyzing the
effect of changing growth rates on value. There are two ways in which this manifests itself in valuation:

1. **Story telling**: Rather than deal with differences with growth rates quantitatively, some analysts argue for the use of higher multiples for higher growth companies, without being explicit about the relationship between growth and value, with a “growth story”. Consequently, they argue that Chinese consumer product companies should trade at higher multiples of earnings than European companies, because there is more potential growth in China, though they are fuzzy on how much more growth there is and what premium it justifies.

2. **Modified Multiple**: A compromise that takes into account growth, while preserving simplicity, would be to incorporate growth into the multiple, but this requires us to make assumptions about the relationship between growth and value that are unreasonable. Consider, for instance, the price earnings ratio. We know that higher growth companies trade at higher PE ratios than lower growth companies and that investing in the lowest PE stocks will bias you towards lower growth companies. It was to counter this bias that analysts developed the PEG ratio, the ratio of PE to expected growth:

   \[
   \text{PEG} = \frac{\text{PE}}{\text{Expected growth in earnings per share}}
   \]

   As an illustration, a firm with a PE ratio of 20 and an expected growth rate in earnings per share of 10% would have a PEG ratio of 2. Companies that trade at low PEG ratios represent bargains, because you are getting growth at a lower price.

   All short cuts in valuation come with a price and the PEG ratio comes with a hefty price tag. First, it ignores the effects of risk. If two firms have the same expected growth rate in earnings, the higher risk firm should trade at a lower PE (and a lower PEG) ratio. Second, it assumes that PE increases proportionately with growth; as growth doubles, the PE ratio doubles. In reality, though, value increases less than proportionately with growth; value increases by less than 100% when growth is doubled. Figure 10.4 presents the intrinsic PEG ratio for a hypothetical firm, at different expected growth rates and shows how undervalued (or over valued) the firm will look, using the conventional PEG ratio. The intrinsic PEG ratio reflects the complicated relationship between PE and growth, whereas the conventional approach assumes that it remains unchanged (at one) as growth changes.
Using the conventional PEG ratio, with its flawed assumptions of growth and PE, leads us to conclude that the firms with high growth are over valued at low growth rates (by more than 100% at a 2% growth rate) to under valued at higher growth rates.

**Forward multiples and changing fundamentals**

When confronted with current year numbers for revenues and earnings that are either too small or negative, there are some who use forecasted values for revenues and earnings to compute forward multiples for comparison. While this is a practice that makes sense and one that we recommended in the last chapter on young, growth companies, we should keep in mind the fact that the multiple we attach to revenues or earnings in a future year should reflect the characteristics of the company in that year rather than its current characteristics. Many analysts, however, use multiples that are based upon current growth characteristics to arrive at forward values and thus double count growth. Consider, for instance, a firm that has revenues of $ 50 million today and a forecasted revenue growth of 50% a year for the next 5 years; the revenues in year 5 will be $380 million. A valuation that applies a high multiple to the revenues in year 5, with
the high multiple justified by the high growth rate of 50%, will in effect be double counting growth. A more reasonable valuation would have used a multiple more in line with growth after year 5 (likely to be much lower than 50%).

**The Light Side of Valuation**

While growth companies raise thorny estimation problems, we can navigate our way through these problems to arrive at values for these firms that are less likely to be contaminated by internal inconsistencies. In this section, we will lay out the steps to follow in discounted cash flow and relative valuations of growth companies.

**Discounted Cash Flow Valuation**

Given that the objective in discounted cash flow valuation is to arrive at reasonable estimates of the cash flows and the discount rates, we will list out some of the considerations that should enter into the process when we are valuing growth companies.

**Choice of Model**

In chapter 2, we listed the choices we face with discounted cash flow models, noting that we can either value the entire business (by discounting cash flows to the firm at the cost of capital) or value the equity directly (by discounting cash flows to equity at the cost of equity). While both approaches should yield the same value for the equity, estimating cash flows to equity, if we expect the debt ratio to change over time, is much more difficult than estimating the cost of capital. The former requires us to forecast new debt issues, debt repayments and interest payments each period, as the dollar debt changes, whereas the latter is based upon changing debt ratios.

Since many growth companies have little or no debt in their capital structure, analysts often fall back on equity valuation models, using the absence of debt as justification. However, this assumes that growth companies will continue with their policy of not using debt in perpetuity, even as growth decreases and the companies become more mature. If we make the more reasonable assumption that growth companies will become mature companies over time and adopt the financing practices of the latter, firm valuation models provide analysts with more flexibility to reflect these changes.
Needless to say, the discounted cash flow models used need to allow for high growth and even changing operating margins over time. As a general rule, rigid models that lock in the current characteristics of the company do not perform as well as more flexible models, where analysts can change the inputs over time, in valuing growth companies.

*Valuing the operating assets*

If we accept the premise that firm valuation models work better than equity valuation models, when valuing growth companies, the first step in the process is valuing the operating assets of the firm, incorporating both existing assets and growth assets.

*Revenue growth rates*

The valuation process starts with estimating future revenues. In making these estimates, many of the considerations that we raised in chapter 9, for young companies, come into play. The biggest issue, and one that we have emphasized repeatedly in this chapter, is the scaling factor. Revenue growth rates will decrease as companies get larger, and every growth company will get larger over time, if our forecasts of growth come to fruition. In a test of how growth changes as firms get larger, Metrick (2006) examined the revenue growth rate for high growth firms, relative to growth rate in revenues for the sector in which they operate, in the immediate aftermath of their initial public offerings.\(^3\) The results are reported in Figure 10.5 below:

---

\(^3\) Metrick, A., 2006, Venture Capital and the Finance of Innovation, John Wiley & Sons.
At the time of going public, firms have growth rates that are much higher than the industry average. Note how quickly the revenue growth at these high growth firms moves towards the industry average – from a 15% higher revenue growth (then the industry average) one year after the IPO to 7% higher in year 2 to 1% higher in year 4 to the industry average in year 5. While we are not suggesting that this will happen at every high growth firm, the aggregate evidence suggests that growth firms that are able to maintain high growth rates for extended periods remain the exception rather than the rule.

The question of how quickly revenue growth rates will decline at a given company can generally be addressed by looking at the company’s specifics – the size of the overall market for its products and services, the strength of the competition and quality of both its products and management. Companies in larger markets with less aggressive competition (or protection from competition) and better management can maintain high revenue growth rates for longer periods.⁴

---

There are a few tools that we can use to assess whether the assumptions we are making about revenue growth rates in the future, for an individual company, are reasonable:

- **Absolute revenue changes**: One simple test is to compute the absolute change in revenues each period, rather than to trust the percentage growth rate. Even experienced analysts often under estimate the compounding effect of growth and how much revenues can balloon out over time with high growth rates. Computing the absolute change in revenues, given a growth rate in revenues, can be a sobering antidote to irrational exuberance when it comes to growth.

- **Past history**: Looking at past revenue growth rates for the firm in question should give us a sense of how growth rates have changed as the company size changed in the past. To those who are mathematically inclined, there are clues in the relationship that can be used for forecasting future growth.

- **Sector data**: The final tool is to look at revenue growth rates of more mature firms in the business, to get a sense of what a reasonable growth rate will be as the firm becomes larger.

In summary, expected revenue growth rates will tend to drop over time for all growth companies but the pace of the drop off will vary across companies.

**Current margins versus target margins**

To get from revenues to operating income, we need operating margins over time. The easiest and most convenient scenario is the one where the current margins of the firm being valued are sustainable and can be used as the expected margins over time. In fact, if this is the case, we can dispense with forecasting revenue growth and instead focus on operating income growth, since the two will be the equivalent. In most growth firms, though, it is more likely that the current margin is likely to change over time.

Let us start with the most likely case first, which is that the current margin is either negative or too low, relative to the sustainable long-term margin. There are three reasons why this can happen. One is that the firm has up-front fixed costs that have to be incurred in the initial phases of growth, with the payoff in terms of revenue and growth in later periods. This is often the case with infrastructure companies such as energy,
telecommunications and cable firms. The second is the mingling of expenses incurred to generate growth with operating expenses; we noted earlier that selling expenses at growth firms are often directed towards future growth rather than current sales but are included with other operating expenses. As the firm matures, this problem will get smaller, leading to higher margins and profits. The third is that there might be a lag between expenses being incurred and revenues being generated; if the expenses incurred this year are directed towards much higher revenues in 3 years, earnings and margins will be low today.

The other possibility, where the current margin is too high and will decrease over time, is less likely but can occur, especially with growth companies that have a niche product in a small market. In fact, the market may be too small to attract the attention of larger, better-capitalized competitors, thus allowing the firms to operate under the radar for the moment, charging high prices to a captive market. As the firm grows, this will change and margins will decrease. In other cases, the high margins may come from owning a patent or other legal protection against competitors, and as this protection lapses, margins will decrease.

In both of the latter two scenarios – low margins converging to a higher value or high margins dropping back to more sustainable levels – we have to make judgment calls on what the target margin should be and how the current margin will change over time towards this target. The answer to the first question can be usually be found by looking at both the average operating margin for the industry in which the firm operates and the margins commanded by larger, more stable firms in that industry. The answer to the second will depend upon the reason for the divergence between the current and the target margin. With infrastructure companies, for instance, it will reflect how long it will take for the investment to be operational and capacity to be fully utilized.

*Reinvest to sustain growth*

A constant theme in the earlier chapters has been the insistence that growth is not free and that firms will have to reinvest to growth. As we noted earlier in the chapter, it is dangerous to base reinvestment assumptions on a growth company’s history of reinvestment. In other words, taking the net capital expenditures and working capital
changes from the most recent year and assuming that these items will grow at the same rate as revenues can result in reinvestment numbers that are both unrealistic and inconsistent with our assumptions about growth.

To estimate reinvestment for a growth firm, we will follow one of three paths, depending largely upon the characteristics of the firm in question:

1. **For growth firms earlier in the life cycle**, we will adopt the same roadmap we used for young growth companies, where we estimated reinvestment based upon the change in revenues and the sales to capital ratio.

   \[
   \text{Reinvestment}_t = \frac{\text{Change in revenues}_t}{(\text{Sales/Capital})}
   \]

   The sales to capital ratio can be estimated using the company’s data (and it will be more stable than the net capital expenditure or working capital numbers) and the sector averages. Thus, assuming a sales to capital ratio of 2.5, in conjunction with a revenue increase of $250 million will result in reinvestment of $100 million. We can build in lags between the reinvestment and revenue change into the computation, by using revenues in a future period to estimate reinvestment in the current one.

2. **With a growth firm that has a more established track record of earnings and reinvestment**, we can use the relationship between fundamentals and growth rates that we laid out in chapter 2:

   \[
   \text{Expected growth rate in operating income} = \text{Return on Capital} \times \text{Reinvestment Rate} + \text{Efficiency growth (as a result of changing return on capital)}
   \]

   In the unusual case where margins and returns and capital have settled into sustainable levels, the second term will drop out of the equation.

3. **Growth firms that have already invested in capacity for future years** are in the unusual position of being able to grow with little or no reinvestment for the near term. For these firms, we can forecast capacity usage to determine how long the investment holiday will last and when the firm will have to reinvest again. During the investment holiday, reinvestment can be minimal or even zero, accompanied by healthy growth in revenues and operating income.

With all three classes of firms, though, the leeway that we have in estimating reinvestment needs during the high growth phase should disappear, once the firm has
reached its mature phase. The reinvestment in the mature phase should hew strictly to fundamentals:

Reinvestment rate in mature phase = \( \frac{\text{Growth Rate}_{\text{stable}}}{\text{Return on Capital}_{\text{stable}}} \)

In fact, even in cases where reinvestment is estimated independently of the operating income during the growth period, and without recourse to the return on capital, we should keep track of the imputed return on capital (based on our forecasts of operating income and capital invested) to ensure that it stays within reasonable bounds. The process for doing so is described in chapter 9.

Risk profile consistent with growth and operating numbers

While the components of the cost of capital – the beta(s) and the cost of equity, the cost of debt and the debt ratio – are the same for a growth company as they are for a mature company, what sets growth companies apart is that their risk profiles will shift over time. The key to maintaining balance in growth company valuations is to adjust the discount rates over time to keep them consistent with the growth and margin assumptions that we are making in each period. As general rules:

- Growth firms should have high costs for equity and debt when revenue growth is highest, but the costs of debt and equity should decline as revenue growth moderates and margins improve.
- As earnings improve and growth drops, another phenomenon will come into play, which is that the firm will generate more cash flows than it needs, which it can use to not only pay dividends but also to service debt financing. While firms are not required to use this debt capacity, and some of them do not, the tax advantages of debt will lead some firms to borrow, causing debt ratios to increase over time.

In summary, the cost of capital for a growth company should almost never be a number that remains unchanged over the entire time horizon. Instead, it should be a year-specific number that keeps track with the rest of the changes that we are forecasting at the firm.

In terms of estimating risk parameters (betas), we would steer as far as we can from using the limited price data that is available on growth companies: the standard errors on the estimates are likely to be huge. Instead, we would use estimates of betas obtained by looking at other publicly traded firms that share the same risk, growth and
cash flow characteristics as the firm being valued. If the case for using these bottom up betas (industry average as opposed to a regression beta) is strong with any firm, it is even stronger with growth firms.

For growth firms that have either operating losses carried forward from prior years or are expected to keep losing money in the future, there is one final factor to consider when computing discount rates. The tax advantage of debt, manifested as an after-tax cost of borrowing, is dependent upon having positive earnings to offset interest expenses. With operating losses (and carry forwards), there may be no or limited tax benefits from interest expenses and the after-tax cost of debt should reflect this fact.

Stable growth assumptions: When and what will the firm look like?

The assumptions we make about terminal value loom large with a growth company, since it will comprise a much larger portion of the firm’s current value than is the case with a mature firm. When will a growth firm become a stable growth, mature firm? While we have a little more information than we did with young companies, in making this assessment, it is difficult to do, and akin to looking at a teenager and wondering what he or she will look like or be doing, in middle age.

While no one answer or approach will work with every growth company, we will draw on the discussion both in chapter 2 and this one to develop the following general propositions:

• **Do not wait too long to put a firm into stable growth:** As we noted in the section on the dark side of valuing growth companies, analysts often allow for very long growth periods for growth firms and justify the assumption by pointing to past growth. As we noted in figure 10.5, both scale and competition conspire to lower growth rates quickly at even the most promising growth companies. Growth periods that exceed 10 years, especially when accompanied by high growth rates over these periods, are difficult to defend, since only a handful of companies have been able to accomplish this over time.

• **When you put your firm into stable growth, give it the characteristics of a stable growth firm:** In keeping with the emphasis on preserving internal consistency, we should change the characteristics of the company to reflect stable growth. With
discount rates, as we noted in the last section, this will take the form of using lower costs of debt and equity and a higher debt ratio. With reinvestment, the key assumption will be the return on capital that we assume for the stable growth phase. While some analysts believe that the return on capital should be set equal to the cost of capital in stable growth, we would preserve some company-specific flexibility and suggest that the difference between return on capital and cost of capital should narrow during stable growth to a sustainable level (less than 4 or 5%).

The nature of the cash flows at growth companies – low or negative in the early years and higher later – will ensure that the terminal value is a high proportion of value, accounting for 80.90 or even more than 100% of value. Some analysts use this as ammunition against using discounted cash flow valuations, suggesting that assumptions about the high growth phase will be drowned out by the terminal value assumptions. This is not true, since the base year value for the terminal value calculation (earnings and cash flows in year 5 or 10) is a function of the assumptions during the high growth phase; changing these assumptions will have dramatic effects (as it should) on value.

**Illustration 10.3: Valuing Operating Assets - Evergreen Solar**

To value Evergreen Solar, we first updated the operating numbers to reflect the firm’s operations through the end of September 2008, the most recent quarter for which we had financial data in early 2009: Table 10.5 summarizes the estimates:

<table>
<thead>
<tr>
<th>Table 10.5: Trailing 12-month operating numbers – Evergreen Solar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-tax Operating income</strong></td>
</tr>
<tr>
<td>Pre-tax Operating income</td>
</tr>
<tr>
<td>Interest Expense</td>
</tr>
<tr>
<td>Capital Spending</td>
</tr>
<tr>
<td>Depreciation and Amortization</td>
</tr>
<tr>
<td>Revenues</td>
</tr>
</tbody>
</table>

*Trailing 12 month number = Last 10K – 9-mth 10Q, Sept 07 + 9-mth 10Q, Sept 08

In summary, Evergreen Solar became a larger firm on every dimension – revenues, operating income and reinvestment – between the end of 2007 and the third quarter of 2008.
The two key assumptions that will determine the value of Evergreen Solar are about revenue growth in future years and expected pre-tax operating margins. In table 10.6, we summarize these estimates, as well as our estimates of taxes and after-tax operating income each year.

_table 10.6: Revenues and Operating Income – Evergreen Solar_

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Revenue growth rate</th>
<th>Pre-tax Margin</th>
<th>Pre-tax operating income</th>
<th>NOL</th>
<th>Taxes</th>
<th>After-tax Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing 12 month</td>
<td>$89.89</td>
<td>-55.31%</td>
<td>-49.72</td>
<td>$98.00</td>
<td>$0.00</td>
<td></td>
<td>-$49.72</td>
</tr>
<tr>
<td>1</td>
<td>$125.85</td>
<td>40.00%</td>
<td>-31.87%</td>
<td>-$40.11</td>
<td>$138.11</td>
<td>$0.00</td>
<td>-$40.11</td>
</tr>
<tr>
<td>2</td>
<td>$176.18</td>
<td>40.00%</td>
<td>-16.25%</td>
<td>-$28.63</td>
<td>$166.74</td>
<td>$0.00</td>
<td>-$28.63</td>
</tr>
<tr>
<td>3</td>
<td>$246.66</td>
<td>40.00%</td>
<td>-5.83%</td>
<td>-$14.39</td>
<td>$181.13</td>
<td>$0.00</td>
<td>-$14.39</td>
</tr>
<tr>
<td>4</td>
<td>$345.32</td>
<td>40.00%</td>
<td>1.11%</td>
<td>$3.84</td>
<td>$177.29</td>
<td>$0.00</td>
<td>$3.84</td>
</tr>
<tr>
<td>5</td>
<td>$483.45</td>
<td>40.00%</td>
<td>5.74%</td>
<td>$27.75</td>
<td>$149.54</td>
<td>$0.00</td>
<td>$27.75</td>
</tr>
<tr>
<td>6</td>
<td>$628.48</td>
<td>30.00%</td>
<td>8.83%</td>
<td>$55.48</td>
<td>$94.06</td>
<td>$0.00</td>
<td>$55.48</td>
</tr>
<tr>
<td>7</td>
<td>$785.61</td>
<td>25.00%</td>
<td>10.88%</td>
<td>$85.51</td>
<td>$8.55</td>
<td>$0.00</td>
<td>$85.51</td>
</tr>
<tr>
<td>8</td>
<td>$942.73</td>
<td>20.00%</td>
<td>12.26%</td>
<td>$115.55</td>
<td>$0.00</td>
<td>$42.80</td>
<td>$72.75</td>
</tr>
<tr>
<td>9</td>
<td>$1,084.14</td>
<td>15.00%</td>
<td>13.17%</td>
<td>$142.79</td>
<td>$0.00</td>
<td>$57.12</td>
<td>$85.68</td>
</tr>
<tr>
<td>10</td>
<td>$1,192.55</td>
<td>10.00%</td>
<td>13.78%</td>
<td>$164.34</td>
<td>$0.00</td>
<td>$65.74</td>
<td>$98.60</td>
</tr>
<tr>
<td>Terminal year</td>
<td>$1,219.38</td>
<td>2.25%</td>
<td>15.00%</td>
<td>$182.91</td>
<td>$0.00</td>
<td>$73.16</td>
<td>$109.74</td>
</tr>
</tbody>
</table>

Note that Evergreen had a net operating loss (NOL) carry forward of $98 million coming into the valuation, that we track and use to compute the taxes and after-tax operating income each year. The net operating loss carried forward is augmented by the expected losses in the first three years, reaching a peak of $181.13 million at the end of year 3 and shelters the expected operating income from taxes for the next few years. By our estimates, Evergreen does not pay its full marginal tax rate of 40% until the ninth year.

To ensure that we reinvest enough to sustain this expected growth, we estimate Evergreen’s reinvestment needs, using a sales-to-capital ratio of 2.50. The resulting reinvestment and free cashflows are summarized in table 10.7:

_table 10.7: Expected Free Cash Flow to Firm – Evergreen Solar_

<table>
<thead>
<tr>
<th>Year</th>
<th>After-tax Operating Income</th>
<th>Change in revenues</th>
<th>Sales to Capital</th>
<th>Reinvestment</th>
<th>FCFF</th>
<th>Capital Invested</th>
<th>Implied ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing 12 month</td>
<td>-$49.72</td>
<td>-$40.11</td>
<td>$35.96</td>
<td>2.50</td>
<td>$14.38</td>
<td>$884.82</td>
<td>-4.53%</td>
</tr>
</tbody>
</table>

5 We did not build in a lag between reinvestment and revenue change. If we had, the reinvestment numbers would have been higher, since they would have been tied to revenue change in future years.
There are two trends to note in the cash flows. The first is that the reinvestment outflows in the first three years are accompanied by operating losses, creating negative cash flows in those periods. Even after the firm starts generating positive earnings in year 4, the reinvestment needs make the cash flows negative in years 4 through 6. To check on our reinvestment numbers, we compute two numbers: the capital invested in each year by adding the reinvestment during the year to the previous year’s capital invested and the return on capital, estimated by dividing the after-tax operating income in each year by the capital invested at the end of the prior year.\textsuperscript{6} Not surprisingly, the returns on capital are negative at the start of the estimation period but they climb to a more respectable 7.69% by the end of our estimation period.

To estimate the costs of capital to use to discount these cash flows, we begin with the assumption that the beta of the firm will be 1.60 (based upon the average beta of other alternative energy companies). Using a riskfree rate of 2.25% and an equity risk premium of 6% yields a cost of equity of 11.85% to start the valuation. Since the firm has substantial default risk and significant debt outstanding, we assign it a cost of debt of 8.25%, with no tax benefit to offset the cost for the first 5 years. As the firm’s revenues grow and margins improve, we lower the beta to 1.00 (in stable growth) and assume that the debt ratio will move down towards a more sustainable level of 20%, with a lower pre-tax cost of 5.25%. These changes, in conjunction with interest expenses finally benefiting from tax savings, show up as a lower cost of capital in future years in table 10.8:

\textit{Table 10.8: Costs of debt, equity and capital - Evergreen Solar}

<table>
<thead>
<tr>
<th>Year</th>
<th>Beta</th>
<th>Cost of equity</th>
<th>Pre-tax cost of debt</th>
<th>Tax savings</th>
<th>After-tax cost of debt</th>
<th>Debt ratio</th>
<th>Cost of capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.60</td>
<td>11.85%</td>
<td>8.25%</td>
<td>0.00%</td>
<td>8.25%</td>
<td>41.20%</td>
<td>10.37%</td>
</tr>
<tr>
<td>2</td>
<td>1.60</td>
<td>11.85%</td>
<td>8.25%</td>
<td>0.00%</td>
<td>8.25%</td>
<td>41.20%</td>
<td>10.37%</td>
</tr>
</tbody>
</table>

As the firm matures, the cost of capital drops from 10.37% in year 1 to 7.23% in year 10 (and beyond).

To provide closure on the valuation, we assume that Evergreen Solar, as a stable firm (after year 10) will earn a return on capital of 7.23% in perpetuity, equal to its cost of capital. We believe it will be difficult for any firm in this business to earn excess returns in perpetuity. We also assume that the growth rate after year 10 will be capped at the risk-free rate of 2.25% that we have used in the analysis and that the reinvestment rate and terminal value can be computed as follows:

Reinvestment rate (after year 10) = Stable growth rate/ Stable Return on capital

= 2.25%/ 7.23% = 31.12%

Terminal value

= \frac{\text{EBIT}_t(1-t)(1-\text{Reinvestment Rate})}{(\text{Cost of capital}_{\text{stable}} - \text{g}_{\text{stable}})}

= \frac{\$182.91(1-.40)(1-.3112)}{(.0723-.0225)}

Now that we have the cash flows and the costs of capital for Evergreen Solar, we can estimate the value of the operating assets today in table 10.9:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of capital</th>
<th>Cumulated Cost of Capital</th>
<th>FCFF</th>
<th>Terminal value</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.37%</td>
<td>1.1037</td>
<td>-$54.50</td>
<td></td>
<td>-$49.38</td>
</tr>
<tr>
<td>2</td>
<td>10.37%</td>
<td>1.2181</td>
<td>-$48.76</td>
<td></td>
<td>-$40.03</td>
</tr>
<tr>
<td>3</td>
<td>10.37%</td>
<td>1.3444</td>
<td>-$42.58</td>
<td></td>
<td>-$31.67</td>
</tr>
<tr>
<td>4</td>
<td>10.37%</td>
<td>1.4837</td>
<td>-$35.63</td>
<td></td>
<td>-$24.01</td>
</tr>
<tr>
<td>5</td>
<td>10.37%</td>
<td>1.6375</td>
<td>-$27.50</td>
<td></td>
<td>-$16.79</td>
</tr>
<tr>
<td>6</td>
<td>9.84%</td>
<td>1.7987</td>
<td>-$2.54</td>
<td></td>
<td>-$1.41</td>
</tr>
<tr>
<td>7</td>
<td>9.37%</td>
<td>1.9672</td>
<td>$22.66</td>
<td></td>
<td>$11.52</td>
</tr>
<tr>
<td>8</td>
<td>7.94%</td>
<td>2.1234</td>
<td>$9.90</td>
<td></td>
<td>$4.66</td>
</tr>
</tbody>
</table>

Table 10.9: Cashflows, Discount rates and Value today
Note two details in the computations. The first is that the cash flows are discounted back at the cumulated cost of capital, reflecting the changing cost of capital over time. For instance, the cumulated cost of capital in year 7 is computed as follows:

Cumulated cost of capital in year 7 = (1.1037)\(^5\) (1.0984) (1.0937) = 1.9672

The second is that the value of the operating assets of the firm is $509 million, with the terminal value tipping the balance. In fact, the present value of cash flows for the first 10 years is -$112 million, largely because of the extended string of negative cash flows in the early years. Intuitively, this represents the loss in ownership (or dilution, if you prefer that term) to existing stockholders, accruing from the firm’s need to raise additional capital, from debt and equity, in future years. Incidentally, this is also why we do not try to adjust the number of shares today for future equity issues, since that would be double counting.

*Illustration 10.4: Valuing Operating Assets – Under Armour*

To value Under Armour’s operating assets, we begin by updating the numbers to reflect most recent data. Table 10.10 summarizes the most recent twelve months of data for Under Armour (at least as of January 2009):

*Table 10.10: Updated twelve-month numbers: Under Armour*

<table>
<thead>
<tr>
<th></th>
<th>Last 10K</th>
<th>Last year thru Q</th>
<th>This year’s thru Q</th>
<th>Trailing 12 month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current EBIT =</td>
<td>$86.27</td>
<td>$58.01</td>
<td>$54.05</td>
<td>$82.31</td>
</tr>
<tr>
<td>EBIT (adjusted for leases)</td>
<td></td>
<td></td>
<td></td>
<td>$88.28</td>
</tr>
<tr>
<td>Current Interest Expense =</td>
<td>$0.80</td>
<td>$0.53</td>
<td>$0.86</td>
<td>$1.13</td>
</tr>
<tr>
<td>Current Capital Spending</td>
<td>$33.96</td>
<td>$26.24</td>
<td>$30.85</td>
<td>$38.57</td>
</tr>
<tr>
<td>Current Depreciation and Amortization =</td>
<td>$14.62</td>
<td>$10.00</td>
<td>$15.48</td>
<td>$20.10</td>
</tr>
<tr>
<td>Current Revenues =</td>
<td>$606.56</td>
<td>$431.72</td>
<td>$545.97</td>
<td>$720.81</td>
</tr>
</tbody>
</table>

The updated numbers reflect the higher revenues and lower operating income at the firm over the last twelve months, relative to the last annual report.

As in the previous valuation, we begin with our estimates of revenues and operating income in table 10.11:

*Table 10.11: Revenues and Operating Income – Under Armour*
<table>
<thead>
<tr>
<th>Year</th>
<th>Revenues</th>
<th>Revenue growth rate</th>
<th>Pre-tax Margin</th>
<th>Pre-tax operating income</th>
<th>NOL</th>
<th>Taxes</th>
<th>After-tax Operating Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing 12 month</td>
<td>$720.81</td>
<td>12.25%</td>
<td>$88.28</td>
<td>$0.00</td>
<td>$35.31</td>
<td>$52.97</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$973.09</td>
<td>35.00%</td>
<td>12.46%</td>
<td>$121.22</td>
<td>$0.00</td>
<td>$48.49</td>
<td>$72.73</td>
</tr>
<tr>
<td>2</td>
<td>$1,216.37</td>
<td>25.00%</td>
<td>12.57%</td>
<td>$152.95</td>
<td>$0.00</td>
<td>$61.18</td>
<td>$91.77</td>
</tr>
<tr>
<td>3</td>
<td>$1,459.64</td>
<td>20.00%</td>
<td>12.64%</td>
<td>$184.48</td>
<td>$0.00</td>
<td>$73.79</td>
<td>$110.69</td>
</tr>
<tr>
<td>4</td>
<td>$1,678.59</td>
<td>15.00%</td>
<td>12.67%</td>
<td>$212.76</td>
<td>$0.00</td>
<td>$85.10</td>
<td>$127.66</td>
</tr>
<tr>
<td>5</td>
<td>$1,846.44</td>
<td>10.00%</td>
<td>12.69%</td>
<td>$234.41</td>
<td>$0.00</td>
<td>$93.76</td>
<td>$140.64</td>
</tr>
<tr>
<td>6</td>
<td>$1,994.16</td>
<td>8.00%</td>
<td>12.71%</td>
<td>$253.83</td>
<td>$0.00</td>
<td>$101.35</td>
<td>$152.03</td>
</tr>
<tr>
<td>7</td>
<td>$2,113.81</td>
<td>6.00%</td>
<td>12.71%</td>
<td>$268.71</td>
<td>$0.00</td>
<td>$107.49</td>
<td>$161.23</td>
</tr>
<tr>
<td>8</td>
<td>$2,208.93</td>
<td>4.50%</td>
<td>12.72%</td>
<td>$280.88</td>
<td>$0.00</td>
<td>$112.35</td>
<td>$168.53</td>
</tr>
<tr>
<td>9</td>
<td>$2,275.20</td>
<td>3.00%</td>
<td>12.72%</td>
<td>$289.35</td>
<td>$0.00</td>
<td>$115.74</td>
<td>$173.61</td>
</tr>
<tr>
<td>10</td>
<td>$2,343.46</td>
<td>3.00%</td>
<td>12.72%</td>
<td>$298.06</td>
<td>$0.00</td>
<td>$119.22</td>
<td>$178.83</td>
</tr>
</tbody>
</table>
Under Armour has positive cash flows from day 1, because it is already generating profits and reinvesting less than the entire earnings. As with Evergreen Solar, we check the reinvestment numbers by computing the return on capital implied by our forecasts of operating income and reinvestment. The return on capital exceeds 20% to begin the valuation but drifts down to 14.82% by the end of the tenth year, a number in line with what mature firms in the business (like Nike) generate as returns on capital.

To estimate the cost of equity today for Under Armour, we used a beta of 1.30 (the industry average for apparel firms that offer niche products at high prices) and kept the riskfree rate of 2.25% and an equity risk premium of 6%. While the firm has little conventional debt, we converted lease commitments and other fixed commitments (related to sponsorships) to debt, resulting in an initial debt ratio of 16%. Over time, we moved the debt ratio down towards 1.10, the cost of debt from 6.25% to 4.25% and increased the debt ratio towards the industry average of 25%. Table 10.13 summarizes the costs of debt, equity and capital for Under Armour:

<table>
<thead>
<tr>
<th>Year</th>
<th>Beta</th>
<th>Cost of equity</th>
<th>Pre-tax cost of debt</th>
<th>Tax savings</th>
<th>Afer-tax cost of debt</th>
<th>Debt ratio</th>
<th>Cost of capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.30</td>
<td>10.05%</td>
<td>6.25%</td>
<td>40.00%</td>
<td>3.75%</td>
<td>12.44%</td>
<td>9.27%</td>
</tr>
<tr>
<td>2</td>
<td>1.30</td>
<td>10.05%</td>
<td>6.25%</td>
<td>40.00%</td>
<td>3.75%</td>
<td>12.44%</td>
<td>9.27%</td>
</tr>
<tr>
<td>3</td>
<td>1.30</td>
<td>10.05%</td>
<td>6.25%</td>
<td>40.00%</td>
<td>3.75%</td>
<td>12.44%</td>
<td>9.27%</td>
</tr>
<tr>
<td>4</td>
<td>1.30</td>
<td>10.05%</td>
<td>6.25%</td>
<td>40.00%</td>
<td>3.75%</td>
<td>12.44%</td>
<td>9.27%</td>
</tr>
<tr>
<td>5</td>
<td>1.30</td>
<td>10.05%</td>
<td>6.25%</td>
<td>40.00%</td>
<td>3.75%</td>
<td>12.44%</td>
<td>9.27%</td>
</tr>
<tr>
<td>6</td>
<td>1.26</td>
<td>9.81%</td>
<td>5.85%</td>
<td>40.00%</td>
<td>3.51%</td>
<td>14.95%</td>
<td>8.87%</td>
</tr>
<tr>
<td>7</td>
<td>1.22</td>
<td>9.57%</td>
<td>5.75%</td>
<td>40.00%</td>
<td>3.45%</td>
<td>15.58%</td>
<td>8.62%</td>
</tr>
<tr>
<td>8</td>
<td>1.18</td>
<td>9.33%</td>
<td>5.58%</td>
<td>40.00%</td>
<td>3.35%</td>
<td>16.62%</td>
<td>8.34%</td>
</tr>
<tr>
<td>9</td>
<td>1.14</td>
<td>9.09%</td>
<td>5.25%</td>
<td>40.00%</td>
<td>3.15%</td>
<td>18.72%</td>
<td>7.98%</td>
</tr>
<tr>
<td>10</td>
<td>1.10</td>
<td>8.85%</td>
<td>4.25%</td>
<td>40.00%</td>
<td>2.55%</td>
<td>25.00%</td>
<td>7.28%</td>
</tr>
</tbody>
</table>

While the change in the cost of capital is not as dramatic as it was for Evergreen Solar, the cost of capital for Under Armour drops from 9.27% to 7.28% over the next 10 years.

---

7 We start the process of estimating capital invested with the current book value of capital (debt + equity) or $357.19 million.
As a final step, we assess what Under Armour will look like as a stable growth firm. As a slightly less risky business, with more debt in its capital structure, it should have a lower cost of capital (7.28%). We will assume that the firm will be able to use the magic of its brand name to generate returns on capital of 9% in perpetuity on new investments, above the cost of capital. The reinvestment rate and terminal value for the firm are computed below:

Reinvestment rate (after year 10) = Stable growth rate/ Stable Return on capital

\[
= \frac{2.25\%}{9\%} = 25\%
\]

Terminal value

\[
= \frac{\text{EBIT}_{11}(1-t)(1-\text{Reinvestment Rate})}{(\text{Cost of capital}_{\text{stable}} - g_{\text{stable}})}
\]

\[
= \frac{304.79(1-.40)(1-.25)}{(.0728 -.0225)} = $2729.50 \text{ million}
\]

As the final step, we pull together the expected free cash flows to the firm and the costs of capital in table 10.14, with the intent of computing the value of the operating assets of the firm:

**Table 10.14: Cash flows, discount rates and value**

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost of capital</th>
<th>Cumulated Cost of Capital</th>
<th>FCFF</th>
<th>Terminal value</th>
<th>Present value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.27%</td>
<td>1.0927</td>
<td>-$65.13</td>
<td></td>
<td>-$59.60</td>
</tr>
<tr>
<td>2</td>
<td>9.27%</td>
<td>1.1939</td>
<td>-$41.17</td>
<td></td>
<td>-$34.48</td>
</tr>
<tr>
<td>3</td>
<td>9.27%</td>
<td>1.3046</td>
<td>-$22.25</td>
<td></td>
<td>-$17.05</td>
</tr>
<tr>
<td>4</td>
<td>9.27%</td>
<td>1.4254</td>
<td>$8.01</td>
<td>$48.92</td>
<td>$5.62</td>
</tr>
<tr>
<td>5</td>
<td>9.27%</td>
<td>1.5575</td>
<td>$48.92</td>
<td>$31.41</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8.87%</td>
<td>1.6957</td>
<td>$71.31</td>
<td>$42.05</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>8.62%</td>
<td>1.8418</td>
<td>$95.85</td>
<td>$52.04</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8.34%</td>
<td>1.9953</td>
<td>$116.55</td>
<td>$58.41</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>7.98%</td>
<td>2.1545</td>
<td>$137.40</td>
<td>$63.77</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>7.28%</td>
<td>2.3112</td>
<td>$141.54</td>
<td>$2,729.50</td>
<td>$1,242.22</td>
</tr>
</tbody>
</table>

Sum of PV of cash flows = $1,384.40

The value that we estimate for the operating assets of the firm is $1.384 billion.

**From operating asset value to equity value per share**

Navigating the way from operating asset value to equity value per share for growth companies can be fraught with dangers, many of which we outlined in earlier
sections. In this section, we will outline precautions that can protect, at least partially, against some of these dangers.

*Cash and non-operating assets*

Earlier in this chapter, we noted how quickly growth firms can burn through cash balances and how using the cash balance from the most recent financial statements can lead to misleading values. At least in theory, it would be useful to know what the cash balance is today, when valuing a firm. While investors in public equity markets have no way of accessing this information, an acquirer (or at least a friendly acquirer) should be able to get this information from the target firm and use it estimate an updated value. Even public investors can make judgments about current cash balances by using two pieces of public information – the cash flows of the firm and any new financing during the period since the last financial statement. For instance, assume that the last cash balance (from three months ago) is $100 million for a firm that reported EBITDA of negative $80 million in the most recent twelve-month period. If the firm has not raised any new financing in the last three months (through either equity issues or new debt), the current cash balance for the firm is likely to be closer to $80 million than $100 million. (We are reducing the cash balance by the estimated EBITDA of -$20 million – one quarter of -$80 million.)

*Debt and other Non-equity Claims*

If convertible debt is the preferred mode of borrowing for a growth firm, we should treat it for what it is – a hybrid security that is part debt and part equity. Since the conversion option is equity and the rest is debt, the easiest way to decompose convertible debt into debt and equity is to value the convertible debt as if it were straight debt and to treat the resulting number as debt. For instance, assume that a growth firm has 5-year convertible debt outstanding, with a face value of $50 million and a coupon rate of 4%, and that the current pre-tax cost of debt for the firm, assuming it used conventional debt, is 10%. The value of the convertible bond, treated like a conventional debt would be:8

---

8 For simplicity, we have assumed annual interest payments. This equation can be easily modified to allow for semi-annual payments.
Debt Value of convertible bond = \((50 \times .04) \left( \frac{1 - (1.10)^5}{1.10} \right) + \frac{50}{(1.10)^5} = \$38.63\) million

Subtracting this value from the market value of convertible bond will yield the value of the conversion option. Thus, if the convertible debt is trading at $52 million, the conversion option (equity) will be valued at $13.37 million.\(^9\) When valuing this company, we would treat this part as equity and rest as debt in computing the current cost of capital. We would subtract out only the debt portion from the value of the firm to arrive at the overall value of equity.

Another aspect of debt that is potentially problematic is that the debt ratios will change over time, and with those changes will come changes in the debt outstanding at the firm. Since the value of equity is the value of the firm, net of debt, analysts often get caught up in the question of whether they should subtract the debt outstanding today (which may be negligible) or the expected debt outstanding in the future (which may be very large). The answer, when valuing the firm, is that we should subtract out only the current debt outstanding, even though that value may be miniscule relative to future debt issues.

**Post-valuation corrections**

Once we have derived the value of equity in a growth firm, the final step is to allocate the value of equity across the shares outstanding in the firm. In making this final judgment, there are three considerations to keep in mind.

**Survival and Illiquidity**

The first two are issues that were raised with young growth companies – the probability of survival has to be factored into the value and illiquidity can cause discounts to this value. While neither of these factors is as significant with growth firms as for young businesses – the probability of survival for growth firms is much higher than for nascent businesses and the equity is usually more liquid (especially if the growth firm is publicly traded- they can affect value. Even publicly traded growth firms have to shut down operations, especially if they run out of cash, and shares in these firms may trade

\(^9\) If the market value of the debt is not available, an approximation would be to use the face value.
far less frequently (and with much higher transactions costs) than shares in more mature companies.

If survival is truly a concern, we would suggest using the approaches we developed in the last chapter for dealing with it. In summary, we would estimate the probability that the growth firm will fail and the consequences, in terms of what equity investors will receive, in case they do. The expected value of equity will then reflect the weighted average of the going concern and failure values, weighted by the probabilities of success and failure. Similarly, if illiquidity is weighing down value, using one of the approaches described in the last section – adjusting the cost of capital or applying a post valuation illiquidity discount – will help.

Voting right differentials

The final factor to consider in arriving at value of equity per share is differences in voting rights across shares. While we would expect voting shares to trade at a premium on non-voting shares, the magnitude of the difference should be a function of the value of voting rights and consequently vary across firms.

How much are voting rights worth? The earliest studies of voting share premiums were done with companies with different voting share classes in the United States. Lease, McConnell and Mikkelson (1983) found that voting shares in that market trade, on average, at a relatively small premium of 5-10% over non-voting shares. They also found extended periods where the voting share premium disappeared or voting shares traded at a discount to non-voting shares, a surprising finding that can be explained partially by the relative illiquidity of voting shares (since only a small percentage is available for public trading). Reilly (2003) updated this study to look at 28 companies with voting and non-voting shares in 1994 and 1999 and concluded that the median voting share premium increased from 2% in 1994 to 2.8% in 1999.

Studies in recent years have expanded the analysis of voting share premiums to other markets, where differential voting rights are more common. Premiums of a
magnitude similar to those found in the United States (5-10%) were found in the United Kingdom and Canada. Much larger premiums are reported in Latin America (50-100%), Israel (75%) and Italy (80%). In a comparative study of voting premiums across 661 companies in 18 countries, Nenova (2003) finds that the median value of control block votes varies widely across the countries, ranging from less than 1% in the US to 25% or greater in France, Italy, Korea and Australia. She concludes that the legal environment is the key factor in explaining differences across countries and that the voting premium is smaller in countries with better legal protection for minority and non-voting stockholders and larger for countries without such protection.  

The most common way to allocate value across voting and non-voting shares is to use the evidence from these studies to justify a premium. In the United States, for instance, voting share premiums have generally been set at between 5% and 10%. While we are not entirely convinced of this rule of thumb, we will stick with it for this chapter but return to examine it in the next.

*Illustration 10.5: From Operating Asset to Equity Value per share – Evergreen and Under Armour*

To get from operating asset to equity value, we have to add back cash and subtract out debt. With Evergreen Solar, we have to consider how best to deal with the fact that all of its debt is convertible (and thus has an equity component) and whether to take the cash balance reported in the September 2008 financial statements as the cash balance today. With Under Armour, we have to examine the consequences of the debt primarily taking the form or lease and sponsorship commitments and the existence of two classes of shares, with different voting rights.

*a. Evergreen Solar*

In illustration 10.3, we valued of the operating assets of Evergreen Solar at $509 million. To get to value of equity per share, we have to add back the current cash balance and subtract debt owed:

- **Cash balance**: Evergreen Solar reported a cash balance of $285.23 million in its most recent financial statements, from September 2008. This represents a big

---

jump from the cash balance of $99.7 million, reported at the end of 2007. The reason for the increase, though, was that the firm raised almost $492 million from new financing ($166 million from equity and the balance from the issue of a convertible bond).\textsuperscript{13} If we consider the new funding raised and the cash balances from December 2007 and September 2008, we can estimate the cash that the firm is “burning” each month:

\[
\text{Cash burn/ month} = \left( \frac{\text{Cash}_{\text{Dec 2007}} + \text{New financing}_{\text{Dec to Sept}} - \text{Cash}_{\text{Sept 2008}}}{\text{Number of intervening months}} \right)
\]

\[
= \left( \frac{99.7 + 492.44 - 285.23}{9} \right) = $34.10 \text{ million}
\]

Since three months have elapsed since the last financial statements, the updated cash balance can be computed as follows:

Updated Cash balance = Most recent cash balance – Cash burn/month * # months since last financials = 285.23 – (3*34.10) = $182.92 million

Adding this amount to the estimated value of the operating assets yields the value for Evergreen Solar as a firm:

Value of firm = Value of operating assets + Updated cash balance

\[
= $509 \text{ million} + $ 183 \text{ million} = $ 692 \text{ million}
\]

- **Debt:** During 2008, Evergreen Solar retired its existing debt and replaced it with 5-year convertible debt, with a face value of $373.75 million and a coupon rate of 4%. To break this debt down into debt and equity components, we valued this debt as if it were conventional debt, using the pre-tax cost of debt of 8.25% that we had estimated earlier for the firm. Discounting the expected semi-annual coupons of $14.95 million (4% of $373.75 million) and the face value back at 8.25% yields a value for the bond of $312 million.

\[
\text{Debt Value} = (373.75 \times 0.04) \left( \frac{1 - (1.0825)^{-5}}{0.0825} \right) + \frac{373.75}{1.0825^{5}} = $312 \text{ million}
\]

\textsuperscript{13} We used the statement of cash flows from September 2008, and used the cash from financing activities for the first three quarters of 2008.
We consider this to be the debt portion of the convertible debt, and attribute the difference between the market value of the convertible bond ($360 million) and the debt amount to the conversion option, which is equity.

Conversion option (equity) = Market value – Straight debt value

= $360 million - $312 million = $48 million

Subtracting the debt amount alone from the value of the firm yields the value of equity of $380 million.

Value of equity in Evergreen Solar = Value of firm – Debt

= $692 – $312 = $380 million

- Equity value per share: To estimate the value of equity per share, we consider the two claims on equity – one from the option holders (valued at $48 million) and one from common stockholders.

Value of equity (in common stock) = Value of Equity – Value of equity options

= 380 – 48 = $332 million

Since we have already netted out the value of equity options, this number can be divided by the actual number of shares outstanding (as opposed to a diluted number) to arrive at a value per share of $2.01 per share:

\[
\text{Value per share} = \frac{\text{Value of Equity in common stock}}{\text{Primary shares outstanding}} = \frac{332}{164.875} = $2.01/\text{share}
\]

b. Under Armour

To get from operating asset value to equity value for Under Armour poses fewer challenges than it did at Evergreen Solar. The cash balance of $40.15 million reported by the firm in its most recent financial statements in September 2008 is very similar to the cash balance of $40.59 million it reported in December 2007. Since the firm is generating positive earnings, we feel comfortable assuming that the cash balance is intact at the time of the valuation in January 2009. With debt, the only confounding detail is that the bulk of the debt takes the form of leases and sponsorship commitments; of the total debt of $133 million, $95.5 million represents the present value of future commitments. From a valuation perspective, though, we see no need to separate the two types of debt. Consequently, the value of equity at Under Armour can be estimated as follows:

Value of Equity = Value of operating assets + Cash – Debt
\[ = 1,384 \text{ million} + 40 \text{ million} - 133 \text{ million} = 1.292 \text{ million} \]

To get from this value to the value of equity per share, there are two final details that we have to take care of. The first is to consider the overhang of equity options that have been granted in the past to management; we estimated the value of the 2.13 million options outstanding at the firm, with an average strike price of $8.26 and an average expiration of 3.7 years, to be $23 million after taxes.\(^{14}\) (We will return to this issue in more depth in a later chapter, when we look at technology firms.) The second is that the firm has two classes of shares – 36.791 million class A shares that are held by the investing public and are traded and 12.5 million class B shares that are held by Kevin Plank, the founder of the firm; class B shares have 10 times the voting rights of class A shares. If we attribute no value to voting rights the value per share that we estimate is $25.73.

\[
\text{Value per share} = \frac{\text{Value of Equity}}{\text{(# Class A shares + # Class B shares)}} = \frac{(1,292 - 23)}{(36.791 + 12.5)} = 25.73
\]

Note that control component should give class B shares a premium but the fact that the shares are not traded will result in an illiquidity discount. If we assume that class B shares have a 10% premium on class A shares, we can estimate the value of equity per share for class A and class B shares as follows:

\[
\text{Value per class A share} = \frac{\text{Value of Equity}}{\text{(# Class A shares + Value premium * # Class B shares)}} = \frac{(1,292 - 23)}{(36.791 + 1.1*12.5)} = 25.09/\text{share}
\]

\[
\text{Value per class B share} = \text{Value of class A share} * 1.1 = 27.60
\]

Note that the cumulative market value stays at $1263 million and that all we are doing is reallocating the value across the two classes of shares. The 10% premium is based upon past studies of voting shares and we will consider a more nuanced approach to estimating the value of control (and voting/non-voting shares) in the next chapter.

**Dealing with Uncertainty**

It is almost a given that the value of a growth company, no matter how much we pay attention to the details and how much information we use, will be less precisely

\(^{14}\) We used the standard Black Scholes model and adjusted for the potential dilution and the tax savings that will accrue to the firm when the options are exercised.
estimated than the value of a mature company. This uncertainty can lead to post-valuation angst where analysts second-guess themselves and try to reconcile differences not only between their estimates and the market price but also across different valuations (done by different analysts).

Note, though, that much of this uncertainty comes not from the quality of the information or the precision of the valuation model used, but from the real world. The future is full of surprises, and for growth firms, where so much of the value lies in the future, this will translate into big changes in value. This is small consolation to the analyst who gets the value of equity in a growth company wrong and is called to account as a consequence. In chapter 3, we presented probabilistic approaches including decision trees, simulations and scenario analysis that can be used to enrich valuations. These approaches offer some promise with growth companies, not because they provide more precise estimates of value or even because they generate risk measures but because they allow analysts to be more comfortable with their own estimates of value. They are, however, not particularly useful for a simple reason. The uncertainty in the estimates will result in distributions in value that reflect that uncertainty. Thus, a simulation of Evergreen’s value, even if well done, will tell us that the value per share for Evergreen can range from a very low number to a very high number and that the market price falls well within that range.

A more useful technique for grappling with uncertainty, with growth companies, is to focus on the one of two key drivers of value for that company and look at not only the effects on value of varying assumptions about those drivers but also breakeven points in terms of the current price. For instance, assuming that revenue growth is the key determinant of value for a firm, we can ask the question: What would the revenue growth rate have to be to justify the current market price? We can then follow up by looking whether we are comfortable as investors, with the market-implied revenue growth rate.

Consider the valuation of Evergreen Solar. From our perspective, we feel comfortable with the revenue growth assumption, since the market is such a large one, but are uncertain about what the operating margins will be in stable growth (since so few alternative energy companies have made it to stable growth). In figure 10.7, we graph our
estimates of value per share against the target pre-tax operating margin, varying it from our base case assumption of 15%:

*Figure 10.7: Value per Share for Evergreen Solar – Target Operating Margin*

To justify its current stock price of $2.70 a share, Evergreen Solar would have to generate a pre-tax operating margin of 17% in steady state.

With Under Armour, where margins are at fairly close to industry averages already, the key question is whether revenues will continue to grow at high rates. In figure 10.8, we look at the value per share for Under Armour as a function of the compounded revenue growth over the next 10 years:
Figure 10.8: Value per Share for Under Armour – Compounded Revenue Growth Rate

The compounded revenue growth rate over the next 10 years has to be above 8% to justify paying the current stock price of $19 a share.

Relative Valuation

There is no reason why relative valuation cannot be used to arrive at an independent estimate of the value of equity in a growth firm as long as we keep two key factors in mind. The first is that using multiples and comparables cannot reduce the uncertainty inherent in valuing growth companies. The second is that relative valuation techniques have to be adapted to meet the limitations of growth companies – the paucity and unreliability of current operating numbers and the shifting risk/growth characteristics over time.

Comparable firms

Optimally, we would like to assess how a growth firm is valued by the market by comparing its pricing with that of otherwise similar growth firms. In a business like software, where there are growth firms aplenty, this can be accomplished by staying
within the traditional framework of defining comparable firms as those in the same industry. In businesses like retailing or automotive parts, a growth firm may be the exception in a sector where the bulk of the firms are either mature or in decline. In these cases, we may have to abandon the conventional practice and define growth firms in terms of fundamentals rather than business. The pricing of a retail firm with growth prospects should be compared to how the market is pricing growth firms in other sectors rather than more mature firms in its own industry; there is no reason why the PE ratio for a high growth retail firm should not be comparable to the PE ratio for a high growth software firm.

*Choice of multiples and base year*

As we noted in the section on the dark side as it relates to relative valuation, analysts valuing growth companies tend to use either revenues in the current year or estimates of operating performance in future years (forward earnings or revenues) to compute multiples. Each carries some danger:

- **Revenue multiples** are troubling simply because they gloss over the fact that the company being valued could be losing significant amounts of money. Consequently, we would suggest bringing in the expected future profit margins (which will be estimates) into the discussion of what comprises a reasonable multiple of revenues. Other things held constant, we would expect firms with higher expected profit margins (in mature phase) to trade at higher multiples of current revenues than firms with lower expected profit margins.

- **Forward earnings multiples** implicitly assume that the firm being valued will survive to the forward year and that the estimates of earnings for that year are reasonable. If forward multiples are used, controlling for survival becomes a critical component of the analysis. Firms that have a greater chance of surviving to the forward year, should trade at a higher multiple of earnings than firms that have a greater chance of failure.

As a general rule, we would steer away from multiples of either current book value or current earnings with growth companies early in the growth cycle, simply because these numbers are likely to be small and unstable.
Adjusting for differences in growth and risk

No matter how careful we are about constructing a set of comparable firms and picking the right multiple, there will be significant differences across the firms on their fundamentals. As we noted earlier in the chapter, the two ways in which analysts control for these differences – story telling and assuming that multiples increase proportionately with growth – yield misleading results. In fact, both approaches break down when we have to control for more than one variable when making comparisons.

When confronted with large differences in growth and risk across companies, the approach that offers the most flexibility in dealing with these differences is a multiple regression, with the chosen multiple being the dependent variable and growth, risk and any other fundamentals that we want to control for representing independent variables. With large enough samples of comparable firms, not only can we control for as many variables as we want, but the approach allows us to allow for complex relationships between growth and each variable.

Illustration 10.6: A Relative Valuation of Under Armour

To evaluate how Under Armour is being priced, relative to other firms in the sector, we extracted information on 34 publicly traded apparel firms in the United States, with earnings growth rates estimates available for the next 5 years from analysts following the companies.\textsuperscript{15} Table 10.15 provides the PE ratios, expected growth rates and two-year betas for these companies:

\textbf{Table 10.15: PE, Growth and Risk – Apparel Companies}

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Market Capitalization</th>
<th>PE</th>
<th>Expected growth rate in EPS - Next 5 years</th>
<th>Beta</th>
<th>PEG Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nike Inc. (NYSE:NKE)</td>
<td>$22,102.80</td>
<td>11.91</td>
<td>13.10%</td>
<td>1.04</td>
<td>0.91</td>
</tr>
<tr>
<td>Kimberly-Clark Corporation (NYSE:KMB)</td>
<td>$21,830.00</td>
<td>12.64</td>
<td>7.33%</td>
<td>0.603</td>
<td>1.72</td>
</tr>
<tr>
<td>Avon Products Inc. (NYSE:AVP)</td>
<td>$8,896.80</td>
<td>11.53</td>
<td>13.00%</td>
<td>0.966</td>
<td>0.89</td>
</tr>
<tr>
<td>VF Corp. (NYSE:VFC)</td>
<td>$5,996.90</td>
<td>9.21</td>
<td>10.60%</td>
<td>1.02</td>
<td>0.87</td>
</tr>
<tr>
<td>Polo Ralph Lauren Corp. (NYSE:RL)</td>
<td>$3,781.30</td>
<td>8.00</td>
<td>13.60%</td>
<td>1.25</td>
<td>0.59</td>
</tr>
<tr>
<td>Cintas Corp. (NasdaqGS:CTAS)</td>
<td>$3,627.20</td>
<td>11.26</td>
<td>10.80%</td>
<td>0.999</td>
<td>1.04</td>
</tr>
<tr>
<td>Guess? Inc. (NYSE:GES)</td>
<td>$1,472.40</td>
<td>6.67</td>
<td>16.00%</td>
<td>1.25</td>
<td>0.42</td>
</tr>
<tr>
<td>Gildan Activewear Inc. (NYSE:GIL)</td>
<td>$1,291.90</td>
<td>8.93</td>
<td>12.50%</td>
<td>1.1</td>
<td>0.71</td>
</tr>
<tr>
<td>Tupperware Brands Corporation (NYSE:TUP)</td>
<td>$1,285.10</td>
<td>8.54</td>
<td>12.00%</td>
<td>1.45</td>
<td>0.71</td>
</tr>
</tbody>
</table>

\textsuperscript{15} There were 84 companies in the overall sample; only 34 had positive earnings (to compute PE) and expected growth rates in earnings for the next 5 years.
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Price</th>
<th>P/E</th>
<th>Growth Rate</th>
<th>Beta</th>
<th>PEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia Sportswear Company (NasdaqGS:COLM)</td>
<td>$1,083.70</td>
<td>8.87</td>
<td>9.70%</td>
<td>0.664</td>
<td>0.91</td>
</tr>
<tr>
<td>Warnaco Group Inc. (NYSE:WRC)</td>
<td>$969.80</td>
<td>11.21</td>
<td>20.00%</td>
<td>1.91</td>
<td>0.56</td>
</tr>
<tr>
<td>Under Armour, Inc. (NYSE:UA)</td>
<td>$969.10</td>
<td>20.71</td>
<td>20.90%</td>
<td>1.44</td>
<td>0.99</td>
</tr>
<tr>
<td>Phillips-Van Heusen Corp. (NYSE:PVH)</td>
<td>$968.30</td>
<td>6.05</td>
<td>14.00%</td>
<td>1.25</td>
<td>0.43</td>
</tr>
<tr>
<td>Carters Inc. (NYSE:CRI)</td>
<td>$964.70</td>
<td>12.64</td>
<td>15.00%</td>
<td>1.19</td>
<td>0.84</td>
</tr>
<tr>
<td>Wolverine World Wide Inc. (NYSE:WWW)</td>
<td>$929.80</td>
<td>9.56</td>
<td>12.60%</td>
<td>0.693</td>
<td>0.76</td>
</tr>
<tr>
<td>Hanesbrands Inc. (NYSE:HBI)</td>
<td>$918.00</td>
<td>5.77</td>
<td>15.30%</td>
<td>1.44</td>
<td>0.38</td>
</tr>
<tr>
<td>Fossil Inc. (NasdaqGS:FOSL)</td>
<td>$814.70</td>
<td>6.62</td>
<td>16.50%</td>
<td>1.35</td>
<td>0.34</td>
</tr>
<tr>
<td>Polaris Industries, Inc. (NYSE:PII)</td>
<td>$772.50</td>
<td>6.50</td>
<td>11.20%</td>
<td>1.5</td>
<td>0.58</td>
</tr>
<tr>
<td>Timberland Co. (NYSE:TBL)</td>
<td>$642.50</td>
<td>11.92</td>
<td>12.00%</td>
<td>1.06</td>
<td>0.99</td>
</tr>
<tr>
<td>UniFirst Corp. (NYSE:UNF)</td>
<td>$551.20</td>
<td>8.69</td>
<td>13.00%</td>
<td>0.906</td>
<td>0.67</td>
</tr>
<tr>
<td>Jos. A Bank Clothiers Inc. (NasdaqGS:JOSB)</td>
<td>$529.10</td>
<td>9.71</td>
<td>15.00%</td>
<td>1.11</td>
<td>0.65</td>
</tr>
<tr>
<td>Iconix Brand Group, Inc. (NasdaqGS:ICON)</td>
<td>$511.20</td>
<td>7.08</td>
<td>17.00%</td>
<td>1.74</td>
<td>0.42</td>
</tr>
<tr>
<td>Bebe Stores, Inc. (NasdaqGS:BEBE)</td>
<td>$507.30</td>
<td>8.61</td>
<td>13.00%</td>
<td>1.55</td>
<td>0.66</td>
</tr>
<tr>
<td>Raven Industries Inc. (NasdaqGS:RAVN)</td>
<td>$415.40</td>
<td>12.94</td>
<td>14.50%</td>
<td>1.08</td>
<td>0.89</td>
</tr>
<tr>
<td>K-Swiss Inc. (NasdaqGS:KSWS)</td>
<td>$382.00</td>
<td>11.24</td>
<td>19.00%</td>
<td>1.17</td>
<td>0.59</td>
</tr>
<tr>
<td>G&amp;K Services Inc. (NasdaqGS:GKSR)</td>
<td>$347.10</td>
<td>9.86</td>
<td>17.00%</td>
<td>0.922</td>
<td>0.92</td>
</tr>
<tr>
<td>Ennis Inc. (NYSE:EBF)</td>
<td>$301.40</td>
<td>7.32</td>
<td>10.00%</td>
<td>1.21</td>
<td>0.73</td>
</tr>
<tr>
<td>True Religion Apparel Inc. (NasdaqGS:TRLG)</td>
<td>$284.30</td>
<td>7.00</td>
<td>19.00%</td>
<td>1.3</td>
<td>0.41</td>
</tr>
<tr>
<td>Volcom Inc. (NasdaqGS:VLCM)</td>
<td>$225.20</td>
<td>5.99</td>
<td>20.00%</td>
<td>1.9</td>
<td>0.30</td>
</tr>
<tr>
<td>Maidenform Brands Inc. (NYSE:MFB)</td>
<td>$211.70</td>
<td>7.40</td>
<td>14.50%</td>
<td>1.45</td>
<td>0.51</td>
</tr>
<tr>
<td>American Apparel, Inc. (AMEX:APP)</td>
<td>$157.10</td>
<td>18.33</td>
<td>30.00%</td>
<td>0</td>
<td>0.61</td>
</tr>
<tr>
<td>Cherokee Inc. (NasdaqGS:CHKE)</td>
<td>$133.70</td>
<td>9.03</td>
<td>12.00%</td>
<td>1.27</td>
<td>0.75</td>
</tr>
<tr>
<td>Oxford Industries Inc. (NYSE:OXM)</td>
<td>$104.90</td>
<td>20.61</td>
<td>13.00%</td>
<td>1.54</td>
<td>1.59</td>
</tr>
<tr>
<td>G-III Apparel Group, Ltd. (NasdaqGS:GIII)</td>
<td>$85.80</td>
<td>4.47</td>
<td>18.30%</td>
<td>1.32</td>
<td>0.24</td>
</tr>
<tr>
<td>Lacrosse Footwear Inc. (NasdaqGM:BOOT)</td>
<td>$64.90</td>
<td>8.78</td>
<td>13.50%</td>
<td>0.283</td>
<td>0.65</td>
</tr>
<tr>
<td>Perry Ellis International Inc. (NasdaqGS:PERY)</td>
<td>$60.80</td>
<td>3.27</td>
<td>13.50%</td>
<td>1.57</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Sector Average</strong></td>
<td><strong>2288.25</strong></td>
<td><strong>9.70</strong></td>
<td><strong>15.00%</strong></td>
<td><strong>1.15</strong></td>
<td><strong>0.70</strong></td>
</tr>
</tbody>
</table>

Let us consider first the two most common approaches used by analysts, following growth companies.

- **Subjective**: The PE ratio for Under Armour in January 2009 is 20.71, well above the average PE ratio for the sector (9.70). An optimistic analyst would undoubtedly point to Under Armour’s higher expected growth in earnings (20.90% versus the industry average of 15%) as justification for a higher PE, though a pessimistic analyst would draw attention to Under Armour’s higher risk (a beta of 1.44 versus the industry average of 1.15) to suggest that the stock was over valued.

- **PEG ratio**: A simple way to control for differences is growth is to compute the PEG ratio that we described earlier in the chapter; lower PEG ratios are considered
indicative of an under valued company. The PEG ratio for Under Armour is a shade under 1.00:

$$\text{PEG}_{\text{Under Armour}} = \frac{\text{PE}}{\text{Expected growth rate in EPS}} = \frac{20.71}{20.90} = 0.99$$

Since the average PEG ratio for the sector is much lower at 0.70, this would seem to indicate that Under Armour is overvalued.

Since neither approach captures the effects of both growth and risk satisfactorily, and the PEG ratio assumes that PE increases in lock step with growth, we first graphed the PE ratios of apparel firms against expected EPS growth in the next 5 years in figure 10.8:

*Figure 10.8: PE versus Expected Growth – Apparel companies*

Note that Under Armour (UA) has the highest PE ratio in the group, but it also has a high growth rate. We regressed PE ratios against the expected growth rate and betas,
weighting each firm, by market capitalization. The results are as follows (with t statistics in brackets below the coefficients):

\[
\text{PE} = 13.78 + 32.04 \text{ (Expected Growth Rate)} - 6.60 \text{ Beta} \quad R^2 = 25.9\%
\]

\[
(10.88) \quad (3.49) \quad (1.91)
\]

In keeping with intuition, higher growth firms have higher PE ratios and higher risk pushes down the PE, and both relationships are statistically significant. Using the expected growth in earnings per share of 20.9% that analysts are forecasting for Under Armour for the next 5 years and the 2-year beta estimate of 1.44, we can estimate the expected PE ratio for the firm:

\[
\text{Expected PE}_{\text{Under Armour}} = 13.78 + 32.04 \times 0.209 - 6.60 \times 1.44 = 10.98
\]

At its existing PE ratio of 20.71, Under Armour looks overvalued, on a relative valuation basis, by almost 89%.

*Illustration 10.7: A Relative Valuation of Evergreen Solar*

With small revenues, miniscule book value and big operating losses, Evergreen Solar presents more of a challenge when it comes to relative valuation. To begin with, the only multiple that we can use, with current numbers, is a revenue multiple. We will consider three ways in which we can approach this relative valuation and the pluses and minuses of each.

a. **Similar companies:** The simplest way to approach relative valuation is to find alternative energy companies that are close to Evergreen in terms of current operating statistics – revenues and margins – and compare the multiples of revenues that these firms trade at in comparison to Evergreen’s numbers. In January 2009, for instance, we found four companies that had revenues similar to Evergreen (about $90 million). Table 10.16 summarizes the Enterprise value/Sales multiples for these firms:

*Table 10.16: Enterprise Value to Sales: Comparable Alternative Energy Companies*

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Market Capitalization</th>
<th>Enterprise Value</th>
<th>EV/Sales</th>
<th>Total Revenue ($mm) [LTM]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumatec Resources</td>
<td>10.7</td>
<td>74.71</td>
<td>1.23</td>
<td>60.7</td>
</tr>
<tr>
<td>China Windpower</td>
<td>169.3</td>
<td>174.73</td>
<td>2.62</td>
<td>66.7</td>
</tr>
<tr>
<td>Viridis Clean</td>
<td>52.9</td>
<td>290.4</td>
<td>3.31</td>
<td>87.8</td>
</tr>
</tbody>
</table>
Note that the average EV/Sales ratio across these firms is 3.17 and applying this to Evergreen Solar’s revenues of $90 million in 2007 would have yielded an enterprise value today of $285.3 million. In using this sample, we are implicitly assuming that these firms have the same growth and profit potential in steady state. Note also how much variation there is in the EV/Sales ratio across these four firms; t

b. **Forward values:** One reason why we have trouble using multiples with growth companies is that the current numbers are not representative of what we expect the firm to look like in the future. One way around this problem is to use the forecasted revenues and other operating numbers to estimate value. With Evergreen, we draw on our estimates of future revenues and earnings in illustration 10.5. In table 10.6, we forecast Evergreen’s revenues in year 5 to be $483 million and its pre-tax operating income to be $27.75 million. Looking across the larger publicly traded firms that are listed under alternative energy, we estimated an average EV/Sales ratio of 1.55. Applying this to the revenues in year 5 yields an expected enterprise value (in year 5) of $749 million.

Expected Enterprise value in year 5 = $483 * 1.55 = $749 million

Discounting this value back at Evergreen’s cost of capital of 10.37% for the first 5 years (see table 10.8), we estimate an enterprise value today of $457 million.

Enterprise value today = $749 million/ 1.1037^5 =$457 million

This approach is based on three premises. The first is that the firm will survive and make it to year 5, which may or may not happen, given operating losses and the overlay of debt. The second is that our forecasts of revenues and operating income in year 5 are reasonable numbers; if we have over or under estimated these numbers, the resulting estimates of values will also be affected. The third is that the firm being valued will look like larger firms in the industry in five years, thus making it all right to use the industry average multiple.

c. **Melded approach:** In this approach, we take elements of the second approach, where we use forward revenues/earnings but superimpose two factors. The first is
risk, captured both in the discount rate used to bring the value back to today, but also in the probability that the firm will not make it. The second is the use of a multiple that is not the industry average; instead, we would use a multiple that will reflect the company’s characteristics in the forward year. To estimate this value, we would look at the relationship between the multiple and fundamentals across the sector today.

Consider the last component first. To measure how the multiple of revenues changes as expected growth rate changes in this sector, we ran a regression of EV/Sales against expected revenue growth rates and operating margins across the sector today. The resulting output is summarized below:

$$\text{EV/Sales}_{\text{Evergreen}} = 0.85 + 7.41 \times (\text{Operating Margin}) + 3.56 \times (\text{Expected growth})$$

To estimate the multiple of revenues that Evergreen Solar will trade at the end of the fifth year, we estimated the revenue growth rate of 20.32% from years 6-10 in table 10.6, and the pre-tax operating margin of 5.74% in year 5; plugging these values into the regression provides us with a forecasted EV/Sales ratio at the end of year 5.

Forecasted EV/Sales in year 5 = 0.85 + 7.41 (0.0574) + 3.56 (0.2032) = 2.00

Applying this multiple to the revenues in year 5 yields the enterprise value and discounting back to today provides us with an estimate of the enterprise value today.

Revenues$$_{\text{Evergreen in year 5}} = $483 million

Enterprise Value$$_{\text{Evergreen in year 5}} = $483 \times 2.00 = $966 million

Enterprise Value$$_{\text{Evergreen today}} = $966/ \ 1.1037 = $589 million

This is much closer to the $509 million we estimated in the discounted cash flow model for Evergreen Solar’s enterprise value today.

**Conclusion**

When valuing a growth company, we confront many of the issues that we faced with young and idea companies, albeit on a lesser scale. Data on past operations provide a short, volatile and not particularly useful basis for forecasting the future. Much of the value of the company comes from expectations about how high growth will be in the
future, how long this growth can be sustained and the quality of this growth, all of which are difficult to forecast. In particular, the rate at which growth rates will drop as the company becomes bigger will be a key factor determining its value. Estimating risk parameters from stock price data can yield strange values and the risk profile of the firm will change as its growth rate changes.

Analysts, confronted with these challenges, often adopt short cuts that may save them time but yield misleading values. They fail to adjust growth rates as the company gets bigger, allowing firms to grow for too long at high rates, make assumptions about risk and reinvestment that are inconsistent with their own growth estimates and are often cavalier about when they put their firms into stable growth and the assumptions they make to get terminal value. When doing relative valuation, they stick with the standard practices used to value mature companies, using other firms n the industry as comparable companies, revenue or forward earnings multiples and adjusting for differences across firms not at all, subjectively or in the most simplistic fashions.

There are three key components to valuing growth companies well, in a discounted cash flow framework. The first is to ensure that the assumptions we are making about growth and margins reflect not only market potential and competition, but also change to reflect the firm’s changing size over time. The second is to reinvest enough back into the business to sustain the forecasted growth rates. The third is modify the risk profile of the firm to match its growth characteristics – the costs of equity, debt and capital are all likely to decrease as the firm goes from high growth to stable growth. With relative valuation, controlling for differences in growth and risk when comparing companies is essential.