ESTIMATING FIRM VALUE

In the last chapter, you examined the determinants of expected growth. Firms that reinvest substantial portions of their earnings and earn high returns on these investments should be able to grow at high rates. But for how long? In this chapter, you bring closure to firm valuation by considering this question. As a firm grows, it becomes more difficult for it to maintain high growth and it eventually will grow at a rate less than or equal to the growth rate of the economy in which it operates. This growth rate, labeled stable growth, can be sustained in perpetuity, allowing you to estimate the value of all cash flows beyond that point as a terminal value. The key question that you confront in this chapter is the estimation of when and how this transition to stable growth will occur for the firm that you are valuing. Will the growth rate drop abruptly at a point in time to a stable growth rate or will it occur more gradually over time? To answer these questions, you will look at a firm's size (relative to the market that it serves), its current growth rate, and its competitive advantages.

In the second part of the chapter, you examine how to incorporate the value of cash, marketable securities and other non-operating assets into the value of the firm. Cross holdings in other companies can pose problems in valuation, partly because of the way these holdings are reflected in accounting statements.

Closure in Valuation

In theory, at least, publicly traded firms can have infinite lives. Since you cannot estimate cash flows forever, you generally impose closure in discounted cash flow valuation, by stopping your estimation of cash flows sometime in the future and then computing a terminal value that reflects the value of the firm at that point.

Value of a Firm = $\sum_{t=1}^{t=n} \frac{CF_t}{(1+k_c)^t} + \frac{\text{Terminal Value}_n}{(1+k_c)^n}$

You can find the terminal value in one of three ways. One is to apply a multiple to estimate the value in the terminal year. The second is to assume a liquidation of the firm's assets in the terminal year, and estimate what other would pay for the assets that the firm has accumulated at that point. The third is to assume that the cash flows of the firm will grow at a constant rate forever – a stable growth rate. With stable growth, the terminal value can be estimated using a perpetual growth model.

Multiple Approach

In this approach, the value of a firm in a future year is estimated by applying a multiple to the firm's earnings or revenues in that year. For instance, a firm with expected revenues of \$ 6 billion ten years from now will have an estimated terminal value in that year of \$ 12 billion, if a value to sales multiple of 2 is used. While this approach has the virtue of simplicity, the multiple has a huge effect on the final firm value and where it is obtained can be critical. If, as is common, the multiple is estimated by looking at how comparable firms in the business today are priced by the market, the valuation becomes a relative valuation, rather than a discounted cash flow valuation. If the multiple is estimated using fundamentals, it converges on the stable growth model that will be described in the next section.

All in all, using multiples to estimate terminal value, when those multiples are estimated from comparable firms, results in a dangerous mix of relative and discounted cash flow valuation. While there are advantages to relative valuation, and you will consider these in a later chapter, a discounted cash flow valuation should provide you with an estimate of intrinsic value, not relative value. Consequently, the only consistent way of estimating terminal value in a discounted cash flow model is to use either a liquidation value or to use a stable growth model.

Liquidation Value

In some valuations, you can assume that the firm will cease operations at a point in time in the future and sell the assets it has accumulated to the highest bidders. The estimate that emerges is called a liquidation value. There are two ways in which the liquidation value can be estimated. One is to base it on the book value of the assets, adjusted for any inflation during the period. Thus, if the book value of assets ten years from now is expected to be \$ 2 billion, the average age of the assets at that point is 5 years and the expected inflation rate is 3%, the expected liquidation value can be estimated as:

Expected Liquidation value = Book Value of $Assets_{Term}$ yr (1+ inflation rate)^{Average life of assets}

$$=$$
 \$ 2 billion (1.03)⁵ = \$2.319 billion

The limitation of this approach is that it is based upon accounting book value and does not reflect the earning power of the assets.

The alternative approach is to estimate the value based upon the earning power of the assets. To make this estimate, you would first have to estimate the expected cash flows from the assets and then discount these cash flows back to the present, using an appropriate discount rate. In the example above, for instance, if you assumed that the assets in question could be expected to generate \$ 400 million in after-tax cash flows for 15 years (after the terminal year) and the cost of capital was 10%, your estimate of the expected liquidation value would be:

Expected Liquidation value = \$400 million
$$\frac{(1-\frac{1}{(1.10)^{15}})}{.10}$$
 = \$3.042 billion

Stable Growth Model

In the liquidation value approach, you are assuming that your firm has a finite life and that it will be liquidated at the end of that life. Firms, however, can reinvest some of their cash flows back into new assets and extend their lives. If you assume that cash flows, beyond the terminal year, will grow at a constant rate forever, the terminal value can be estimated as follows:

Terminal value_n = Free Cashflow to $\operatorname{Firm}_{n+1}$ / (Cost of Capital_{n+1} - g_n) where the cost of capital and the growth rate in the model are sustainable forever. It is this fact, i.e., that they are constant forever, that allows you to put some reasonable constraints on the growth rate. Since no firm can grow forever at a rate higher than the growth rate of the economy in which it operates, the constant growth rate cannot be greater than the overall growth rate of the economy. This constant growth rate is called a *stable growth rate*. In fact, constraining the stable growth rate to be less than or equal to the growth rate of the economy will also ensure that the growth rate will always be less than the cost of capital¹.

Key Assumptions about Stable Growth

In every discounted cash flow valuation, there are three critical assumptions you need to make on stable growth. The first relates to when the firm that you are valuing will become a stable growth firm, if it is not one already. The second relates to what the characteristics of the firm will be in stable growth, in terms of return on capital and cost of capital. The final assumption relates to how the firm that you are valuing will make the transition from high growth to stable growth.

I. Length of the High Growth Period

The question of how long a firm will be able to sustain high growth is perhaps one of the more difficult questions to answer in a valuation, but two points are worth making. One is that it is not a question of whether but when firms hit the stable growth wall. All firms ultimately become stable growth firms, in the best case, because high growth makes a firm larger, and the firm's size will eventually become a barrier to further high growth. In the worst case scenario, firms may not survive and will be liquidated. The second is that high growth in valuation, or at least high growth that creates value², comes from firms earning high returns on their marginal investments. In other words, increased value comes from

¹ The cost of capital includes a nominal riskless rate, which should reflect both expected inflation in the economy and real growth. Thus, if the nominal growth rate of the economy is 5% in the long term, the long term nominal riskless rate should be at least that number.

² Growth without excess returns will make a firm larger but not more valuable.

firms having a return on capital that is well in excess of the cost of capital. Thus, when you assume that a firm will experience high growth for the next 5 or 10 years, you are also implicitly assuming that it will earn excess returns (over and above the cost of capital) during that period. In a competitive market, these excess returns will eventually draw in new competitors, and the excess returns will disappear.

You should look at three factors when considering how long a firm will be able to maintain high growth.

- 1. *Size of the firm*: Smaller firms are much more likely to earn excess returns and maintain these excess returns than otherwise similar larger firms. This is because they have more room to grow and a larger potential market. Ariba and Amazon are small firms in large markets and should have the potential for high growth (at least in revenues) over long periods. The same can be said about Rediff.com. When looking at the size of the firm, you should look not only at its current market share, but also at the potential growth in the total market for its products or services. Cisco may have a large market share of its current market, but it may be able to grow in spite of this because the entire market is growing rapidly
- 1. *Existing growth rate and excess returns:* Momentum does matter, when it comes to projecting growth. Firms that have been reporting rapidly growing revenues are more likely to see revenues grow rapidly at least in the near future. Firms that are earnings high returns on capital and high excess returns in the current period are likely to sustain these excess returns for the next few years.
- 1. *Magnitude and Sustainability of Competitive Advantages*: This is perhaps the most critical determinant of the length of the high growth period. If there are significant barriers to entry and sustainable competitive advantages, firms can maintain high growth for longer periods. If, on the other hand, there are no or minor barriers to entry, or if the firm's existing competitive advantages are fading, you should be far more conservative about allowing for long growth periods. The quality of existing

management also influences growth. Some top managers³ have the capacity to make

the strategic choices that increase competitive advantages and create new ones.

Illustration 6.1: Length of High Growth Period

To examine how long high growth will last at each of the five firms, their standings on each of the above characteristics is assessed in Table 6.1:

	Firm Size/ Market Size	Current Growth/ Competitive Advantages	Length of High Growth Period
Amazon	Firm has a very small market share of a very large market (specialty retailing). There is ample potential for growth (at least in revenues)	Firm is losing money currently but has a first- mover advantage as one of the first e-tailers. Amazon also has a small technological edge in the processing of online orders.	10 years
Ariba	Firm has small revenues in a small and fast- growing market (if you define the market as B2B commerce). However, the potential market is huge.	Ariba is losing money but it is in a technological battle for this market. If Ariba's technology wins, it could earn excess returns for an extended period	10 years
Cisco	Firm has a large market share of a fast-growing market.	Firm has a technological edge on its rivals and a knack of succeeding with its acquisition strategy. Firm is earning significant excess returns now.	12 years
Motorola	Firm has a small market share of a growth market that is maturing (semi conductors) and a significant market share of a growing market (telecommunication equipment)	Motorola's research has provided it with technological advantages as well as patents. It is not the technological leader in any of its markets, though. Firm has anemic returns currently.	5 years
Rediff.com	Has a small market share of a small market (Indian internet users) that could grow	Local language capabilities give its portals an advantage over foreign	10 years

Table 6.1: Assessment of length of High Growth Period

difference in the growth of their firms.

³ Jack Welch at GE and Robert Goizueta at Coca Cola are good examples of CEOs who made a profound

		exponentially.	competitors.	
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There is clearly a strong subjective component to making a judgment on how long high growth will last. Much of what was said about the interrelationships between qualitative variables and growth towards the end of chapter 5 has relevance for this discussion as well.

II. Characteristics of Stable Growth Firm

As firms move from high growth to stable growth, you need to give them the characteristics of stable growth firms. A firm in stable growth is different from that same firm in high growth on a number of dimensions. For instance,

- High growth firms tend to be *more exposed to market risk* (and have higher betas) than stable growth firms. Thus, although it might be reasonable to assume a beta of 1.8 in high growth, it is important that the beta be lowered, if not to one, at least toward one in stable growth⁴.
- 1. High growth firms tend to have *high returns on capital and earn excess returns*. In stable growth, it becomes much more difficult to sustain excess returns. There are some who believe that the only assumption consistent with stable growth is to assume no excess returns; the return on capital is set equal to the cost of capital. While, in principle, excess returns in perpetuity are not feasible, it is difficult in practice to assume that firms will suddenly lose the capacity to earn excess returns. Since entire industries often earn excess returns over long periods, assuming a firm's return on capital will move towards its industry average will yield more reasonable estimates of value.
- 1. Finally, high growth firms tend to *use less debt* than stable growth firms. As firms mature, their debt capacity increases. The question whether the debt ratio for a firm

⁴ As a rule of thumb, betas above 1.2 or below 0.8 are inconsistent with stable growth firms. Two-thirds of all US firms have betas that fall within this range.

should be moved towards a more sustainable level in stable growth cannot be answered without looking at the incumbent managers' views on debt, and how much power stockholders have in these firms. If managers are willing to change their debt ratios, and stockholders retain some power, it is reasonable to assume that the debt ratio will move to a higher level in stable growth; if not, it is safer to leave the debt ratio at existing levels.

1. Finally, stable growth firms tend to reinvest less than high growth firms. In fact, you can estimate how much a stable growth firm will need to reinvest, using the relationship developed in chapter 5 between growth rates, reinvestment needs and returns on capital.

Reinvestment Rate in stable growth = Stable growth rate $/ ROC_n$

where the ROC_n is the return on capital that the firm can sustain in stable growth. This reinvestment rate can then be used to generate the free cash flow to the firm in the first year of stable growth.

Linking the reinvestment rate to the stable growth rate also makes the valuation less sensitive to assumptions about stable growth. While increasing the stable growth rate, holding all else constant, can dramatically increase value, changing the reinvestment rate as the growth rate changes will create an offsetting effect. The gains from increasing the growth rate will be partially or completely offset by the loss in cash flows because of the higher reinvestment rate. Whether value increases or decreases as the stable growth increases will entirely depend upon what you assume about excess returns. If the return on capital is higher than the cost of capital in the stable growth period, increasing the stable growth rate will increase value. If the return on capital is equal to the stable growth rate, increasing the stable growth $\frac{\text{rate will have no effect on value}}{\text{Terminal Value}} = \frac{\text{EBIT}_{n+1}(1-t) (1-\text{Reinvestment Rate})}{\text{Cost of Capital}_n - \text{Stable Growth Rate}}$

Substituting in the stable growth rate as a function of the reinvestment rate, from above, you get:

Terminal Value =
$$\frac{\text{EBIT}_{n+1}(1-t) (1-\text{Reinvestment Rate})}{\text{Cost of Capital}_n - (\text{Reinvestment Rate} * \text{Return on Capital})}$$

Setting the return on capital equal to the cost of capital, you arrive at:

Terminal Value =
$$\frac{\text{EBIT}_{n+1}(1-t) (1-\text{Reinvestment Rate})}{\text{Cost of Capital}_n - (\text{Reinvestment Rate} * \text{Cost on Capital})}$$

Simplifying, the terminal value can be stated as:

Terminal Value _{ROC=WACC} =
$$\frac{\text{EBIT}_{n+1}(1-t)}{\text{Cost of Capital}_n}$$

Illustration 6.2: Stable Growth Inputs

In chapter 5, reinvestment rates and reinvestment rates were calculated for the five firms that are being valued, and in chapter 4, the costs of capital were estimated. These estimates will now be revisited and revised for the firms in their stable growth periods in Table 6.2:

	Am	azon	Aı	riba	Ci	sco	Mot	orola	Redi	ff.com
	High	Stable	High	Stable	High	Stable	High	Stable	High	Stable
	Growth	Growth	Growth	Growth	Growth	Growth	Growth	Growth	Growth	Growth
Beta	1.74	1.10	1.78	1.20	1.43	1.00	1.21	1.00	1.90	1.20
Cost of	12.94%	10.40%	13.12%	10.80%	11.72%	10.00%	10.85%	10.00%	25.82%	18.52%
Equity										
After-tax	8.00%	4.55%	9.25%	4.55%	4.03%	4.03%	4.23%	4.23%	10.00%	4.31%
Cost of Debt										
Debt Ratio	7.81%	15.00%	0.15%	10.00%	0.18%	10.00%	6.86%	6.86%	0.00%	20.00%
Cost of	12.56%	9.52%	13.11%	10.18%	11.71%	9.40%	10.39%	9.60%	25.82%	15.67%
Capital										
Return on	-7.18%	16.94%	-218.1%	20.00%	34.07%	16.52%	17.22%	17.22%	-73.69%	25.00%
Capital										
Reinvestmen	NMF	29.52%	NMF	25.00%	106.8%	30.27%	52.99%	29.04%	NMF	20.00%
t Rate										
Expected	NMF	5.00%	NMF	5.00%	36.39%	5.00%	13.22%	5.00%	NMF	5.00%
Growth Rate										

Table 6.2: Stable Growth Estimates

The betas for all of the firms are adjusted down toward one. For Amazon, the average beta of stable specialty retailers (1.10) is used as the stable period beta. For Cisco and Motorola, you moved the beta to the average for the market since the sectors to which they belong are still in high growth and have higher betas. For Ariba and Rediff, a stable beta of 1.20 is used to reflect the fact that even in stable growth, these firms are likely to be riskier than the average firm in the market. The debt ratio for all of the firms is adjusted upwards, moving Amazon's up to the average for the specialty retailing sector (15%) and Ariba and Rediff to a debt ratio (10%) that is sustainable given their operating incomes in 10 years. Cisco's debt ratio was also moved up to 10% in stable growth⁵, but Motorola's debt ratio was left at its current levels. The firm has had the capacity to borrow money for the last few years and it has not used it, reflecting management's aversion to debt.

For all of the firms, a stable growth rate of 5% is used. While Rediff is an Indian internet portal, the valuation is in the U.S. dollars and the stable growth rate is therefore set at the same level as the other firms that you are valuing⁶. The reinvestment rate in stable growth is estimated, using the following equation:

Reinvestment Rate = Expected Growth Rate / Return on Capital

Note that the reinvestment rate is lower for firms with higher returns on capital in stable growth. To estimate the return on capital in stable growth, the industry average for specialty retailers (16.96%) is used for Amazon and of comparable firms (16.52%) is used for Cisco. For Motorola, the return on capital in stable growth is left unchanged from the high growth phase level of 17.22%, which was estimated as the mid-point between the firm's current return on capital and the industry average. For Ariba, the return on capital is moved to 20%

⁵ The optimal debt ratio for Cisco currently is 10%. The details of the calculation will be provided in a later chapter.

in stable growth, which is slightly lower than the current industry average of 23.96%⁷. Finally, for Rediff.com, a return on capital of 25% is used, based upon the estimate of operating income and capital invested in the firm in ten years⁸.

For all of the firms, it is worth noting that you are assuming that excess returns continue in perpetuity by setting the return on capital above the cost of capital. While this is potentially troublesome, the competitive advantages that these firms have built up historically or will build up over the high growth phase will not disappear in an instant. The excess returns will fade over time, but moving them to or towards industry averages in stable growth seems like a reasonable compromise.

eva.xls: This dataset on the web summarizes the returns on capital, costs of capital and excess returns, by industry group, for firms in the United States.III. The Transition to Stable Growth

Once you have decided that a firm will be in stable growth at a point in time in the future, you have to consider how the firm will change as it approaches stable growth. There are three distinct scenarios. In the first, the firm will be maintain its high growth rate for a period of time and then become a stable growth firm abruptly; this is a two-stage model. In the second, the firm will maintain its high growth rate for a period and then have a transition period where its characteristics change gradually towards stable growth levels; this is a three

⁶ An argument can be made that real growth in India will be higher in the long term than for the rest of the world. If we subscribed to this argument, we would use a slightly higher expected growth rate.

⁷ As the industry itself matures, we would expect to see the return on capital drift down.

⁸ While this may seem high, it has to reflect the fact that we defined operating income as income before selling expenses, and that a significant portion of the capital will be capitalized selling expenses. In

stage model. In the third, the firm's characteristics change each year from the initial period to the stable growth period; this can be considered an n-stage model.

Which of these three scenarios gets chosen depends upon the firm being valued. Since the firm goes in one year from high growth to stable growth in the two-stage model, this model is more appropriate for firms with moderate growth rates, where the shift will not be too dramatic. For firms with very high growth rates in operating income, a transition phase allows for a gradual adjustment not just of growth rates but also of risk characteristics, returns on capital and reinvestment rates towards stable growth levels. For very young firms or for firms with negative operating margins, allowing for changes in each year (in an n-stage model) is prudent.

Illustration 6.3: Choosing a Growth Pattern

For Motorola, the high growth rate during the next 5 years is mostly due to the improvement expected in the return on capital; without the adjustment, the growth rate would have been about 6%, while with the improvement, it is 13.63%. Once the return improvements end, the firm will be close to stable growth. Consequently, you will use a 2-stage model and assume that stable growth begins after year 5.

For Cisco, the estimated growth rate is 36.39%, as a consequence of its phenomenal reinvestment rate (106.81%) and its high return on capital (34.07%). While the firm is expected to maintain its current reinvestment rate and return on capital for the next few years, the return on capital will be difficult to sustain as the firm becomes larger and competition increases. As a result, the growth period of 12 years is divided into a high growth phase (6 years) and a transition phase (6 years). During the transition phase, the beta, debt ratio, reinvestment rate and growth rates of the firm adjust towards stable growth levels. In practical terms, you are assuming that Cisco will maintain its current acquisition

addition, we also use a much higher cost of capital for Rediff, because of the country risk premium associated with India.

pace for the next 6 years, and that both the pace and the returns will begin slowing down after year 6. Table 6.3 summarizes the values of each in years 7 through 12.

Year	Yrs 1-6	7	8	9	10	11	12
1000	11510	,	0		10		12
Expected Growth	36.39%	31.16%	25.93%	20.70%	15.46%	10.23%	5.00%
Reinvestment Rate	106.81%	94.05%	81.29%	68.54%	55.78%	43.02%	30.27%
Beta	1.43	1.36	1.29	1.22	1.14	1.07	1.00
Debt Ratio	0.18%	1.81%	3.45%	5.09%	6.73%	8.36%	10.00%
Cost of Capital	11.71%	11.32%	10.94%	10.55%	10.17%	9.79%	9.40%

Table 6.3: Cisco's Transition to Stable Growth

Note that the adjustment over the transition period is linear, making estimation more straightforward.

For Amazon, Ariba and Rediff.com, the operating margins, reinvestment rates and returns on capital change each year during the high growth period. The betas, debt ratios and costs of capital change only in the second half of the high growth period for each of these firms.

Valuing Operating Assets

Now that you have estimated the basic inputs to the discounted cash flow valuation model – the discount rates, cash flows, high growth period and characteristics in stable growth – you are in a position to value the operating assets in these firms. In summary, the value of the operating assets of a firm should be the present value of the expected cash flows to the firm, discounted at the cost of capital, added to the present value of the terminal value estimated as described in the last section.

fcffginzu.xls: This spreadsheet allows you to value the operating assets of a firm, allowing for a high growth and a transition phase.

Illustration 6.4: Valuation of Amazon.com's Operating Assets

The assumptions about Amazon are summarized and presented in table 6.4 below.

Input	Assumptions
Revenue Growth	Compounded average growth rate over next 10 years = 40%
	Growth rate decreases from 120% next year to 5% in year 10.
Operating Margin	Operating margin improves from current level of - 16.27% to a
	target margin of 9.32% (which is the average for specialty retailers)
	in year 10.
Reinvestment needs	The reinvestment each year is estimated based upon the assumption
	that the sales to capital ratio will be 3.02; For every dollar of
	additional capital invested, there will be \$3.02 in additional sales.
Beta	The beta of the firm is 1.74 for the first 5 years, and decreases
	gradually to a stable period beta of 1.10. (The riskfree rate is 6% and
	the market risk premium is 4%.)
Debt Ratio	The debt ratio for the next 5 years remains at current levels (7.81%)
	and increases gradually to 15% by year 10.

Table 6.4: Assumptions for Valuing Amazon

The details of these assumptions have been discussed through the last three chapters. Using these inputs, you generate the expected cash flows and costs of capital for Amazon in table 6.5.

To compute the value of Amazon at the end of the high growth period, you use the expected cash flow to the firm in the terminal year, the cost of capital in that year and the stable growth rate:

Terminal value for Amazon (in year 10) = \$2,126 (.0952-.05) = \$47,016 million

The value of Amazon's operating assets is the sum of the present values of the cash flows during the high growth phase and the present value of the terminal value⁹:

15,731 million

PV of FCFF during high growth phase = \$ (1,760) million	\$ (1,760) mil	PV of FCFF during high growth phase =
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PV of Terminal Value = \$47,016/2.9888 = \$

⁹ The present value is computed using the compounded cost of capital over time. For example, the compounded cost of capital in year 6 = (1.1256)(1.1256)(1.1244)(1.1234)(1.1234)(1.1175) = 2.0090.

Value of Operating Assets for Amazon =

\$ 13,971 million

Illustration 6.5: Valuation of Ariba's Operating Assets

The assumptions underlying the Ariba valuation are summarized in table 6.6 below.

Input	Assumptions
mput	rosumptions
Revenue Growth	Compounded average growth rate over next 10 years = 82.39%
	Growth rate decreases from 400% next year to 5% in year 10.
Operating Margin	Operating margin improves from current level of -160% to a target
	margin of 16.36% (which is the average for comparable firms) in
	year 10.
Reinvestment needs	The reinvestment each year is estimated based upon the assumption
	that the sales to capital ratio will be 2.50; For every dollar of
	additional capital invested, there will be \$2.50 in additional sales.
Beta	The beta of the firm is 1.78 for the first 5 years, and decreases
	gradually to a stable period beta of 1.20. (The riskfree rate is 6% and
	the market risk premium is 4%.)
Debt Ratio	The debt ratio for the next 5 years remains at current levels (0.15%)
	and increases gradually to 10% by year 10.

Table 6.6: Assumptions for Valuing Ariba

The expected cash flows and costs of capital for Ariba are summarized in table 6.7.

The value of Ariba when high growth ends in ten years is estimated using the free cash flow to the firm in the terminal year and the stable growth rate:

Terminal value for Ariba (in year 10) = 3,159/(.1018-.05) = 61,034 million

The value of Ariba's operating assets is the sum of the present values of the cash flows during the high growth phase and the present value of the terminal value estimated above:

PV of FCFF during high growth phase =	\$ (1,367)
PV of Terminal Value = \$61,034/3.1816 =	\$ 19,184
Value of Operating Assets for Ariba =	\$ 17,816

Illustration 6.6: Valuation of Cisco's Operating Assets

The inputs in the Cisco valuation are summarized in Table 6.8 below:

	High Growth	Transition	Forever
Length of period	6 years	6 years	Past year 12
Growth Rate	36.39%	Decreases linearly from 36.39% to 5%	5.00%
Debt Ratio	0.18%	Increases linearly from 0.18% to 10%	10.00%
Beta	1.43	Decreases linearly from 1.43 to 1.00.	1.00
Pre-tax cost of debt	6.20%	6.20%	6.20%
Tax Rate	35.00%	35.00%	35.00%
Return on Capital	34.07%	Decreases from 34.07% to 16.52%.	16.52%
Reinvestment Rate	106.81%	Decreases from 106.81% to 30.27%	30.27%

Table 6.8: Assumptions for Valuing Cisco

A riskfree rate of 6% and a market risk premium of 4% are used in the valuation. The expected cash flows and costs of capital are summarized in table 6.9.

Cisco's terminal value at the end of year 12, when high growth ends, is estimated using the free cash flows to the firm in the terminal year (year 13), the cost of capital in that year and the stable growth rate:

Free Cash Flow to $Firm_{13}$ = After-tax Operating income₁₃ (1- Reinvestment Rate_{Stable})

= \$61,028 (1-.3027) = \$42,557 million

Terminal value for Cisco (in year 12) = \$42,557/(.094-.05) = \$966,545

The value of Cisco's operating assets is the sum of the present values of the cash flows

during the high growth phase and the present value of the terminal value estimated above:

Present Value of FCFF in high growth phase =	\$34,779 million
Present Value of Terminal Value of Firm = \$966,545/3.5104 =	\$275,336 million
Value of operating assets of the firm =	\$310,115 million

Illustration 6.7: Valuation of Motorola's Operating Assets

To value Motorola, the assumptions are summarized in table 6.10 below:

	High Growth Period	Stable Growth Phase
Length of High Growth Period =	5	Forever
Growth Rate =	13.63%	5.00%

Table 6.10: Assumptions for valuing Motorola

Debt Ratio =	6.86%	6.86%
Beta used for stock =	1.21	1.00
Cost of Debt =	6.50%	6.50%
Tax Rate =	35.00%	35.00%
Return on Capital =	Improves from 12.18% to	17.22%
	17.22%	
Reinvestment Rate =	52.99%	29.04%

A riskfree rate of 6% and a market risk premium of 4% are used in the valuation. The expected cash flows and costs of capital over the high growth period are summarized in table 6.11.

Motorola's value in year 5 is estimated using the free cash flows to the firm in year 6, the cost of capital in that year and the stable growth rate:

Free Cash Flow to Firm₆ = After-tax Operating income₆ (1- Reinvestment Rate_{Stable}) = \$6,075 (1-.2904) = \$4,311 million

Terminal value for Motorola (in year 5) = 4,311/(.096-.05) = 93,641 million

The value of Motorola's operating assets is the sum of the present values of the cash flows

during the high growth phase and the present value of the terminal value estimated above:

Present Value of FCFF in high growth phase =		\$7,980
Present Value of Terminal Value of Firm =	\$93,641/1.6394 =	\$58,159
Value of operating assets of the firm =		\$66,139

Illustration 6.8: Valuation of Rediff's Operating Assets

The assumptions for valuing Rediff.com are contained in table 6.12 below:

Input	Assumptions
Revenue Growth	Compounded average growth rate over next 10 years = 104.57%
	Growth rate decreases from 500% next year to 5% in year 10.
Operating Margin	Operating margin improves from current level of -113% to a target
	margin of 40.00% (which is the average for comparable firms) in
	year 10.

Table 6.12: Assumptions for Valuing Rediff.com

Reinvestment needs	The reinvestment each year is estimated based upon the assumption
	that the sales to capital ratio will be 1.00; For every dollar of
	additional capital invested, there will be \$1.00 in additional sales.
Beta	The beta of the firm is 1.90 for the first 5 years, and decreases
	gradually to a stable period beta of 1.20.
	The riskfree rate is 6% (since the valuation is in U.S \$). To estimate
	the risk premium, a mature market premium of 4% is added to a
	country risk premium for India of 6.43%.
Debt Ratio	The debt ratio for the next 5 years remains at current levels (0%) and
	increases gradually to 20% by year 10.

The expected cash flows and costs of capital are summarized in table 6.13. Implicit in these estimates is the assumption that Rediff.com will remain an internet portal for the bulk of this period. If, in fact, Rediff chooses a different route (business mix), the estimates will have to change, as will the value.

Rediff's value at the end of its high growth period (ten years) is estimated using the cash flows in the terminal year, the cost of capital in that year and the stable growth rate: Terminal value (in '000s) for Rediff (in year 10) = 505,602/(.1567-.05) = 4,736,851The value of Rediff's operating assets is the sum of the present values of the cash flows during the high growth phase and the present value of the terminal value estimated above: PV of FCFF during high growth phase = \$ (140,793) PV of Terminal Value = 4,736,851/7.8479 = \$ 603,585 Value of Operating Assets of the firm = \$ 462,792