III. The E-Model - A Three Stage FCFE Model

The E model is designed to value firms that are expected to go through three stages of growth - an initial phase of high growth rates, a transitional period where the growth rate declines and a steady state period where growth is stable.

The Model

The E model calculates the present value of expected free cash flow to equity over all three stages of growth:

$$P_0 = \sum_{t=1}^{t=n1} \frac{FCFE_t}{(1+k_{e,hg})^t} + \sum_{t=n1+1}^{t=n2} \frac{FCFE_t}{(1+k_{e,t})^t} + \frac{P_{n2}}{(1+k_{e,st})^n}$$

where,

P_0 = Value of the stock today

$FCFE_t$ = FCFE in year t

k_e = Cost of equity

P_{n2} = Terminal price at the end of transitional period = $\frac{FCFE_{n2+1}}{r - g_n}$

n1 = End of initial high growth period

n2 = End of transition period

Caveats in using model

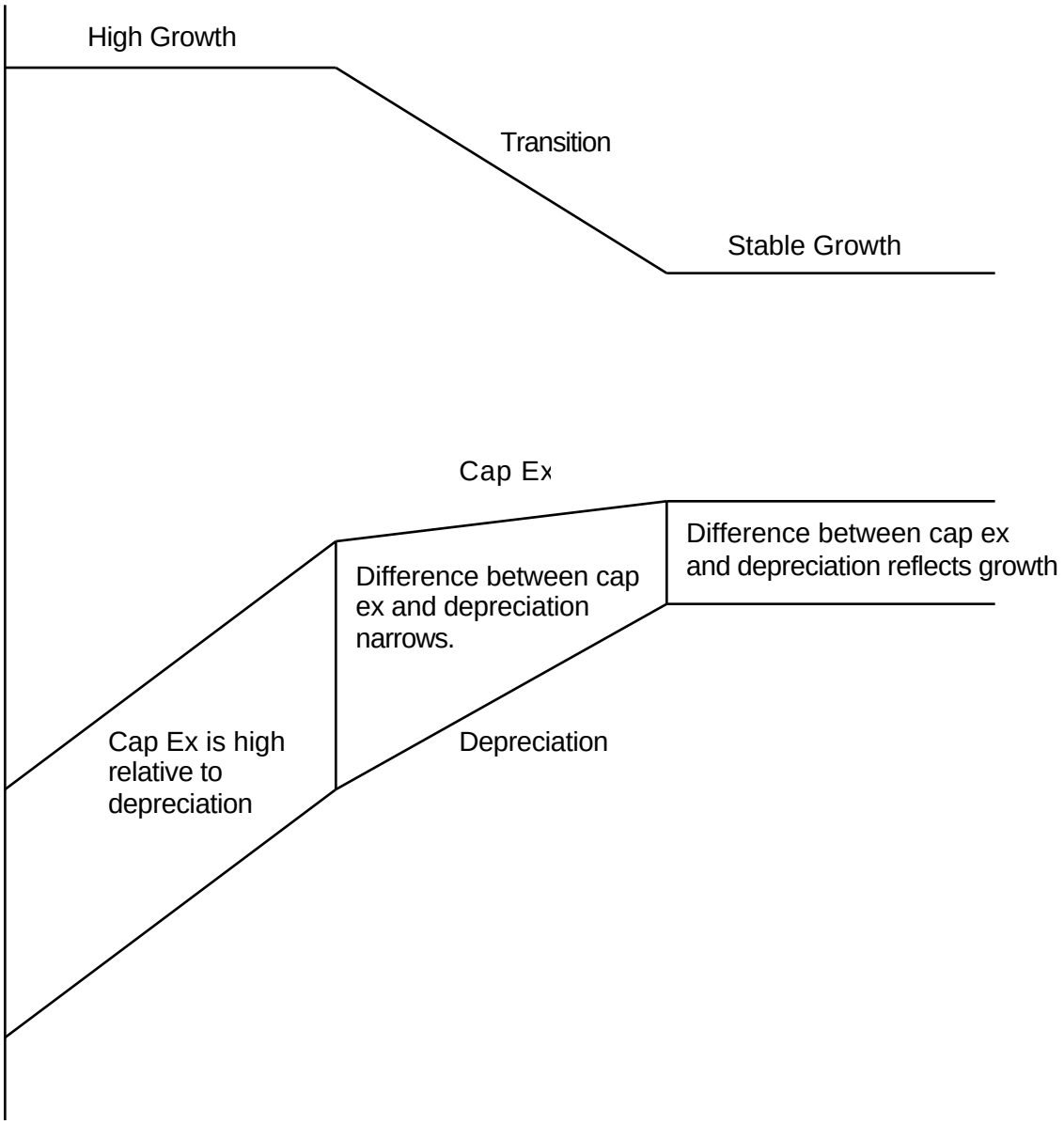
Since the model assumes that the growth rate goes through three distinct phases - high growth, transitional growth and stable growth - it is important that assumptions about other variables are consistent with these assumptions about growth.

1. Capital Spending versus Depreciation

It is reasonable to assume that as the firm goes from high growth to stable growth, the relationship between capital spending and depreciation will change. In the high growth phase, capital spending is likely to be much larger than depreciation. In the transitional phase, the difference is likely to narrow. Finally, the difference between capital spending

and depreciation will be lower still in stable growth, reflecting the lower expected growth rate.

Figure 14.5: Three Stage FCFE Model: Reinvestment Needs



2. Risk

As the growth characteristics of a firm change, so do its risk characteristics. In the context of the CAPM, as the growth rate declines, the beta of the firm can be expected to change. The tendency of betas to converge towards one in the long term has been confirmed by empirical observation of portfolios of firms with high betas. Over time, as

these firms get larger and more diversified, the average betas of these portfolios move towards one.

Works best for:

Since the model allows for three stages of growth, and for a gradual decline from high to stable growth, it is the appropriate model to use to value firms with very high growth rates currently. The assumptions about growth are similar to the ones made by the three-stage dividend discount model, but the focus is on FCFE instead of dividends, making it more suited to value firms whose dividends are significantly higher or lower than the FCFE.

Illustration 14.5: Three Stage FCFE Model: Tsingtao Breweries (China)

Tsingtao Breweries produces and distributes beer and other alcoholic beverages in China and around the world under the Tsingtao brand name. The firm has 653.15 million shares listed on the Shanghai and Hong Kong Exchanges.

Rationale for using Three-Stage FCFE Model

- *Why three stage?* Tsingtao is a small firm serving a huge and growing market – China, in particular, and the rest of Asia, in general. The firm's current return on equity is low and we anticipate that it will improve over the next 5 years. As it increases, earnings growth will be pushed up.
- *Why FCFE?* Corporate governance in China tends to be weak and dividends are unlikely to reflect free cash flow to equity. In addition, the firm consistently funds a portion of its reinvestment needs with new debt issues.

Background Information

In 2000, Tsingtao Breweries earned 72.36 million CY (Chinese Yuan) in net income on a book value of equity of 2,588 million CY, giving it a return on equity of 2.80%. The firm had capital expenditures of 335 million CY and depreciation of 204 million CY during the year and non-cash working capital dropped by 1.2 million CY during the year. The total reinvestment in 2000 was therefore:

Total Reinvestment

= Capital expenditures – Depreciation + Change in non-cash working capital

= 335 - 204 - 1.2 = 129.8 million

The working capital changes over the last 4 years have been volatile and we normalize the change using non-cash working capital as a percent of revenues in 1999.

Normalized change in non-cash working capital

$$= \left(\frac{\text{Non - cash working capital}_{1999}}{\text{Revenues}_{1999}}\right)\left(\text{Revenuess}_{1999} - \text{Revenues}_{1998}\right)$$

$$= \left(\frac{180}{2253}\right)(2253 - 1598) = 52.3 \text{ million CY}$$

The normalized reinvestment in 1999 can then be estimated.

Normalized Reinvestment

= Capital expenditures – Depreciation + Normalized Change in non-cash working capital

= 335 - 204 + 52.3 = 183.3 million CY

As with working capital, debt issues have been volatile. We estimate the firm's book debt to capital ratio of 40.94% at the end of 1999 and use it to estimate the normalized equity reinvestment in 1999.

Equity Reinvestment in 2000 = Reinvestment (1- Debt ratio)

= 183.3 (1-0.4094) = 108.27million CY

As a percent of net income,

$$\text{Equity Reinvestment rate in 2000} = \frac{108.27}{72.36} = 149.97\%$$

Estimation

To estimate free cash flows to equity for the high growth period, we make the assumption that the return on equity, which is 2.80% today, will drift up to 12% by the fifth year. In addition, we will assume that new investments from now on will earn a return on equity of 12%. Finally, we will assume that the equity reinvestment rate will remain at its current level (149.97%) each year for the next 5 years. The expected growth rate over the next 5 years can then be estimated.

Expected growth rate- next 5 years

$$= (\text{Equity reinvestment rate})(\text{ROE}_{\text{New}}) + \left(\frac{\text{ROE}_5 - \text{ROE}_{\text{today}}}{\text{ROE}_{\text{today}}}\right)^{\frac{1}{5}} - 1$$

$$= (1.4997)(0.12) + \left(\frac{0.12 - 0.0280}{0.0280}\right)^{\frac{1}{5}} - 1 = 44.91\%$$

After year 5, we will assume that the expected growth rate declines linearly each year from years 6 through 10 to reach a stable growth rate of 10% in year 10. (Note that the growth rate is in nominal CY; the higher stable growth rate reflects the higher expected inflation in that currency.) As the growth rate declines, the equity reinvestment rate also drops off to a stable period equity reinvestment rate of 50%, estimated using the 10% stable growth rate and an assumed return on equity in stable growth of 20%.

$$\text{Stable period equity reinvestment rate} = \frac{g}{ROE} = \frac{10\%}{20\%} = 50\%$$

To estimate the cost of equity, we used a riskfree rate of 10% (in nominal CY), a risk premium of 6.28% (4% for mature market risk and 2.28% as the country risk premium for China) and a beta of 0.75 (reflecting the bottom-up beta for breweries):

Cost of equity = 10% + 0.75 (6.28%) = 14.71%

In stable growth, we assume that the beta will drift up to 0.80 and that the country risk premium will drop to 0.95%.

Cost of equity = 10% + 0.80(4.95%) = 13.96%

The cost of equity adjusts in linear increments from 14.71% in year 5 to 13.96% in year 10.

Valuation

To value Tsingtao, we will begin by projecting the free cash flows to equity during the high growth and transition phases, using an expected growth rate of 44.91% in net income and an equity reinvestment rate of 149.97% for the first 5 years. The next 5 years represent a transition period, where the growth drops in linear increments from 44.91% to 10% and the equity reinvestment rate drops from 149.97% to 50%. The resulting free cash flows to equity are shown in Table 14.6.

Table 14.6: Estimated FCFE for Tsingtao Breweries

Year	Expected Growth	Net Income	Equity Reinvestment Rate	FCFE	Cost of Equity	Present Value
Current		CY72.36	149.97%			
1	44.91%	CY104.85	149.97%	(CY52.40)	14.71%	(CY45.68)

2	44.91%	CY151.93	149.97%	(CY75.92)	14.71%	(CY57.70)
3	44.91%	CY220.16	149.97%	(CY110.02)	14.71%	(CY72.89)
4	44.91%	CY319.03	149.97%	(CY159.43)	14.71%	(CY92.08)
5	44.91%	CY462.29	149.97%	(CY231.02)	14.71%	(CY116.32)
6	37.93%	CY637.61	129.98%	(CY191.14)	14.56%	(CY84.01)
7	30.94%	CY834.92	109.98%	(CY83.35)	14.41%	(CY32.02)
8	23.96%	CY1,034.98	89.99%	CY103.61	14.26%	CY34.83
9	16.98%	CY1,210.74	69.99%	CY363.29	14.11%	CY107.04
10	10.00%	CY1,331.81	50.00%	CY665.91	13.96%	CY172.16
Sum of the present values of FCFE during high growth =						($186.65)

To estimate the terminal value of equity, we used the net income in the year 11, reduce it by the equity reinvestment needs in that year and then assume a perpetual growth rate to get to a value.

Expected stable growth rate =10%

Equity reinvestment rate in stable growth = 50%

Cost of equity in stable growth = 13.96%

Expected FCFE in year 11

$= (\text{Net Income}_{11})(\text{1-Stable period equity reinvestment rate})$

$= (1331.81)(1.10)(1-0.5) = 732.50 \text{ million}$

Terminal Value of equity in Tsingtao Breweries:

$$= \frac{\text{FCFE}_{11}}{\text{Stable period cost of equity} \quad \text{Stable growth rate}}$$

$$= \frac{732.50}{0.1396-0.10} = 18{,}497 \text{ million}$$

To estimate the value of equity today, we sum up the present value of the FCFE over the high growth period and transition period and add to it the present value of the terminal value of equity.

$$= \text{PV of FCFE during the high growth period} + \text{PV of terminal value}$$

$$\text{Value of Equity} = -186.65 + \frac{18{,}497}{(1.1471)^5(1.1456)(1.1441)(1.1426)(1.1411)(1.1396)}$$

$$= 4{,}596 \text{ million}$$

$$\text{Value of Equity per share} = \frac{\text{Value of Equity}}{\text{Number of Shares}} = \frac{4{,}596}{653.15} = CY\,7.04 \text{ per share}$$

The stock was trading at 10.10 Yuan per share, which would make it overvalued, based upon this valuation.

 .*FCFE3st..xls*: This spreadsheet allows you to value a firm with a temporary period of high growth in FCFE, followed by a transition period, followed by stable growth.

Negative FCFE, Equity Dilution and Value per Share

Unlike dividends, free cash flows to equity can be negative. This can occur either because net income is negative or because a firm's reinvestment needs are significant – this is the case with Tsingtao in the illustration above. The resulting net capital expenditure and working capital needs may be much larger than the net income. In fact, this is likely to occur fairly frequently with high growth firms.

The model that we have described above is flexible enough to deal with this issue. The free cash flows to equity will be negative as the firm reinvests substantial amounts to generate high growth. As the growth declines, the reinvestment needs also drop off and free cash flows to equity turn positive.

Intuitively, though, consider what a negative free cash flow to equity implies. It indicates that the firm does not generate enough cash flows from current operations to meet its reinvestment needs. Since the free cash flow to equity is after net debt issues, the firm will have to issue new equity in years where the cash flow is negative. This expected dilution in future years will reduce the value of equity per share today. In the FCFE model, the negative free cash flows to equity in the earlier years will reduce the estimated value of equity today. Thus, the dilution effect is captured in the present value and no additional consideration is needed of new stock issues in future years and the effect on value per share today.

FCFE Valuation versus Dividend Discount Model Valuation

The discounted cash flow model that uses FCFE can be viewed as an alternative to the dividend discount model. Since the two approaches sometimes provide different estimates of value, it is worth examining when they provide similar estimates of value, when they provide different estimates of value and what the difference tells us about the firm.

a. When they are similar

There are two conditions under which the value from using the FCFE in discounted cashflow valuation will be the same as the value obtained from using the dividend discount model. The first is the obvious one, where the dividends are equal to the FCFE. The second condition is more subtle, where the FCFE is greater than dividends, but the excess cash (FCFE - Dividends) is invested in projects with net present value of zero. (For instance, investing in financial assets which are fairly priced should yield a net present value of zero.)

b. When they are different

There are several cases where the two models will provide different estimates of value. First, when the FCFE is greater than the dividend and the excess cash either earns below-market interest rates or is invested in negative net present value projects, the value from the FCFE model will be greater than the value from the dividend discount model. There is reason to believe that this is not as unusual as it would seem at the outset. There are numerous case studies of firms, which having accumulated large cash balances by paying out low dividends relative to FCFE, have chosen to use this cash to finance unwise takeovers (where the price paid is greater than the value received from the takeover). Second, the payment of dividends less than FCFE lowers debt-equity ratios and may lead the firm to become underlevered, causing a loss in value.

In the cases where dividends are greater than FCFE, the firm will have to issue either new stock to pay these dividends leading to at least three negative consequences for value. One is the flotation cost on these security issues, which can be substantial for equity issues and creates an unnecessary expenditure that decreases value. Second, if the firm borrows the money to pay the dividends, the firm may become overlevered (relative to the optimal) leading to a loss in value. Finally, paying too much in dividends can lead

to capital rationing constraints where good projects are rejected, resulting in a loss of value.

There is a third possibility and it reflects different assumptions about reinvestment and growth in the two models. If the same growth rate used in the dividend discount and FCFE models, the FCFE model will give a higher value than the dividend discount model whenever FCFE are higher than dividends and a lower value when dividends exceed FCFE. In reality, the growth rate in FCFE should be different from the growth rate in dividends, because the free cash flow to equity is assumed to be paid out to stockholders. This will affect the reinvestment rate of the firm. In addition, the return on equity used in the FCFE model should reflect the return on equity on non-cash investments, whereas the return on equity used in the dividend discount model should be the overall return on equity. Table 14.7 summarizes the differences in assumptions between the two models.

Table 14.7: Differences between DDM and FCFE Model

	Dividend Discount Model	*FCFE Model*
Implicit Assumption	Only dividends are paid. Remaining portion of earnings are invested back into the firm, some in operating assets and some in cash & marketable securities.	The FCFE is paid out to stockholders. The remaining earnings are invested only in operating assets.
Expected Growth	Measures growth in income from both operating and cash assets. In terms of fundamentals, it is the product of the retention ratio and the return on equity	Measures growth only in income from operating assets. In terms of fundamentals, it is the product of the equity reinvestment rate and the non-cash return on equity.
Dealing with cash and marketable securities	The income from cash and marketable securities is built into earnings and ultimately	You have two choices: 1. Build in income from cash and marketable securities

	into dividends. Therefore, cash and marketable securities do not need to be added in	into projections of income and estimate the value of equity. 2. Ignore income from cash and marketable securities, and add their value to equity value in model

In general, when firms pay out much less in dividends than they have available in FCFE, the expected growth rate and terminal value will be higher in the dividend discount model, but the year-to-year cash flows will be higher in the FCFE model. The net effect on value will vary from company to company.

3. What does it mean when they are different?

When the value using the FCFE model is different from the value using the dividend discount model, with consistent growth assumptions, there are two questions that need to be addressed - What does the difference between the two models tell us? Which of the two models is the appropriate one to use in evaluating the market price?

The more common occurrence is for the value from the FCFE model to exceed the value from the dividend discount model. The difference between the value from the FCFE model and the value using the dividend discount model can be considered one component of the value of controlling a firm - it measures the value of controlling dividend policy. In a hostile takeover, the bidder can expect to control the firm and change the dividend policy (to reflect FCFE), thus capturing the higher FCFE value.

As for which of the two values is the more appropriate one for use in evaluating the market price, the answer lies in the openness of the market for corporate control. If there is a sizable probability that a firm can be taken over or its management changed, the market price will reflect that likelihood and the appropriate benchmark to use is the value from the FCFE model. As changes in corporate control become more difficult, either because of a firm's size and/or legal or market restrictions on takeovers, the value from the dividend discount model will provide the appropriate benchmark for comparison.

Illustration 14.6: Comparing the DDM and FCFE Models: Coca Cola

In Chapter 13, we valued Coca Cola using a three-stage dividend discount model at $42.72 a share. Here, we will value Coca Cola using a three stage free cash flow to equity model.

Rationale for using Three-Stage FCFE Model

- *Why three stage?* Coca Cola's strong brand name will allow it to overcome some of the constraints that may exist on its high growth rate – the saturation of its domestic market and its high market share in the market. However, we believe that this growth will come under assault from competition in future years, leading us to allow for a transition to stable growth.
- *Why FCFE?* While the firm does have a history of returning cash to stockholders, we wanted to examine the differences in value, if any, estimated with the dividend and FCFE models.
- The firm has used debt a little more liberally in the last few years, but it remains a firm that uses equity for much of its reinvestment needs.

Background Information

Net Income =$3,878

Number of shares outstanding =2487.03

Current Capital Expenditures =$992.00

Current Depreciation =$773.00

Increase in non-cash Working capital in most recent year =$852.00

Net Debt Issued (Paid) during the year =($585.00)

Based upon these values, we can estimate the free cash flows to equity in the most recent year as follows:

Free Cash flow to equity = Net Income – (Cap Expenditures – Depreciation) – Change in non-cash working capital + Net Debt Issued = 3878 – (992- 773) – 852 + (-585) = $2,222 million

The return on equity in the most recent year was estimated to be 23.37% in the dividend discount model. We re-estimated the return on equity excluding the income from cash and

marketable securities from net income[3] and the value of the cash and marketable securities from book equity:

Modified return on equity = (Net Income – After-tax Interest income from cash)/ (Book Value of Equity – Cash and Marketable Securities) = $\frac{2177 - 91}{9317 - 1822} = 27.83\%$

Estimation

We assume that the cost of equity for Coca Cola will be 9.99% for the five-year high growth period, declining in linear increments to 9.40% in year 10 and stable growth beyond. This cost of equity is slightly higher than the cost of equity used in the dividend discount model to reflect the fact that we are valuing operating assets (not including cash) – the beta used was 0.82, slightly higher than the beta of 0.80 used in the dividend discount model.

The capital expenditures, working capital requirements and the debt ratio for Coca Cola have been volatile over the last five years. To normalize changes over time, we decided to do the following:

- We computed the net capital expenditures as a percent of earnings before interest and taxes each year for the last 5 years.

	-5	*-4*	*-3*	*-2*	*Current*	*Average*
Net Cap Ex	$1,391.00	$1,485.00	$1,996.00	$2,332.00	$219.00	$1,484.60
EBIT	$4,833.00	$5,001.00	$4,967.00	$3,982.00	$5,134.00	$4,783.40
						31.04%

Normalized net capital expenditure = Average as % of EBIT over last 5 years * EBIT in most recent year = 0.3104* 5134 = $1,593 million

- We estimated non-cash working capital as a percent of revenues in the most recent year and used it to estimate the change in non-cash working capital over the last year.

Non-cash working capital in current year = $223 million

Revenues in current year = $20,458 million

[3] As in the dividend discount model, we used a normalized net income ($2177 million) just for this computation. The rest of the valuation is based upon the actual net income prior to extraordinary items.

Revenues last year = $19,805 million

Normalized change in non-cash working capital last year =

$$\left(\frac{223}{20458}\right)(20458 - 19805) = \$7.12 \text{ million}$$

- We normalized the net debt issued by assuming that Coca Cola would continue to fund its reinvestment needs with its market debt to capital ratio. To estimate the market debt to capital ratio, we used the total interest bearing debt outstanding at the end of 2000 and the current market value of equity.

$$\text{Debt Ratio} = \frac{\text{Interest bearing debt}}{\text{Interest bearing debt} + \text{Market value of equity}}$$
$$= \frac{5651}{5651 + 115125} = 4.68\%$$

Normalized debt issued in current year = (Normalized net capital expenditures + Normalized change in non-cash working capital) * Debt Ratio

= (1593+7.12)*(0.0468) =$74.89 million

The normalized free cash flow to equity can then be computed.

Normalized FCFE = Net Income – Normalized Net Cap Ex – Normalized change in working capital + Normalized net debt issued = 3878 – 1593 – 7.12 + 74.89 = $2,353 million

This normalized FCFE also lets us compute the equity reinvestment rate for the firm:

$$\text{Equity reinvestment rate} = 1 - \frac{\text{FCFE}}{\text{Net Income}} = 1 - \frac{2353}{3878} = 39.3\%$$

With the current return on equity of 27.83%, this yields an expected growth rate in net income at Coca Cola of 10.94%.

Expected Growth = Equity reinvestment rate * Return on Equity = 0.393*0.2783 = 0.1094

In stable growth, we assume that the return on equity drops to 20% and that the growth rate in perpetuity in net income is 5.5%. The equity reinvestment rate can then be estimated as follows:

$$\text{Equity Reinvestment rate in stable growth} = \frac{g}{\text{ROE}} = \frac{5.5\%}{20\%} = 27.5\%$$

Valuation

To value Coca Cola, we will begin by projecting the free cash flows to equity during the high growth and transition phases, using an expected growth rate of 10.94% in non-cash net income and an equity reinvestment rate of 39.3% for the first 5 years.

Non-cash Net Income = Net Income – After-tax Interest income from cash and marketable securities = $3,878 million – 89 million = $3,789 million

The next 5 years represent a transition period, where the growth drops in linear increments from 10.94% to 5.5% and the equity reinvestment rate drops from 39.3% to 27.5%. The resulting free cash flows to equity are shown in Table 14.8.

Table 14.8: Estimated FCFE for Coca Cola

Year	Expected Growth	Net Income	Equity Reinvestment Rate	FCFE	Cost of Equity	Present Value
High Growth Stage						
1	10.94%	$4,203.28	39.32%	$2,550.42	9.99%	$2,318.73
2	10.94%	$4,663.28	39.32%	$2,829.53	9.99%	$2,338.80
3	10.94%	$5,173.61	39.32%	$3,139.18	9.99%	$2,359.03
4	10.94%	$5,739.79	39.32%	$3,482.72	9.99%	$2,379.44
5	10.94%	$6,367.93	39.32%	$3,863.86	9.99%	$2,400.03
Steady Growth Stage						
6	9.85%	$6,995.48	36.96%	$4,410.06	9.87%	$2,493.13
7	8.77%	$7,608.71	34.59%	$4,976.57	9.76%	$2,563.34
8	7.68%	$8,192.87	32.23%	$5,552.37	9.64%	$2,608.54
9	6.59%	$8,732.68	29.86%	$6,124.69	9.52%	$2,627.34
10	5.50%	$9,212.97	27.50%	$6,679.40	9.40%	$2,619.11
Sum of the present values of FCFE during high growth =						$24,707.49

To estimate the terminal value of equity, we used the net income in the terminal year (Year 11), reduce it by the equity reinvestment needs in that year and then assume a perpetual growth rate to get to a value.

Expected stable growth rate = 5.5%

Equity reinvestment rate in stable growth = 27.5%

Cost of equity in stable growth = 9.40%

Expected FCFE in year 11

$$= (\text{Net Income}_{11})(1 - \text{Stable period equity reinvestment rate})$$
$$= (9212.97)(1.055)(1 - 0.275) = 7{,}047 \text{ million}$$

$$\text{Value of equity in Coca Cola} = \frac{\text{FCFE}_{11}}{\text{Stable period cost of equity} - \text{Stable growth rate}}$$
$$= \frac{7{,}047}{0.094 - 0.055} = 180{,}686$$

To estimate the value of equity today, we sum up the present value of the FCFE over the high growth period and add to it the present value of the terminal value of equity.

$$\text{Value of Equity} = \text{PV of FCFE during the high growth period} + \text{PV of terminal value}$$
$$= 24{,}707 + \frac{180{,}686}{(1.0988)^5(1.0987)(1.0976)(1.0964)(1.0952)(1.0940)}$$
$$= 95{,}558 \text{ million}$$

Adding in the value of the cash and marketable securities that Coca Cola had on hand at the end of 2001, we obtain the total value of equity:

Value of Equity including cash = $95,558 + $1,892 = $97,447 million

$$\text{Value of Equity per share} = \frac{\text{Value of Equity}}{\text{Number of Shares}}$$
$$= \frac{97{,}447}{2{,}487.03} = \$39.19$$

The FCFE model yields a lower value than the dividend discount model value of $42.72 a share. This may seem surprising since the FCFE each year for the high growth period are greater than the dividends, but this effect is more than offset by the decline in the expected growth rate which is generated by the equity reinvestment rate being lower than the retention ratio. We would argue that this valuation is probably more realistic than the dividend discount model because it keeps investments in cash and marketable securities separate from investments in operating assets. The dividend discount model overstates the expected growth rate because it does not consider the fact that the low return earned by cash investments will bring the return on equity down over time (and the growth rate down with it).

Conclusion

The primary difference between the dividend discount models described in the previous chapter and the free cashflow to equity models described in this one lies in the definition of cash flows - the dividend discount model uses a strict definition of cashflow to equity, i.e., the expected dividends on the stock, while the FCFE model uses an expansive definition of cashflow to equity as the residual cashflow after meeting all financial obligations and investment needs. When firms have dividends that are different from the FCFE, the values from the two models will be different. In valuing firms for takeovers or in valuing firms where there is a reasonable chance of changing corporate control, the value from the FCFE provides the better estimate of value.

Problems

1. Respond true or false to the following statements relating to the calculation and use of FCFE.

A. The free cash flow to equity will generally be more volatile than dividends.

B. The free cash flow to equity will always be higher than the dividends.

C. The free cash flow to equity will always be higher than net income.

D. The free cash flow to equity can never be negative.

2. Kimberly-Clark, a household product manufacturer, reported earnings per share of $3.20 in 1993 and paid dividends per share of $1.70 in that year. The firm reported depreciation of $315 million in 1993 and capital expenditures of $475 million. (There were 160 million shares outstanding, trading at $51 per share.) This ratio of capital expenditures to depreciation is expected to be maintained in the long term. The working capital needs are negligible. Kimberly-Clark had debt outstanding of $1.6 billion and intends to maintain its current financing mix (of debt and equity) to finance future investment needs. The firm is in steady state and earnings are expected to grow 7% a year. The stock had a beta of 1.05. (The treasury bond rate is 6.25%.)

a. Estimate the value per share, using the Dividend Discount Model.

b. Estimate the value per share, using the FCFE Model.

c. How would you explain the difference between the two models and which one would you use as your benchmark for comparison to the market price?

3. Ecolab Inc. sells chemicals and systems for cleaning, sanitizing and maintenance. It reported earnings per share of $2.35 in 1993 and expected earnings growth of 15.5% a year from 1994 to 1998 and 6% a year after that. The capital expenditure per share was $2.25 and depreciation was $1.125 per share in 1993. Both are expected to grow at the same rate as earnings from 1994 to 1998. Working capital is expected to remain at 5% of revenues and revenues, which were $1,000 million in 1993, are expected to increase 6% a year from 1994 to 1998, and 4% a year after that. The firm currently has a debt ratio (D/(D+E)) of 5%, but plans to finance future investment needs (including working capital investments) using a debt ratio of 20%. The stock is expected to have a beta of 1.00 for the period of the analysis and the treasury bond rate is 6.50%. (There are 63 million shares outstanding)

a. Assuming that capital expenditures and depreciation offset each other after 1998, estimate the value per share.

b. Assuming that capital expenditures continue to be 200% of depreciation even after 1998, estimate the value per share.

c. What would the value per share have been, if the firm had continued to finance new investments with its old financing mix (5%)? Is it fair to use the same beta for this analysis?

4. Dionex Corporation, a leader in the development and manufacture of ion chromography systems (used to identify contaminants in electronic devices), reported earnings per share of $2.02 in 1993 and paid no dividends. These earnings are expected to grow 14% a year for five years (1994 to 1998) and 7% a year after that. The firm reported depreciation of $2 million in 1993 and capital spending of $4.20 million, and had 7 million shares outstanding. The working capital is expected to remain at 50% of revenues, which were $106 million in 1993, and are expected to grow 6% a year from 1994 to 1998 and 4% a year after that. The firm is expected to finance 10% of its capital expenditures and working capital needs with debt. Dionex had a beta of 1.20 in 1993, and this beta is expected to drop to 1.10 after 1998. (The treasury bond rate is 7%)

a. Estimate the expected free cash flow to equity from 1994 to 1998, assuming that capital expenditures and depreciation grow at the same rate as earnings.

b. Estimate the terminal price per share (at the end of 1998). Stable firms in this industry have capital expenditures which are 150% of revenues and maintain working capital at 25% of revenues.

c. Estimate the value per share today, based upon the FCFE model.

5. Biomet Inc. designs, manufactures and markets reconstructive and trauma devices and reported earnings per share of $0.56 in 1993, on which it paid no dividends (It had revenues per share in 1993 of $2.91). It had capital expenditures of $0.13 per share in 1993 and depreciation in the same year of $0.08 per share. The working capital was 60% of revenues in 1993 and will remain at that level from 1994 to 1998, while earnings and revenues are expected to grow 17% a year. The earnings growth rate is expected to decline linearly over the following five years to a rate of 5% in 2003. During the high growth and transition periods, capital spending and depreciation are expected to grow at the same rate as earnings, but are expected to offset each other when the firm reaches steady state. Working capital is expected to drop from 60% of revenues during the 1994-1998 period to 30% of revenues after 2003. The firm has no debt currently, but plans to finance 10% of its net capital investment and working capital requirements with debt.

The stock is expected to have a beta of 1.45 for the high growth period (1994-1998) and it is expected to decline to 1.10 by the time the firm goes into steady state (in 2003). The treasury bond rate is 7%.

a. Estimate the value per share, using the FCFE model.

b. Estimate the value per share, assuming that working capital stays at 60% of revenues forever.

c. Estimate the value per share, assuming that the beta remains unchanged at 1.45 forever.

6. Which of the following firms is likely to have a higher value from the dividend discount model, a higher value from the FCFE model or the same value from both models?

(a) A firm that pays out less in dividends than it has available in FCFE, but which invests the balance in treasury bonds.

(b) A firm which pays out more in dividends than it has available in FCFE, and then issues stock to cover the difference.

(c) A firm which pays out, on average, its FCFE as dividends.

(d) A firm which pays out less in dividends that it has available in FCFE, but which uses the cash at regular intervals to acquire other firms, with the intent of diversifying.

(e) A firm which pays out more in dividends than it has available in FCFE, but borrows money to cover the difference. (The firm is over-levered to begin with.)