II. The Two-stage FCFE Model

The two stage FCFE model is designed to value a firm which is expected to grow much faster than a stable firm in the initial period and at a stable rate after that.

The Model

The value of any stock is the present value of the FCFE per year for the extraordinary growth period plus the present value of the terminal price at the end of the period.

$$= \text{PV of FCFE} + \text{PV of terminal price}$$

$$\text{Value} = \sum \frac{\text{FCFE}_t}{(1+k_e)^t} + \frac{P_n}{(1+k_e)^n}$$

where,

$FCFE_t$ = Free Cashflow to Equity in year t

P_n = Price at the end of the extraordinary growth period

k_e = Cost of equity in high growth (hg) and stable growth (st) periods

The terminal price is generally calculated using the infinite growth rate model,

$$P_n = \frac{\text{FCFE}_{n+1}}{r - g_n}$$

where,

g_n = Growth rate after the terminal year forever.

Calculating the terminal price

The same caveats that apply to the growth rate for the stable growth rate model, described in the previous section, apply here as well. In addition, the assumptions made to derive the free cashflow to equity after the terminal year have to be consistent with the assumption of stability. For instance, while capital spending may be much greater than depreciation in the initial high growth phase, the difference should narrow as the firm enters its stable growth phase. We can use the two approaches described for the stable growth model – industry average capital expenditure requirements or the fundamental growth equation (equity reinvestment rate = g/ROE) to make this estimate.

The beta and debt ratio may also need to be adjusted in stable growth to reflect the fact that stable growth firms tend to have average risk (betas closer to one) and use more debt than high growth firms.

Illustration 14.3: Capital Expenditure, Depreciation and Growth Rates

Assume you have a firm that is expected to have earnings growth of 20% for the next five years and 5% thereafter. The current earnings per share is $2.50. Current capital spending is $2.00 and current depreciation is $1.00. We assume that capital spending and depreciation grow at the same rate as earnings and there are no working capital requirements or debt.

Earnings in year 5	= 2.50 * $(1.20)^5$ =	$ 6.22
Capital spending in year 5	= 2.00 * $(1.20)^5$ =	$ 4.98
Depreciation in year 5	= 1.00 * $(1.20)^5$ =	$ 2.49

Free cashflow to equity in year 5 = $6.22 + 2.49 - 4.98 = $3.73

If we use the infinite growth rate model, but fail to adjust the imbalance between capital expenditures and depreciation, the free cashflow to equity in the terminal year is --

Free cashflow to equity in year 6 = 3.73* 1.05 = $ 3.92

This free cashflow to equity can then be used to compute the value per share at the end of year 5, but it will understate the true value. There are two ways in which you can adjust for this:

1. Adjust capital expenditures in year 6 to reflect industry average capital expenditure needs: Assume, for instance, that capital expenditures are 150% of depreciation for the industry in which the firm operates. You could compute the capital expenditures in year 6 as follows:

   Depreciation in year 6 = 2.49 (1.05) = $2.61

   Capital expenditures in year 6 = Depreciation in year 6* Industry average capital expenditures as percent of depreciation = $2.61 *1.50 = $3.92

   FCFE in year 6 = $6.53 + $2.61 - $3.92 = $5.23
2. Estimate the equity reinvestment rate in year 6, based upon expected growth and the firm's return on equity. For instance, if we assume that this firm's return on

equity will be 15% in stable growth, the equity reinvestment rate would need to be:

Equity reinvestment rate = g/ ROE = 5%/15% = 33.33%

Net Capital expenditures in year 6 = Equity reinvestment rate * Earnings per share

= 0.3333* $ 6.53 = $2.18

FCFE in year 6 = $6.53 - $2.18 = $4.35

Works best for:

This model makes the same assumptions about growth as the two-stage dividend discount model, i.e., that growth will be high and constant in the initial period and drop abruptly to stable growth after that. It is different because of its emphasis on FCFE rather than dividends. Consequently, it provides much better results than the dividend discount model when valuing firms which either have dividends which are unsustainable (because they are higher than FCFE) or which pay less in dividends than they can afford to (i.e., dividends are less than FCFE).

Illustration 14.4: Two-Stage FCFE Model: Nestle

Nestle has operations all over the world, with 97% of its revenues coming from markets outside Switzerland, where it is headquartered. The firm, like many large European corporations, has a weak corporate governance system and stockholders have little power over managers.

A Rationale for using the Model

- *Why two-stage?* Nestle has a long and impressive history of growth, and while we believe that its growth will be moderate, we assume that it will be able to maintain high growth for 10 years.
- *Why FCFE?* Given its weak corporate governance structure and a history of accumulating cash, the dividends paid by Nestle bear little resemblance to what the firm could have paid out.

Background Information

Current Net Income =Sfr 5,763 million	Earnings per share =Sfr 148.33
Current Capital Spending= Sfr 5,058 million	Capital Expenditures/sh = Sfr 130.18

Current Depreciation = Sfr 3,330 million
Depreciation / share = Sfr 85.71
Current Revenues = Sfr 81,422 million
Revenue/ share = Sfr 2,095.64
Non-cash Working Capital= Sfr 5,818 million
Working Capital/share = Sfr 149.74
Change in Working capital = Sfr 368 million
Chg. Working Capital/share Sfr 9.47

Estimates

We will begin by estimating the cost of equity for Nestle during the high growth period in Swiss francs. We will use the 10-year Swiss Government Sfr bond rate of 4% as the riskfree rate. To estimate the risk premium, we used the breakdown of Nestle's revenues by region in Table 14.4.

Table 14.4: Risk Premium for Nestle: Regional Breakdown

Region	*Revenues*	*Weight*	*Risk Premium*
North America	20.21	24.82%	4.00%
South America	4.97	6.10%	12.00%
Switzerland	1.27	1.56%	4.00%
Germany/France/UK	21.25	26.10%	4.00%
Italy/Spain	7.39	9.08%	5.50%
Asia	6.70	8.23%	9.00%
Rest of W. Europe	15.01	18.44%	4.00%
Eastern Europe	4.62	5.67%	8.00%
Total	81.42	100.00%	5.26%

The risk premiums for each region represent an average of the risk premiums of the countries in the region. Using a bottom-up beta of 0.85 for Nestle, we estimated a cost of equity of

$$\text{Cost of Equity} = 4\% + 0.85\ (5.26\%) = 8.47\%$$

To estimate the expected growth rate in free cash flows to equity, we first computed the free cash flows to equity in the current year.

FCFE

= Net Income-(Cap Ex – Depreciation) – Change in working capital + Net Debt Issues

= 5763 – (5058 –3330) –368 + 272 = Sfr 3,939 million

The equity reinvestment rate can be estimated from this value:

$$\text{Equity reinvestment rate} = 1 - \frac{\text{FCFE}}{\text{Net Income}} = 1 - \frac{3939}{5763} = 31.65\%$$

The return on equity in 2000 was estimated using the net income from 2000 and the book value equity from the end of the previous year.

$$\text{Return on equity} = \frac{5763}{25078} = 22.98\%$$

The expected growth rate in FCFE is a product of the equity reinvestment rate and the return on equity:

Expected growth in FCFE = Equity Reinvestment rate * Return on Equity

= 0.3165 * 0.2298 = 7.27%

We will assume that net capital expenditures and working capital will grow at the same rate as earnings and that the firm will raise 33.92% of its reinvestment needs from debt (which is its current book value debt to capital ratio).

In stable growth, we assume a stable growth rate of 4%. We also assume that the cost of equity remains unchanged but that the return on equity drops to 15%. The equity reinvestment rate in stable growth can be estimated as follows:

$$\text{Equity reinvestment in stable growth} = \frac{g}{\text{ROE}} = \frac{4\%}{15\%} = 26.67\%$$

Valuation

The first component of value is the present value of the expected FCFE during the high growth period, assuming earnings, net capital expenditures and working capital grow at 7.27% and33.92 % of reinvestment needs come from debt:

Table 14.5: Estimated Free Cash Flows to Equity: Nestle

Year	*Earnings per Share*	*Net Cap Ex/Share*	*Change in Working Capital/share*	*Reinvestment/share*	*Equity Reinvestment Share*	*FCFE/share*	*Present Value*
1	159.12	47.71	10.89	58.60	38.72	120.39	110.99
2	170.69	51.18	11.68	62.86	41.54	129.15	109.76
3	183.10	54.90	12.53	67.44	44.56	138.54	108.55

4	196.42	58.90	13.44	72.34	47.80	148.62	107.35
5	210.71	63.18	14.42	77.60	51.28	159.43	106.17
6	226.03	67.77	15.47	83.25	55.01	171.02	105.00
7	242.47	72.70	16.60	89.30	59.01	183.46	103.84
8	260.11	77.99	17.80	95.80	63.30	196.81	102.69
9	279.03	83.67	19.10	102.76	67.91	211.12	101.56
10	299.32	89.75	20.49	110.24	72.85	226.48	100.44
Sum of present value of FCFE =							1056.34

Note that the change in working capital each year is computed based upon the current working capital of Sfr 149.74 per share. The present value of FCFE is computed using the cost of equity of 8.47%.

To estimate the terminal value, we first estimate the free cash flows to equity in year 11.

Expected Earnings per share in year 11 = $EPS_{10}(1+g) = 299.32(1.04) = 311.30$

Equity Reinvestment in year 11 = EPS_{11}*Stable Equity reinvestment rate

$= 311.30 * 0.2667 = 83.02$

Expected FCFE in year 11 = EPS_{11}-Equity $Reinvestment_{11}$

$= 311.30 – 83.02 = 228.28$

Terminal value of equity per share = $FCFE_{11}$/(Cost of $equity_{11}$-g)

$$= \frac{228.28}{0.0847 - 0.04} = 5{,}105.88$$

The value per share can be estimated as the sum of the present value of FCFE during the high growth phase and the present value of the terminal value of equity:

$$\text{Value per share} = \text{PV of dividend during high growth phase} + \frac{\text{Terminal Price}}{(1+k_e)^n}$$

$$= 1056.34 + \frac{5105.88}{1.0847^{10}} = 3320.65 \text{ Sfr}$$

The stock was trading 3390 Sfr per share in May 2001, at the time of this valuation.

 *.FCFE2st..xls*: This spreadsheet allows you to value a firm with a temporary period of high growth in FCFE, followed by stable growth.

Reinvestment Assumptions, Terminal Value and Equity Value

We have repeatedly emphasized the importance of linking growth assumptions to assumptions about reinvestment and especially so in stable growth. A very common assumption in many discounted cash flow valuations is that capital expenditures offset depreciation in stable growth. When combined with the assumption of no working capital changes, this translates into zero reinvestment. While this may be a reasonable assumption for a year or two, it is not consistent with the assumption that operating income will grow in perpetuity. How much of a difference can one assumption make? In the Nestle valuation above, we re-estimated terminal value of equity per share assuming no reinvestment.

$$\text{Estimated terminal value of equity per share} = \frac{311.30}{0.0847 - 0.04} = 6962.57$$

Keeping all of our other assumptions intact, this results in an increase in the estimated value of equity per share to 4144 Sfr per share.