

APPENDIX 2C

ENTERPRISE DCF VALUATION: 2-STAGE AND 3-STAGE GROWTH MODELS

In our chapter 2 discussions we worked with detailed year-by-year forecasts which permitted any kind of variation in any item from year to year. When such detailed forecasts are not available, we may have to rely on simplified versions of the DCF approach. This section discusses two simplified versions of the DCF approach:

- Two-stage growth model
- Three-stage growth model

Two Stage Growth Model

The two stage growth model allows for two stages of growth—an initial period of higher growth followed by a stable (but lower) growth forever.

$$\text{Value of the firm} = \text{Present value of the FCF during the high growth phase} + \text{Present value of terminal value}$$

Note that in simplified versions of the DCF approach, it is generally assumed that the free cash flow (FCF) is equal to the cash flow to the investors. In other words, it is assumed that non-operating cash flows are nil.

To illustrate the two stage-growth model, let us consider an example. Exotica Corporation is expected to grow at a higher rate for five years; thereafter the growth rate will fall and stabilise at a lower level. The following information is available:

Base Year (Year 0) Information

- | | |
|---|----------------|
| • Revenues | = 4000 million |
| • EBIT (12.5% of revenues) | = 500 million |
| • Capital expenditure | = 300 million |
| • Depreciation | = 200 million |
| • Net working capital as a percentage of revenues | = 30 percent |
| • Corporate tax rate (for all time) | = 40 percent |
| • Paid up equity capital (10 par) | = 300 million |
| • Market value of debt | = 1250 million |

Inputs for the High Growth Rate

- | | |
|-----------------------------------|-----------|
| • Length of the high growth phase | = 5 years |
|-----------------------------------|-----------|

- Growth rate in revenues, depreciation, EBIT and capital expenditure = 10 percent
- Net working capital as a percentage of revenues = 30 percent
- Cost of debt = 15 percent (pre-tax)
- Debt-equity ratio = 1 : 1
- Risk free rate = 13 percent
- Market risk premium = 6 percent
- Equity beta = 1.333

Inputs for the Stable Growth Period

- Expected growth rate in revenues and EBIT = 6 percent
- Capital expenditures are offset by depreciation
- Net working capital as a percentage of revenues = 30 percent
- Cost of debt = 15 percent (pre-tax)
- Debt-equity ratio = 2 : 3
- Risk free rate = 12 percent
- Market risk premium = 7 percent
- Equity beta = 1.0

Given the above information, the forecasted FCF during the high growth period are calculated in Exhibit 2C.1

Exhibit 2C.1 *Forecasted FCF: Exotica Corporation*

	in million					
	1	2	3	4	5	Terminal year
1. Revenues	4400	4840	5324	5856.4	6442.0	6828.6
2. EBIT	550	605	665.6	732.1	805.1	853.4
3. EBIT (1 - t)	330	363	399.3	439.2	483.2	512.1
4. Cap exp-Depreciation	110	121	133.1	146.4	161.1	-
5. Δ Net working capital	120	132	145.2	159.7	175.7	116.0
6. FCF (3-4-5)	100	110	121	133.1	146.4	396.1

The cost of equity (r_E), using the capital asset pricing model, and the weighted average cost of capital (WACC) during the high growth period and stable growth period are calculated below:

	$r_E = \text{Risk free rate} + \text{Equity beta (Market risk premium)}$	$\text{WACC} = w_E r_E + w_D r_D (1 - t)$
High growth period	$13\% + 1.333 (6\%) = 21\%$	$0.5(21\%) + 0.5(15\%)(0.6) = 15\%$
Stable growth period	$12\% + 1.0(7\%) = 19\%$	$0.6(19\%) + 0.4 (15\%)(0.6) = 15\%$

The present value of the FCF during the explicit forecast period is:

$$= \frac{100}{(1.15)} + \frac{110}{(1.15)^2} + \frac{121}{(1.15)^3} + \frac{133.1}{(1.15)^4} + \frac{146.4}{(1.15)^5} = 398.58 \text{ million}$$

The present value of the terminal value is:

$$= \frac{396.1}{0.15 - 0.06} \times \frac{1}{(1.15)^5} = 2188.13 \text{ million}$$

The value of the firm is:

$$= 398.58 + 2188.13 = 2586.71 \text{ million}$$

Three Stage Growth Model

The three-stage growth model assumes that:

- The firm will enjoy a high growth rate for a certain period (usually 3 to 7 years).
- The high growth period will be followed by a transition period during which the growth rate will decline in linear increments.
- The transition period will be followed by a stable growth rate forever.

Hence the value of the firm is expressed as follows:

$$\text{Value of the firm} = \text{PV of FCF during the high growth period} + \text{PV of FCF during the transition period} + \text{PV of terminal value}$$

The three-stage growth model may be illustrated with an example. Multiform Limited is being appraised by an investment banker. The following information has been assembled.

Base Year (Year 0) Information

- Revenues = 1000 million
- EBIT = 250 million
- Capital expenditure = 295 million
- Depreciation and amortisation = 240 million
- Net working capital as a percentage of revenues = 20 percent

- Tax rate = 40 percent
(for all time to come)

Inputs for the High Growth Period

- Length of the high growth period = 5 years
- Growth rate in revenues, depreciation, EBIT, and capital expenditures = 25 percent
- Net working capital as a percentage of revenues = 20 percent
- Cost of debt = 15 percent (pre-tax)
- Debt-equity ratio = 1.5
- Risk free rate = 12 percent
- Market risk premium = 6 percent
- Equity beta = 1.583
- WACC = $0.4 [12 + 1.583(6)] + 0.6 [15(1-0.4)]$ = 14.00 percent

Inputs for the Transition Period

- Length of the transition period = 5 years
- Growth rate in EBIT will decline from 25 percent in year 5 to 10 percent in year 10 in linear movements of 3 percent each year
- Net working capital as a percentage of revenues = 20 percent
- The debt-equity ratio during this period will drop to 1:1 and the pre-tax cost of debt will be 14 percent
- Risk-free rate = 11 percent
- Market risk premium = 6 percent
- Equity beta = 1.10
- WACC = $0.5 [11 + 1.1(6)] + 0.5 [14 (1-0.4)]$
= 13.00 percent

Inputs for the Stable Growth Period

- Growth rate in revenues , EBIT, capital expenditure, and depreciation = 10 percent
- Net working capital as a percentage of revenues = 20 percent
- Debt-equity ratio = 0:1
- Pre-tax cost of debt = 12 percent
- Risk free rate = 10 percent
- Market risk premium = 6 percent
- Equity beta = 1.00

- WACC $= 1.0 [10 + 1 (6)]$
 $= 16.00$ percent

The above inputs are used to estimate free cash flows to the firm, the cost of capital, and the present values during the high growth and transition period as shown in Exhibit 2C.2.

Exhibit 2C.2 Forecasted FCF : Multiform Limited

Period	Growth rate (%)	EBIT (1-t)	Cap Exp	Dep	NWC	Δ NWC	FCF	D/E	Beta	WACC (%)	Present Value
1	25	187.5	368.8	300	250	50	68.7	1.5	1.583	14	60.26
2	25	234.4	460.9	375	312.5	62.5	85.9	1.5	1.583	14	66.10
3	25	293.0	576.2	468.8	390.6	78.1	107.3	1.5	1.583	14	72.43
4	25	366.2	720.2	585.9	488.3	97.7	134.2	1.5	1.583	14	79.45
5	25	457.8	900.3	732.4	610.4	122.1	167.8	1.5	1.583	14	87.15
6	22	558.5	1098.3	893.6	744.6	134.2	219.6	1.0	1.100	13	100.93
7	19	664.6	1307.0	1063.3	886.1	141.5	279.4	1.0	1.100	13	113.64
8	16	770.9	1516.1	1233.5	1027.9	141.8	346.5	1.0	1.100	13	124.72
9	13	871.1	1713.2	1393.8	1161.5	133.6	418.1	1.0	1.100	13	133.18
10	10	958.2	1884.6	1533.2	1277.7	116.2	490.6	1.0	1.100	13	138.30

The terminal value at the end of year 10 can be calculated based on the FCF in year 11, the stable growth rate of 10 percent, and the WACC of the stable growth period, 16 percent.

$$FCF_{11} = FCF_{10} \times (1.10) = 490.6 (1.10) = 539.7 \text{ million}$$

$$\text{Terminal value}_{10} = \frac{FCF_{11}}{WACC - g} = \frac{539.7}{0.16 - 0.10} = 8995 \text{ million}$$

$$\text{Present value of terminal value} = \frac{8995}{(1.14)^5 (1.13)^5} = 2535.62 \text{ million}$$

The value of Multiform Limited is arrived at as follows:

Present value of FCF during the high growth period	: 365.39 million
Present value of FCF in the transition period	: 610.77 million
Present value of the terminal value	: 2535.62 million
Value of the firm	: 3511.78 million

SOLVED PROBLEMS

1. Magnavision Corporation is expected to grow at a higher rate of 4 years; thereafter the growth rate will fall and stabilise at a lower level. The following information has been assembled:

Base Year (Year 0) Information

• Revenues	3000 million
• EBIT	500 million
• Capital expenditure	350 million
• Depreciation	250 million
Net working capital as a percentage of revenues	25%
• Corporate tax rate (for all time)	30%
• Paid-up equity capital (10 par)	400 million
• Market value of debt	1200 million

Inputs for the High Growth Phase

• Length of high growth phase	4 years
• Growth rate in revenues, depreciation, EBIT and capex	20 %
• Net working capital as a percentage of revenues	25 %
• Cost of debt (pre-tax)	13 %
• Debt-equity ratio	1:1
• Risk-free rate	11 %
• Market risk premium	7 %
• Equity beta	1.129

Inputs for the Stable Growth Period

• Expected growth rate in revenues and EBIT	10 %
• Capital expenditure are offset by depreciation	
• Net working capital as a percentage of revenues	25 %
• Cost of debt (pre-tax)	12.14%
• Risk-free rate	10%
• Market risk premium	6%
• Equity beta	1.0
• Debt-equity ratio	2:3

- (i) What is the WACC for the high growth phase and the stable growth phase?
(ii) What is the value of the firm?

Solution

- (i) According to the CAPM, the cost of equity during the high growth phase will be:

$$11\% + 1.129 (7\%) = 18.90\%$$

The cost of debt during the high growth phase will be:

$$13\% (1 - 0.30) = 9.10\%$$

The WACC for the high growth phase will be:

$$\begin{aligned} \text{WACC} &= 0.5 \times 18.90 + 0.5 \times 9.10 \\ &= 14.0\% \end{aligned}$$

According to the CAPM, the cost of equity during the stable growth phase will be:

$$10\% + 1.0 (6\%) = 16\%$$

The cost of debt during the stable growth phase will be:

$$12.14 (1 - 0.30) = 8.50\%$$

The WACC during the stable growth phase will be:

$$0.4 \times 8.50\% + 0.60 \times 16\% = 13.0\%$$

- (ii) The forecasted FCF during the high growth period and the terminal year are given below:

Exhibit 2C.3 Forecasted FCF: Magnavision Corporation*in million*

	1	2	3	4	Terminal year
1. Revenues	3600	4320	5184	6220.8	6842.9
2. EBIT	600	720	864	1036.8	1140.5
3. EBIT (1-t)	420	504	604.8	725.8	798.3
4. Capital expenditure-depreciation	120	144	172.8	207.4	-
5. Δ Net working capital	150	180	216	259.2	155.5
6. FCF (3 - 4 - 5)	150	180	216	259.2	642.8

The present value of the FCF during the explicit forecast period is:

$$\frac{150}{(1.14)} + \frac{180}{(1.14)^2} + \frac{216}{(1.14)^3} + \frac{259.2}{(1.14)^4} = 569.3 \text{ million}$$

The present value of the terminal value is:

$$\frac{642.8}{0.13 - 0.10} \times \frac{1}{(1.14)^4} = 12686.3 \text{ million}$$

The value of the firm is:

$$569.3 \text{ million} + 12686.3 \text{ million} = 13255.6 \text{ million}$$