Spotlight Test: Valuation Under Changing Assumptions Worked Solutions

The Base Case

You are attempting to value a business using DCF principles. After appropriate thought and consultation you have formed a set of assumptions concerning the cash flows over the next 5 years, the capital structure you intend to impose on the business and other relevant factors.

You have determined the following base case forecast for the performance of the business under its new management.

(All figures are in £M)	Year				
	1	**2**	**3**	**4**	**5**
Sales	100.00	110.00	121.00	133.10	146.41
Gross Profit	25.00	27.50	30.25	33.28	36.60
Overheads:					
rent, insurance etc	5.00	5.00	5.00	5.00	5.00
depreciation	10.00	10.00	10.00	10.00	10.00
Trading profit	10.00	12.50	15.25	18.28	21.60
Interest	3.00	3.00	3.00	3.00	3.00
Profit Before Tax	7.00	9.50	12.25	15.28	18.60
Taxation	1.75	2.37	3.06	3.82	4.65
PAT	5.25	7.13	9.19	11.46	13.95
Dividend	3.00	3.00	3.00	3.00	3.00
Ret Profit	2.25	4.13	6.19	8.46	10.95

Further assumptions have been made as follows:
1. For the first 2 years capital expenditure will be £25M per year. In the 3rd and subsequent years the expenditure will be a steady 110% of the year's depreciation charge.
2. The marginal effective tax rate will be 30%. Tax payments are made 1 year in arrears. The tax payment in the first year will reflect the fact that taxable profit is unchanged from the previous year, so the payment in year 1 will be the same as that calculated for year 2.
3. In calculating the Terminal Value the assumed perpetuity growth rate is 2%.
4. In order to calculate the appropriate WACC you have assumed a capital structure consisting of 35% debt and 65% equity, based on market values, a risk-free rate of 4%, an equity risk premium of 3% and an ungeared beta of 0.75.
5. You have observed that the existing business pays a spread of 2% over the risk-free rate for its debt. (Currently it has £55M debt and you have assumed the same cost in your assumptions)
6. Your working capital assumptions are: stocks will be stable at 15% of sales, debtors will also stay at 15% sales, creditors will remain stable at 10% of sales. You expect that, regardless of any changes in sales, the net working capital investment will be unchanged in the first year of the forecast period.

Question 1

Using the assumptions above, what is the post-tax WACC for the business?

       (a) 4.15% - 4.25%.
       (b) 6.05% – 6.15%.
       (c) 7.05% - 7.15%.
       (d) 8.05% - 8.15%.
       (e) don't know.

Answer
The right answer is (b) 6.05% - 6.15%

The ungeared beta is 0.75, so the geared beta will be increased for the 35% debt in the capital structure.

$$B_g = 0.75 \times (1 + \{35\% \times (1\text{-tax rate}) / (65\% \text{ equity})\}$$

$$= 1.033$$

Equity cost is therefore 4% + (1.033 × 3%) = 7.10%   *(answer (c))*
Debt cost is 4% + 2% spread all reduced by (1 – tax rate),
    i.e. 6% × 0.7% = 4.2%   *(answer (a))*

These are combined as a weighted average to give
    (7.1% × 65%) + (4.2% × 35%) = **6.08%**

Question 2

Given the assumptions above, what is the current value of the business's equity if it is valued using the 5 years projected cash flows shown above plus a terminal value using a perpetuity growth rate of 2%? (Take the year 5 cash flow as representative for future years and sustainable).

       (a) £100M – £110M.
       (b) £145M – £155M.
       (c) £180M – £190M.
       (d) £235M – £245M.
       (e) don't know.

Answer
The right answer is (c) £180M – £190M

The first step is to calculate the cash flow statement, as follows.

(All figures in £M)	**Year**				
	1	*2*	*3*	*4*	*5*
Trading profit	10.00	12.50	15.25	18.28	21.60
Depreciation	10.00	10.00	10.00	10.00	10.00
Change in Net Working Capital	0.00	-2.00	-2.2.0	-2.42	-2.66
Capex	-25.00	-25.00	-11.00	-11.00	-11.00
Tax (1 yr lag)	-3.00	-3.00	-3.75	-4.58	-5.48
Net Cash Flow (Post-tax)	**-8.00**	**-7.50**	**8.30**	**10.28**	**12.46**

Then, using the WACC calculated in Q1, determine the present value for each year's cash flows;

Discount factor	0.9427	0.8886	0.8377	0.7897	0.7444
PV cash flow	-7.5420	-6.6650	6.9530	8.1180	9.2750
Sum of PVs	10.1400				

Terminal Value is calculated using the formula TV = cash flow / (k – g) where the cash flow of concern is that following the latest year in our projection, k is the WACC and g is the perpetuity growth rate.

Cash flow is our year 5 figure increased by the perpetuity growth rate (we are implicitly assuming that this growth applies for all years after year 5),
i.e. 12.46 × 1.02 = 12.71

For the denominator; (k-g) = (6.08% - 2%) = 4.08%

Thus the TV is (12.71 / 0.0408) = 311.5 But this is a value in Year 5, so the Present Value of the TV is 311.5 × discount factor for year 5 (0.7444) = 231.9

Total value for the business is therefore the sum of each year's PV, 10.1 plus the TV, 231.9 = 242

But the business has 55 debt thus the value of the equity in the business is
242 – 55 = £187M

Question 3

After some careful consideration and discussion, it has been decided that the perpetuity growth rate should be increased from 2% to 2.5%.

What is the impact of this change on the base case equity value of the business?

    (a) increases the equity value by £0 – £10M.
    (b) increases the equity value by £20M – £30M.
    (c) increases the equity value by £30M – £40M.
    (d) increases the equity value by £40M - £50M.
    (e) don't know.

Answer

The right answer is (c) increases the equity value by £30M – £40M

The sum of each year's PVs remains the same but the TV will change.

Cash flow is, again, the year 5 figure increased by the perpetuity growth rate which is now 2.5%
        i.e. 12.46 × 1.025 = 12.77

But the bigger impact is from the denominator of the equation:
        (k-g) = (6.08% - 2.5%) = 3.58%

Thus the TV is (12.77 / 0.0358) = 356.7   But this is a value in Year 5, so the Present Value of the TV is 356.7 × discount factor for year 5 0.7444 = 265.5

Total value for the business is therefore the sum of each year's PV plus the TV
        i.e. 10.1 + 265.5 = 275.6

But the business has 55 debt now, thus the value of the equity in the business is
        *275.6 – 55 = £**220.6M***

This is an increase of £33.6M over the base case value.

Question 4

Now it has been decided that the original forecast of 2% perpetuity growth was much more 'sustainable'. Instead, it has been decided that the capital structure is to be more aggressive. The assumption is to be changed from 35% debt and 65% equity to 70% debt and 30% equity. Surprisingly, the debt spread is expected to remain the same at 2%.

What is the impact of this change on the base case equity value of the business?

   (a) increases the equity value by £0 – £10M.
   (b) increases the equity value by £10M – £20M.
   (c) increases the equity value by £20M – £30M.
   (d) increases the equity value by £30M – £40M.
   (e) don't know.

Answer

The right answer is (b) increases the equity value by £10M – £20M

The change in capital structure affects the WACC which, in turn, affects the PV for each year's cash flow and the TV.

<u>*Step 1 – recalculating beta*</u>
The ungeared beta is 0.75, so the geared beta will be increased for the 70% debt in the capital structure.

$Bg = 0.75 \times (1 + \{70\% \times (1\text{-tax rate}) / (30\% \text{ equity})\}$

$= 1.975$

Equity cost is therefore 4% + (1.975 × 3%) = 9.93%
Debt cost is 4% + 2% spread all reduced by (1 – tax rate),
i.e. 6% × 0.7% = 4.2%

These are combined as a weighted average to give
*(9.93% × 30%) + (4.2% × 70%) = **5.92%***

<u>Step 2 Present value of the forecast years</u>
Discount factors and Present Values for each forecast year then become

	Year				
	1	*2*	*3*	*4*	*5*
Discount factor	*0.9441*	*0.8913*	*0.8415*	*0.7945*	*0.7501*
PV cash flow	*-7.553*	*-6.685*	*6.984*	*8.167*	*9.346*
Sum of PVs	*10.3*				

<u>Step 3 Terminal Value</u>

Cash flow is, again, the year 5 figure increased by the perpetuity growth rate which is now back to 2.0%
i.e. 12.46 × 1.02 = 12.71

But the bigger impact is from the denominator of the equation:
(k-g) = (5.92% - 2%) = 3.92%

Thus the TV is (12.71 / 0.0392) = 324.2 But this is a value in Year 5, so the Present Value of the TV is 324.2 × discount factor for year 5, 0.7501 = 243.2

Total value for the business is therefore the sum of each year's PV plus the TV
i.e. 10.3 + 243.2 = 253.5

But the business has 55 debt, thus the value of the equity in the business is
*253.5 – 55 = **198.5***

*i.e. **an increase of £11.5M over the base case value.***

Question 5

It has been decided that this capital structure might be a little too aggressive and so the assumption reverts to the original 35% debt and 65% equity. However, you have received a visit from an investment bank who argues that, using an approach derived from option theory, the equity risk premium should be zero (0%). You decide that you will adopt this as an assumption.

What is the impact of this change on the base case equity value of the business?

(a) increases the equity value by £0 – £50M.
(b) increases the equity value by £50M – £100M.
(c) increases the equity value by £100M – £150M.
(d) increases the equity value by £200M – £300M.
(e) don't know.

Answer

The right answer is (d) increases the equity value by £200M – £300M
        i.e. two and a half times the base case value!

Step 1 – recalculating beta
The ungeared beta is 0.75, so the geared beta will be increased for the 35% debt in the capital structure.

$$Bg = 0.75 \times (1 + \{35\% \times (1\text{-tax rate}) / (65\% \text{ equity})\}$$

$$= 1.033$$

Equity cost is therefore 4% + (1.033 × 0%) = 4%
Debt cost is 4% + 2% spread all reduced by (1 – tax rate),
        i.e. 6% × 0.7% = 4.2%

These are combined as a weighted average to give
        *(4% × 65%) + (4.2% × 35%) = **4.07%***

Step 2 Present Value of the forecast years
Discount factors and Present Values for each forecast year then become

	Year				
	1	**2**	**3**	**4**	**5**
Discount factor	0.9609	0.9233	0.8872	0.8525	0.8192
PV cash flow	-7.6870	-6.9250	7.3640	8.7640	10.2070
Sum of PVs	11.7000				

Step 3 Terminal Value
Cash flow is, again, the year 5 figure increased by the perpetuity growth rate which is now back to 2.0%
        i.e. 12.46 × 1.02 = 12.71

But the bigger impact is from the denominator of the equation:
        (k-g) = (4.07% - 2%) = 2.07%

Thus the TV is (12.71 / 0.0207) = 614.0 But this is a value in Year 5, so the Present Value of the TV is 614.0 × discount factor for year 5, 0.8192 = 503.0

Total value for the business is therefore the sum of each year's PV plus the TV
        i.e. 11.7 + 503.0 = 514.7

But the business has 55 debt, thus the value of the equity in the business is
        *514.7 – 55 = **459.7***

i.e. an increase of £273M over, or 2½ times, the base case value.

Question 6

After much internal debate, you reject the idea that there is no equity risk premium, and revert to the original assumption of 3%. However, you suspect that the political climate is such that a long-term figure for the effective and marginal tax rate may be 25% rather than the 30% you had originally supposed.

What is the impact of this change on the base case equity value of the business?

>   (a)   increases the equity value by £0 – £5M.
>   (b)   increases the equity value by £5M – £15M.
>   (c)   increases the equity value by £15M – £25M.
>   (d)   increases the equity value by £25M – £35M.
>   (e)   don't know.

Answer

The right answer is (b) increases the equity value by £5M – £15M

The tax rate impinges on the WACC through the calculation of geared beta and the after-tax cost of debt. Further it impinges on the after-tax cash flows for each year and the terminal value.

Step 1 – recalculating beta
The ungeared beta is 0.75, so the geared beta will be increased for the 35% debt in the capital structure.

> B_g *= 0.75 × (1 + {(35% × (1-25%)) / (65% equity)}*

>   *= 01.053*

Equity cost is therefore 4% + (1.053 × 3%) = 7.16%
Debt cost is 4% + 2% spread all reduced by (1 – tax rate),
        i.e. 6% × 0.75% = 4.5%

These are combined as a weighted average to give
        *(7.16% × 65%) + (4.5% × 35%) = **6.23%***

Step 2 Present Value of the forecast years
The cash flows with the revised tax payments are

	Year				
	1	*2*	*3*	*4*	*5*
Net Cash Flow (Post-tax)	*-7.5*	*-7.0*	*8.93*	*11.05*	*13.37*

Discount factors and Present Values for each forecast year then become

	Year				
	1	*2*	*3*	*4*	*5*
Discount factor	0.9414	0.8861	0.8342	0.7853	0.7392
PV cash flow	-7.0610	-6.2030	7.4490	8.6780	9.8830
Sum of PVs	12.7000				

<u>*Step 3 Terminal Value*</u>
Cash flow is, again, the year 5 figure increased by the perpetuity growth rate which is now back to 2.0%
> *i.e. 13.37 × 1.02 = 13.64*

But the bigger impact is from the denominator of the equation:
> *(k-g) = (6.23% - 2%) = 4.23%*

Thus the TV is (13.64 / 0.0423) = 322.5 But this is a value in Year 5, so the Present Value of the TV is 322.5 × discount factor for year 5, 0.7392 = 238.4

Total value for the business is therefore the sum of each year's PV plus the TV
> *i.e. 12.7 + 238.4 = 251.1*

But the business has 55 debt, thus the value of the equity in the business is
> *251.1 – 55 = **196.1***

i.e. an increase of £9.1M over the base case value.

Interpretation of Scores

0-1 This score indicates that you obviously appreciate the importance of discounted cash flows, and the consequences that they have on valuing companies. However, you may have fallen down on some of the formulae. Read the worked solutions carefully and rework your incorrect answers. You may also benefit from reading p25-p39 in the 2004 edition of *The Treasurer's Handbook* or attending either the "Capital Investment Appraisal" training course or the "Advanced Aspects of Investment Appraisal" training course.

2-3 Well done, your score indicates that you that probably had the majority of the formulas for CAPM (Capital Asset Pricing Model) correct, but one slip has meant the wrong final answer. If this was an exam you may well have received some marks for your workings. Review the worked solutions carefully and examine the chapters covered in p25-p39 of the 2004 edition of *The Treasurer's Handbook*. You may also want to read chapters 2 and 3 of AMCT Manual VI and chapters 2, 5 and 6 of MCT Manual VII.

4-5 You obviously know a great deal about discounted cash flow and have a good grasp of the calculations. A couple of minor slips though may have resulted

in this score. Review the worked solutions carefully and re-work your incorrect answers.

6   Well done, you have a very good grasp of this important concept and the impact that they have on valuing companies. Be sure to retain this knowledge by reading around the subject and attending relevant training courses/conferences.