Answers to website questions

The answers provided relate to the numerical or analytical component of answers only.

Chapter 1

There are no analytical questions in this chapter

Chapter 2

Question 3*

	0	1	2	3	4	5
Initial Investment	10000	10000	10500	11025	11576	12155
Add interest at 5%		500	525	551	579	608
Balance invested for the year	10000	10500	11025	11576	12155	12763

Note the question erroneously refers to 7.5 per cent, for those generating a table using that rate of interest the answer would be as follows:

	0	1	2	3	4	5
Initial Investment	10000	10000	10750	11556	12423	13355
Add interest at 7.5%		750	806	867	932	1002
Balance invested for the year	10000	10750	11556	12423	13355	14356

Question 4

$10000x1.1^{7} = 19487$

Question 5

$$\frac{80000}{1.08^{5}} = 54447$$

Question 6

NPV = 34340
IRR = 67%

Question 7

NPV = 29163
IRR = 42%

Question 8

	0	1	2	3	4	5	6	7	8	9	10

Current rental - saving		450000	450000	450000	450000	450000	450000	450000	450000	450000	450000
New fitout and removal	-500000										
Rent on new property		-475000	-475000	-475000	-500000	-500000	-500000	-500000	-500000	-500000	-500000
Saving in operating costs		75000	75000	75000	75000	75000	75000	75000	75000	75000	75000
saving in taxes		50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
Net cash change to business	-500000	100000	100000	100000	75000	75000	75000	75000	75000	75000	75000
discounted cash flow	-500000	92593	85734	79383	55127	51044	47263	43762	40520	37519	34740
Net present value	67684										
Internal rate of return	11.14%										
Future value of return phase		199900	185093	171382	119016	110200	102037	94478	87480	81000	75000
Sum of future value	1225586										
Modified internal rate of return	9.38%										
cumulative cash flow	-500000	-400000	-300000	-200000	-125000	-50000	25000	100000	175000	250000	325000
payback	5.67 years										
cum discounted cash flow	-500000	-407407	-321674	-242290	-187163	-136119	-88857	-45095	-4575	32944	67684
discounted payback	8.12 years										

Question 9

Bernie Flower:

	0	1	2	3	4	5	6	7	8	9	10
Saving in hire charges		4875	4875	4875	4875	4875	4875	4875	4875	4875	4875
Saving in labour time		1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Running costs		-480	-480	-480	-480	-480	-480	-480	-480	-480	-480
Operating cash flow (current prices)		5895	5895	5895	5895	5895	5895	5895	5895	5895	5895
Nominal operating cash flow		6131	6376	6631	6896	7172	7459	7757	8068	8390	8726
Capex (minidigger)	-24000										4000
Capex (trailer bar)	-6000										
Project cash flow	-30000	6131	6376	6631	6896	7172	7459	7757	8068	8390	12726
Discounted cash flow	-30000	5677	5466	5264	5069	4881	4700	4526	4359	4197	5895
Net present value	**20035**										
Internal rate of return	**19.8%**										
Project cash flow	-30000	6131	6376	6631	6896	7172	7459	7757	8068	8390	12726
Cumulative cash flow	-30000	-23869	-17493	-10862	-3966	3206	10665	18423	26491	34881	47607
Payback	**4.6 years**										
Project cash flow	-30000	5677	5466	5264	5069	4881	4700	4526	4359	4197	5895
Cumulative discounted cash flow	-30000	-24323	-18857	-13593	-8524	-3643	1058	5584	9943	14140	20035
Discounted payback	**5.8 years**										

Chapter 3

Question 3

See chapter 3, pp.77-85 and selected end of chapter references

Question 4

(i) Set up the risk equation and solve by setting the first differential to zero as shown on p.113.

The inputs to the risk equation are:

$$\sigma_p^2 = w_a^2 0.24^2 + w_b^2 0.1^2 + 2w_a w_b x - 0.2x0.24x0.1$$

Given that the two weights must sum to one then:

$$\sigma_p^2 = w_a^2 0.24^2 + (1-w_a)^2 0.1^2 + 2w_a(1-w_a)x - 0.2x0.24x0.1$$

Resolving and simplifying:

$$\sigma_p^2 = 0.0576w_a^2 + 0.01x(1-w_a)^2 - .0096w_a(1-w_a)$$

therefore

$$\sigma_p^2 = 0.0576w_a^2 + 0.01 - 0.02w_a + 0.01w_a^2 - .0096w_a + .0096w_a^2$$

$$\sigma_p^2 = 0.0772w_a^2 + 0.01 - 0.0296w_a$$

and

$$\frac{d(\sigma_p^2)}{dw_a} = 0.1544w_a - 0.0296 = 0$$

therefore

$$w_a = 0.1905$$

and

$$w_b = 0.8095$$

(ii) Return is the weighted average return using the above weights = 11.14%

(iii) At 8 per cent the risk is lower than the minimum risk portfolio that is available given these two securities and thus the optimum return is 11.14 per cent.

Question 5

Portfolio risk where one security is risk free and the other is the efficient market portfolio is given by:

$$\sigma_p = w_m \sigma_m$$

(i) two thirds market risk

$$0.1 = w_m 0.15$$

therefore

$$w_m = 0.667$$

The fund allocation is £66667 in the market portfolio and the balance in the risk free security

(ii) double market risk

$$0.3 = w_m 0.15$$

therefore

$$w_m = 2$$

The fund allocation is £200000 in the market portfolio financed by £100000 of personal capital and £100000 of borrowing at the risk free rate.

Question 6

(i) 7.15 per cent
(ii) 1.429

Question 7

Beta is given by the formula:

$$\beta = \frac{\rho_{im} \sigma_i \sigma_m}{\sigma_m^2}$$

(i) Security 1 has a beta of 0.9333 and security 2 a beta of 0.1111.
(ii) An equally weighted portfolio has a beta of 0.5185

Chapter 4

Question 3

$$discount = \frac{par - issue}{par} = \frac{100 - 94}{100} = 6\%$$

$$return = \frac{par - issue}{issue} = \frac{100 - 94}{94} = 6.38\%$$

Question 4

The six monthly yield is calculated as follows:

$$107.50 = \frac{4}{(1+yld)} + \frac{4}{(1+yld)^2} + \frac{4}{(1+yld)^3} + \frac{4}{(1+yld)^4} + \frac{4}{(1+yld)^5} + \frac{4}{(1+yld)^6} + \frac{4}{(1+yld)^7} + \frac{104}{(1+yld)^8}$$

$$yld = 2.9345\%$$

The annual equivalent yield is as follows:

$$yld = 1.029345^2 - 1 = 5.9552\%$$

Question 5

	0	1	2	3	4	5	6	7	8
Cash flow from bond	-107.50	4.00	4.00	4.00	4.00	4.00	4.00	4.00	104.00
yield	0.0293								
discounted cash flows		3.89	3.78	3.67	3.56	3.46	3.36	3.27	82.52
Weighted years		0.03615	0.07024	0.10235	0.13258	0.16100	0.18769	0.21273	6.14082
Duration (six monthly intervals)	7.04								
Duration	3.52								

Question 6

(i)

	0	1	2	3	4	5	6	7	8	9	10
Cash flow from bond	-102.5	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	103.25
yield	0.030										
yield (annual)	**0.060**										
discounted cash flows		3.16	3.07	2.98	2.89	2.81	2.73	2.65	2.57	2.50	77.14
Weighted years		0.031	0.060	0.087	0.113	0.137	0.160	0.181	0.201	0.220	7.526
Duration (six monthly intervals)	8.72										
Duration	**4.36**										

(ii)

Modified duration	4.11082

Change in value	-4.21359

The change in value is calculated by multiplying the modified duration (note the calculation must be undertaken in years) by the bond value and by the change in interest rate. Note that convexity effects lead to some inaccuracy (the actual fall in value is -4.0916).

Question 7

The answers to this question can be found in pp. 141-145 of the text.

Chapter 5

Question 4

Retention ratio (b) = 1-1/cover = 0.519

$$r = \frac{yld}{1-b-bxyld} = \frac{0.0308}{1-0.519-0.519x0.0308} = 6.62\%$$

Question 5

The Blume correction is as follows:

$\beta_e = 0.371 + 0.635\beta_o$

$\beta_e = 0.371 + 0.635x2.04$

$\beta_e = 1.67$

The Vasicek correction is as follows

$$\beta_i(adj) = \left[\frac{SE(group)^2}{SE(group)^2 + SE(\text{sec}urity)^2}\right] x\beta_i + \left[\frac{SE(\text{sec}urity)^2}{SE(group)^2 + SE(\text{sec}urity)^2}\right] x\beta_{group}$$

$$\beta_i(adj) = \left[\frac{0.135^2}{0.135^2 + 0.24^2}\right] x2.04 + \left[\frac{.24^2}{0.135^2 + 0.24^2}\right] x1.06$$

$\beta_i(adj) = 1.296$

Question 6

The weighted number of years to redemption and the weighted coupon are as follows:

Year of repayment	Coupon	Book value (£(m)	weighted years	weighted coupon
2007	5.00%	4.4	320	0.80%
2008	5.50%	5.0	364	1.00%
2010	7.00%	10.2	743	2.59%
2014	7.25%	8.0	584	2.10%
		27.6	2010	6.48%

(i) The weighted coupon is 6.48 per cent.

(ii) The 31 December 04 yield curve is appropriate and shows that at 6 years 4.55 per cent is the appropriate Treasury bill rate. With an addition of 65 basis points this gives a yield on the corporate bond of 5.2 per cent.

	0	2005	2006	2007	2008	2009	2010
coupon + repayment		6.48	6.48	6.48	6.48	6.48	106.48
present value of bond at 5.2 per cent	106.46	6.16	5.86	5.57	5.29	5.03	78.55

This gives a market value of £106.46 per £100 nominal or £29.38 million on a book value of £27.6 million.
(iii) The firms cost of debt capital is 60 per cent of 5.2 per cent i.e., 3.12 per cent.

Question 7

This question utilises the dividend growth model to value a company using the dividend growth model introduced in the chapter. This topic is dealt with in more detail in chapter 10 but this question is a useful precursor or can be left until that chapter. A clear refinement of the question involves regearing the beta for Beaser (see chapter 6).

Ape market value	
dps	40
equity cost of capital	0.101
retention ratio	0.5789474
growth through retention	0.0584737
Value using the growth model	995.59406
growth (analysts) estimates	0.05334
value using growth model	884.04532
Beaser PE ratio	16.75
Apply to APE yields a price of	1591.25
suggest a growth average price	939.81969

Ape	No	Price	Cap	return	weight	
Equity	10000000	939.81969	9398196902	0.101	0.88	0.08888
Debt				0.065	0.12	0.00468
WACC (net of tax)						0.09356

(i) The equity cost of capital assumes that Ape carries the same beta as Beeser although the higher degree of diversification would suggest a lower beta. The equity cost of 10.1 per cent is appropriate for the calculation of equity residuals such as market value. The WACC which is approximated above at 9.356 per cent is useful for internal investment decisions.

(ii) The valuation is sensitive to measures of growth and the equity rate of return. On the assumption that analysts forecasts are correct a price of 884p per share is indicated. If the firm could achieve the growth suggested by its rate of reinvestment then 995p would be indicated. This is the likely range. The PE multiple method leaves too much to chance: the uncertainty attaching to the equity rate and ignoring future earnings growth.

(iii) The valuation presents a number of problems: the DGM assumes constant growth which is unlikely to be realised in practice especially as the market moves to capacity. The equity cost of capital is rather suspect given that we are using a competitor's beta value and there is some indication

that Ape may carry lower market risk exposure than Beeser. The only thing we can be sure of is last year's dividend!

Chapter 6

Question 4

Note: this question misses one important fact: the current cost of debt capital which is 5 per cent. Further to make the question more interesting you can drop the 150p and use the equity data to calculate the equity value.

(i) The market value of the company's equity is the share price (150p) times the number of shares in issue (50 million) to give £75 million.

(ii)

		1	2	3
coupon plus repayment		6	6	106
discounted at 5 per cent	102.72	5.71	5.44	91.57

Given a cost of debt of 5 per cent and a market value of 102.72 per cent of 25 million the M&M relationship gives us the pure equity rate:

$$r_e = r_e' + (1-T)(r_e' - r_d)\frac{MV_d}{MV_e}$$

$$0.08 = r_e' + 0.6x(r_e' - 0.05)x\frac{25.68}{75}$$

$$r_e' = 0.0749$$

(iii) The cost of equity will increase as follows:

$$r_e = r_e' + (1-T)(r_e' - r_d)\frac{MV_d}{MV_e}$$

$$r_e = .0749 + 0.6x(.0749 - 0.0525)x\frac{30}{75}$$

$$r_e = 0.0803$$

(Note: the problem here is in estimating the extent to which the market value of equity will change. We have assumed it remains unchanged. If you have followed the DVM route for calculating the value of equity then you can revalue using the model).

(iv) The weighted average cost of capital in each case is:

$$WACC = (1-w_d)r_e + w_d r_d(1-T)$$

$$WACC(before) = 6.288\%$$

$$WACC(after) = 6.078\%$$

(v) Some difficulties with this question including the movement in the value of equity. However, it also assumes that the cost of equity is not influenced by the increased default risk but only by the increase in financial risk and the benefit of the tax shield.

Question 5

The relationship between equity and asset beta is as follows:

$$\beta_a = (1 - w_d)\beta_e$$

The trick with this question is that we need to calculate the tax adjusted gearing without relying upon a valuation of the equity (as we are not given the equity value within the revised gearing). This particular requires a bit of algebraic manipulation not given in the book.

$$w_d = \frac{D}{D+E}$$

$$\frac{E}{D} = w_d^{-1} - 1$$

$$\frac{E}{D} = 0.45^{-1} - 1 = 1.2222$$

Using this we can calculate the tax adjusted gearing ratio:

$$w_d = \frac{Dx(1-T)}{Dx(1-T)+E}$$

$$w_d^{'} = \left[1 + \frac{E}{D}(1-T)^{-1}\right]^{-1}$$

$$w_d^{'} = \left[1 + 1.2222(0.6)^{-1}\right]^{-1} = 32.93 percent$$

This implies an asset beta:

$$\beta_a = (1 - 0.3293)x1.6$$

$$\beta_a = 1.0731$$

Regearing to 60 per cent gives a tax adjusted gearing level of:

$$\frac{E}{D} = 0.6^{-1} - 1$$

$$\frac{E}{D} = 0.6667$$

$$w_d^{'} = \left[1 + \frac{E}{D}(1-T)^{-1}\right]^{-1}$$

$$w_d^{'} = \left[1 + 0.6667(0.6)^{-1}\right]^{-1} = 47.37 percent$$

$$1.0731 = (1 - 0.4737) x \beta_e$$

$$\beta_e = 2.039$$

Question 6

Thomson Teazers is covered in pp. 213 -222 plus the references cited at the end of the chapters concerned.

Question 7

The working sheet and summary cash flow are as follows:

	Δ	*Operating cash flow*	*Interest Paid rec'd*	*Taxation*	*Capex/ disposals*	*Dividends paid*	*Financing*
Changes in owner's equity							
Equity shares issued	300000						300000
Operating profit	3789000	*3789000*					
Surplus on the disposal of fixed assets	125680				125680		
Interest paid and payable	-114000		-114000				
Tax at 35 per cent	-1330238			-1330238			
Less dividend proposed	-1200000					-1200000	
	1270442						
Current liabilities							
Decrease in trade creditors	-136690	*-136690*					
Increase in tax payable	1235238			1235238			
increase in dividend payable	200000					200000	
increase in interest payable	1580		1580				
	1300128						
Long term liabilities							
increase in borrowing	400000						400000
Sum of positive cash drivers	3270570	*3652310*	*-112420*	*-95000*	*125680*	*-1E+06*	*700000*
Change in Fixed assets							
acquisitions in the year	1768000				1768000		
disposals in the year	-540900				-540900		
	1227100						
depreciation on disposals	432720				432720		
depreciation for the year	-717200	*-717200*					
	-284480						
Change in net book value	942620						
Change in stock	184100	*184100*					
Change in debtors							
Trade Debtors	65500	*65500*					
Prepayments and accrued income	18000	*18000*					
Balance due on sale of fixed assets	500000				500000		
Other debtors	10150	*10150*					
	593650						

Sum of negative cash drivers	1720370	*-439450*	*0*	*0*	*2159820*	*0*	*0*
Cash flow	1550200	4091760	-112420	-95000	-2034140	-1000000	700000

Summary cash flow statement

Operating cash flow	4091760
less interest paid	-112420
less tax paid	-95000
Free cash flow before net reinvestment	3884340
Capital expenditure less disposals	-2034140
	1850200
Dividends paid	-1000000
	850200
Capital introduced	700000
Change of cash in year	1550200

(ii) The cash flow statement indicates that the company has £3.884million before net reinvestment and that capital expenditure less capital introduced was £1.334 million. This implies that £2.550million was available for distribution or £1.550 million after the dividend of £1million was paid.

Chapter 7

Question 3

Using the Fisher formula the nominal rate is 7.12 per cent.

Question 4

The analytics for this question are as follows (ranked order of projects):

	0	1	2	3	4	npv	PI	cash	irr
F	-0.5	0.7				0.14	0.273	7.5	40%
D	-2	1	1.8			0.40	0.198	5.5	23%
A	-3.9	-1.9	2	3	3.5	0.67	0.172	1.6	15%
B	-1.5	1	1			0.24	0.157	0.1	22%
E	-8	-2	7	4	3	1.02	0.128	-7.9	15%
C	-0.1	0.05	0.08			0.01	0.116	-8	18%

(i) The projects to be adopted are F, D, A, B and assuming divisibility a reduced investment of 0.1 million in project E.

(ii) The minimum rate of return is the IRR on project E which is 15%.

(iii) Perfect divisibility of the projects concerned and capital rationing limited to one year only.

(iv) Scaling of projects is very unlikely although a single period of rationing is quite common due to time delays in raising short term finance.

Question 5

The analytics for this question are as follows:

	01-Jan	31-Dec-01	31-Dec-02	31-Dec-03	31-Dec-04	31-Dec-05	NPV	IRR	NPV/£
alpha	-130000	0	0	0	0	220000	£19,728	11%	£0.152
beta	-9000	3000	3000	3000	3000	3000	£2,978	20%	£0.331
gamma	-199000	200000	80000	0	0	0	£54,772	31%	£0.275
delta	-44000	-22000	70000	10000	12000	0	£12,402	18%	£0.282
epsilon	-97000	20000	38000	50000	25000	10000	£18,971	16%	£0.196
	-479000	201000	191000	63000	40000	233000			

	01-Jan	31-Dec-01	31-Dec-02	31-Dec-03	31-Dec-04	31-Dec-05	NPV	NPV/£	IRR	Investment	CumCash	Project (NPV)
beta	-9000	3000	3000	3000	3000	3000	£2,978	£0.331	20%	9000	9000	2978
delta	-44000	-22000	70000	10000	12000	0	£12,402	£0.282	18%	44000	53000	12402
gamma	-199000	200000	80000	0	0	0	£54,772	£0.275	31%	199000	252000	54772
epsilon	-48000	9897	18804	24742	12371	4948	£9,388	£0.196	16%	48000	300000	9388
alpha	0	0	0	0	0	0	£0					
	-300000	190897	171804	37742	27371	7948	£79,540					79540

	01-Jan	31-Dec-01	31-Dec-02	31-Dec-03	31-Dec-04	31-Dec-05	
Turnover		780500	820000	861000	904000	949200	
Gross profit		172000	180400	190000	199000	208500	
Capital employed	1021250	1075000	1127500	1187500	1243750	1303125	average
ROCE (original)		16.41%	16.38%	16.41%	16.37%	16.37%	16.39%
Gross profit + NCF		362897	352204	227742	226371	216448	
Depreciation		32200	32200	32200	32200	32200	
Accumulated depreciation		32200	64400	96600	128800	161000	
Gross profit		330697	320004	195542	194171	184248	
Capital employed	1321250	1364800	1385100	1412900	1436950	1464125	
Average capital employed		1343025	1374950	1399000	1424925	1450538	
ROCE (after)		24.62%	23.27%	13.98%	13.63%	12.70%	17.64%

(i) On the basis of this the acceptable projects are beta, delta, gamma and epsilon which is scaled down to an investment of £48000. The equity of the firm should rise by the NPV of the accepted projects which is £79540.

(ii) For very short term finance the maximum rate is 8 per cent plus the net present value per £ of invested value which gives a total rate of 27.6 per cent. For longer term finance the IRR of the marginal project is the maximum rate (16 per cent).

(iii) The average ROCE will rise from 16.39 per cent to 17.64 per cent.

(iv) See pp.243-244

Question 6

(i) Bernie Flower returns but this time the sensitivity issue arises. See chapter 2 question 9 for the first part.

(ii) Capital spending has a direct effect upon the NPV of a project in that a £1 increase in spending leads to a £1 fall in NPV.

The second part relies upon the calculation of the project's duration:

	0	1	2	3	4	5	6	7	8	9	10
DCF of project		5677	5466	5264	5069	4881	4700	4526	4359	4197	5895
PV of project	50035										
DCF/NPV		0.113	0.109	0.105	0.101	0.098	0.094	0.090	0.087	0.084	0.118
Weighted years		0.113	0.219	0.316	0.405	0.488	0.564	0.633	0.697	0.755	1.178
Duration	5.368										

$$\frac{d(NPV)}{di} = -\frac{1}{(1+i)} xDxPV$$

$$d(NPV) = -\frac{1}{(1.08)} x5.368x50035x1\%$$

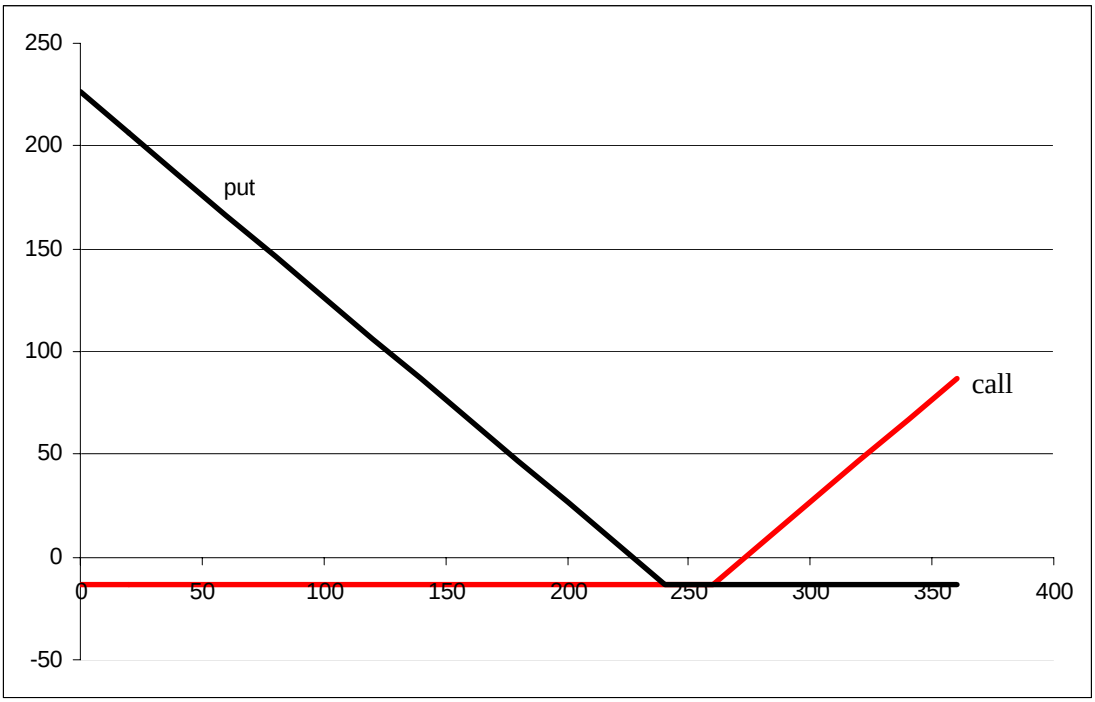
$$d(NPV) = -£2487$$

Therefore a 1 per cent change in interest rates brings about a change of NPV of £2487 (convexity effects give a slightly different result to the actual sensitivity of £2398).

Chapter 8

Question 3

(i)



(ii) At any market value above 260p the call is in the money and at any value below 240p the put is in the money.

(iii) The cost of establishing the combination is £130 per contract for the call and £135 per contract for the put giving £265 in total.

Question 4:

Current price	**214.00**
Exercise price	**215.00**
Risk free rate	**0.05**
Time to exercise (days)	**250**
Volatility	**0.3000**
Dividend	**0.0250**
d1	0.21779
d2	-0.08221
N(d1)	0.58620
N(d2)	0.46724
call value	**26.79**
Current price	**220.00**

Exercise price	**215.00**
Risk free rate	**0.05**
Time to exercise (days)	**250**
Volatility	**0.3000**
Dividend	**0.0250**
d1	0.30997
d2	0.00997
N(d1)	0.37829
N(d2)	0.49602
put value	**18.22**

Note that the call is valued relative to the price for which the security could be sold on the open market as this gives the actual gain on exercise. The reverse is the case for the put.

Question 5

See pp. 272-274

Question 6

Current price	**90.00**
Exercise price	**80.00**
Risk free rate	**0.04879**
Time to exercise (days)	**124**
Volatility	**0.7465**
Dividend	**0.0000**
d1	0.53293
d2	0.00718
N(d1)	0.70296
N(d2)	0.50287
call value	**24.00**

(i) Thus the implied volatility is 74.65 per cent
(ii) The option delta is 0.53293 and the option gamma is 0.007315 (see p.300)
(iii) The revised deltas would be 0.71421 and 0.33254, and the gammas would be 0.005939 and 0.008864 for a rise of 10% and a fall of 10% respectively.
(iv) See pp.299-302

Question 7

(i) 90 day American Put

PRICE GENERATION TABLE

0	1	2	3	4	5	6	7	8	9	10
180.00	190.24	201.07	212.51	224.60	237.38	250.89	265.16	280.25	296.19	313.05
	170.31	180.00	190.24	201.07	212.51	224.60	237.38	250.89	265.16	280.25
		161.14	170.31	180.00	190.24	201.07	212.51	224.60	237.38	250.89

			152.47	161.14	170.31	180.00	190.24	201.07	212.51	224.60
Time steps	10			144.26	152.47	161.14	170.31	180.00	190.24	201.07
Current price	180				136.49	144.26	152.47	161.14	170.31	180.00
Exercise price	210					129.14	136.49	144.26	152.47	161.14
Time to exercise	90						122.19	129.14	136.49	144.26
Risk free rate	0.05							115.61	122.19	129.14
Volatility	0.35								109.39	115.61
										103.50

PUT

	0	1	2	3	4	5	6	7	8	9	10
	31.22	23.23	16.04	9.98	5.30	2.15	0.50	0.00	0.00	0.00	0.00
		39.69	30.82	22.44	14.92	8.61	3.88	1.04	0.00	0.00	0.00
u=	1.03		48.86	39.69	30.38	21.58	13.60	6.87	2.12	0.00	0.00
d=	0.9689			57.53	48.86	39.69	30.00	20.69	11.86	4.36	0.00
prob(u)	0.5119				65.74	57.53	48.86	39.69	30.00	19.76	8.93
prob(d)	0.4881					73.51	65.74	57.53	48.86	39.69	30.00
disc factor	0.9988						80.86	73.51	65.74	57.53	48.86
								87.81	80.86	73.51	65.74
									94.39	87.81	80.86
										100.61	94.39
											106.50

(ii) 90 Day American Call

PRICE GENERATION TABLE

	0	1	2	3	4	5	6	7	8	9	10
	180.00	190.24	201.07	212.51	224.60	237.38	250.89	265.16	280.25	296.19	313.05
		170.31	180.00	190.24	201.07	212.51	224.60	237.38	250.89	265.16	280.25
			161.14	170.31	180.00	190.24	201.07	212.51	224.60	237.38	250.89
				152.47	161.14	170.31	180.00	190.24	201.07	212.51	224.60
Time steps	10				144.26	152.47	161.14	170.31	180.00	190.24	201.07
Current price	180					136.49	144.26	152.47	161.14	170.31	180.00
Exercise price	190						129.14	136.49	144.26	152.47	161.14
Time to exercise	90							122.19	129.14	136.49	144.26
Risk free rate	0.05								115.61	122.19	129.14
Volatility	0.35									109.39	115.61
											103.50

CALL

	0	1	2	3	4	5	6	7	8	9	10
	10.97	15.66	21.85	29.74	39.41	50.73	63.44	77.14	91.62	106.90	123.05
		6.09	9.21	13.63	19.68	27.63	37.55	49.23	62.16	75.82	90.25
u=	1.03		2.83	4.59	7.32	11.40	17.30	25.39	35.79	47.99	60.89
d=	0.9689			0.99	1.75	3.05	5.25	8.85	14.56	23.08	34.60
prob(u)	0.5119				0.20	0.39	0.76	1.48	2.89	5.66	11.07
prob(d)	0.4881					0.00	0.00	0.00	0.00	0.00	0.00
disc factor	0.9988						0.00	0.00	0.00	0.00	0.00
								0.00	0.00	0.00	0.00
									0.00	0.00	0.00
										0.00	0.00

0.00

(iii) American Put with 10p dividend (note the period 4 price has been reduced by the value of the dividend.

PRICE GENERATION TABLE

	0	1	2	3	4	5	6	7	8	9	10
	180.00	190.24	201.07	212.51	214.60	226.81	239.71	253.35	267.77	283.01	299.11
		170.31	180.00	190.24	191.07	203.05	214.60	226.81	239.71	253.35	267.77
			161.14	170.31	170.00	180.78	191.07	201.94	213.43	225.57	238.41
				152.47	151.14	160.85	170.00	179.67	189.90	200.70	212.12
Time steps	10				134.26	143.00	151.14	159.74	168.83	178.44	188.59
Current price	180					127.03	134.26	141.90	149.97	158.50	167.52
Exercise price	210						120.19	127.03	134.26	141.90	149.97
Time to exercise	90							113.72	120.19	127.03	134.26
Risk free rate	0.05								107.60	113.72	120.19
Volatility	0.35									101.80	107.60
											96.32

PUT

	0	1	2	3	4	5	6	7	8	9	10
	39.55	31.13	22.99	15.52	9.15	4.26	1.21	0.00	0.00	0.00	0.00
		48.49	39.74	30.87	22.24	14.30	7.47	2.48	0.00	0.00	0.00
u=	1.03		57.80	49.14	40.00	30.63	21.50	12.73	5.09	0.00	0.00
d=	0.9689			67.02	58.86	49.33	40.28	30.75	20.77	10.44	0.00
prob(u)	0.5119				75.74	67.07	58.95	50.37	41.29	31.65	21.41
prob(d)	0.4881					82.97	75.74	68.10	60.03	51.50	42.48
disc factor	0.9988						89.81	82.97	75.74	68.10	60.03
								96.28	89.81	82.97	75.74
									102.40	96.28	89.81
										108.20	102.40
											113.68

American Call with 10p dividend

PRICE GENERATION TABLE

	0	1	2	3	4	5	6	7	8	9	10
	180.00	190.24	201.07	212.51	214.60	226.81	239.71	253.35	267.77	283.01	299.11
		170.31	180.00	190.24	191.07	203.05	214.60	226.81	239.71	253.35	267.77
			161.14	170.31	170.00	180.78	191.07	201.94	213.43	225.57	238.41
				152.47	151.14	160.85	170.00	179.67	189.90	200.70	212.12
Time steps	10				134.26	143.00	151.14	159.74	168.83	178.44	188.59
Current price	180					127.03	134.26	141.90	149.97	158.50	167.52
Exercise price	190						120.19	127.03	134.26	141.90	149.97
Time to exercise	90							113.72	120.19	127.03	134.26
Risk free rate	0.05								107.60	113.72	120.19
Volatility	0.35									101.80	107.60
											96.32

CALL

	0	1	2	3	4	5	6	7	8	9	10
	6.56	10.06	15.17	22.51	28.54	38.85	51.01	64.52	78.79	93.69	109.11
		2.91	4.72	7.52	11.73	17.81	26.19	36.98	49.73	63.36	77.77

u=	1.03	1.01	1.79	3.13	5.38	9.08	14.93	23.70	35.57	48.41
d=	0.9689		0.20	0.39	0.77	1.51	2.96	5.78	11.31	22.12
prob(u)	0.5119			0.00	0.00	0.00	0.00	0.00	0.00	0.00
prob(d)	0.4881				0.00	0.00	0.00	0.00	0.00	0.00
disc factor	0.9988					0.00	0.00	0.00	0.00	0.00
							0.00	0.00	0.00	0.00
								0.00	0.00	0.00
									0.00	0.00
										0.00

Chapter 9

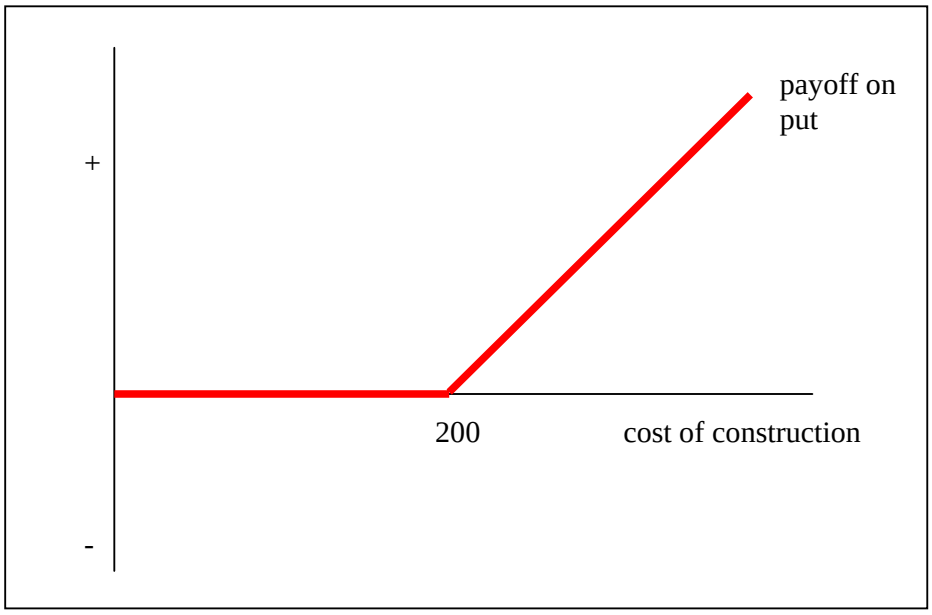
Question 3

(Please note a vagrant – sign appeared in the final version and of course it should be +)

There are a number of sections in the chapter where this topic is discussed but the best reference is to pp. 336-337.

Question 4

(i) This is an abandonment option which is an American Put
(ii) The diagram for this type of option is somewhat counterintuitive in that the put option appears to have a payoff function for a call. The reason of course is that the payoff is in terms of cost saved so, in effect by selling the project to the consortium the Olympic Association saves cost. The diagram is therefore as follows:



(iii) The construction cost path is straightforward and although the question is not explicit, we have taken the start as at 1 January 2007 and assumed that completion would occur at the end of the second quarter 2012. Any timing will serve to demonstrate the process.

COST GENERATION TABLE

2007				2008					2009				2010				2011				2012		
0	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	307.99	325.51	344.03	363.61	384.30	406.16	429.27	453.70	479.51	506.80	
	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	307.99	325.51	344.03	363.61	384.30	406.16	429.27	453.70	
		134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	307.99	325.51	344.03	363.61	384.30	406.16	
			127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	307.99	325.51	344.03	363.61	
				120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	307.99	325.51	
					113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	275.72	291.40	
						107.62	113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	246.83	260.87	
Time steps			22				101.83	107.62	113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	220.97	233.54	
Current price			200					96.34	101.83	107.62	113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	197.82	209.07	
Exercise price			210						91.16	96.34	101.83	107.62	113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	177.09	187.17	
Time to exercise			1980							86.25	91.16	96.34	101.83	107.62	113.74	120.21	127.05	134.28	141.92	150.00	158.53	167.56	
Risk free rate			0.05								81.61	86.25	91.16	96.34	101.83	107.62	113.74	120.21	127.05	134.28	141.92	150.00	
Volatility			0.2									77.21	81.61	86.25	91.16	96.34	101.83	107.62	113.74	120.21	127.05	134.28	
													73.06	77.21	81.61	86.25	91.16	96.34	101.83	107.62	113.74	120.21	
														69.12	73.06	77.21	81.61	86.25	91.16	96.34	101.83	107.62	
															65.40	69.12	73.06	77.21	81.61	86.25	91.16	96.34	
																61.88	65.40	69.12	73.06	77.21	81.61	86.25	
																	58.55	61.88	65.40	69.12	73.06	77.21	
																		55.40	58.55	61.88	65.40	69.12	
																			52.41	55.40	58.55	61.88	
																				49.59	52.41	55.40	
																					46.92	49.59	
																						44.40	

Chapter 10

Question 3

This is a straightforward question looking at the gap between observed and asset values. A minor point not picked up in the book is that asset valuations are usually estimates of likely fair values whereas equity prices are actual traded values. Part of the difference between the two coan simply be due to estimation errors. More on this is dealt with in chapter 11 but additional material can be found in this chapter pp. 364-373.

Question 4

(i) FCFE (after net reinvestment) = £450m - £260M = £190m

Implied rate of retention = 260/450 = 0.578

Implied rate of growth = 0.578 x 0.08 = 4.624 per cent

$$V_0 = \frac{FCFE_0(1+g)}{r_e - g} = \frac{£190m(1.04624)}{0.08 - 0.04624} = £5888.199million$$

On a per share basis this gives a share price of £14.72 per share based upon 400 million shares in issue.

(ii) See pp. 381 – 387

Question 5

(i) The company EPS = £0.271m/£1m = 27.1p per share
Actual P/E = 8.40/0.271 = 31
Retention ratio = 102/256 = 0.3984
$P/E = \frac{1}{r_e} + b = \frac{1}{.08} + .3984 = 12.89$ (Assuming growth is controlled by the retention ratio)
$P/E = \frac{(1-b)(1+g)}{(r_e - g)} = \frac{(1-0.3984)(1.05)}{(0.08 - 0.05)} = 21.056$ (Assuming the company's anticipated rate of growth).

(ii) Valuation based on 5 per cent growth:

$$V_0 = \frac{15.4p(1.05)}{(0.08 - 0.03)} = 539p$$

Valuation based on retention rate:

$$V_0 = \frac{15.4p(1+0.3984x0.08)}{(0.08-0.3984x0.08)} = 330p$$

Question 6

This question gives ample opportunity to explore a wide range of valuation approaches and engage in discussion on the problems of estimating growth and the cost of capital for an unlisted company.

(i) The cost of equity capital is derived from the Capital Asset Pricing Model but given this is an unquoted company a proxy must be taken for the company's beta and regeared to reflect the different financial risk exposure of Virgin Atlantic

Ideally regearing beta requires an estimate of the market gearing for both companies. In the absence of that the book gearing can be used. However, the presence of corporation tax means that we need the values for both the debt and equity in BA

$$BV(equity) = \frac{£3026.71m}{1.25} = £2421.4m$$

$$Gearing = \frac{BV(debt)}{BV(equity)}$$

$$BV(debt) = BV(equity)xgearing$$

$$BV(debt) = 2421.4mx1.867 = £4520.75m$$

Using the formula for the asset beta where debt carries zero market risk:

$$\beta_A = \beta_e x(1-w_d)$$

where

$$w_d = \frac{BV_d x(1-T)}{BV_e + BV_d x(1-T}$$

$$w_d = \frac{4520.75x(0.7)}{2421.4 + 4520.75x(0.7)}$$

$$w_d = 0.5665$$

$$\beta_A = 2.01x(1-0.5665)$$

$$\beta_A = 0.871$$

This is the asset beta for BA. We can now regear the beta to that for Virgin as follows by recalculating the tax adjusted gearing ratio for Virgin and then applying it to the equity beta:

$$w_d = \frac{BV_d x(1-T)}{BV_e + BV_d x(1-T}$$

$$w_d = \frac{154.7x(0.7)}{81.2+154.7x(0.7)}$$

$$w_d = 0.572$$

$$\beta_e = \frac{\beta_a}{(1-w_d)}$$

$$\beta_e = \frac{0.871}{(1-0.572)}$$

$$\beta_e = 2.033$$

This is the estimated equity beta for FlyMe Ltd which when applied to the CAPM gives an expected rate of return as follows:

$$E(r_e) = R_F + \beta_e xERP$$

$$E(r_e) = 0.045 + 2.033x0.035$$

$$E(r_e) = 0.045 + 2.033x0.035$$

$$E(r_e) = 0.1162(\equiv 11.62\%)$$

The weighted average cost of capital is then as follows:

$$WACC = w_e E(r_e) + w_d R_d$$

$$WACC = \frac{81.2}{81.2+154.7} x11.62\% + \frac{154.7}{81.2+154.7} x5\% x0.7$$

$$WACC = 6.30 percent$$

The modelling of the equity cost of capital has embedded within it the assumptions implicit in the CAPM that:

Investors are mean variance efficient
Markets are frictionless
Expectations are homogenous and,
There is a risk free asset

Of more practical significance we have also assumed that:

The exposure to market risk is the same for both companies (this is questionable given the differences in the markets in which they operate)
That the book gearing ratio is a reasonable approximation to the market gearing ratio.
That Virgin Ltd does not carry a size and default premium on its cost of capital. If there is such a premium then we would need to use the Fama and French 3 factor model which incorporates these elements of risk.

(ii) The EVA© estimate is:

EVA = NOPAT - WACC x CE

NOPAT = operating profit x (1 – tax rate)
= 61.5 x 0.7 = £43.05m

EVA = 43.05 – 6.3% x (81.2+154.7) = £28.19 million

(iii) The value of a firm using EVA is given (assuming no growth in EVA) as:

$$V_0 = C_0 + \frac{EVA}{WACC}$$

For Virgin this relationship gives:

$$V_0 = 235.9 + \frac{28.19}{0.063} = £683.4 million$$

Two other approaches to valuation are:

P/E multiples:

Take the forward P/E for BA which is 11.01 which when applied to the earnings for Virgin (£47.2 million) give a valuation of £521.9 million

FCFE method using Gordon's approximation:

Gordon's approximation requires a retention ratio which can be derived from the cash flow statement. The free cash flow to equity (before reinvestment) is defined as operating cash flow less interest and tax:

For 2005 the FCFE for Virgin is as follows:

FCFE = operating cash flow – net interest paid – tax
FCFE (£m) = 191.2 - 2.1 - 0.6 = £188.5million

In the current year a net figure of £113.7m – £20m = £93.7m was reinvested from the FCFE. This implies a retention ratio (b) of:

$$b = \frac{reinvestment}{FCFE}$$

$$b = \frac{93.7}{188.5}$$

$$b = 0.4971$$

$$g = bxr_e$$

$$g = 0.4971x0.1162$$

$$g = 5.78 percent$$

Using the formula:

$$V_e = \frac{188.5(1.0578)}{0.1162 - 0.0578} = £3414m$$

The three methods give quite different results. The EVA method above has not included any measure of EVA growth (a topic not covered in the book). However, using a figure of 5 per cent for example revises the EVA value to £2320 million. Indeed the answer is extremely sensitive to the growth rate used (which is a discussion in itself). It should also be noted that the P/E and FCFE methods are calculating shareholder value whilst the EVA approach gives the value of the whole firm.

Question 7

See pp.387 -391 for answers to this question

Chapter 11

Question 2

Lev's valuation of intangible assets takes a charge of 5% of monetary assets and 7 per cent for real assets against the firm's earnings. Following the format of Exhibit 11.1.

		0	1	2	3	4	5	6	7	8	9	10
Forecast earnings		70.0										
Charge for monetary assets employed		-0.3										
Charge for real assets employed		-13.5										
Knowledge earnings		56.3										
Growth rate expected (years 1- 4)	12.00%											
Long term growth rate	5.00%											
Decay rate (years 6-10)	1.17%											
Projected growth			12.00%	12.00%	12.00%	12.00%	10.83%	9.67%	8.50%	7.33%	6.17%	5.00%
Projected knowledge earnings (years 1-11)			63.0	70.6	79.0	88.5	98.1	107.6	116.7	125.3	133.0	139.7
Discounted earnings (years 1-11)		929	57.3	64.1	71.8	80.5	89.2	97.8	106.1	113.9	120.9	127.0
PV of terminal intangible asset value		565										1466
Value of intangible assets		1494										

(ii) and (iii) commentary on the method can be found in pp. 408-411

Chapter 12

Question 2

(i)

$$w_d = \frac{D}{D+E}$$

$$\frac{E}{D} = w_d^{-1} - 1$$

$$\frac{E}{D} = 0.40^{-1} - 1 = 1.5$$

Using this we can calculate the tax adjusted gearing ratio for Ruskin:

$$w_d = \frac{Dx(1-T)}{Dx(1-T)+E}$$

$$w_d^{'} = \left[1 + \frac{E}{D}(1-T)^{-1}\right]^{-1}$$

$$w_d^{'} = \left[1 + 1.5(0.7)^{-1}\right]^{-1} = 31.82 percent$$

This implies an asset beta for Ruskin (and for Alf):

$$\beta_a = (1 - 0.3182)x1.8$$

$$\beta_a = 1.227$$

Regearing to 10 per cent gives a tax adjusted gearing level for Alf of:

$$\frac{E}{D} = 0.1^{-1} - 1$$

$$\frac{E}{D} = 9$$

$$w_d^{'} = \left[1 + \frac{E}{D}(1-T)^{-1}\right]^{-1}$$

$$w_d^{'} = \left[1 + 9(0.7)^{-1}\right]^{-1} = 7.22 percent$$

Using this Alf's equity beta is:

$$1.227 = (1 - .0722)x\beta_e$$

$$\beta_e = 1.3224$$

(ii) Given that both firms have the same asset beta the combined beta will also be 1.227. The combined equity beta is given as follows:

$$\beta_{e,C} = \frac{4}{10} x 1.3224 + \frac{6}{10} x 1.8 = 1.609$$

(iii) The principal reason why the combined asset beta might change is if there arises a synergistic cash flow which is not of the same exposure to market risk as the underlying business of the two firms operating independently.

Question 3

This challenging question requires the student to think about the data presented and how to make reasonable approximations and assumptions. It also involves some sophisticated model building.

Because this is a type 3 acquisition the model is set up as an excel algorithm. Here are the steps in the model building process:

(i) Calculate the value of Aqualot's debt post acquisition and the firm's cost of debt capital:

Aqualot - cost of debt capital	0	1	2	3	4	5
Cash flows	-108	5	5	5	5	105
Yield	3.241%					
Yield post acquisition	4.041%					
Revised value of debt (post acquisition)	£104.26					

(ii) Using the PE ratios and the distributable profits for each firm calculate the total equity values and using the best estimate of the value of each firms debt and effective tax rate calculate the tax adjusted gearing for each firm:

	Aqualot	Permalot
Equity value pre acquisition	4590.00	840.00
Debt value pre acquisition	280.80	10.00
Tax adjusted gearing (pre acquisition)	0.0425	0.0083

(iii) Set up the following excel model to generate an asset beta, a combined asset beta and combined equity beta. From this the equity cost of capital and the weighted average cost of capital can be modelled:

	Aqualot	Permalot	synergy	Total
Value of cash flows to firm post acquisition	4590.0	840.0	300.5	5730.5
Debt value				271.1
Value of components and equiy value of the firm	4590.0	840.0	300.5	5459.4

Beta and Cost of Capital				
Effective tax rate (implied from abstract P&L)	28%	30%		28%
Equity beta	1.5	2.4		
Tax adjusted gearing post acquisition				0.0347
Asset beta	1.436	2.380	1.582	
combined asset beta (component weights to total)				1.582
Combined equity beta				1.639

Equity cost of capital	10.24%
Weighted average cost of capital	**9.89%**

(iv) Extend the model to calculate the value of each cash flow stream using the WACC. Once the combined value of the cash flows have been calculated then deduct the current equity value of Aqualot, the value of Aqualot's existing debt at its revised market value, the payment to clear Permalot's debt, the costs of reorganisation to give a total increase in shareholder value before the premium for taking control is deducted. For a first run assume that the entire potential shareholder premium is paid to Permalot. Finally calculate how much new debt is entailed at the level of control premium set in the model.

Valuation of cash flows	**Aqualot**	**Permalot**	**synergy**	**Total**
operating cash flow	640	240		
less tax at implied rate	-176	-71		
free cash flow before reinvestment	464	169		
less net reinvestment	-150	-10		
free cash flow to the firm	314	159	14	
assumed growth rate	0.05	0.05	0.05	
Value of combined cash flows	**6740.00**	**3412.93**	**300.51**	**10453.43**
Less adjustments to obtain increase in Aqualot Shareholder value				
Equity value Aqualot				-4590.00
Equity value Permalot				-840.00
Debt value Aqualot (post acquisition)				-271.09
Payment to clear Permalot debt				-10.00
Year 1 reorganisation cost				-12.00
Year 2 reorganisation cost (discounted at WACC)				-4.55
Increase in Aqualot's shareholder value before control premium				4725.80
Control premium paid			0.16	-732.50
Potential increase in Aqualot shareholder value				3993.30

New debt issue	
50 per cent of current Permalot equity value	420.00
100 per cent of premium paid	732.50
New debt raised	1152.50
Value paid to Permalot	1572.50

(v) Now, after checking the iteration function in excel's <tools><options><calculation> pick up the value of the combined cash flows as the entries in the values to the 'values of the firm post acquisition' (in (iii) above) and adding the new debt raised at the foot of the table to the debt value in (iii) above.

Here is the complete excel model if no control premium is paid:

	Aqualot	**Permalot**	**synergy**	**Total**
Equity value pre acquisition	4590.00	840.00		
Debt value pre acquisition	280.80	10.00		
Tax adjusted gearing (pre acquisition)	0.0425	0.0083		

	Aqualot	**Permalot**	**synergy**	**Total**
Value of cash flows to firm post acquisition	6106.0	3091.9	272.2	9470.1
Debt value				691.1
Value of components and equity value of the firm	6106.0	3091.9	272.2	8779.0

Beta and Cost of Capital				
Effective tax rate (implied from abstract P&L)	28%	30%		28%
Equity beta	1.5	2.4		
Tax adjusted gearing post acquisition				0.0540
Asset beta	1.436	2.380	1.754	
combined asset beta (component weights to total)				1.754
Combined equity beta				1.854
Equity cost of capital				10.99%
Weighted average cost of capital				**10.40%**

Valuation of cash flows	**Aqualot**	**Permalot**	**synergy**	**Total**
operating cash flow	640	240		
less tax at implied rate	-176	-71		
free cash flow before reinvestment	464	169		
less net reinvestment	-150	-10		
free cash flow to the firm	314	159	14	
assumed growth rate	0.05	0.05	0.05	
Value of combined cash flows	**6105.96**	**3091.87**	**272.24**	**9470.08**
Less adjustments to obtain increase in Aqualot Shareholder value				
Equity value				-4590.00
Debt value Aqualot (post acquisition)				-271.09
Payment to clear Permalot debt				-10.00
Year 1 reorganisation cost				-12.00
Year 2 reorganisation cost (discounted at WACC)				-4.53
Increase in Aqualot's shareholder value before control premium				4582.46
Control premium paid			0.00	0.00
Potential increase in Aqualot shareholder value				4582.46
New debt issue				
50 per cent of current Permalot equity value				420.00
100 per cent of premium paid				0.00
New debt raised				420.00
Value paid to Permalot				840.00

The minimum price is that with a zero control premium and the current share price. The maximum price is where Aqualot surrenders its entire value added to the Permalot shareholders. The point at which this is achieved is shown below with a value paid of £9706.56 million.

	Aqualot	**Permalot**	**synergy**	**Total**
Value of cash flows to firm post acquisition	9409.9	4764.9	419.5	14594.3
Debt value				9557.6
Value of components and equiy value of the firm	9409.9	4764.9	419.5	5036.6

Beta and Cost of Capital				
Effective tax rate (implied from abstract P&L)	28%	30%		28%
Equity beta	1.5	2.4		
Tax adjusted gearing post acquisition				0.5791
Asset beta	1.436	2.380	1.754	
combined asset beta (component weights to total)				1.754
Combined equity beta				4.166
Equity cost of capital				19.08%
Weighted average cost of capital				**8.50%**

Valuation of cash flows	**Aqualot**	**Permalot**	**synergy**	**Total**
operating cash flow	640	240		
less tax at implied rate	-176	-71		

free cash flow before reinvestment	464	169		
less net reinvestment	-150	-10		
free cash flow to the firm	314	159	14	
assumed growth rate	0.05	0.05	0.05	
Value of combined cash flows	**9409.85**	**4764.86**	**419.55**	**14594.26**
Less adjustments to obtain increase in Aqualot Shareholder value				
Equity value Aqualot				-4590.00
Equity value Permalot				-840.00
Debt value Aqualot (post acquisition)				-271.09
Payment to clear Permalot debt				-10.00
Year 1 reorganisation cost				-12.00
Year 2 reorganisation cost (discounted at WACC)				-4.61
Increase in Aqualot's shareholder value before control premium				8866.56
Control premium paid			1.0000	-8866.56
Potential increase in Aqualot shareholder value				0.00
New debt issue				
50 per cent of current Permalot equity value				420.00
100 per cent of premium paid				8866.56
New debt raised				9286.56
Value paid to Permalot				9706.56

Note: the impact of the alterations in the WACC upon the value of the component flows and hence the theoretical maximum that should be paid. In this case the combination effects and the impact of the reduction of the cost of debt capital through increased gearing serve to reduce the cost of capital and hence the value of the cash streams. In reality we would presume that gearing to this level would increase the default premium well above the additional 80 points suggested in the case.

(ii) The current equity proportions are: 84.5 per cent (Aqualot) and 15.5 per cent (Permalot). By setting this as the proportion of control premium paid the model generates:

	Aqualot	**Permalot**	**synergy**	**Total**
Equity value pre acquisition	4590.00	840.00		
Debt value pre acquisition	280.80	10.00		
Tax adjusted gearing (pre acquisition)	0.0425	0.0083		

	Aqualot	**Permalot**	**synergy**	**Total**
Value of cash flows to firm post acquisition	6342.9	3211.8	282.8	9837.5
Debt value				1326.9
Value of components and equiy value of the firm	6342.9	3211.8	282.8	8510.6

Beta and Cost of Capital				
Effective tax rate (implied from abstract P&L)	28%	30%		28%
Equity beta	1.5	2.4		
Tax adjusted gearing post acquisition				0.1016
Asset beta	1.436	2.380	1.754	
combined asset beta (component weights to total)				1.754
Combined equity beta				1.952
Equity cost of capital				11.33%
Weighted average cost of capital				**10.20%**

Valuation of cash flows	**Aqualot**	**Permalot**	**synergy**	**Total**

operating cash flow	640	240		
less tax at implied rate	-176	-71		
free cash flow before reinvestment	464	169		
less net reinvestment	-150	-10		
free cash flow to the firm	314	159	14	
assumed growth rate	0.05	0.05	0.05	
Value of combined cash flows	**6342.87**	**3211.84**	**282.80**	**9837.51**
Less adjustments to obtain increase in Aqualot Shareholder value				
Equity value Aqualot				-4590.00
Equity value Permalot				-840.00
Debt value Aqualot (post acquisition)				-271.09
Payment to clear Permalot debt				-10.00
Year 1 reorganisation cost				-12.00
Year 2 reorganisation cost (discounted at WACC)				-4.54
Increase in Aqualot's shareholder value before control premium				4109.89
Control premium paid			0.1547	-635.78
Potential increase in Aqualot shareholder value				3474.10
New debt issue				
50 per cent of current Permalot equity value				420.00
100 per cent of premium paid				635.78
New debt raised				1055.78
Value paid to Permalot				1475.78

Part of the problem this case highlights is that part of the value creation has come about because of the significant increase in the value of the firm that can be achieved by altering the level of gearing. Indeed, even given that a bid is made and accepted where the proportions of value added exchanged are in line with the original equity values Aqualot still has the possibility of boosting shareholder value through increased gearing.

(iii) The regulation of takeovers and stake building are dealt with in pp. 451 – 457.

Question 4

The arguments covering this bid are discussed at length through the chapter.

Question 5

(i) The rate of return on equity (CAPM) for M&S is: 6.385 per cent.

Using Gordon's approximation:

$$g = bxr_e = \frac{587 - 203.3}{587} x(4.6\% + 0.51x3.5\%) = 4.17 percent$$

On the basis of analysts' forecasts over the next three years:

	2005	2006	2007	2008
Analysts' EPS	20.58	29.09	32.5	34.84
annual growth		41.35%	11.72%	7.20%
3 year compound				23.10%

On the basis of the previous three years reported EPS:

	2005	2004	2003	2002
Actual EPS	0.29	0.24	0.21	0.17
annual growth	20.83%	14.29%	23.53%	
3 year compound	23.53%			

On the basis of past performance and analysts expectations we would anticipate a 23 per cent growth in earnings. The company's own reinvestment rate and rate of return on equity at equilibrium in the market suggests that a rate of 4.17 per cent is sustainable in the longer run. Using the short term forecast for three years and the current rate of reinvestment, but reverting to a long run growth rate thereafter we can predict a share price as follows:

		2005	2006	2007	2008
EPS growth at 23 per cent		20.58	25.31	31.14	38.30
Current rate of retention		0.6537	0.6537	0.6537	0.6537
Expected DPS			8.77	10.78	13.26
Value of residual					623.78
			8.77	10.78	637.04
Discounted value of dividends and residue	546.85		8.24	9.53	529.09

The share price predicted is considerably in excess of the market price as at the 21 November 2005 (but is not surprising in terms of the subsequent performance of M&S).

$$V_0 = \frac{D_0(1+g)}{r_e - g} = \frac{13.45x1.0417}{0.06385 - 0.0417} = 632$$

This price considerably overstates the 2005 share price

(ii) If Green were to promise 2 per cent higher growth in the 3 year term then the model predicts a price (using the current rate of retention) as follows:

		2005	2006	2007	2008
EPS growth at 25 per cent		20.58	25.73	32.16	40.20
Current rate of retention		0.6537	0.6537	0.6537	0.6537
Expected DPS			8.91	11.14	13.92
Value of residual					654.70
			8.91	11.14	668.62
Discounted value of dividends and residue	573.53		8.37	9.84	555.32

The net effect is a 26.68p increase in shareholder value.

(iii) The other issues Green might wish to consider are discussed in the chapter.

Chapter 13

Question 3

See p. 491

Question 4

See pp. 496 – 498

Question 5

See pp. 510 – 511

Question 6

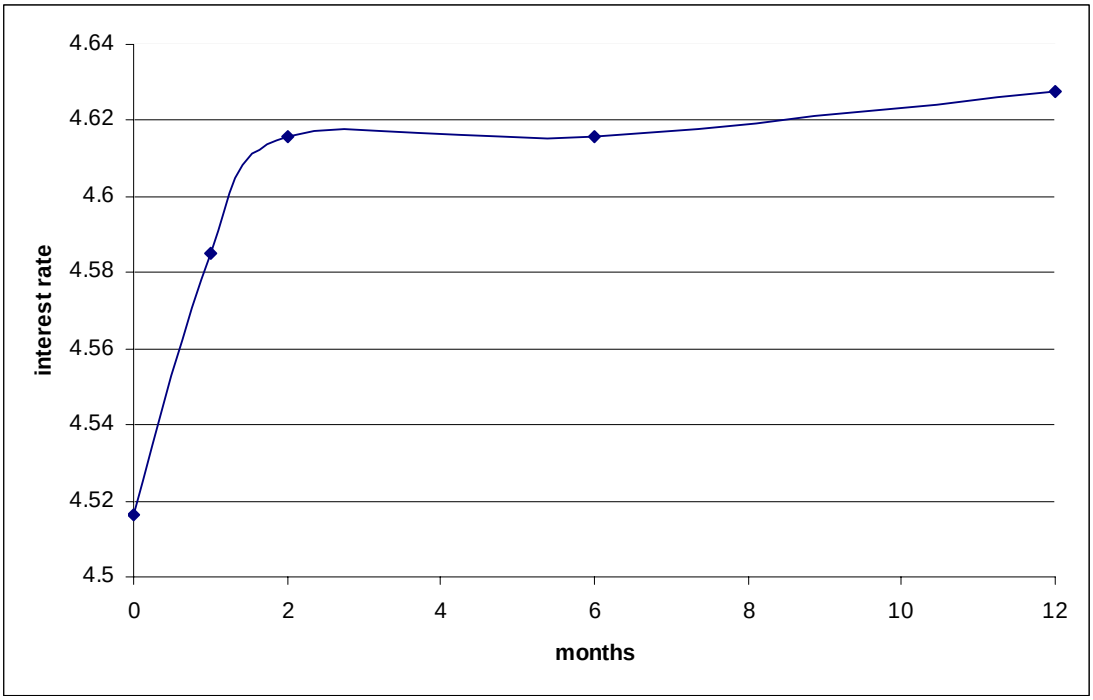
Given a tick size of 0.01per cent, a 3 month IRF has a tick of £12.50

A loan exposure of £20million requires 40 contracts for the hedge. The risk is an increase in interest rates and so interest rate futures should be sold short. The IRF would be sold to establish the hedge at 95.40, but 30 contracts would have to be closed at 95.16 one month later giving a gain of 24ticks which is £300 per contract or £9000 in total. The remaining 10 contracts would be closed at 94.90 giving a gain of 50bp or £625 per contract being £6250 in total. The interest rate movement on the underlying is 5.1% - 4.6% which is hedged by the 10 contracts. The net interest paid is therefore £48500 or 3.88 per cent per annum.

A hedge like this may be imperfect for two reasons: (a) the value of the IRF does not exactly track the movements in LIBOR (basis risk) and (b) the exposure may not be exactly divisible by the standard contract size. A third reason can occur when early close out is required to adjust the hedge and an exceptional gain or loss is made on that early close out. In this case an exceptional gain has been made.

Question 7

(i) The twelve month LIBOR curve is as below. The curve reveals a short term upward movement in rates suggesting that there is short term inflationary pressure which is likely to stabilise in the next quarter.



(ii) The value of a £10 million swap is the difference between the fixed rate received (5.75 per cent) and the fixed rate paid (4.72 per cent) for LIBOR. Because the bank receives and pays LIBOR that interest flow is neutral. For a one year swap the value to the bank is £103000 discounted at LIBOR to give £98444.

Chapter 14

Question 4

(i) If the Euro is to the base currency, the Swiss franc the counter currency and the dollar the cross base then the cross rate is given as follows:

$$\text{Cross rate (euro/Swiss franc)} = \frac{\text{Euro}}{\text{dollar}} x \frac{\text{dollar}}{\text{Swiss Franc}} = 0.8471^{-1} x 1.313 = 1.5499$$

This is the indirect rate. The direct rate is the inverse i.e., 0.6452

(ii) On the basis of this and exhibit 14.2 there is no arbitrage opportunity given the quoted rates of 0.6452 and 1.5499

Question 5

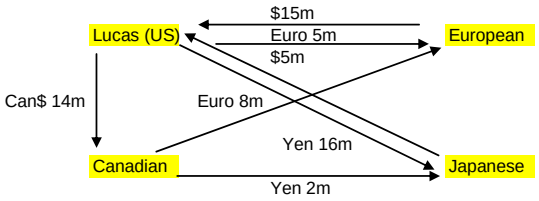
100 dollar/euro contracts are acquired for 1.1721. The spot rate is 1.1793 giving a target dollar cost of $23586000 on the underlying transaction. The dollar actually moves to $23660000 which is an increased cost of $74000. Given a tick size of $20 a movement of
74000/(20 x 100) = 37pips is required i.e. a close out rate of 1.1758. Note that because the price quoted is direct the hedge follows the underlying transaction which is achieved by going long in the futures (i.e., purchasing at 1.1721 and selling at the close out rate of 1.1758).

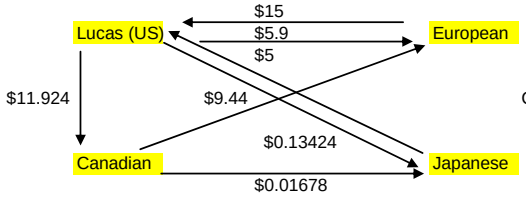
Question 6

See pp. 536-538

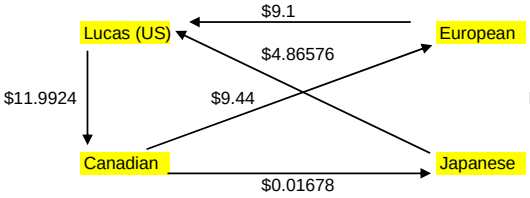
Question 7

The simplification routine is as shown giving just three transfers to settle the inter company indebtedness:

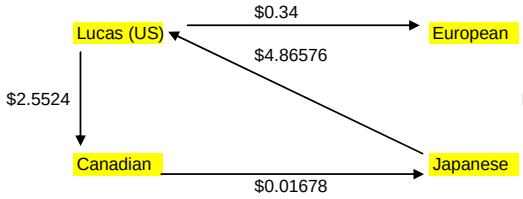




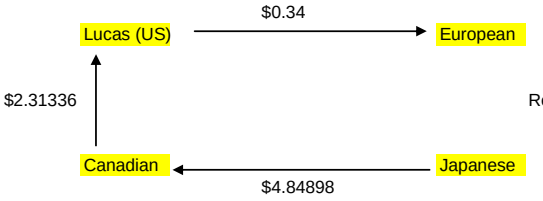
Convert all to dollars



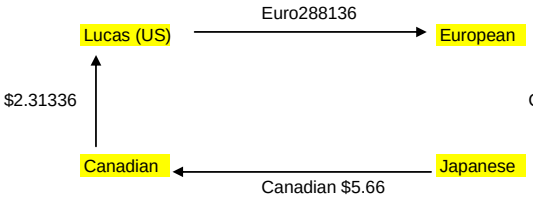
Eliminate contra flows



Resolve first circuit



Resolve second circuit



Convert back to currency of transfer