

Professional Pilot Paper – Options module

Advanced Financial Management

Time allowed

Reading and planning: 15 minutes

Writing: 3 hours

This paper is divided into two sections:

Section A – BOTH questions are compulsory and MUST be attempted

Section B – TWO questions ONLY to be attempted

Do NOT open this paper until instructed by the supervisor.

During reading and planning time only the question paper may be annotated. You must NOT write in your answer booklet until instructed by the supervisor.

This question paper must not be removed from the examination hall.

The Association of Chartered Certified Accountants

P4
Paper
ACCA

Section A: BOTH questions are compulsory and MUST be attempted

- 1 You are the chief financial officer of Fly4000 a large company in the airline and travel business whose principal market base is in Europe and the Middle East. Its principal hub is a major Northern European airport and Fly4000 has a small holiday business through its partnership with a number of independent tour operators. It has a good reputation as a business carrier within its European market, earned through very high standards of punctuality and service. Following the recent disinvestment of associated interests and a joint venture, it has cash reserves of \$860 million.

FliHi is a smaller airline which also has its centre of operations at the same airport as Fly4000. It has, since it was founded in 1988, developed a strong transatlantic business as well as a substantial position in the long and medium haul holiday market. In the year to 31 December 2005 its reported turnover was in \$1.7 billion and its profit after tax for the financial year was \$50 million. The company's net assets are \$120 million and it has \$150 million of long term loans on its balance sheet. It has recently expanded its fleet of wide bodied jets suitable for its expanding holiday business and has orders placed for the new Airbus 380 super-Jumbo to supplement its long haul fleet. FliHi has route licenses to New York and six other major US cities.

FliHi's cash flow statement for the current and preceding year is as follows:

**FliHi Consolidated Cash Flow Statement (extract)
For the year ended 31 December 2005**

	31 December 2005		31 December 2004	
	\$m	\$m	\$m	\$m
Net cash inflow from operating activities		210.0		95.0
Return on investment and servicing of finance				
Interest received	12.0		6.0	
Interest paid	(4.0)		(3.0)	
Interest element on finance leases	(6.5)		(4.0)	
		1.5		(1.0)
Taxation		(4.1)		(0.2)
Capital Expenditure		(120.2)		(75.0)
Acquisitions and disposals				
Proceeds from the sale of interest in joint ventures		10.0		15.0
Cash inflow before management of Liquid resources and financing		97.2		33.8
Management of liquid resources				
Decrease/(increase) in short term deposits		35.5		(32.2)
Financing				
Repayment of secured loans		(31.0)		(25.0)
Increase/(decrease) in cash for the year		101.7		(23.4)

There is no other airline of comparable size and business mix to Fly4000 although analysts regard Rover Airways as a useful comparator. The statement below contains market data relating to Rover Airways:

Key Fundamentals

Forward P/E*	11.00	Dividend Yield	0.00
Price to Book value of equity	1.25	1Yr Total Return (%)**	25.07
Price To Cash Flow	3.00	Beta**	2.00
1Yr Sales Growth	-1.67	1Yr EPS Growth	80.50

** Equity Market Cap £3bn

You also note the following:

The current risk-free rate is 4.5 per cent and the equity risk premium is estimated at 3.5 percent. The prevailing share price for Rover Airways is 290¢ per share and its P/E ratio is 10. The corporation tax rate for both companies is 30 per cent.

The gearing ratio for Rover Airways, expressed as total debt to total capital (debt plus equity), is 60 per cent and as total debt to equity is 150 per cent.

You may assume that:

- 1 FliHi has undertaken a consistent programme of reinvestment
- 2 The debt in both companies is not expected to be sensitive to market risk.

There has been considerable consolidation in the airline industry and you are advising your board of directors of Fly4000 on the value of FliHi as a potential target for acquisition. It is anticipated that over the longer term the domestic airline industry will settle down to a rate of growth in line with GDP growth in the European economy which stands at 4 per cent per annum (nominal). However, the current rates of growth for this company are likely to be sustained for the next five years before reverting to the GDP growth rate from the sixth year forward.

Required:

- (a) **Estimate the current cost of equity capital for FliHi using the Capital Asset Pricing Model, making notes on any assumptions that you have made.** (9 marks)
- (b) **Estimate the expected growth rate of Flihi using the current rate of retention of free cash flow and your estimate of the required rate of return on equity for each of the next six years. Make notes on any assumptions you have made.** (6 marks)
- (c) **Estimate the value of Flihi on the basis of its expected free cash flow to equity, explaining the limitations of the methods you have used.** (7 marks)
- (d) **Write a brief report outlining the considerations your colleagues on the board of Fly4000 might bear in mind when contemplating this acquisition.** (8 marks)

(30 marks)

- 2 You are the finance director of Sydonics Engineering and expect that a bid to build a new plant in Southern France may be accepted in three months time. If the contract is accepted, an immediate capital spend of €150million will be required in three months and the company will receive a €75million grant from the European Development Fund in nine months time. The current Euro/sterling exchange rate is EUR 0.6900 to the pound.

Three month and nine month Euro LIBOR is 2.76563 per cent and 3.05194 per cent respectively. The three and nine month sterling LIBOR is 4.62313 per cent and 4.73031 per cent respectively. You have decided to hedge the exchange rate risk by the purchase of EUR/STERLING at-the-money options which have a contract size of 100,000 Euros. The monthly volatility of the Euro against sterling is 6.35 per cent. At the current exchange rate, the project has a net present value of £25 million at the company's cost of capital of 8.5 per cent.

The board of directors are concerned about the use of derivatives in managing the firm's treasury operations. They argue that the diversity of the firm's interests in Europe, the UK and the United States means that such hedging transactions are unnecessary.

Required:

- (a) **Prepare a memorandum, to be considered at the next board meeting, which summarises the arguments for and against foreign currency risk hedging and recommends a general policy concerning the hedging of foreign exchange risk.** (10 marks)
(Including 2 professional marks)
- (b) **Prepare a short report justifying your use of derivatives to minimise the firm's exposure to foreign exchange risk. Your report should contain:**
- (i) **The likely option price for an at-the-money option, stating the circumstances in which the option would be exercised. You should use the Grabbe variant of the Black-Scholes model for both transactions, adjusted on the basis that deposits generate a rate of return of LIBOR.** (10 marks)
 - (ii) **A calculation of the number of contracts that would be required to eliminate the exchange rate risk and the cost of establishing a hedge to cover the likely foreign currency exposure.** (4 marks)
 - (iii) **A summary of the issues the board should bear in mind when reviewing a hedging proposal such as this, taking into account the limitations of the modelling methods employed and the balance of risk to which the firm will still be exposed to when the position is hedged.** (6 marks)

(30 marks)

Section B: TWO questions ONLY to be attempted

- 3** The board of directors of Jonas Chemical Systems Limited has used payback for many years as an initial selection tool to identify projects for subsequent and more detailed analysis by its financial investment team. The firm's capital projects are characterised by relatively long investment periods and even longer recovery phases. Unfortunately, for a variety of reasons, the cash flows towards the end of each project tend to be very low or indeed sometimes negative. As the company's new chief financial officer (CFO), you are concerned about the use of payback in this context and would favour a more thorough pre-evaluation of each capital investment proposal before it is submitted for detailed planning and approval. You recognise that many board members like the provision of a payback figure as this, they argue, gives them a clear idea as to when the project can be expected to recover its initial capital investment.

All capital projects must be submitted to the board for initial approval before the financial investment team begins its detailed review. At the initial stage the board sees the project's summarised cash flows, a supporting business case and an assessment of the project payback and accounting rate of return.

A recent capital investment proposal, which has passed to the implementation stage after much discussion at board level, had summarised cash flows and other information as follows:

Distillation Plant at the Gulf Refining Centre

	Investment Phase		Recovery Phase	
	Cash flow (tax adjusted, nominal) \$m	Cumulative Cash Flow \$m	Cash flow (tax adjusted, nominal) \$m	Cumulative Cash Flow \$m
01 January 2006	(9.50)	(9.50)		
31 December 2006	(5.75)	(15.25)		
31 December 2007	(3.00)	(18.25)		
31 December 2008			4.5	(13.75)
31 December 2009			6.40	(7.35)
31 December 2010			7.25	(0.10)
31 December 2011			6.50	6.40
31 December 2012			5.50	11.90
31 December 2013			4.00	15.90
31 December 2014			(2.00)	13.90
31 December 2015			(5.00)	8.90
Cost of Capital		8%		
Expected net present value (\$m)		1.964		
Net present value volatility (\$m) – annualised		1.02		
Internal rate of return		11.0%		
Payback (years)		5.015		

The normal financial rules are that a project should only be considered if it has a payback period of less than five years. In this case the project was passed to detail review by the financial investment team who, on your instruction, have undertaken a financial simulation of the project's net present value to generate the expected value and volatility as shown above. The board minute of the discussion relating to the project's preliminary approval was as follows:

31 May 2005 Agenda Item 6

New capital projects – preliminary approvals

Outline consideration was given to the construction of a new distillation facility at the Gulf Refining Centre which is regarded as a key strategic component of the company's manufacturing capability. The cash flow projections had been prepared in accordance with existing guidelines and there was some uncertainty with respect to capital build and future profitability. Mrs Chua (chief financial officer) had given approval for the project to come to the board given its strategic importance and the closeness of the payback estimate to the company's barrier for long term capital investment of five years. Mr Lazar (non-executive director) suggested that they would need more information about the impact of risk upon the project's outcome before giving final approval. Mr Bright (operations director) agreed but asked why the board needed to consider capital proposals twice. The board was of the view that what was needed was clearer information about each proposal and the risks to which they were exposed. The chair requested the CFO to provide a review of

the company's capital approval procedures to include better assessment of the firm's financial exposure. The revised guidelines should include procedures for both the preliminary and final approval stages. Approved (Action CFO to report)

Required:

- (a) Prepare a paper for the next board meeting, recommending procedures for the assessment of capital investment projects. Your paper should make proposals about the involvement of the board at a preliminary stage and the information that should be provided to inform their decision. You should also provide an assessment of the alternative appraisal methods.** (8 marks)
- (b) Using the appraisal methods you have recommended in (a), prepare a paper outlining the case for the acceptance of the project to build a distillation facility at the Gulf plant with an assessment of the company's likely value at risk. You are not required to undertake an assessment of the impact of the project upon the firm's financial accounts.** (12 marks)

(Including 2 professional marks)

(20 marks)

- 4 You are the chief financial officer of a multinational company in the Do-It-Yourself (DIY) retail business based in the United States. Your company is considering a major expansion into the rapidly developing China market where one of your competitors has already established a presence with three stores, one in Beijing and two in Shanghai. After conducting local market research and a personal review, you are convinced that, although your competitor has successfully opened a new market in those cities, the demand is considerably greater than its ability to supply. Your overseas operations group report that they can open the appropriate supply chains and that, unlike the competition, you will be able to get a greater variety of goods onto the shelves and maintain supply at competitive prices.

Your assessment is that the company will need to raise the equivalent of \$380 million of new finance over 10 years for this venture, of which \$80 million could come from the company's existing liquid reserves. You have completed your review of the financial merits of the case and the project offers a rate of return in excess of 80 per cent. The company's current credit rating is assessed at AA-. Its total market capitalisation is \$3.5bn, which includes a ten year syndicated loan of \$0.5 billion due for retirement in three years. The balance of the firm's capital is in the form of common stock (ordinary shares) trading on the New York and Hong Kong markets.

You wish to undertake a preliminary review of the options for financing this project. Your assessment is that borrowing the money is a possibility but that the increase in gearing would drop your credit rating to A+. You believe that the likelihood of that happening is 60 per cent, with a further 40 per cent chance that the company's rating could fall to A. The company's existing weighted average cost of capital (tax adjusted at the company's average corporation tax rate of 30 per cent) is 6.8 per cent. The current nominal yield curve and credit spreads for the retail sector are shown below:

Exhibit 1: 30 year yield curve

Yield

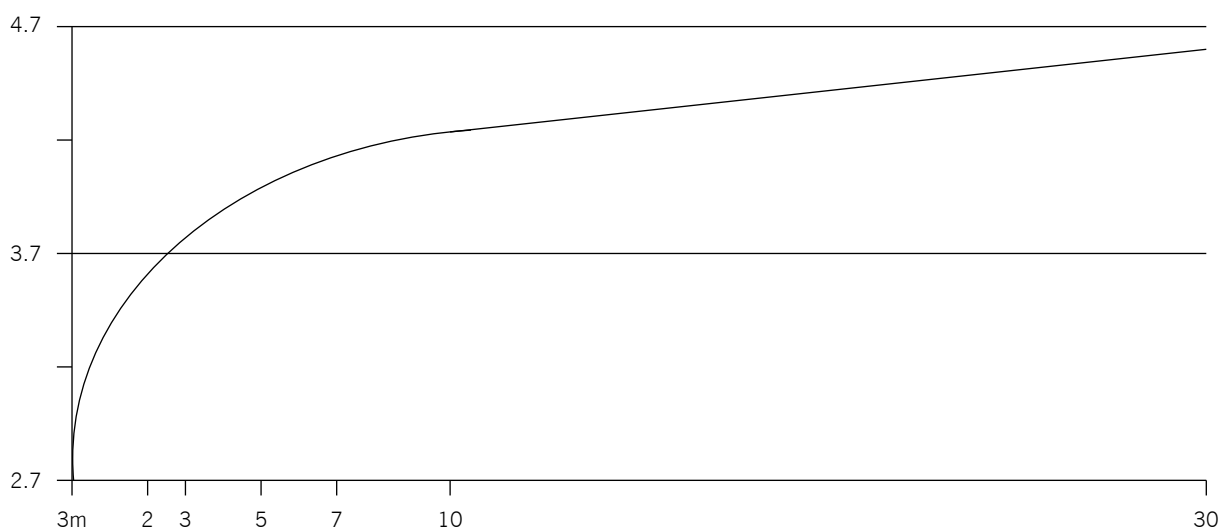


Exhibit 2: Yield spreads for retail sector (in basis points)

Rating	1yr	2yr	3yr	5yr	7yr	10yr	30yr
Aaa/AAA	4	8	12	18	20	30	50
Aa1/AA+	8	12	20	30	32	35	60
Aa2/AA	15	24	30	34	40	50	65
Aa3/AA-	24	35	40	45	54	56	78
A1/A+	28	37	44	55	60	70	82
A2/A	55	65	75	85	95	107	120

Required:

- (a) Estimate the expected cost of capital for this project on the assumption that the additional finance is raised through a bond issue in the US market. (10 marks)
- (b) Draft a brief report for the board which outlines the alternative sources of finance that are potentially available for this project. Include, in your report, a brief discussion of the advantages and disadvantages and the likely impact of each alternative source upon the firm's cost of capital. (10 marks)

(Including 2 professional marks)

(20 marks)

- 5 You have been appointed as the chief financial officer of a multimedia company which is financed by private equity. There is considerable public interest in the company and it continues a very rapid rate of growth under the leadership of its dynamic founder and chief executive officer, Martin Pickle. Martin Pickle owns over 30 per cent of the company's equity and has also loaned the business substantial sums to sustain its overseas development. The balance of the other investors consist of some small shareholdings held by current and past employees and the remainder is in the hands of a private equity company which is represented by two directors on the board.

You enjoy a substantial salary and package of other benefits. Your role description gives you overall responsibility to the board for the financial direction of the company, the management of its financial resources, direction and oversight of its internal control systems and responsibility for its risk management. After two months in the job you are called to a meeting with Martin Pickle and the company's non-executive chairman. In that time you have made significant progress in improving the financial controls of the business and the current year end, which is three weeks away, looks very promising. The company's underlying earnings growth promises to be in excess of 20 per cent and its cash generation is strong. The CEO tells you that he would like you to put together a plan to take the company to full listing as a first step to him undertaking a substantial reduction in his financial stake in the business. He tells you that this discussion must be confidential, as he expects that the market would react adversely to the news. However, he would like to see what could be done to make sure that the year end figures are as strong as possible. Given your performance, he also tell you that they would like to offer you a substantial incentive in the form of share options.

Required:

- (a) **Prepare a board paper, describing the procedure for obtaining a listing on an international stock exchange such as the London or New York Stock Exchange.** (6 marks)
- (b) **Prepare a briefing note, itemising the advantages and disadvantages of such a step for a medium-sized company.** (6 marks)
(Including 2 professional marks)
- (c) **Discuss any ethical considerations or concerns you may have concerning this proposed course of action.** (8 marks)

(20 marks)

Formula Sheet

Modigliani and Miller Proposition 2 (with tax)

$$k_e = k_e^i + (1 - T)(k_e^i - k_d) \frac{V_d}{V_e}$$

Two asset portfolio

$$s_p = \sqrt{w_a^2 s_a^2 + w_b^2 s_b^2 + 2 w_a w_b r_{ab} s_a s_b}$$

The Capital Asset Pricing Model

$$E(r_i) = R_f + b_i(E(r_m) - R_f)$$

The asset beta formula

$$b_a = \left[\frac{V_e}{(V_e + V_d(1 - T))} b_e \right] + \left[\frac{V_d(1 - T)}{(V_e + V_d(1 - T))} b_d \right]$$

The Growth Model

$$P_o = \frac{D_o(1 + g)}{(r_e - g)}$$

Gordon's growth approximation

$$g = br_e$$

The weighted average cost of capital

$$WACC = \left[\frac{V_e}{V_e + V_d} \right] k_e + \left[\frac{V_d}{V_e + V_d} \right] k_d(1 - T)$$

The Fisher formula

$$(1 + i) = (1 + r)(1 + h)$$

Purchasing power parity and interest rate parity

$$S_1 = S_0 \times \frac{(1 + h_c)}{(1 + h_b)} \qquad F_0 = S_0 \times \frac{(1 + i_c)}{(1 + i_b)}$$

The Black Scholes Option Pricing Model	The FOREX modified Black and Scholes option pricing model
$c = P_a N(d_1) - P_e N(d_2) e^{-rt}$ <p>Where:</p> $d_1 = \frac{\ln(P_a/P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$ $d_2 = d_1 - s\sqrt{t}$	$c = e^{-rt} [F_0 N(d_1) - XN(d_2)]$ <p>Or</p> $p = e^{-rt} [XN(-d_2) - F_0 N(-d_1)]$ <p>Where:</p> $d_1 = \frac{\ln(F_0/X) + s^2T/2}{s\sqrt{T}}$ <p>and</p> $d_2 = d_1 - s\sqrt{T}$

The Put Call Parity relationship

$$p = c - P_a + P_e e^{-rt}$$

Present Value Table

Present value of 1 i.e. $(1 + r)^{-n}$

Where r = discount rate

n = number of periods until payment

		<i>Discount rate (r)</i>										
<i>Periods</i>		1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
(n)												
1		0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	1
2		0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	2
3		0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	3
4		0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	4
5		0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	5
6		0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	6
7		0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	7
8		0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	8
9		0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	9
10		0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	10
11		0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	11
12		0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	12
13		0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	13
14		0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	14
15		0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	15
(n)		11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1		0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833	1
2		0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694	2
3		0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579	3
4		0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482	4
5		0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402	5
6		0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335	6
7		0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279	7
8		0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233	8
9		0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194	9
10		0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162	10
11		0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135	11
12		0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112	12
13		0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093	13
14		0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078	14
15		0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065	15

Annuity Table

Present value of an annuity of 1 i.e. $\frac{1 - (1 + r)^{-n}}{r}$

Where r = discount rate
 n = number of periods

		<i>Discount rate (r)</i>										
<i>Periods</i>		1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
(n)												
1		0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	1
2		1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	2
3		2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	3
4		3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	4
5		4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	5
6		5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	6
7		6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	7
8		7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	8
9		8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	9
10		9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	10
11		10.37	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	11
12		11.26	10.58	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	12
13		12.13	11.35	10.63	9.986	9.394	8.853	8.358	7.904	7.487	7.103	13
14		13.00	12.11	11.30	10.56	9.899	9.295	8.745	8.244	7.786	7.367	14
15		13.87	12.85	11.94	11.12	10.38	9.712	9.108	8.559	8.061	7.606	15
(n)		11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1		0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833	1
2		1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528	2
3		2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106	3
4		3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589	4
5		3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991	5
6		4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326	6
7		4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605	7
8		5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837	8
9		5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031	9
10		5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192	10
11		6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327	11
12		6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439	12
13		6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533	13
14		6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611	14
15		7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675	15

Standard normal distribution table

	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09
0·0	0·0000	0·0040	0·0080	0·0120	0·0160	0·0199	0·0239	0·0279	0·0319	0·0359
0·1	0·0398	0·0438	0·0478	0·0517	0·0557	0·0596	0·0636	0·0675	0·0714	0·0753
0·2	0·0793	0·0832	0·0871	0·0910	0·0948	0·0987	0·1026	0·1064	0·1103	0·1141
0·3	0·1179	0·1217	0·1255	0·1293	0·1331	0·1368	0·1406	0·1443	0·1480	0·1517
0·4	0·1554	0·1591	0·1628	0·1664	0·1700	0·1736	0·1772	0·1808	0·1844	0·1879
0·5	0·1915	0·1950	0·1985	0·2019	0·2054	0·2088	0·2123	0·2157	0·2190	0·2224
0·6	0·2257	0·2291	0·2324	0·2357	0·2389	0·2422	0·2454	0·2486	0·2517	0·2549
0·7	0·2580	0·2611	0·2642	0·2673	0·2703	0·2734	0·2764	0·2794	0·2823	0·2852
0·8	0·2881	0·2910	0·2939	0·2967	0·2995	0·3023	0·3051	0·3078	0·3106	0·3133
0·9	0·3159	0·3186	0·3212	0·3238	0·3264	0·3289	0·3315	0·3340	0·3365	0·3389
1·0	0·3413	0·3438	0·3461	0·3485	0·3508	0·3531	0·3554	0·3577	0·3599	0·3621
1·1	0·3643	0·3665	0·3686	0·3708	0·3729	0·3749	0·3770	0·3790	0·3810	0·3830
1·2	0·3849	0·3869	0·3888	0·3907	0·3925	0·3944	0·3962	0·3980	0·3997	0·4015
1·3	0·4032	0·4049	0·4066	0·4082	0·4099	0·4115	0·4131	0·4147	0·4162	0·4177
1·4	0·4192	0·4207	0·4222	0·4236	0·4251	0·4265	0·4279	0·4292	0·4306	0·4319
1·5	0·4332	0·4345	0·4357	0·4370	0·4382	0·4394	0·4406	0·4418	0·4429	0·4441
1·6	0·4452	0·4463	0·4474	0·4484	0·4495	0·4505	0·4515	0·4525	0·4535	0·4545
1·7	0·4554	0·4564	0·4573	0·4582	0·4591	0·4599	0·4608	0·4616	0·4625	0·4633
1·8	0·4641	0·4649	0·4656	0·4664	0·4671	0·4678	0·4686	0·4693	0·4699	0·4706
1·9	0·4713	0·4719	0·4726	0·4732	0·4738	0·4744	0·4750	0·4756	0·4761	0·4767
2·0	0·4772	0·4778	0·4783	0·4788	0·4793	0·4798	0·4803	0·4808	0·4812	0·4817
2·1	0·4821	0·4826	0·4830	0·4834	0·4838	0·4842	0·4846	0·4850	0·4854	0·4857
2·2	0·4861	0·4864	0·4868	0·4871	0·4875	0·4878	0·4881	0·4884	0·4887	0·4890
2·3	0·4893	0·4896	0·4898	0·4901	0·4904	0·4906	0·4909	0·4911	0·4913	0·4916
2·4	0·4918	0·4920	0·4922	0·4925	0·4927	0·4929	0·4931	0·4932	0·4934	0·4936
2·5	0·4938	0·4940	0·4941	0·4943	0·4945	0·4946	0·4948	0·4949	0·4951	0·4952
2·6	0·4953	0·4955	0·4956	0·4957	0·4959	0·4960	0·4961	0·4962	0·4963	0·4964
2·7	0·4965	0·4966	0·4967	0·4968	0·4969	0·4970	0·4971	0·4972	0·4973	0·4974
2·8	0·4974	0·4975	0·4976	0·4977	0·4977	0·4978	0·4979	0·4979	0·4980	0·4981
2·9	0·4981	0·4982	0·4982	0·4983	0·4984	0·4984	0·4985	0·4985	0·4986	0·4986
3·0	0·4987	0·4987	0·4987	0·4988	0·4988	0·4989	0·4989	0·4989	0·4990	0·4990

This table can be used to calculate $N(d_i)$, the cumulative normal distribution functions needed for the Black-Scholes model of option pricing. If $d_i > 0$, add 0·5 to the relevant number above. If $d_i < 0$, subtract the relevant number above from 0·5.

End of Question Paper

Answers

- 1 (a) 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 regear to reflect the different financial risk exposure of Fly4000.

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 Rover Airways.

$$BV(\text{equity}) = \frac{\$3bn}{1.25} = \$2.4bn$$

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

$$BV(\text{debt}) = BV(\text{equity}) \times \text{gearing}$$

$$BV(\text{debt}) = \$2.4bn \times 1.5 = \$3.6bn$$

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

$$\beta_A = \beta_e \times (1 - W_d)$$

where

$$W_d = \frac{BV_d \times (1 - T)}{BV_e + BV_d \times (1 - T)}$$

$$W_d = \frac{3.6 \times (0.7)}{2.4 + 3.6 \times (0.7)}$$

$$W_d = 0.5122$$

$$\beta_A = 2.0 \times (1 - 0.5122)$$

$$\beta_A = 0.9756$$

This is the asset beta for Rover Airways. We can now regear the beta to that for FliHi as follows:

Calculate the tax adjusted gearing ratio for FliHi.

$$W_d = \frac{BV_d \times (1 - T)}{BV_e + BV_d \times (1 - T)}$$

$$W_d = \frac{150 \times (0.7)}{120 + 150 \times (0.7)}$$

$$W_d = 0.4667$$

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

$$\beta_e = \frac{0.9756}{(1 - 0.4667)}$$

$$\beta_e = 1.8294$$

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

$$E(r_e) = R_f + \beta_e \times ERP$$

$$E(r_e) = 0.045 + 1.8294 \times 0.035$$

$$E(r_e) = 0.045 + 1.8294 \times 0.035$$

$$E(r_e) = 0.1090 (= 10.90\%)$$

The equity cost of capital for FliHi is therefore approximately 10.90 per cent.

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

However, of more practical significance we have also assumed that:

- The underlying 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. The use of book values, can seriously distort the cost of capital that is calculated converting it into a measure of the average cost of capital in the firm's historical gearing ratio rather than in the ratio of the current capitalised values of the firm's equity and debt.
- That FliHi Ltd does not carry a size and default premium on its cost of capital. Default and size premia can be included through the use of such variants on the standard CAPM as the Fama and French 3 factor model which incorporates these elements of risk.

- (b) 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 is as follows:

$$\begin{aligned} \text{FCFE} &= \text{operating cash flow} - \text{net interest paid} - \text{tax} \\ \text{FCFE} (\$m) &= 210 + 1.5 - 4.1 = \$207.4 \text{ million} \end{aligned}$$

In the current year \$120.2m was reinvested. This implies a retention ratio (b) of:

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

$$b = \frac{120.2}{207.4}$$

$$b = 0.58$$

Gordon's approximation was originally developed to measure the growth in earnings assuming a given retention ratio and rate of return. We can apply the same logic to the free cash flow model but here we are looking at the rate of cash generation by the business on new capital investment. The current rate of return is, in principle, the internal rate of return on the current business portfolio. If we assume that the business is highly competitive then the internal rate of return will be close to the company's equity cost of capital. Growth is therefore expected to be:

$$\begin{aligned} g &= b \times r_e \\ g &= 0.58 \times 0.1090 \\ g &= 0.06322 (=6.322\%) \end{aligned}$$

If we use the company's current rate of return on equity from the accounts we would have:

$$\text{ROE} = \frac{\text{net profit}}{\text{equity employed (net assets)}}$$

$$\text{ROE} = \frac{50}{120} = 42\%$$

This would suggest a rate of growth of 24.2 per cent which is unlikely in this industry.

On the basis of a growth rate of 6.322 per cent and given that the year six growth rate and forward will be 4 per cent, the pattern of growth we anticipate is therefore:

Year	1	2	3	4	5	6
Growth rate	6.322%	6.322%	6.322%	6.322%	6.322%	4.00%

The assumptions here are embedded within the method of measuring growth. Gordon's growth approximation will give the next year value for the FCFE for the business on the assumption that the cost of capital is achieved and no more. We have also assumed that the current figures for cash generation and reinvestment are typical and likely to be replicated over the near term. In this context we would note the significant increase in operating cash flow from 2004 and question whether this was sustainable.

- (c) Using the free cash flow to equity net of reinvestment we have the free cash flow which is, in principle, distributable. We build a valuation model expanding this free cash flow through the next five years. From year six forward the rate of growth is a perpetuity and we use the free cash flow analogue of the dividend growth model to estimate the value at year six.

Step 1: take the growth rates as projected and estimate the future free cash flow to equity taking (\$210m – \$120.2m = \$87.2m) as the starting point.

Step 2 discount these projected values at the cost of equity capital (10.9%) to give a present value of \$384.89million.

Step 3 using the formula:

$$V_e = \frac{\text{FCFE}_0(1+g)}{r_e - g}$$

Calculate the value of the growing perpetuity at the end of year 6 (note the timing of the year is important) using the expected FCFE in year 5. This gives a value at year 5 of \$1,785.73.

Step 4: discount this at 10.9 per cent to give a present value of the residual term of \$1,064.53

Step 5: add the two present values to give a valuation of the firm's equity at \$1,449.42 million

Year	2006	2007	2008	2009	2010	2011
Growth	6.32%	6.32%	6.32%	6.32%	6.32%	4.00%
FCFE (2005)=\$87.2m	92.71	98.57	104.81	111.43	118.48	
Discount at 10.9 per cent	83.60	80.15	76.84	73.67	70.63	
PV of year 1–6	\$384.89					
PV of perpetuity at 2011					\$1,785.73	
PV of perpetuity at 2005	\$1,064.53					
Present value of the firm's equity	\$1,449.42					

The limitations of the method is that we assume:

- The current operating cash flows are sustainable
- The constant patterns of growth of operating cash flow will be achieved as specified.
- The rate of return required by investors is constant throughout the life of the business
- The business has an indefinite life beyond 2011.

These assumptions are unlikely to hold in practice and it should be noted that where the rate of growth (4%) is relatively low compared with the cost of equity that we would not expect the perpetuity to be a good approximation of residual value. It might be better to seek a likely break up value from the accounts as the residual value of the business. If we take the company's net asset figure and extrapolate forward at the rate of growth as shown above we obtain a figure of \$169.55 million in 2011 which has a present value of \$91.14 million. This would put a value on the business of \$476.03 million. This incidentally gives a closer approximation to the market valuation if we apply the Rover Airlines P/E ratio to FliHi's net profit figure:

$$\begin{aligned} \text{Value} &= \text{benchmark P/E} \times \text{FliHi Earnings} \\ &= 11.0 \times \$50\text{million} \\ &= \$550 \text{ million} \end{aligned}$$

(d) To whomsoever it may concern:

The proposed acquisition of FliHi represents a substantial capital investment for your airline. However, there are a number of issues which you might wish to consider before making a bid. These issues I have separated into synergies, risk exposure, future options, financing and valuation.

Synergies: From the perspective of your respective markets there would appear to be considerable advantage in integration. From the synergistic perspective these can be categorised as:

Revenue synergies: is there likely to be an enhancement in your ability to capture market share in a way that will add shareholder value. Simply acquiring the business as it stands will not be sufficient as investors can achieve the same at lower cost by diversification. Synergies only arise if a market opportunity presents itself which would not exist if both firms remain independent. One example would be where the domestic and European service can be used as a feeder system for an expanded long haul business from your principal airport and centre of operations.

Cost synergies: are there opportunities to save cost through more efficient operations? Economies of scale and scope are available in the airline business in the areas of in-flight catering, fuel supplies, maintenance and ticketing. The larger fleet size would also present operational opportunities.

Financial synergies: would the company have greater opportunities in the domestic and international capital market to acquire finance at more favourable rates and under better conditions.

Risk exposure: the larger operation would not necessarily improve the firm's exposure to market risk and indeed is likely to leave it unchanged as we would expect the underlying asset beta of both firms to be the same. There are a number of other risk areas that could be improved: operational risk may be mitigated by the firm's increased ability to hedge its operations (see the notes on the real options available below). Other risk effects include: economic, political, transactions and translation. Some of these are minimised (transactions) largely because your business is principally in the domestic market although this may change if you decide, for example, to develop your European network as a feeder system to your hub.

Future options: an acquisition of this type can create real options to expand, redeploy and exchange resources which add value to the proposition not easily captured with conventional valuation procedures. A real option is a claim upon some future course of action which can be exercised at your discretion. The availability of the new Airbus 380 offers potential both within the long haul business but also to medium haul holiday destinations at peak seasons. Access to your fleet of short to medium range aircraft offers the possibility of opening the European market to your long haul business. When and how you exercise these real options depends on circumstances at the time but paradoxically the more uncertain the underlying business the greater the value that attaches to this flexibility.

Financing: an acquisition of this type would require substantial extra financing. FliHi would appear to have a high level of off balance sheet value partly because of the scale of their operational leasing of aircraft but more significantly because of their business name and the quality of their operations. A substantial sum is likely to be paid for the goodwill of this business which suggests that this may not be a proposition that would be attractive to the debt market. Your own substantial cash reserves and the level of retained earnings suggest that this may be the route to financing this acquisition through a cash offer plus shares.

Valuation: we estimate the value of FliHi based upon its current cash flow generation to be of the order of \$1.450 billion. Using market multiples a lower figure of \$550million is obtained. The key point of this valuation process is to determine the lowest likely figure that the owners of FliHi would be prepared to accept. Our judgement is that the figure is likely to be closer to the upper end of this range. The free cash flow model relies upon our best forecast of future cash flow and reinvestment within the business. We believe that the owners of FliHi would have access to similar advice. The key question now to resolve is what would be the value of FliHi to your company. This has most of the characteristics of a type 2 acquisitions where the financial risk of the business is likely to be disturbed. For this reason we would need to value your current business using available market data and revalue it on the basis that the bid goes ahead using your preferred financing package. The potential increase in the value of your firm will reveal the potential control premium at any proposed offer price that may be decided upon.

2 (a) Sydonics Engineering Memorandum

Our FOREX risk exposure is primarily driven by our European and US business and the variability of the Sterling/Euro and Sterling/Dollar exchange rates. The volatilities of both rates are of the order of 20 per cent (annualised) which indicates significant Value at Risk in any forward commitment to either currency. There are arguments for and against the use of derivative contracts to manage this transactions risk exposure.

In principal, nothing is added to the value of the firm if we attempt to do something which the investors can easily achieve, possibly, at lower cost. If the capital markets are perfect then investors should be indifferent to firm specific risk (which they can diversify away) and will only be concerned about the market driven risks as reflected in the firm's beta value. Arguably investors can diversify away the forex risk exposure within their portfolio much more efficiently and at lower cost than the company can through hedging. Hedging also brings costs: there are the direct costs of the treasury management function and the indirect costs of developing the in-house expertise required to assess hedging alternatives. There are also compliance costs in that any imperfect hedging agreement must be valued and shown in the accounts. Finally, hedging through derivative contracts can be avoided by the creation of internal hedging arrangements whereby finance is raised in the country of operations and hence borrowing costs are currency matched with the revenue streams.

On the other hand, the market perfection argument can be turned on its head. In as far as hedging is a means of reducing the firm's exposure to exchange rate volatility (a market wide phenomenon), then its impact will be to reduce the firm's beta and thus its cost of capital. This is a general argument for hedging but does not necessarily imply that we should use the derivative markets to manage our exposure to exchange rate risk. The empirical evidence on practice in industry is surprisingly sparse although Geczy, Minton and Schrand, (1997) found that 41 per cent of their sample of 370 US firms actively used derivative instruments to manage their forex risk. The benefits of hedging through the use of derivatives is that, with care, risk exposure can be tightly controlled although the use of exchange traded derivatives still leaves a residual 'basis risk' because of differences between the closeout rates and the underlying rates of exchange. Basis risk can be avoided through the use of OTC agreements wherever possible.

Hedging FOREX risk using derivatives can be expensive especially, as in this case, when the exposure is uncertain. Where the exposure is certain the use of futures or forward contracts can eliminate a large element of uncertainty at much lower cost. Any policy must therefore address the following issues:

- What is the magnitude of the risk exposure (in this case the very high volatility and long term exposure creates a very high hedging cost). Value at Risk (VaR) may be an appropriate method for measuring the likely financial exposure.
- The materiality of the exposure in terms of the magnitude of the sums involved.
- To what extent can the risk be mitigated by matching agreements (borrowing in the counter currency to mitigate CAPEX for example)?
- To what extent has the exposure crystallised? If it is uncertain FOREX options allow the hedging of the downside risk but at a high cost.

A policy would then lay down the principles that should be followed to cover the following:

- Risk assessment – an assessment of the likelihood and impact of any given risk upon the financial position of the firm. Derivative positions can be highly geared and the firm may be exposed to very high liabilities under certain exchange rate and/or interest rate conditions. It is recommended that derivatives should only be used for the management of specific risks and that no speculative or uncovered position should be taken.
- Cost of hedging – measured not only in terms of the direct costs involved but also in the use of scarce management time in establishing the positions and operating the internal control procedures appropriate where derivatives are used as a means of hedging risk. It is recommended that hedging costs should be minimised to an agreed percentage of the Value at Risk through the unhedged position.
- Contract and approval procedures – where OTC products are purchased and specific contracts are raised then the firm needs to establish policies with respect to the legal aspects of the contracting process. With both OTC and exchange traded products the firm should also establish an approval process with clear lines of responsibility and sign off on contracts up to and including board level. It is recommended that the board appoint a risk management committee to review and monitor all hedging contracts where the Value at Risk is in excess of an agreed amount.
- Hedge monitoring – policy needs to be established as to the monitoring of derivative positions and the conditions under which any given position will be reversed. It is recommended that the risk management committee actively monitor all open positions.

- (b) This part of the question focuses on the use of options for foreign exchange hedging and deploys the Grabbe (1983) variant of the Black Scholes model.

The analytics for the question are shown in the tables below:

The price of the 'at the money' options are as follows:

	3 months	9 months
Sterling Euro Spot	0.6900	0.6900
Sterling Euro (indirect)	1.4493	1.4493
Euro Libor	2.7656	3.0519
Sterling Libor	4.6231	4.7303
Sterling Euro forward (indirect)	1.4426	1.4317
Sterling Euro forward (direct)	0.6932	0.6985
Annual volatility of £/Euro	0.2200	0.2200
D1	0.0968	0.1595
D2	-0.0132	-0.0310
N(d1)	0.5386	0.4367
N(d2)	0.4948	0.5124
3 month call and 9 month put price (pence per Euro) (ie the price of a call or put to buy or sell one Euro at spot Contract value (euro equivalent))	3.1581 3158	4.6853 4685

The values for d_1 and d_2 have been calculated as follows:

$$d_1 = \frac{\left(\ln \left(\frac{F}{S} \right) + \sigma^2 \frac{T}{2} \right)}{\sigma \sqrt{T}}$$

$$d_1 = \frac{\left(\ln \left(\frac{0.6932}{0.6900} \right) + 0.22^2 \frac{0.25}{2} \right)}{0.22 \sqrt{0.25}}$$

$$d_1 = 0.0968$$

$$d_2 = d_1 - \sigma \sqrt{T}$$

$$d_2 = 0.0968 - 0.22 \sqrt{0.25}$$

$$d_2 = -0.0132$$

Where F and S are the forward and spot rates respectively (note the forward must have the same maturity as the option), σ is the volatility, T is the time to maturity.

$N(d_1)$ and $N(d_2)$ are derived from the supplied tables for the normal density function for situations where $N(x) \geq 0$ and $N(x) \leq 0$.

The value of the currency call and the currency put are as follows:

$$c = e^{-rT} [FN(d_1) - SN(d_2)]$$

$$c = e^{-0.046231 \times 0.25} [0.6932 \times 0.5386 - 0.6900 \times 0.4948]$$

$$c = 3.1581 \text{ pence}$$

and

$$p = e^{-rT} [SN(-d_2) - FN(-d_1)]$$

$$p = e^{-0.047303 \times 0.75} [0.6900 \times 0.5124 - 0.6985 \times 0.4367]$$

$$p = 4.6853 \text{ pence}$$

The call should be exercised if the exchange rate rises above 0.6900 (thus making the sterling equivalent more expensive) and the nine month put should be exercised if the spot should be below 0.6900 at the exercise date.

The key points here are to note that the rates into the formula must all be direct, the volatility and interest rates are employed on an annual basis (they have been quoted as such in the question).

Candidates should also be aware of the money market conventions for quoting exchange rates that the base currency is shown first and the counter currency second. They should be sufficiently familiar with the relative values of the principal currencies to identify whether the quote is direct to indirect.

- (iii) The hedge ratio (N(d1) and N(-d1)) reveals the inverse of the number of option contracts we require to hedge a one euro exposure. Therefore the number of contracts we will require to hedge the exposures are as follows:

	3 months	9 months
Number of contracts	2,785	3,435
Cost of hedge	8,795,723	16,094,798
As percentage of value	0.058638	0.214597

- (iv) The issues to be borne in mind are:

- Hedging with options eliminates downside risk (unlike futures) and are particularly useful when the exposure is uncertain.
- The cost of this type of hedge can be very high (especially for the long dated put) although the company may wish to reduce the cost by purchasing out of the money options. This will not eliminate the downside risk completely but will allow them to hedge to a known exposure.
- An alternative approach would be to hedge the three month exposure which is where the option is most valuable given the uncertainty over whether the bid will be accepted and then, if it is accepted, to enter into a future contract at that date to lock in the prevailing spot rate. Alternatively, purchasing the put option may be held back until the contract is won.
- Given the set contract sizes it is not possible to create a perfect hedge. The position would need continual monitoring and adjustment to offset gamma risk which is likely to be high for near-the-money options.
- There is timing risk given that currency options are quoted as Europeans. Early sale of the option if the requirement materialises early will create basis risk, if the requirement materialises late the residual time delay will be unhedged.

3 (a) Board Paper Presenting Proposed Procedures for Large CAPEX.

This paper proposes revised guidelines for the Board approval of large (in excess of \$10,000) capital investment projects. The current two stage process of preliminary and final approval serves an important role in ensuring that any initial concerns of the Board in terms of strategic fit and risk are brought to the attention of the Financial Appraisal Team. The two stage process would consider:

Stage 1:

Business proposal including assessment of strategic requirement, business fit and identified risks.

Outline financial appraisal to include capital requirement, mode of financing, expected net present value, modified internal rate of return and project duration.

It is recommended that conventional payback is dropped because it ignores the cost of finance and the magnitude of post payback cash flows. Duration is recommended as this measures the time required to recover half of the project value.

Stage 2:

- A proposed business plan must be presented giving the business case with an assessment of strategic benefits, risks, finalised capital spend and capital source.
- A value impact assessment giving an NPV calculation supported by a calculation of the project value at risk. The net present value of the project represents our best estimate of the likely impact of the investment on the value of the firm. This is the key statistic from the capital market perspective in that, unless we are assured that the project NPV is positive, the investment will reduce and not enhance the value of the firm. This net present value calculation should be supported by a modified internal rate of return which measures the additional economic return of the project over the firm's cost of capital where intermediate cash flows are reinvested at that cost of capital. In a highly competitive business the reinvestment assumption implicit in the MIRR is more realistic than that assumed with IRR where intermediate cash flows are assumed to be reinvested at the IRR. This may be satisfactory for near-the-money projects but is far less satisfactory for projects which offer high levels of value addition to the firm.
- An accounting impact assessment including the differential rate of return on capital employed and a short term liquidity assessment. Although positive NPV projects are value enhancing they may not do so in ways that are readily apparent in the financial reports. To manage investor expectations effectively the firm needs to be aware of the impact of the project on the firm's reported profitability and this is most accurately reflected by the differential rate of return measure. Accounting rate of return as normally calculated does not examine the impact of the project on the financial position of the firm but is restricted to the rate of return the investment offers on the average capital employed.
- An assessment of the project duration. This project, for example, reveals a duration of 4.46 years which is the mean time over which half of the project value is recovered. This is more useful than the other liquidity based measures especially when used as a relative as opposed to an absolute measure of the cash recovery. Cash recovery assumes that the future project cash flows are achieved at a constant rate over the life of the project.

- (b) The proposed business case concludes that this is a key strategic investment for the firm to maintain operating capacity at the Gulf Plant. The financial assessment is as detailed above (excluding an assessment of the impact of the project on the financial reports of the firm).

- (i) The net present value of this project is calculated using a discount rate of 8 per cent and gives a value of \$1.964 million. The volatility attaching to the net present value of \$1.02 million indicates that there is (z) standard deviations between the expected net present value and zero as follows:

$$z = \frac{1.964-0}{1.02} = 1.9255$$

This suggests that this project has a 97.3 per cent probability that it will have a positive net present value or conversely a 2.7 per cent probability of a negative net present value (these probabilities are taken from the normal density function tables supplied).

Unlike the assessment of the probability of the project failing to generate a positive net present value given above, VaR measures the value which could potentially be lost by the business, over the project life time, given the volatility of the net present value. The project value at risk is based upon an assessment of the number of years that the project cash flow is at risk (10), the annual volatility and the confidence level required by the firm. VaR assumes that the net present value of the project is normally distributed and thus there is the potential, in theory at least, for those losses to be unlimited. The application of the confidence level of 95% places a level of potential loss that the firm will consider in its project evaluation processes whilst recognising that there is a one in twenty chance that the loss could turn out to be greater. The formula for project VaR is:

$$\begin{aligned} \text{projectVaR} &= N(0.95) \times \sqrt{T} \\ \text{projectVaR} &= 1.645 \times 1.02 \times 3.162 = \$5.3 \text{ million} \end{aligned}$$

This assumes a 95 per cent confidence level, at 99 per cent the project VaR is \$7.51 million. This value reflects the fact that the capital invested is at risk for ten years and assumes that the volatility of the project is fairly represented by the volatility of its net present value.

- (ii) Project Return

The internal rate of return is shown as 11.01 per cent. The Modified Internal Rate of Return is calculated by (i) projecting forward the cash flows in the recovery stage of the project at 8 per cent to future value of \$41.798 million and (ii) discounting back the investment phase cash flows to give a present value of the investment of \$17.396 million.

The Modified Internal Rate of Return is therefore:

$$\begin{aligned} \text{MIRR} &= \sqrt[10]{\frac{41.798}{17.396}} - 1 \\ \text{MIRR} &= 9.16\% \end{aligned}$$

This rate suggests that the margin on the cost of capital is rather small with only a 1.16 per cent premium for the strategic and competitive advantage implied by this project.

- (iii) Project Liquidity

With a present value of the recovery phase of \$19.6931 million and of the investment phase of \$17.3961 million this suggests that the project will have a recovery period of:

$$\text{recovery} = 2 + \frac{17.396}{19.361} \times 8 = 9.188 \text{ years}$$

In practice the actual recovery is shorter than this because the expected cash in flows occur earlier rather than later during the recovery phase of the project.

The project duration is calculated by multiplying the proportion of cash recovered in each year (discounted recovery cash flow/present value of the recovery phase) by the relevant year number from project commencement. The sum of the weighted years gives the project duration.

Year	3	4	5	6	7	8	9	10
Discounted cash flow (recovery) (\$m)	3.5722	4.7042	4.9342	4.0961	3.2092	2.1611	-1.0005	-2.316
Present value of recovery phase	19.3606							
duration of recovery phase proportion of CF recovered	0.1845	0.2430	0.2549	0.2116	0.1658	0.1116	-0.0517	-0.1196
weighted years	0.5535	0.9719	1.2743	1.2694	1.1603	0.8930	-0.4651	-1.1962
project duration (Years)	4.46							

The project duration reveals that the project is more highly cash generative in the early years notwithstanding the two year investment phase.

In summary, the analysis confirms that this project if financially viable, it will be value adding to the firm although there is substantial value at risk given the volatility of the net present value quoted. In terms of return the premium over the firm's hurdle rate is small at 1.16 per cent and any significant deterioration in the firm's cost of capital would be very damaging to the value of this project. The liquidity statistics reveal that the bulk of the project's cash returns are promised in the early part of the recovery phase and that half the value invested in the project should be recovered by year five. Taking this into account acceptance is recommended to the board.

4 (a) Calculation of the expected WACC

A preliminary view suggests that the increased cost of debt is more than offset by the impact of the tax shield. The steps in the calculation are to estimate the cost of debt before and after the new issue. The existing cost of equity is calculated from the WACC and the ungeared equity cost calculated using M&M. The equity is then regearred to the new level assuming the higher level of gearing but not assuming any increase in the cost of debt through default or term structure. We then use the increased cost of debt to calculate the revised WACC. The analytics are as below:

Current WACC	6.80%			
	D/E	D/(D+E)		
Current gearing	0.1667	0.1429		
New gearing	0.2667	0.2105		
		risk free	spread	Total
Current yield on debt		0.03450	0.00400	0.03850
New yield on debt	3 years	0.03450	0.00440	0.03890
spread = 0.6x70 basis points (bp) + 0.4x107bp = 84.8bp	10 years	0.04200	0.00848	0.05048
Combined rate	MVd	Rd		
market value of 3 year debt	0.5	0.03890	0.02431	
market value of new debt	0.3	0.05048	0.01893	
Total market value of debt and combined rate	0.8		0.04324	
Existing cost of equity	7.48%			
Calculate ungeared cost of equity	7.11%			
Calculate regearred cost of equity (keeping cost of debt constant)	7.72%			
Calculate new weighted average cost of capital	6.73%			

The existing cost of equity is calculated by rearranging the WACC as follows:

$$r_e = \frac{wacc - w_d r_d (1-T)}{(1-w_d)}$$

$$r_e = \frac{6.8\% - 0.1429 \times 3.85\% \times 0.7}{(1 - 0.1429)}$$

$$r_e = 7.48\%$$

The ungeared equity cost of capital (r_e^1) is discovered from Modigliani and Miller Proposition 2:

$$r_e = r_e^1 + (r_e^1 - r_d) \frac{D}{E} (1-T)$$

Rearranging and substituting:

$$r_e = r_e^1 + r_e^1 \frac{D}{E} (1-T) - r_d \frac{D}{E} (1-T)$$

$$r_e^1 = \frac{r_e + r_d \frac{D}{E} (1-T)}{1 + \frac{D}{E} (1-T)}$$

$$r_e^1 = \frac{7.48\% + 3.85\% \times 0.1667 \times 0.7}{1 + 0.1667 \times 0.7}$$

$$r_e^1 = 7.11\%$$

The regeared cost of equity capital assuming that the cost of debt remains unchanged is given by again using proposition 2:

$$r_e = r_e^1 + (r_e^1 - r_d) \frac{D}{E} (1-T)$$
$$r_e = 7.11\% + (7.11\% - 3.850\%) \times 0.2667 \times 0.7$$
$$r_e = 7.72\%$$

This assumes that the equity cost of capital is unaffected by the change in the level of default risk. This is a reasonable assumption at modest levels of gearing but would not be expected to hold at very high gearing levels.

Finally the new weighted average costs of capital is calculated using the revised equity cost and the revised debt cost as follows:

$$wacc = (1 - w_d) r_e + w_d r_d (1 - T)$$
$$wacc = (1 - 0.2105) \times 7.72\% + 0.2105 \times 4.324\% \times 0.7$$
$$wacc = 6.73\%$$

This demonstrates a less than 10 basis point fall in the weighted average cost of capital.

(b) Paper on the alternative sources of capital

For a company in this position the following sources of finance suggest themselves:

- Sale and lease back of existing assets
- US debt financed through a further bond issue
- Debt raised on the Chinese market
- Equity finance by rights or new issue

The choice of financing is partly down to the cost and availability of the various sources and partly down to the method the company chooses to hedge its FOREX exposure.

If we ignore foreign exchange considerations for a moment, pecking order theory suggests that debt should be preferred to equity and the weighted average cost of capital calculation suggests that the firm should increase its gearing to capture further tax shield effects which are not currently being offset by increased default risk (static trade off theory). However, issue costs may be expensive and the company may seek to raise finance by sale and lease back of existing assets. There are implications for reporting under FASB 13 depending upon whether the leases are financing or operating leases. Raising \$300 million of debt by a bond issue is at the low end of the scale for new debt issues of this type although it may be possible that a syndicated issue where a number of companies of similar credit rating are joined by a lead bank could be arranged. It is to be expected that the costs of the issue will be high in terms of commissions and underwriting fees.

Raising finance directly in China has been eased considerably with recent changes in the rules of the Chinese Securities Regulatory Commission opening better access of foreign firms to the Chinese bond and equity markets. However, the entry of China into the WTO in 2002 is still feeding through the economy as tariff barriers and other constraints are removed. This process of liberalisation is likely to continue accelerating although, as with any emerging market, there are risks associated with inward investment and capital entry. These risks may be sufficient to raise the risk assessment against this company and as a result the benign implications of increased gearing outlined above may not be realised in practice.

The problem of hedging the foreign exchange exposure can be partly solved by borrowing directly in China and using the income flows from the new venture to finance the interest charges and capital repayments. Because the borrowing and the income flows are in the same currency transactions exposure is largely eliminated although any appreciation in the Chinese currency would increase the dollar value of the translated debt in the firm's balance sheet. If the borrowing is used to purchase matching assets in China then the translation risk is mitigated along with the transaction risk. However, if the assets are not owned but leased or rented then translation effects will impact upon the balance sheet and may be misread by the market. A second alternative would be to raise finance in the US and then engage in a currency swap for a ten year term. The effect of this would be to lock in the current exchange rate for the duration of the borrowing. However, finding a swap of this type would entail the services of a financial institution specialising in bringing appropriate counter-parties together. Such derivative arrangements have been mis-sold in the past with disastrous leveraging effects built into the contract.

- 5 (a) Normally, obtaining a listing consists of three steps: legal, regulatory and compliance. In the UK, as in many other jurisdictions a company must ensure that it is entitled to issue shares to the public as opposed to an issue by private treaty. In the UK a firm seeking listing must register as a public limited company. This entails a change in its memorandum and articles agreed by the existing members at a special meeting of the company.

The company must then meet the regulatory requirements of the Listing Agency which, in the UK, is part of the Financial Services Authority (FSA). These requirements impose a minimum size restriction on the company and other conditions concerning length of time trading. Once these requirements are satisfied the company is then placed on an official list and is allowed to make a public offering of its shares.

Once the company is on the official list it must then seek the approval of the Stock Exchange for its shares to be traded. In principle it is open to any company to seek a listing on any exchange where shares are traded. The London Exchange imposes strict requirements and invariably the applicant company will need the services of a sponsoring firm that specialises in this type of work.

- (b) The advantages of seeking a public listing are that it opens the capital market to the firm. It offers the company access to equity capital from both institutional and private investors and the sums that can be raised are usually much greater than can be obtained through private equity sources. The presence of the firm as a listed company on a major exchange also enhances its credibility as investors and the general public are aware that by doing so it has opened itself to a much higher degree of public scrutiny than is the case for a firm that is privately financed. The disadvantages are significant. A distributed shareholding does place the firm in the market for corporate control increasing the likelihood that the firm will be subject to a takeover bid. There is also a much more public level of scrutiny with a range of disclosure requirements. Financial accounts must be prepared in accordance with IFRS or FASB and with the relevant GAAP as well as the Companies Acts. Under the rules of the London Stock Exchange companies must also comply with the governance requirements of the Combined Code and also have in place an effective and ongoing business planning process. Much of this may be regarded as desirable within a privately owned company but the requirements to comply or explain imposed on a public company can impose a significant regulatory burden and exposure to critical comment.
- (c) There is an ethical dimension to the request made by Martin Pickles. He is of course entitled to acquire or dispose of his equity claim as he sees fit but his position as a large shareholder does impose on him certain duties with respect to the other shareholders. He should not undertake any action which is prejudicial to them and in this case making any move towards listed status would require their consent. It may well be that the private equity firm involved has in mind its own exit strategy and that his proposed course of action would be acceptable to them. If the decision was made to go public his own intentions would be a material factor in the valuation of the firm and the offer price made to subscribers. An immediate intention to divest would need to be disclosed. There would appear to be nothing wrong at this stage with asking the CFO to investigate the matter on a confidential basis although the request that he or she should seek to enhance the earnings of the business should be resisted in as far as it represents an instruction to engage in earnings manipulation beyond that required to present a true and fair view of the affairs of the business.

Earnings management techniques whereby revenues and costs are accelerated/ decelerated to achieve desired earnings figures are severely limited by GAAP and in the US for example could lead to arraignment under the Sarbanes Oxley Act. The proposal that the CFO would be offered share options adds a veneer of impropriety to this discussion. He or she is in a difficult position but does need to make clear that he or she must act to preserve the interests of all the shareholders and all the directors. An invitation to participate in a share option scheme is a fairly crude attempt to win support for the proposed course of action (as the shares are not yet quoted) and should be resisted.

- 1 30 marks distributed over four sections. Key numbers presented in the analysis must be contextualised and justified.
- (a) Estimate the current cost of equity capital for FliHi using the Capital Asset Pricing Model making notes on any assumptions that you have made. (9 marks)
- | | |
|---|---|
| Calculation of the asset beta for Rover Airways at 0.9756 | 2 |
| Regear for FliHi to 1.8294. | 1 |
| Calculate FliHi's cost of equity at 10.90 per cent | 2 |
| Notes on the assumptions relating to the CAPM | 2 |
| Notes on the assumptions of more practical significance | 2 |
- (b) Estimate the expected growth rate of this company using the current rate of retention of Free Cash Flow and your estimate of the required rate of return on equity for each of the next seven years. Make notes on any assumptions you have made. (6 marks)
- | | |
|--|---|
| Calculation of the retention ratio as specified in the question as 0.58 | 2 |
| Estimate of the growth for the next six years (justifying the return on equity chosen) | 2 |
| Assumptions embedded within the calculation of growth and Gordon's approximation | 2 |
- (c) Value this company on the basis of its expected Free Cash Flow to Equity explaining the limitations of the methods you have used. (7 marks)
- | | |
|--|---|
| Calculation and projection of the free cash flow to equity with explanations | 2 |
| Discount these values at the rate of return on equity | 2 |
| Calculate the present value of the perpetuity at 2011 with explanations | 2 |
| Calculate the present value of the firm's equity | 1 |
- (d) Write a brief report outlining the considerations your colleagues on the Board of Fly4000 might bear in mind when contemplating this acquisition. (8 marks)
- | | |
|---|---|
| Discussion of synergies and their capture | 2 |
| Examination of the risk exposure and the potential real options | 3 |
| Review of the financing options | 2 |
| Summary of valuation and recommendation of the next steps to the board of Fly4000 | 1 |
- 2 30 marks distributed over four sections.
- (a) Prepare a memorandum, to be considered at the next board meeting, which summarises the arguments for and against forex risk hedging and recommends a general policy concerning the hedging of foreign exchange risk. (10 marks)
- | | |
|---|---|
| Summary of the principle arguments for and against hedging with specific reference to the market perfection and reduction of cost of capital arguments. | 4 |
| Clear policy recommendations focusing risk assessment, cost management, contracts and approvals, and monitoring. | 4 |
| Quality of the memorandum assessed in terms of clarity, argumentation and persuasiveness. | 2 |
- (b) Prepare a short report justifying your use of derivatives to minimise the firm's exposure to foreign exchange risk. Your report should contain:
- (iv) The likely option price for an at the money option stating the circumstances in which the option would be exercised (you should use the Grabbe variant of the Black-Scholes model for both transactions adjusted on the basis that deposits generate a rate of return of LIBOR). (10 marks)
- | | |
|--|---|
| Correct calculation of d_1 and d_2 using the forward and spot rates as specified | 5 |
| Calculation of $N(x)$ from the tables given | 1 |
| Correct calculation of the currency call | 2 |
| Correct calculation of the currency put | 2 |
- (v) A calculation of the number of contracts that would be required to eliminate the exchange rate risk and the cost of establishing a hedge to cover the likely FOREX exposure. (4 marks)
- | | |
|--|---|
| Calculation of the number of contracts for the 3 month hedge | 2 |
| Calculation of the number of contracts for the 9 month hedge | 2 |
- (vi) A summary of the issues the board should bear in mind when reviewing a hedging proposal such as this taking into account the limitations of the modelling methods employed and the balance of risk to which the firm will still be exposed when the position is hedged. (6 marks)
- | | |
|--|---|
| Cost of the hedge and identification of alternatives | 2 |
| Problems of establishing a perfect hedge (contract size) | 2 |
| Understanding demonstrated of the nature of basis risk and how it is influenced by timing. | 2 |

- 3 (a) Prepare a paper for the next Board meeting recommending procedures for the assessment of capital investment projects. Your paper should make proposals about the involvement of the Board at a preliminary stage and the information that should be provided to inform their decision. You should also provide an assessment of the alternative appraisal methods. (8 marks)**
- Clear definition of a two stage process for Board involvement in capital expenditure decisions 2
 Recommendation for the stage 1 appraisal procedure and metrics focusing on the role of payback and viable alternatives 3
 Stage 2 appraisal focusing on the business plan, value and accounting impact and cash recovery. 3
- (b) Using the appraisal methods you have recommended in (a) prepare a paper outlining the case for acceptance of the project to build a distillation facility at the Gulf plant with an assessment of the company's likely value at risk. You are not required to undertake an assessment of the impact of the project upon the firm's financial accounts. (12 marks)**
- Calculation of the project VAR and assessment of its significance 4
 Estimation of the potential value impact using MIRR and the assumptions that underpin it. 3
 Estimation of the potential cash recovery using procedures recommended in a) 3
 Quality and persuasiveness of the written report 2
- 4 (a) Estimate the expected cost of capital for this project on the assumption that the additional finance is raised through a bond issue in the US market. (10 marks)**
- Estimation of the current cost of debt capital at 4.324 per cent 3
 Calculation of the existing cost of equity capital at 7.48 per cent 2
 Ungearing and regearing the cost of equity capital using M&M proposition 2 3
 Calculation of the revised weighted average cost of capital and comment thereon 2
- (b) Draft a brief report for the board outlining the alternative sources of finance that are potentially available for this project including a brief discussion of their advantages and disadvantages and the likely impact upon the firm's cost of capital of each of the alternatives that you consider. (10 marks)**
- Note of the theoretical issues in the selection of finance source (M&M, pecking order theory) 2
 Clear description of the potential sources of capital within the context of the Chinese economy, regulation and capital market 2
 Evaluation of the likely advantages and disadvantages of the principal sources of finance 2
 Discussion of the risk management strategies available 2
 Professional marks 2
- 5 (a) Prepare a board paper describing the procedure for obtaining a listing on an international stock exchange such as the London Stock Exchange. (6 marks)**
- Outline of the three step procedure: registration, listing and admission to trading (2 marks for each step) 6
- (b) Prepare a briefing note itemising the advantages and disadvantages of such a step for a medium sized company. (6 marks)**
- Note of the advantages: capital market access, reputation effects 2
 Note of the disadvantages: compliance costs, vulnerability to takeover, public scrutiny 2
 Well written briefing note weighing the advantages and disadvantages and focusing on the judgements that the board would be required to make 2
- (c) Discuss any ethical considerations or concerns you may have concerning this proposed course of action. (8 marks)**
- Identification of the principal ethical issues involved 2
 Note on the issue of transparency and the protection of minority rights 2
 Discussion of alternative ways that the CFO could proceed and the ethical implications of each 2
 Commentary on the ethical issues involved in earnings management 2