Professional Level – Options Module

Advanced Financial Management

Thursday 10 June 2010

Paper P4

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

Formulae and tables are on pages 6–10.

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.

ACCA

The Association of Chartered Certified Accountants

Section A – BOTH questions are compulsory and MUST be attempted

1 The Seal Island Nuclear Power Company has received initial planning consent for an Advanced Boiling Water Reactor. This project is one of a number that has been commissioned by the Government of Roseland to help solve the energy needs of its expanding population of 60 million and meet its treaty obligations by cutting CO_2 emissions to 50% of their 2010 levels by 2030.

The project proposal is now moving to the detailed planning stage which will include a full investment appraisal within the financial plan. The financial plan so far developed has been based upon experience of this reactor design in Japan, the US and South Korea.

The core macro economic assumptions are that Roseland GDP will grow at an annual rate of 4% (nominal) and inflation will be maintained at the 2% target set by the Government.

The construction programme is expected to cost $1 billion over three years, with construction commencing in January 2012. These capital expenditures have been projected, including expected future cost increases, as follows:

Year end	**2012**	**2013**	**2014**
Construction costs ($ million)	300	600	100

Generation of electricity will commence in 2015 and the annual operating surplus in cash terms is expected to be $100 million per annum (at 1 January 2015 price and cost levels). This value has been well validated by preliminary studies and includes the cost of fuel reprocessing, ongoing maintenance and systems replacement as well as the continuing operating costs of running the plant. The operating surplus is expected to rise in line with nominal GDP growth. The plant is expected to have an operating life of 30 years.

Decommissioning costs at the end of the project have been estimated at $600 million at current (2012) costs. Decommissioning costs are expected to rise in line with nominal GDP growth.

The company's nominal cost of capital is 10% per annum. All estimates, unless otherwise stated, are at 1 January 2012 price and cost levels.

Required:

Produce a preliminary briefing note which, on the basis of the above information, includes:

(i) An estimate of the net present value for this project as at the commencement of construction in 2012. (11 marks)

(ii) A discussion of the principal uncertainties associated with this project. (7 marks)

(iii) A sensitivity of the project's net present value (in percentage and in $), to changes in the construction cost, the annual operating surplus and the decommissioning cost. (Assume that the increase in construction costs would be proportional to the initial investment for each year.) (6 marks)

(iv) An explanation of how simulations, such as the Monte Carlo simulation, could be used to assess the volatility of the net present value of this project. (4 marks)

Note: the formula for an annuity discounted at an annual rate (i) and where cash flows are growing at an annual rate (g) is as follows:

$$A_n = \left[\frac{1-\left(\frac{1+g}{1+i}\right)^n}{i-g}\right](1+g)$$

(28 marks)

2 AggroChem Co is undertaking a due diligence investigation of LeverChem Co and is reviewing the potential bid price for an acquisition. You have been appointed as a consultant to advise the company's management on the financial aspects of the bid.

AggroChem is a fully listed company financed wholly by equity. LeverChem is listed on an alternative investment market. Both companies have been trading for over 10 years and have shown strong levels of profitability recently. However, both companies' shares are thinly traded. It is thought that the current market value of LeverChem's shares at $33^1/_3$% higher than the book value is accurate, but it is felt that AggroChem shares are not quoted accurately by the market.

The following information is taken from the financial statements of both companies at the start of the current year:

	AggroChem $'000	LeverChem $'000
Assets less current liabilities	4,400	4,200
Capital Employed		
Equity	4,400	1,200
5-year floating rate loan at yield rate plus 3%		3,000
Total capital employed	4,400	4,200
Net operating profit after tax (NOPAT)	580	430
Net amount retained for reinvestment in assets	180	150

It can be assumed that the retained earnings for both companies are equal to the net reinvestment in assets.

The assets of both companies are stated at fair value. Discussions with the AtReast Bank have led to an agreement that the floating rate loan to LeverChem can be transferred to the combined business on the same terms. The current yield rate is 5% and the current equity risk premium is 6%. It can be assumed that the risk free rate of return is equivalent to the yield rate. AggroChem's beta has been estimated to be 1·26.

AggroChem Co wants to use the Black-Scholes option pricing (BSOP) model to assess the value of the combined business and the maximum premium payable to LeverChem's shareholders. AggroChem has conducted a review of the volatility of the NOPAT values of both companies since both were formed and has estimated that the volatility of the combined business assets, if the acquisition were to go ahead, would be 35%. The exercise price should be calculated as the present value of a discount (zero-coupon) bond with an identical yield and term to maturity of the current bond.

Required:

Prepare a report for the management of AggroChem on the valuation of the combined business following acquisition and the maximum premium payable to the shareholders of LeverChem. Your report should:

(i) Using the free cash flow model, estimate the market value of equity for AggroChem Co, explaining any assumptions made. (9 marks)

(ii) Explain the circumstances in which the Black-Scholes option pricing (BSOP) model could be used to assess the value of a company, including the data required for the variables used in the model. (5 marks)

(iii) Using the BSOP methodology, estimate the maximum price and premium AggroChem may pay for LeverChem. (9 marks)

(iv) Discuss the appropriateness of the method used in part (iii) above, by considering whether the BSOP model can provide a meaningful value for a company. (5 marks)

Professional marks will be awarded in question 2 for the clarity and presentation of the report. (4 marks)

(32 marks)

Section B – TWO questions ONLY to be attempted

3 The finance division of GoSlo Motor Corporation has made a number of loans to customers with a current pool value of $200 million. The loans have an average term to maturity of four years. The loans generate a steady income to the business of 10·5% per annum. The company will use 95% of the loan's pool as collateral for a collateralised loan obligation structured as follows:

- 80% of the collateral value to support a tranche of A-rated floating rate loan notes offering investors LIBOR plus 140 basis points.
- 10% of the collateral value to support a tranche of B-rated fixed rate loan notes offering investors 11%.
- 10% of the collateral value to support a tranche as subordinated certificates (unrated).

In order to minimise interest rate risk, the company has decided to enter into a fixed for variable rate swap on the A-rated floating rate notes exchanging LIBOR for 8·5%.

Service charges of $240,000 per annum will be charged for administering the income receivable from the loans.

You may ignore prepayment risk.

Required:

(a) Calculate the expected returns of the investments in each of the three tranches described above. Estimate the sensitivity of the subordinated certificates to a reduction of 1% in the returns generated by the pool. (10 marks)

(b) Explain the purpose and the methods of credit enhancement that can be employed on a securitisation such as this scheme. (4 marks)

(c) Discuss the risks inherent to the investors in a scheme such as this. (6 marks)

(20 marks)

4 The MandM Company, a large listed company, has two divisions. The first, the MoneyMint division produces coins and notes for the national exchequer and generates 80% of the company's revenues. The second, the LunarMint division, manufactures a brand of sweets which are very popular with traders in the financial markets. The company is considering disposing of its LunarMint division. The LunarMint business is no longer viewed as part of the core business of the MandM Company. The Chief Executive Officer commented that he could never understand why the company entered into sweet-making in the first place. The LunarMint business is profitable and low risk, but has not been a high priority for investment.

Required:

Outline the issues that should be considered when disposing of the LunarMint division noting the risks that might be involved.

(20 marks)

5 You are the financial manager of Multidrop (Group) a European based company which has subsidiary businesses in North America, Europe, and Singapore. It also has foreign currency balances outstanding with two non-group companies in the UK and Malaysia. Last year the transaction costs of *ad-hoc* settlements both within the group and with non-group companies were significant and this year you have reached agreement with the non-group companies to enter into a netting agreement to clear indebtedness with the minimum of currency flows. It has been agreed that Multidrop (Europe) will be the principal in the netting arrangement and that all settlements will be made in Euros at the prevailing spot rate.

The summarised list of year end indebtedness is as follows:

Owed by:	Owed to:	
Multidrop (Europe)	Multidrop (US)	US$6·4 million
Multidrop (Singapore)	Multidrop (Europe)	S$16 million
Alposong (Malaysia)	Multidrop (US)	US$5·4 million
Multidrop (US)	Multidrop (Europe)	€8·2 million
Multidrop (Singapore)	Multidrop (US)	US$5·0 million
Multidrop (Singapore)	Alposong (Malaysia)	Rm25 million
Alposong (Malaysia)	NewRing (UK)	£2·2 million
NewRing (UK)	Multidrop (Singapore)	S$4·0 million
Multidrop (Europe)	Alposong (Malaysia)	Rm8·3 million

Currency cross rates (mid-market) are as follows:

Currency		UK £	US $	Euro	Sing $	Rm
1 UK £	=	1·0000	1·4601	1·0653	2·1956	5·3128
1 US $	=	0·6849	1·0000	0·7296	1·5088	3·6435
1 Euro	=	0·9387	1·3706	1·0000	2·0649	4·9901
1 Sing $	=	0·4555	0·6628	0·4843	1·0000	2·4150
1 Rm	=	0·1882	0·2745	0·2004	0·4141	1·0000

You may assume settlement will be at the mid-market rates quoted.

Required:

(a) Calculate the inter group and inter-company currency transfers that will be required for settlement by Multidrop (Europe). (12 marks)

(b) Discuss the advantages and disadvantages of netting arrangements with both group and non-group companies. (8 marks)

(20 marks)

Formulae

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

$$E(r_i) = R_f + \beta_i (E(r_m) - R_f)$$

The asset beta formula

$$\beta_a = \left[\frac{V_e}{(V_e + V_d(1 - T))}\beta_e\right] + \left[\frac{V_d(1 - T)}{(V_e + V_d(1 - T))}\beta_d\right]$$

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

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

The Put Call Parity relationship

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

Modified Internal Rate of Return

$$MIRR = \left[\frac{PV_R}{PV_I}\right]^{\frac{1}{n}}\left(1 + r_e\right) - 1$$

The Black-Scholes option pricing model	The FOREX modified Black-Scholes option pricing model
$c = P_a N(d_1) - P_e N(d_2) e^{-rt}$ Where: $d_1 = \frac{\ln(P_a / P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$ $d_2 = d_1 - s\sqrt{t}$	$c = e^{-rt}\left[F_0 N(d_1) - XN(d_2)\right]$ Or $p = e^{-rt}\left[XN(-d_2) - F_0 N(-d_1)\right]$ Where: $d_1 = \frac{1n(F_0 / X) + s^2 T/2}{s\sqrt{T}}$ and $d_2 = d_1 - s\sqrt{T}$

Present Value Table

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

Where r = discount rate
n = number of periods until payment

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
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	0·941	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	0·305	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

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
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	0·2704	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 $N(d)$, 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