Professional Level – Options Module

Advanced Financial Management

Tuesday 3 December 2013

Time allowed
Reading and planning: 15 minutes
Writing: 3 hours

This paper is divided into two sections:

Section A – This ONE question is compulsory and MUST be attempted

Section B – TWO questions ONLY to be attempted
Formulae and tables are on pages 7–11.

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

ACCA

Section A – This ONE question is compulsory and MUST be attempted

1   Since becoming independent just over 20 years ago, the country of Mehgam has adopted protectionist measures which have made it difficult for multinational companies to trade there. However, recently, after discussions with the World Trade Organisation (WTO), it seems likely that Mehgam will reduce its protectionist measures significantly.

Encouraged by these discussions, Chmura Co, a company producing packaged foods, is considering a project to set up a manufacturing base in Mehgam to sell its goods there and in other regional countries nearby. An initial investigation costing $500,000 established that Mehgam had appropriate manufacturing facilities, adequate transport links and a reasonably skilled but cheap work force. The investigation concluded that, if the protectionist measures were reduced, then the demand potential for Chmura Co's products looked promising. It is also felt that an early entry into Mehgam would give Chmura Co an advantage over its competitors for a period of five years, after which the current project will cease, due to the development of new advanced manufacturing processes.

Mehgam's currency, the Peso (MP), is currently trading at MP72 per $1. Setting up the manufacturing base in Mehgam will require an initial investment of MP2,500 million immediately, to cover the cost of land and buildings (MP1,250 million) and machinery (MP1,250 million). Tax allowable depreciation is available on the machinery at an annual rate of 10% on cost on a straight-line basis. A balancing adjustment will be required at the end of year five, when it is expected that the machinery will be sold for MP500 million (after inflation). The market value of the land and buildings in five years' time is estimated to be 80% of the current value. These amounts are inclusive of any tax impact.

Chmura Co will require MP200 million for working capital immediately. It is not expected that any further injections of working capital will be required for the five years. When the project ceases at the end of the fifth year, the working capital will be released back to Chmura Co.

Production of the packaged foods will take place in batches of product mixes. These batches will then be sold to supermarket chains, wholesalers and distributors in Mehgam and its neighbouring countries, who will repackage them to their individual requirements. All sales will be in MP. The estimated average number of batches produced and sold each year is given below:

Year	1	2	3	4	5
Batches produced and sold	10,000	15,000	30,000	26,000	15,000

The current selling price for each batch is estimated to be MP115,200. The costs related to producing and selling each batch are currently estimated to be MP46,500. In addition to these costs, a number of products will need a special packaging material which Chmura Co will send to Mehgam. Currently the cost of the special packaging material is $200 per batch. Training and development costs, related to the production of the batches, are estimated to be 80% of the production and selling costs (excluding the cost of the special packaging) in the first year, before falling to 20% of these costs (excluding the cost of the special packaging) in the second year, and then nil for the remaining years. It is expected that the costs relating to the production and sale of each batch will increase annually by 10% but the selling price and the special packaging costs will only increase by 5% every year.

The current annual corporation tax rate in Mehgam is 25% and Chmura Co pays annual corporation tax at a rate of 20% in the country where it is based. Both countries' taxes are payable in the year that the tax liability arises. A bi-lateral tax treaty exists between the two countries which permits offset of overseas tax against any tax liabilities Chmura Co incurs on overseas earnings.

The risk-adjusted cost of capital applicable to the project on $-based cash flows is 12%, which is considerably higher than the return on short-dated $ treasury bills of 4%. The current rate of inflation in Mehgam is 8%, and in the country where Chmura Co is based, it is 2%. It can be assumed that these inflation rates will not change for the foreseeable future. All net cash flows from the project will be remitted back to Chmura Co at the end of each year.

Chmura Co's finance director is of the opinion that there are many uncertainties surrounding the project and has assessed that the cash flows can vary by a standard deviation of as much as 35% because of these uncertainties.

Recently Bulud Co offered Chmura Co the option to sell the entire project to Bulud Co for $28 million at the start of year three. Chmura Co will make the decision of whether or not to sell the project at the end of year two.

Required:

(a) Discuss the role of the World Trade Organisation (WTO) and the possible benefits and drawbacks to Mehgam of reducing protectionist measures. (9 marks)

(b) Prepare an evaluative report for the Board of Directors of Chmura Co which addresses the following parts and recommends an appropriate course of action:

    (i) An estimate of the value of the project before considering Bulud Co's offer. Show all relevant calculations; (14 marks)

    (ii) An estimate of the value of the project taking into account Bulud Co's offer. Show all relevant calculations; (9 marks)

    (iii) A discussion of the assumptions made in parts (i) and (ii) above and the additional business risks which Chmura Co should consider before it makes the final decision whether or not to undertake the project. (14 marks)

Professional marks will be awarded in part (b) for the format, structure and presentation of the report. (4 marks)

(50 marks)

Section B – TWO questions ONLY to be attempted

2   Awan Co is expecting to receive $48,000,000 on 1 February 2014, which will be invested until it is required for a large project on 1 June 2014. Due to uncertainty in the markets, the company is of the opinion that it is likely that interest rates will fluctuate significantly over the coming months, although it is difficult to predict whether they will increase or decrease.

Awan Co's treasury team want to hedge the company against adverse movements in interest rates using one of the following derivative products:

Forward rate agreements (FRAs);
Interest rate futures; or
Options on interest rate futures.

Awan Co can invest funds at the relevant inter-bank rate less 20 basis points. The current inter-bank rate is 4·09%. However, Awan Co is of the opinion that interest rates could increase or decrease by as much as 0·9% over the coming months.

The following information and quotes are provided from an appropriate exchange on $ futures and options. Margin requirements can be ignored.

Three-month $ futures, $2,000,000 contract size
Prices are quoted in basis points at 100 – annual % yield

December 2013:   94·80
March 2014:   94·76
June 2014:   94·69

Options on three-month $ futures, $2,000,000 contract size, option premiums are in annual %

	Calls		Strike		Puts	
December	March	June		December	March	June
0·342	0·432	0·523	94·50	0·090	0·119	0·271
0·097	0·121	0·289	95·00	0·312	0·417	0·520

Voblaka Bank has offered the following FRA rates to Awan Co:

1–7: 4·37%
3–4: 4·78%
3–7: 4·82%
4–7: 4·87%

It can be assumed that settlement for the futures and options contracts is at the end of the month and that basis diminishes to zero at contract maturity at a constant rate, based on monthly time intervals. Assume that it is 1 November 2013 now and that there is no basis risk.

Required:

(a) Based on the three hedging choices Awan Co is considering, recommend a hedging strategy for the $48,000,000 investment, if interest rates increase or decrease by 0·9%. Support your answer with appropriate calculations and discussion.   (19 marks)

(b) A member of Awan Co's treasury team has suggested that if option contracts are purchased to hedge against the interest rate movements, then the number of contracts purchased should be determined by a hedge ratio based on the delta value of the option.

Required:

Discuss how the delta value of an option could be used in determining the number of contracts purchased.
(6 marks)

(25 marks)

3 Makonis Co, a listed company producing motor cars, wants to acquire Nuvola Co, an engineering company involved in producing innovative devices for cars. Makonis Co is keen to incorporate some of Nuvola Co's innovative devices into its cars and thereby boosting sales revenue.

The following financial information is provided for the two companies:

	Makonis Co	Nuvola Co
Current share price	$5·80	$2·40
Number of issued shares	210 million	200 million
Equity beta	1·2	1·2
Asset beta	0·9	1·2

It is thought that combining the two companies will result in several benefits. Free cash flows to firm of the combined company will be $216 million in current value terms, but these will increase by an annual growth rate of 5% for the next four years, before reverting to an annual growth rate of 2·25% in perpetuity. In addition to this, combining the companies will result in cash synergy benefits of $20 million per year, for the next four years. These synergy benefits are not subject to any inflationary increase and no synergy benefits will occur after the fourth year. The debt-to-equity ratio of the combined company will be 40:60 in market value terms and it is expected that the combined company's cost of debt will be 4·55%.

The corporation tax rate is 20%, the current risk free rate of return is 2% and the market risk premium is 7%. It can be assumed that the combined company's asset beta is the weighted average of Makonis Co's and Nuvola Co's asset betas, weighted by their current market values.

Makonis Co has offered to acquire Nuvola Co through a mixed offer of one of its shares for two Nuvola Co shares plus a cash payment, such that a 30% premium is paid for the acquisition. Nuvola Co's equity holders feel that a 50% premium would be more acceptable. Makonis Co has sufficient cash reserves if the premium is 30%, but not if it is 50%.

Required:

(a) Estimate the additional equity value created by combining Nuvola Co and Makonis Co, based on the free cash flows to firm method. Comment on the results obtained and briefly discuss the assumptions made.

(13 marks)

(b) Estimate the impact on Makonis Co's equity holders if the premium paid is increased to 50% from 30%.

(5 marks)

(c) Estimate the additional funds required if a premium of 50% is paid instead of 30% and discuss how this premium could be financed. (7 marks)

(25 marks)

4 Nubo Co has divisions operating in two diverse sectors: production of aircraft parts and supermarkets. Whereas the aircraft parts production division has been growing rapidly, the supermarkets division's growth has been slower. The company is considering selling the supermarkets division and focusing solely on the aircraft parts production division.

Extracts from the Nubo Co's most recent financial statements are as follows:

Year ended 30 November	2013
	$m
Profit after tax	166
Non-current assets	550
Current assets	122
Non-current liabilities	387
Current liabilities	95

About 70% of Nubo Co's non-current assets and current assets are attributable to the supermarkets division and the remainder to the aircraft parts production division. Each of the two divisions generates roughly half of the total profit after tax. The market value of the two divisions is thought to be equivalent to the price-to-earnings (PE) ratios of the two divisions' industries. The supermarket industry's PE ratio is 7 and the aircraft parts production industry's PE ratio is 12.

Nubo Co can either sell the supermarkets division as a going concern or sell the assets of the supermarkets division separately. If the assets are sold separately, Nubo Co believes that it can sell the non-current assets for 115% of the book value and the current assets for 80% of the book value. The funds raised from the sale of the supermarkets division will be used to pay for all the company's current and non-current liabilities.

Following the sale of the supermarkets division and paying off the liabilities, Nubo Co will raise additional finance for new projects in the form of debt. It will be able to borrow up to a maximum of 100% of the total asset value of the new downsized company.

One of the new projects which Nubo Co is considering is a joint venture with Pilvi Co to produce an innovative type of machinery which will be used in the production of light aircraft and private jets. Both companies will provide the expertise and funding required for the project equally. Representatives from both companies will make up the senior management team and decisions will be made jointly. Legal contracts will be drawn up once profit-sharing and other areas have been discussed by the companies and agreed on.

Pilvi Co has approached Ulap Bank for the finance it requires for the venture, based on Islamic finance principles. Ulap Bank has agreed to consider the request from Pilvi Co, but because the financing requirement will be for a long period of time and because of uncertainties surrounding the project, Ulap Bank wants to provide the finance based on the principles of a Musharaka contract, with Ulap Bank requiring representation on the venture's senior management team. Normally Ulap Bank provides funds based on the principles of a Mudaraba contract, which the bank provides for short-term, low-risk projects, where the responsibility for running a project rests solely with the borrower.

Required:

(a) **Advise Nubo Co whether it should sell the supermarkets division as a going concern or sell the assets separately and estimate the additional cash and debt funds which could be available to the new, downsized company. Show all relevant calculations.** (7 marks)

(b) An alternative to selling the supermarkets division would be to demerge both the divisions. In this case, all of Nubo Co's liabilities would be taken over by the demerged supermarkets division. Also, either of the demerged companies can borrow up to 100% of their respective total asset values.

    Required:

    Discuss whether a demerger of the supermarkets division may be more appropriate than a sale. (6 marks)

(c) **Discuss why Ulap Bank may want to consider providing the finance based on a Musharaka contract instead of a Mudaraba contract, and the key concerns Nubo Co may have from the arrangement between Pilvi Co and Ulap Bank.** (12 marks)

(25 marks)

Formulae

Modigliani and Miller Proposition 2 (with tax)

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

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

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

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

$$c = P_a N(d_1) - P_e N(d_2) e^{-rt}$$

Where:

$$d_1 = \frac{\ln(P_a / P_e) + (r + 0.5s^2)t}{s\sqrt{t}}$$

$$d_2 = d_1 - s\sqrt{t}$$

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

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	0·914	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

[P.T.O.

Annuity Table

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

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	10·368	9·787	9·253	8·760	8·306	7·887	7·499	7·139	6·805	6·495	11
12	11·255	10·575	9·954	9·385	8·863	8·384	7·943	7·536	7·161	6·814	12
13	12·134	11·348	10·635	9·986	9·394	8·853	8·358	7·904	7·487	7·103	13
14	13·004	12·106	11·296	10·563	9·899	9·295	8·745	8·244	7·786	7·367	14
15	13·865	12·849	11·938	11·118	10·380	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