



CHARTERED ACCOUNTANTS EXAMINATIONS

PROFESSIONAL LEVEL

P3: STRATEGIC FINANCIAL MANAGEMENT

FRIDAY 19TH JUNE 2015

TOTAL MARKS – 100; TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES

1. You have fifteen (15) minutes reading time. Use it to study the examination paper carefully so that you understand what to do in each question. You will be told when to start writing.
2. This paper is divided into TWO sections:
Section A: One (1) compulsory question.
Section B: Four (4) Optional Questions. Attempt any three (3) questions.
3. Enter your student number and your National Registration Card number on the front of the answer booklet. Your name must **NOT** appear anywhere on your answer booklet.
4. Do **NOT** write in pencil (except for graphs and diagrams).
5. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
6. All workings must be done in the answer booklet.
7. Formulae, Present Value, Annuity and normal distribution tables are attached at the end of the question paper.
8. Graph paper (if required) is provided at the end of the answer booklet.

SECTION A

Attempt this one compulsory question.

QUESTION ONE

- (a) Due to a drastic reduction of water in its major water reservoirs over the years, Sioma Hydro Energy Company (SHEC), a multinational company based in Zambia is considering investing in a solar energy plant that would cost K188 million. The project would be financed as follows: K58 million from retained earnings, K55 million (net of costs) would be raised from a rights issue, K20 million is expected to be financed from a subsidised five year loan from a development bank and K55 million from a bank loan with a five year term at an annual fixed interest rate of 16%.

The subsidised loan is 4% cheaper than a bank term loan. Issue costs associated with the loans are 1.5%. The rights issue will incur administrative costs of 2.0%. This financing package is expected to fully utilize the project's debt capacity. The project is expected to generate after tax (but before WDA tax relief) net cash flows of K60 million annually over the company's five year investment horizon. The plant is expected to be disposed for K90 million at the end of the five years.

Corporate tax is at 30% and paid a year in arrears. Capital expenditure attracts a 25% per year capital allowance (WDA) on a reducing balance basis. The company has sufficient profits to utilize all capital allowances from the project. Companies in the energy industry have an Equity beta of 1.12, with average gearing of 70% equity and 30% debt by market values. The yield on the 91 day Treasury bill rate is 10% and the return on the market is 15.8%.

Assume that the solar energy project will have the same business risk with the company's hydro energy business and that corporate debt is risk free. The cost of equity should be rounded to a whole number.

Required:

- (i) Determine the adjusted present value (APV) of the proposed project and recommend whether it should be undertaken on financial grounds. (22 marks)
- (ii) Discuss two (2) merits and two (2) demerits of the APV method in comparison to other investment appraisal techniques. (8 marks)
- (b) Solar energy technology is a green technology and therefore its used by many companies to assist them in achieving the objective of becoming carbon neutral. However, solar technology is not without controversy. Price wars exist in the solar technology manufacturing industry, with companies in the west accusing those in the far

- east of business practices which are not fair, including receiving of state subsidies to make their products cheaper.

Required:

- (i) Explain four (4) ways in which governments in the far - east may restrict international trade in order to protect their local industries. (4 marks)
- (ii) Discuss three (3) possible consequences of removing trade barriers between countries. (6 marks)

[Total: 40 marks]

SECTION B

Attempt any Three (3) questions out of four (4) in this section.

QUESTION TWO

- (a) Levi Ltd is a multinational company with a regional head- office in Zambia and other subsidiaries in Namibia, Botswana and Kenya. The company uses the cost plus method in determining arm's length transfer prices for its Information Technology hardware and services. Under transfer pricing agreements with subsidiaries, total costs are defined as the total of direct costs plus the actual indirect costs and overheads amounting to 30% of direct costs. These are meant to cover head- office overheads.

Total costs incurred by the company on a product provided to a subsidiary are increased by a gross profit mark- up of 15% in arriving at the transfer price. The transfer price is limited to a maximum of that charged on the same or comparable product by a competitor.

Required:

- (i) Explain four (4) possible objectives of Levi Ltd when formulating its transfer pricing strategies. (4 marks)
 - (ii) Determine the transfer price, given that direct costs are K5 million, actual indirect costs amount to K2 million and a competitor based in South Africa is charging K12 million on a similar product. (6 marks)
- (b) Due to the absence of a centralized treasury function, transactions among subsidiaries and the holding company have previously not been coordinated. Consequently, the currency of invoice varied with each transaction. Transactions due in three months are shown below.

	Payments (read downwards) `million			
Receipts(read across) `million	Zambia	Namibia	Botswana	Kenya
Zambia	-	ZMW 20	BWP 40	USD3
Namibia	USD 4	-	NAD 15	USD 5
Botswana	USD 3	BWP 8	-	-
Kenya	KSh 100	USD 2	-	-

Direct exchange rates are as follows:

	ZMW/ USD	BWP/USD	NAD/USD	KSh/USD
Spot	6.20 - 6.22	9.26 - 9.30	11.28 - 11.30	89.28 – 89.30
Three Months Forward	6.25 - 6.28	9.33 - 9.35	11.32 - 11.35	90.00 – 90.01

Required:

Using forward foreign exchange mid – rates to convert receipts and payments to US Dollar, demonstrate how multilateral netting can reduce the number of transactions for the group in three months' time. (10 marks)

[Total: 20 marks]

QUESTION THREE

Siavonga Mines Plc is considering obtaining financing for a five-year project to search for a mineral called amethyst in Zambia. The company has in the past successfully prospected for minerals and is now quoted on the LuSE Alternative Investment Market. The company is currently financed by 12 million equity shares trading at K8.50 per share. It needs to borrow K16 million and is concerned about the high level of the fixed interest rates available from venture capital funds. The funders are prepared to offer finance against a mezzanine issue of fixed interest rate five-year notes with warrants attached. Each K100,000 note, repayable at par, would carry a warrant for 10,000 equity shares at an exercise price of K9.00 per share. The volatility (standard deviation) of the share returns is estimated to be 20% and the risk free rate of interest is 15%. The company does not pay dividends to its equity investors.

You may assume that the issue of these loan notes will not influence the current value of the firm's equity. The issue will be made at par.

Required:

- (a) Discuss the merits and de-merits of mezzanine finance when used to finance a green field project such as exploration for amethyst. (6 marks)

- (b) Estimate, using the Black-Scholes Option Pricing Model, the current value of each warrant to the lender, stating the assumptions that you have made in the valuation. (10 marks)
- (c) Estimate the coupon rate that would be required by the lenders if they wanted a 20% rate of return on their investment. (4 marks)

[Total: 20 marks]

QUESTION FOUR

- (a) Assume that it's now the end of June and your company has a commitment to borrow £10 million in five months' time for a period of three months. Financial market analysts project that the interest rates could significantly increase in five months' time. Your company can currently borrow at LIBOR + 1.5%. Three months LIBOR is at 6.5%.

Current LIFFE £500,000 sterling three-month futures prices are:

September	93.10
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December	92.80
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Assume that futures contracts mature at the end of the relevant month.

Required:

- (i) Explain how your company could set up a futures hedge to protect it against the potential interest rate risk. (6 marks)
- (ii) Assuming an increase of 2% in LIBOR, estimate the futures price for the hedge at the close out of the contract. Include a brief discussion of whether it is a perfect hedge or not. (8 marks)
- (b) Your company has a four year 8% annual coupon bond with a gross redemption yield of 9%. It was issued at a par value of K100 and redeemable at 5% premium.

Ignore taxation.

Required:

- (i) Calculate the modified duration. (4 marks)
- (ii) Explain one (1) limitation of duration. (2 marks)

[Total: 20 marks]

QUESTION FIVE

- (a) The global debt crisis was as a result of the decrease of the ability to repay the debt by less developed countries (LDCs). The debt crisis has a number of negative impacts on the multinational firms which undertake Foreign Direct Investment (FDI) in less developed countries. Many of these negative impacts include reduction in profitability, devaluation of the domestic currency and lack of capital inflows are as a result of the economic policies adjustment imposed on debtor countries by the International Monetary Fund (IMF).

Required:

- (i) Based on the information above, discuss the effects on a multinational firm of the economic policies adjustment imposed on LDCs by IMF. (8 marks)
- (ii) Explain three (3) general pre-conditions that the IMF places on its loans to debtor countries. (3 marks)
- (b) Assume your company is based in the UK. It expects to receive \$2 million on 14 November and today is 12 September. Today's spot rate is \$/£ 1.5100 – 1.5198.

Futures prices as at 12 September are:

	\$/£ (£62,500) contracts
September	1.5120
December	1.5134
March	1.5149

The spot rate on 14 November, 2015 is \$/£ 1.5210 – 1.5305.

December futures: 1.5283

Required:

Devise the futures hedge and show the outcome.

(9 marks)

[Total: 20 marks]

END OF PAPER

P3 STRATEGIC FINANCIAL MANAGEMENT SOLUTIONS

SOLUTION ONE

1(a)(i)

Adjusted Present Value

	K'million
Base case present value	79.07
PV of bank term loan tax shield	7.45
PV of tax relief on concessional loan	2.03
PV of annual interest savings on concessional loan	2.62
PV of tax relief lost on annual interest savings on concessional loan	(0.68)
PV of the rights issue costs	(1.12)
PV of after – tax loan issue costs	(0.79)
APV	88.58

Given the positive APV from the financial analysis, the company, SHEC should undertake the solar power plant.

Base case NPV

	K'million					
	Outlay on plant	Cash flows	Tax saving on capital allowances	Net cash flow	DF@15%	PV
0	(188)			(188)	1	(188)
1		60		60	0.870	52.2
2		60	14.10	74.1	0.756	56.01
3		60	10.58	70.58	0.658	46.44
4		60	7.93	67.93	0.572	38.86
5	90	60	5.95	155.95	0.497	77.50
6			(9.15)	(9.15)	0.432	(3.95)
					NPV	79.07

Calculation of ungeared cost of equity and pre – tax cost of debt

$$\beta_{\text{asset}} = \beta_e (\text{equity beta}) \times E/E+D(1-t) = 1.12 \times 7/7+3(1-0.3) = \underline{0.86}$$

$$K_e = R_f + \beta_a (R_m - R_f) = 10\% + [15.8\% - 10\%] \times 0.86 = 14.8\%$$

Approximately = 15%

Capital Allowances

Yr		K' million	Tax benefit (30%)	Yr received
0	Cost of solar plant	188.00		
1	Capital allowances (25%)	(47.00)	14.10	2
	WDV	141.00		
2	Capital allowances (25%)	(35.25)	10.58	3
	WDV	105.75		
3	Capital allowances (25%)	(26.44)	7.93	4
	WDV	79.31		
4	Capital allowances (25%)	(19.83)	5.95	5
5	WDV	59.48		
	Disposal Proceeds	(90.00)		
	Balancing Charge	(30.52)	(9.15)	6

PV of financing side effects

- (i) PV of bank term loan tax shield

		K'million
Amount (Km)	Interest rate	Interest/yr
55	16%	8.8
Amount (Km)	Tax rate	Tax Relief
8.8	30%	2.64

$$K2.64 \times 5\text{yrPVAF}@16\% \times (1.16)^{-1} = 2.64 \times 3.274 \times 0.862 = \underline{\underline{K 7.45 \text{ million}}}$$

- (ii) PV of tax relief on concessional loan

		K'million
Amount (Km)	Interest rate	Interest/yr
20	12% (16 - 4)	2.4
Amount (Km)	Tax rate	Tax Relief
2.4	30%	0.72

$$K0.72 \times 5\text{yrPVAF}@16\% \times (1.16)^{-1} = 0.72 \times 3.274 \times 0.862 = \underline{\underline{K 2.03 \text{ million}}}$$

- (iii) PV of annual interest savings on concessional loan
 Interest saved annually = K20 million x 4% (16% - 12%) = K0.8 million
 $PV = K0.8 \text{ million} \times 5\text{yrPVAF}@16\% = 0.8 \times 3.274 = \underline{K2.62 \text{ million}}$
- PV of tax relief lost on annual interest savings on concessional loan
 K0.8 million x 30% = K0.24 annually
 $PV = K0.24 \times 5\text{yrPVAF}@16\% \times (1.16)^{-1} = 0.24 \times 3.274 \times 0.862 = \underline{(K0.68) \text{ million}}$
- (iv) PV of the rights issue costs
 Amount to be raised from rights issue is K55 million (net of issue costs of 2%)
 Gross amount to be raised is therefore $55/0.98 = K56.12 \text{ million}$
 Rights Issue costs = K56.12 m – K55m = (K1.12) million
- (v) PV of after – tax loan issue costs
 $(K55m + K20m) 1.5\% \times (1 - 0.3) = \underline{(K0.79) \text{ million}}$

1(a) (ii)

Merits of APV Method

- Considers value added by financing sources in addition to the actual project
- More flexible since it can be used to evaluate different project profiles
- Incorporates the benefits of other investment appraisal methods that consider time value of money

Demerits of APV Method

- Estimation of bankruptcy costs may be difficult
- More complex compared to NPV

1(b) (i)

Methods of protection

- Tariffs - import duties
- import quotas – imposing quantities
- exchange controls – restrictions to foreign currency
- and non – tariff restrictions – ie administrative barriers

1(b)(ii)

Consequences of removing trade barriers

- Certain local industries with comparative advantages will grow while others may contract
- Specialisation may result leading to economies of scale, cost advantages and better quality
- Decline in local industries may lead to unemployment
- Dumping of cheap products from developed economies may result
- Development of infant industries may be slowed

SOLUTION TWO

2 (a)

(i) Objectives of transfer pricing strategies

- Minimisation of corporate taxes by shifting profits from countries with high tax rates to countries with low tax rates.
- Complying with tax laws in countries it operates
- Minimisation of import duties
- Repatriation of profits in countries with exchange controls or anti – dumping laws
- Assessing performance of subsidiaries using market based transfer pricing methods

(ii) Calculation of transfer price

	K '000
Direct costs	5,000
Indirect costs	2,000
Overheads (30%)	<u>1,500</u>
Total costs	8,500
Mark - up (15%)	<u>1,275</u>
Transfer price	<u>9,775</u>

(b) Convert receipts and payments to US Dollar using forward mid - rates

	Payments (read downwards) USD'000				
Receipts (read across) USD'000	Zambia	Namibia	Botswana	Kenya	
Zambia	-	3,192.34	4,282.66	3,000.00	10,474.99
Namibia	4,000.00	-	441.11	5,000.00	9,441.11
Botswana	3,000.00	856.53	-	-	3,856.53
Kenya	1,111.05	2,000.00	-	-	3,111.05
Total payments	8,111.05	6,048.87	4,723.77	8,000.00	
Receipts minus payments	2,363.94	3,392.24	(867.24)	(4,888.95)	

	ZMW/1USD	BWP/1 USD	NAD/1 USD	KSh/1 USD
Three Months Forward	6.25 - 6.28	9.33 - 9.35	11.32 - 11.35	90.00 – 90.01
Three months forward (mid – rates)	6.27	9.34	11.34	90.01

The number of transactions can be reduced from ten payments to a maximum of three payments using multilateral netting.

SOLUTION THREE

3(a) Mezzanine finance or debt is a hybrid form of capital. The private equity or venture capitalist provides a mix of debt and equity. There is an option attached to the debt capital that in case of default of repayment, the debt will be converted into equity shares.

It is beneficial in that a small, high growth firm such as Siavonga mines plc can raise debt finance where the risk of default is high and there is also a low level of asset coverage for the loan. However, it can raise the financial risk of a start-up considerably, for instance by raising a loan of K16 million, Siavonga Plc would raise its market gearing from zero (assuming there is no current outstanding debt) to 13.6% (debt to total capitalisation). This increase in borrowing for a green field project may not be attractive to the commercial banks, and therefore requires specialized venture capital or private equity finance.

The advantage of issuing the debt with warrants is that it gives the lender the opportunity to participate in the success of the venture but with a reasonable level of interest payments assured. However, the disadvantage for the current equity investors is that the value of their investment will be reduced by the value of the warrants issued. Although it can be expensive, mezzanine finance can provide the K16million required for the project.

3(b) A warrant is an option attached to another financial instrument on issue which can be detached and negotiated independently of the underlying issue. Warrants are usually exercised over a longer term than traded options but can be valued in exactly the same way using the Black Scholes Option Pricing model as follows:

$$\text{Call value} = P_a N(d_1) - P_e N(d_2) e^{-rt}$$

P_a = underlying assets of the business = K8.50 per share (market price of shares)

P_e = exercise price = K9.00 per share

Risk free rate = 15%

Time to exercise = 5 years

Volatility = 0.20

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

$$d_1 = \left[\ln \frac{8.50}{9.00} + (0.15 + 0.5 \times 0.20^2) \times 5 \right] / 0.20\sqrt{5}$$

$$d_1 = \underline{\underline{1.7729}}$$

$$d_2 = d_1 - s\sqrt{t} = 1.7729 - 0.4472 = \underline{\underline{1.3257}}$$

$$N(d_1) = \underline{\underline{0.9616}}$$

$$N(d_2) = \underline{\underline{0.9066}}$$

$$\begin{aligned}\text{Call value} &= [K8.50 \times 0.9616] - [K9.00 \times 0.9066] \times e^{-0.15 \times 5} \\ &= K8.17 - [K8.1594 \times 2.7183^{-0.75}] = K8.17 - K3.85 = \mathbf{K4.32}\end{aligned}$$

Given that each warrant represents an option on 10,000 equity shares the value of each warrant is K43,200.

The Black Scholes model makes a number of assumptions:

1. The warrant is a 'European' style option.
2. The share price follows a log-normal distribution and is continuously traded.
3. Unrestricted short selling of the underlying security is permitted.
4. There are no market frictions such as taxes or transaction costs.
5. No dividends are paid during the life of the warrant.

These assumptions are less realistic with an Alt-M company such as Siavonga mines than with a large enterprise with a full listing. For example, the company's shares may not be actively traded or its equity may be inefficiently priced by the market.

3(c) The coupon rate is derived from the cash flow to the lender as follows:

(i).

	0	1	2	3	4	5
Coupon	(100,000)	$100 \times c\%$	$100 \times c\%$	$100 \times c\%$	$100 \times c\%$	$100 \times c\%$
Repayment						100,000
Call value	43,200					
Cash flow to lender	(56,800)	$100 \times c\%$	$100 \times c\%$	$100 \times c\%$	$100 \times c\%$	$100,000 + 100 \times c\%$

(ii).

Solve the following equation where $c\%$ is the coupon rate and A and Z are the five-year annuity and discount factors at 20% respectively:

$$56,800 = [100 \times c\% \times A] + [100,000 \times DF]$$

$$\text{Therefore: } 56,800 = [100 \times c\% \times 2.991] + [100,000 \times 0.402]$$

$$\text{Re-arranging equation: } c\% = [56,800 - (100,000 \times 0.402)] / (100 \times 2.991) = \mathbf{55.5\%}$$

A coupon rate of 55.5% would give an effective rate of return on the investment to the lenders of 20%.

SOLUTION FOUR

a) (i)

- The company will borrow in late October after expiry of September contracts; therefore it will use December futures contracts.
- The company will hedge against a possible increase in interest rates by selling December futures contracts now. If interest rate rise the futures price will fall and the company will make a futures profit by buying back at a lower price than it sold.
- The company will need to sell 20 (£10million/£0.5million) Number of December three- months sterling contracts at an excise price of 92.80

(ii)	June	November
Cash market (100-6.5)	93.50	(100-8.5) 91.50
December future price	<u>92.80</u>	<u>91.38</u>
	<u>0.70</u> x 1/6	<u>0.12</u>

The futures price and cash market price will converge to the same value at the maturity date of the futures contract at the end of December.

If the interest rates increase by 2% to the equivalent of 91.50 in the cash market, the futures price is expected to move to 91.38. The loss of 2% in the cash market will be offset by a gain of 1.42% (92.80 – 91.38) in the futures market, which is an imperfect hedge. However, there is no guarantee that the basis at the end of November will be 12 basis points.

b) (i)

Year	1	2	3	4
Cash flow	8	8	8	113
Discount@9%	0.917	0.842	0.772	0.708
Present value	7.336	6.736	6.176	80.004

$$\text{Duration} = \frac{(7.336 \times 1) + (6.736 \times 2) + (6.176 \times 3) + (80.004 \times 4)}{100.252}$$

$$\text{Duration} = 359.352 / 100.252 = 3.584 \text{ years}$$

$$\text{Modified duration} = 3.584 / 1.09 = 3.289$$

ii) Limitation

The main limitation of duration is that it assumes a linear relationship between interest rates and price i.e it assumes that for a certain percentage change in interest

rates there will be an equal percentage change in price. However, as interest rates change the bond price is unlikely to change in a linear fashion.

SOLUTION FIVE

a) (i)

Reduction in profitability

IMF imposes deflationary policies on LDCs which are likely to damage the profitability of Multinationals' Subsidiaries by reducing their sales in the local market. These deflationary policies are designed to improve the balance of payments position of the debtor countries by reducing their imports and boosting exports. Higher interest rates are likely to be introduced to suppress domestic consumers demand for imports. However, higher interest rates will tend to dampen domestic investment and could result in increased unemployment and loss of business confidence.

Devaluation of the domestic currency

In order to try to boost the exports, LDCs will adopt the policy of devaluing the domestic currency. The country will be able to sell its exports more cheaply in foreign currency terms, while imports to the country will become more expensive. This will adversely affect the level of operating costs for multinational firms which make use of imported inputs to their production process

Lack of capital inflows

Most international banks have not been willing to provide increased capital inflows to the LDCs. As a result multinationals firms operating in these countries have been forced to rely more heavily on host country funding for their activities in those countries, which they may have preferred not to do.

(ii)

1. The Countries borrowing from IMF must get into a position to start repaying the loans fairly quickly. To do this, the countries must take effective action to improve their balance of payments position.
2. The Country should take action to reduce the demand for goods and services in the economy by increasing taxes and cutting government spending.
3. The debtor countries should comply with deflationary measures imposed by IMF. With these measures, the IMF wants the country to succeed in sorting out its balance of payments and international debt problems.

b)

- Converting at current spot rate= $\$2\text{m}/1.5198 = \text{£}1.32\text{million}$
- Buy December futures at 1.5134
- Number of contracts = $\$2\text{m} \div 1.5134 \div 62,500 = 21$

Outcome:

Underlying transaction on 14 November at spot = $\$2\text{m} \div 1.5305 = \text{£}1.31\text{million}$

Profit on futures market = $(1.5283 - 1.5134) \times 21 \times \text{£}62,500 = \$19,556.25$

$= \$19,556.25 \div 1.5305 = \text{£}0.01\text{m}$

Net receipts = $\text{£}1.31\text{m} + \text{£}0.01\text{m} = \text{£}1.32\text{m}$

END OF SOLUTIONS

Modified Internal Rate of Return

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

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	0.941	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
2		1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3		2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4		3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5		4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6		5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7		6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8		7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9		8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10		9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11		10.37	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12		11.26	10.58	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13		12.13	11.35	10.63	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14		13.00	12.11	11.30	10.56	9.899	9.295	8.745	8.244	7.786	7.367
15		13.87	12.85	11.94	11.12	10.38	9.712	9.108	8.559	8.061	7.606
(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
2		1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3		2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4		3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5		3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6		4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7		4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8		5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9		5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10		5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11		6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12		6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13		6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14		6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15		7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675

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.