OpenTuition

September 2024 to June 2025 exams

ACCA

Advanced Financial Management (AFM)

Spread the word about OpenTuition, so that all ACCA students can benefit.

How to use OpenTuition:

1) Register & download the latest notes
2) Watch ALL OpenTuition free lectures
3) Attempt free tests online
4) **Question practice is vital** - we recommend Interactive BPP Revision & Exam Kit

IMPORTANT!!! PLEASE READ CAREFULLY

To benefit from these notes you **must** watch our free lectures on the OpenTuition website in which we explain and expand on the topics covered.

In addition question practice is vital!!

You **must** obtain a current edition of a Revision / Exam Kit. It contains a great number of exam standard questions (and answers) to practice on.

OpenTuition recommends the interactive books from BPP (an ACCA Approved Content Provider).
If you order on line, you can buy study materials from BPP with our 20% discount code: **bppacca20optu**

You should also use the free "Online Multiple Choice Tests" which you can find on the OpenTuition website:
https://opentuition.com/acca/

Advanced Financial Management (AFM)

Access FREE ACCA AFM online resources on OpenTuition:

AFM Lectures (complete course)
To fully benefit from these notes you should watch our free AFM lectures

AFM Revision Lectures
Watch our AFM revision lectures working through the past ACCA exam questions

Ask the Tutor
Post questions to our ACCA AFM tutor

New! Ask ACCA AI Tutor
Post your questions & get instant answers >>

visit https://opentuition.com/acca/afm/

FORMULAE

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

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

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

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	10·368	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.

Chapter 1

OBJECTIVES OF ORGANISATIONS

1. Introduction

The purpose of this chapter is to introduce the framework within which financial managers operate, and to identify the main areas where they have to make decisions (and also you, in the examination!).

2. Stakeholders

There are many types of organisations and many different groups that have a stake in the performance of the organisations.

2.1. These groups include:

- Shareholders
- The community at large (in particular, environmental considerations)
- Employees of the company
- Managers / directors of the company
- Customers
- Suppliers
- Finance providers (lenders)
- The government

The interests of all stakeholders need to be balanced.

In the UK (and the USA) the focus is on the shareholders, on the basis that it is the shareholders that have a risk and return relationship with the company. The aim is to maximise shareholders' wealth **(maximising)** while at the same time satisfying the requirements of the other stakeholders **(satisficing)**.

In many countries of mainland Europe, and Japan, the focus is more on maximising corporate wealth which includes technical, human and market resources.

3. Maximising shareholders wealth

Shareholders wealth is measured by the market value of their shares. It is important therefore for the financial manager to consider the likely impact on the share price of alternative strategies, and to choose those that are likely to increase the share price.

We will discuss in a later chapter the factors that affect the market values of shares.

4. Types of strategic decisions to be made by the financial manager

The main types of decisions that need to be made (and the main areas for consideration for the examination) are:

- Investment decisions
- Sources of finance decisions
- Decisions regarding the level of dividend to be paid
- Decisions regarding the hedging of currency or interest rate risk

5. Share ownership in the UK

Whereas many years ago the majority of shares in companies were owned by individuals, the pattern has changed dramatically.

These days individual shareholdings account for less than 20% of total share ownership, with the majority of shares being owned by institutional investors. These comprise pension funds, insurance companies and unit trusts.

The dominance of institutional investors is important for the financial managers in that their needs may be different from the needs of individual shareholders. The financial manager needs to be aware of the main types of shareholders in his company.

Chapter 2

CONFLICTS OF INTEREST AND THEIR RESOLUTION

1. Introduction

The various stakeholders in a company are likely to have conflicting interests. In particular the interests of directors may not directly coincide with the interests of the shareholders, even though they are working for the shareholders.

The purpose of this chapter is to consider these conflicts and look briefly at ways of attempting to achieve goal congruence (i.e. to remove the conflicts of interest).

2. Directors' behaviour

Directors are agents for the shareholders and are supposed to be acting in the best interests of the shareholders of their company. However, in recent years they have been accused of having made decisions on the basis of their own self-interest.

Specific allegations include:

- **Excessive remuneration levels**
- **Empire building**

  Chief executives may have the aim of building as large a group as possible by takeovers – not always improving the return to shareholders
- **Creative accounting**

  Using creative techniques to improve the appearance of published accounts and artificially boosting the share price.

  Such techniques include capitalising intangibles on the balance sheet (e.g. development expenditures), putting a value on brands, recognising revenue on long-term contracts at the earliest possible time, not depreciating non-current assets.

  The Accounting Standards Board attempts to cut out creative accounting practices as much as practically possible.
- **Off balance sheet finance**

  For example, leasing assets rather than purchasing them (although this is now dealt with by the Accounting Standards)
- **Takeover bids**

  There have been many instances of directors spending time and money defending their company against takeover bids, even when the takeover would have been in the best interests of the shareholders.

  One reason for this is suggested as being that the directors are frightened for their own jobs were the takeover bid to succeed.

- **Unethical activities**

  Such as trading with unethical countries, using 'slave' labour, spying on competitors, testing products on animals.

3. Agency theory

Agency theory is the relationship between the various interested parties in the firm.

An agency relationship exists when one party, the principal, employs another party, the agent, to perform a task on their behalf.

For example, a manager is an agent of the shareholders. Similarly, an employee is an agent of the managers.

Conflicts of interests exist when the interests of the agent are different from the interests of the principal. For example, an employee is likely to be interested in higher pay whereas the manager may want to cut costs.

It is therefore important for the principal to find ways of reducing the conflicts of interest. One example is to introduce a method of remuneration for the agent that is dependent on the extent to which the interests of the principal are fulfilled – e.g. a director may be given share options so that he is encouraged to maximise the value of the shares of the company.

4. Goal congruence

Goal congruence is where the conflict of interest is removed and the interests of the agent are the same as the interests of the principal.

The main approach to achieving this is through the remuneration scheme – an example of which was given in the previous section of this chapter, that of giving share options to the directors.

However, no one scheme is likely to be 'perfect'. For example, although share options encourage directors to maximise the value of shares in the company, the directors are more likely to be concerned about the short term effect of decision on the share price rather than worry about the long-term effect. The shareholders are more likely to be concerned with long-term growth.

An alternative approach is to introduce profit-related pay, for example by awarding a bonus based on the level of profits. However, again this may not always achieve the desired goal congruence – directors may be tempted to use creative accounting to boost the profit figure, and additionally are perhaps more likely to be concerned more with short-term profitability rather than long-term.

Chapter 3

STRATEGY FORMULATION

1. Introduction

This chapter is concerned with the principles of strategic planning. Most of the chapter relates to topics which you have studied before and is therefore revision. Additionally, there are topics in this chapter that are covered in much greater detail in other syllabuses. In this examination, you will not be examined in detail on these areas, but do not be afraid of drawing on your other knowledge when answering questions.

2. Business planning

Businesses must plan and control their operations so that decisions can be taken in line with the company's objectives.

2.1. Plans are usually classified into:

- **Strategic plans**, which are concerned mainly with external problems, and in particular with deciding which products or services to produce for which market.
- **Tactical plans,** which are concerned with ensuring that the company's resources are adequate for carrying out the strategic plans in order to reach the desired objective
- **Operational plans**, which are concerned with the way in which the company is to be run from day to day in order to optimise performance

A business plan is often regarded as being a combination of a strategic plan and a financial plan. The financial plan sets out quantified financial targets, which usually take the form of forecast financial statements. These are based on forecasts, and are derived from an analysis of past results and predictions of future changes within the economy/industry/company.

3. Financial analysis

Although you must be aware of several key measures of financial performance, it is important that you do not fall into the trap of simply calculating every ratio imaginable for every year available. What the examiner is after is much more of an over-view and being able to determine the key measures and to comment adequately.

The following points should be considered:

- **What is it that you are being asked to comment on?**

  For example, if you are looking at the information from the shareholders perspective, then growth (or otherwise) in the share price will be of great interest.

  However, if you are looking at how well the managers are performing, the growth (or otherwise) in the profit (to the extent to which they control it) is perhaps of more importance.

- **Growth:**

  Always make some comment as to the level of growth. The amount of detail required depends on the information available and the number of marks allocated, but growth in turnover, in profit, and in share price are all potentially relevant.

  Look at the overall level of growth and look for any trends, do not waste time doing detailed year-by-year analysis.

- **Areas for analysis:**

  Subject again to exactly what you are being asked to comment on, the following areas are likely to be worthy of consideration:

  - **Profitability** – how well a company performs, given its asset base
  - **Liquidity** – the short term financial position of the company
  - **Gearing** – the long-term financial position of the company
  - **Investors ratios** – how well investors will appraise the company

- **Bases for comparison:**

  Most measures mean little on their own, and are only really useful when compared with something.

  Depending on the information given in the question, any comparison is likely to be one of the following:

  - with previous years for the same company
  - with other similar companies
  - with industry averages

4. Common ratios

The following is a list of the most common ratios that may be appropriate. However, do not simply calculate every ratio for every question – think about what you are trying to consider and choose the most appropriate ratios. If relevant by all means calculate additional ratios – there is no one set of ratios.

4.1. Profitability ratios

(a) Return on capital employed (ROCE) $= \dfrac{\text{Profit before interest and tax (PBIT)}}{\text{Capital employed}} \%$

(b) Net profit margin $= \dfrac{\text{PBIT}}{\text{Turnover}} \%$

(c) Gross profit margin $= \dfrac{\text{Gross profit}}{\text{Turnover}} \%$

(d) Asset turnover $= \dfrac{\text{Turnover}}{\text{Capital employed}} \%$

Note: Capital employed = shareholders funds plus 'creditors amounts falling due after more than one year' plus long term provisions for liabilities and charges.

Net profit margin × asset turnover = ROCE

$$\frac{\text{PBIT}}{\text{Turnover}} \times \frac{\text{Turnover}}{\text{Capital employed}} = \frac{\text{PBIT}}{\text{Capital employed}}$$

4.2. Liquidity ratios

(a) Current ratio $= \dfrac{\text{Current assets}}{\text{Current liabilities}}$

(b) Acid test (quick ratio) $= \dfrac{\text{Current assets less inventory}}{\text{Current liabilities}}$

(c) Receivables period $= \dfrac{\text{Average receivables}}{\text{Credit sales}} \times 365$

(d) Inventory days $= \dfrac{\text{Average inventory}}{\text{Cost of sales}} \times 365$

(d) Payables period $= \dfrac{\text{Average payables}}{\text{Purchases}} \times 365$

4.3. Gearing ratios

(a) Gearing ratio $= \dfrac{\text{Prior charge capital (long term debt)}}{\text{Long term debt + equity (shareholders funds)}}$

(b) Interest cover $= \dfrac{\text{PBIT}}{\text{Interest}}$

(c) Operating gearing $= \dfrac{\text{Contribution}}{\text{PBIT}}$

4.4. Investor ratios

(a) P/E ratio = $= \dfrac{\text{Market price}}{\text{EPS}}$

(b) Earnings per share (EPS) $= \dfrac{\text{Earnings available for distribution to equity}}{\text{Number of shares in issue and ranking for dividend}}$

(c) Dividend yield = $= \dfrac{\text{Dividend per share}}{\text{Market price}}$

5. EBITDA

EBITDA is a financial performance measure that has appeared relatively recently. It stands for 'earnings before interest, taxes, depreciation and amortisation' and is particularly popular with high-tech startup businesses.

Consideration of earnings before interest and tax has long been common – before interest in order to measure the overall profitability before any distributions to providers and capital, and before tax on the basis that this is not under direct control of management.

The reason that EBITDA additionally considers the profit before depreciation and amortisation is in order to approximate to cash flow, on the basis that depreciation and amortisation are non-cash expenses.

A major criticism, however, of EBITDA is that it fails to consider the amounts required for fixed asset replacement.

Example: 1

Summary financial information for Repse plc is given below, covering performance over the last four years.

	Year 1	*Year 2*	*Year 3*	*Year 4*
Turnover	43,800	48,000	56,400	59,000
Cost of sales	16,600	18,200	22,600	22,900
Salaries and Wages	12,600	12,900	11,900	11,400
Other costs	5,900	7,400	12,200	13,400
Profit before interest and tax	8,700	9,500	9,700	11,300
Interest	1,200	1,000	200	150
Tax	2,400	2,800	3,200	3,600
Profit after interest and tax	5,100	5,700	6,300	7,550
Dividends payable	2,000	2,200	2,550	3,600
Average debtors	8,800	10,000	11,100	11,400
Average creditors	3,100	3,800	5,000	5,200
Average total net assets	33,900	35,000	47,500	50,300
Shareholders' funds	22,600	26,000	44,800	48,400
Long term debt	11,300	9,000	2,700	1,900
Number of shares in issue ('000)	9,000	9,000	12,000	12,000
P/E ratio (average for year)				
Repse plc	17.0	18.0	18.4	19.0
Industry	18.0	18.2	18.0	18.2

The increase in share capital was as a result of a rights issue.

Review Repse's performance in light of its objective being to maximise shareholder wealth.

6. Long-term versus short-term objectives

Most of the syllabus for the examination is concerned with achieving the long-term objectives of the company.

However, the position of the company in the short-term can not be ignored and can result in a conflict.

For example, a strategy aimed at long-term growth in the company might involve substantial investment that results in a fall in profitability in the short-term. The financial manager needs obviously to be aware of this conflict, consider the implications, and consider possible ways of mitigating the problem.

Another example concerns the working capital requirements of the company. A long-term strategy for growth might involve short-term cash deficiencies. The financial manager needs to be concerned with identifying the short-term implications and planning for ways of dealing with them.

Chapter 4

CORPORATE DIVIDEND POLICY

1. Introduction

The fundamental role of the financial manager is to maximise shareholders wealth. Since, in theory, the value of shares is heavily dependent on future expected dividends, it is important to consider the dividend policy of the company and the effect this may have on shareholders expectations.

2. Dividend irrelevance

Modigliani and Miller argued that the level of dividend is irrelevant and that is simply the level of profits that matters. Their logic was that it is the level of earnings that determines the dividends that the company is able to pay, but that the company has the choice as to how much to distribute as dividend and how much to retain for expansion of the company.

A large dividend will result in little future growth whereas a smaller dividend (and therefore more retention) will result in more growth in future dividend. It is expected future dividends that determine the share price and therefore the shareholders should be indifferent between the alternatives outlined above.

As a result, the company should focus on improving earnings rather than worry about the level of dividends to be paid.

3. Practical influences on dividend policy

Despite the above, shareholders are affected by the dividend policy of the company for various reasons:

(a) the signalling effect

If a company reduces a dividend then there is a danger that it will worry the shareholders, even if it results from increased retention and not from a fall in earnings. The danger is that whatever information is given to shareholders about the reasons, their immediate reaction might be to assume that the company is performing badly. If this is their reaction then they will reduce their future expectations with an adverse affect on the share price. Similarly an increase in the dividend payment may serve to increase their future expectations even if it results simply from a reduction in retention rather than an increase in earning.

(b) liquidity preference

Some shareholders invest for income and others for capital growth. If they require income then they will choose to invest in companies that have a record of high dividend payments whereas if they prefer growth then they will choose companies that have a record of lower dividends but more retention and expansion.

If, for example, an investor requires income and has therefore chosen a company paying high dividends, they are going to be unhappy if the company changes its policy and starts to retain a higher proportion of earnings.

Modigliani and Miller counter this by saying that since the expansion should increase the share price then shareholders needing cash can always sell some of the shares to recoup the fall in dividends. This is fine in theory, but ignores transaction costs and also the fact that shareholders can argue that their company should pay them their cash directly and not 'force' them to start selling shares.

(d) taxation

As stated already, the basic choice is between high dividends with low capital growth, or low dividends with high capital growth.

Dividend income is taxed differently from capital gains and therefore the tax position of the investors can influence their preference.

5. Practical dividend policy

In practice there is a tendency for companies to do two things in relation to dividends:

(a) to aim for a steady pattern of dividends

e.g. to have a policy of increasing dividends by 5% p.a.. This enables investors to choose the companies whose dividend policy they prefer, and avoids the signalling problem.

Clearly, the company can only maintain 5% growth in the long-term provided that they can achieve the same earnings growth. Therefore they follow a policy that they think is achievable and trust that years where earning grow in excess of 5% will fund years where earnings grow at less than 5%. They do however leave themselves open to a dramatic 'signalling' problem if they ever are forced to deviate from their stated policy.

(b) scrip dividends

a very common practice in recent years has been to offer investors the choice between taking dividends in cash or in shares. This overcomes the 'liquidity preference' problem by allowing each shareholder to choose whichever is best for them.

Chapter 5

BEHAVIOURAL FINANCE

1. Introduction

When we are asked to advise on a financial decision in the exam - whether it concerns, for example, advising which shares an investor should buy, or whether it concerns, for example, advising how much the financial manager should offer for the acquisition of another company - we assume that the investor or financial manager is acting rationally.

For example, if we are appraising a project we calculate the Net Present Value and if the NPV is positive then we advise that the project should be accepted - this is what rationally the decision should be.

In real life, investors and financial managers do not always make rational decisions and behavioural finance seeks to explain why this is the case.

It does so by examining the assumptions behind rational decision making and why those assumptions may not hold in real life.

2. Assumptions of rational decision making

The following assumptions underlie rational financial decision making:

(1) Financial decision makers seek to maximise their utility. By this we mean that investors wish to maximise the value of their portfolio of shares, and that financial managers wish to maximise the value of their company.

(2) Financial decision makers base their decisions on analysis of all relevant information.

(3) The analysis of financial information that they undertake is rational, objective, and risk-neutral.

We will examine each of these assumptions, firstly for investors, and secondly for financial managers.

3. Investors

3.1. Maximisation of utility.

As already stated, we assume that investors aim to maximise their long-term wealth. However they may decide not to invest in what may be financially attractive companies because they regard them to be unethical e.g. cigarette manufacturers. Also, it is common for investors to hold on to investments that have lost value (and are expected to continue to lose value) because they do not wish to admit to themselves that they made a mistake in not selling them sooner.

3.2. Analysis of relevant information

The most relevant information in deciding where to invest is information as to the future prospects of the company in question. However, other, irrelevant, factors may influence the decision. For example, buying shares in a company because many others are buying the shares (the herd instinct) or selling shares because the price has been rising for some time, and therefore feeling that the price cannot continue to rise.

3.3. Rational, objective and risk-neutral analysis

However much relevant information is available, we assume that investors use all of this information rationally and objectively, but this is not always the case. There is a tendency to attach more importance to the elements of information available that confirm beliefs that they already have, and less importance to other information.

4. Financial managers

4.1. Maximisation of utility

The objective of financial managers is to maximise shareholders wealth. However there have been many examples of situations where decisions have not been rational. For example, they may have made a rational offer for the acquisition of another company, but have ended up paying more than is rational because other companies have made bids and they have ended up in competition with them - they end up paying more than is rational rather than lose out to another company.

4.2. Analysis of relevant information

One big unknown when considering the amount to offer for the acquisition of another company is the extent to which the management of the acquiring company will be able to improve the results of the target company.The managers of the acquiring company may have an unrealistic opinion as to their skills in this respect and as a result may end up paying too much for the target company.

4.3. Rational, objective and risk-neutral analysis

It is difficult for all decision makers to be completely objective when making decisions and to therefore give equal importance to all relevant information. Just as previously explained in respect of investors, financial managers are likely to attach more importance to those elements of information that confirm their basic feelings, and less importance to other elements of information.

Chapter 6

THE COST OF CAPITAL

1. Introduction

This chapter should be revision of your studies for previous examinations.

However, you do need to work through the chapter carefully. You will already be aware of the need to know the Cost of Capital in order to perform net present value calculations, and in this chapter we look at how it may be calculated.

2. The cost of equity

If a company is trying to decide whether or not to invest in a new project, they will need to know the cost of the money being used. If the project is being financed by shareholders (either by way of a new issue of shares, or by the use of retained earnings), then we need to be able to calculate the rate of return that shareholders will require.

One way that we are able to estimate the likely cost of future equity finance is to look at the existing shares and determine what rate of return the shareholders are currently demanding.

We can do this for quoted shares by using the principle that the market value of a share depends on the future expected dividends and the shareholders required rate of return.

For quoted shares we know the market value (it is printed in the newspapers!) and therefore if we know the future expected dividends, we can simply work backwards.

Example 1

S plc has in issue $1 shares with a market value of $2.40 per share. A constant dividend of 30c per share has just been paid.

What is the shareholders required return (k_e), (and therefore the cost of equity to the company)?

The problem with this example is that it assumes that shareholders are expecting a constant dividend. In practice, as we discusses before, it is more likely that they are expecting growth in dividends.

When there is growth in dividends we use the following formula.

The formula is:

$$k_e = \frac{D_0(1+g)}{P_0} + g$$

(Note: this formula is given on the formula sheet - "The Growth Model"
– but needs rearranging to get the formula here)

where: k_e = the shareholders required rate of return (= cost of equity)
D_0 = the current dividend
P_0 = the current market value per share (ex div)
g = the rate of dividend growth p.a.

Example 2

T plc has in issue 50c shares with a market value of $4.20 per share. A dividend of 40c per share has just been paid.

Dividends are growing at 6% p.a..

What is the cost of equity?

Example 3

U plc has in issue $1 shares with a market value of $3.60 per share. A dividend of 30c per share has just been paid.

Dividends are growing at 8% p.a..

What is the cost of equity?

3. Estimating the rate of growth in dividends

When using the formula for the cost of equity, we need to know the rate of dividend growth that shareholders expect in the future. If this figure is given us in the examination then there is obviously no problem.

However, you may be expected to estimate the dividend growth rate using one of two approaches:

- using the rate of growth in the past
- using the 'rb' model

3.1. Past dividend growth

Example 4

It is now the year 2001, and X plc has paid out the following total dividends in past years:

1996	$28,000
1997	$29,000
1998	$32,000
1999	$31,000
2000	$33,000

Estimate the average rate of growth of dividends p.a..

3.2. 'rb' growth

This approach considers the reason for growth in dividends. In order to have long-term growth in dividends, the company needs to achieve long-term growth in earnings.

In order to achieve long-term earnings growth, the company needs to expand, which will require additional investment. The only long-term, continual source of finance that shareholders will be in a position to expect is the retention of earnings. If all earnings are distributed as dividends then shareholders will not be in a position to expect growth, whereas the more of the earnings that are retained for expansion then the more growth shareholders will be expecting.

The growth can be estimate using the following formula:

$$g = r\,b$$

where: b = the proportion of earnings retained in the company

r = the rate of return that the company can earn on re-investment

What follows is a short illustration of the principle of rb growth:

Illustration

COMPANY A

Earnings $100, all distributed as dividend (no retention)

	Yr 0	*Yr 1*	*Yr 2*
Earnings	100	100	100
Retained	–	–	–
Dividend.	100	100	100

High dividend; no dividend growth; no growth in market value

COMPANY B

Earnings $100; 40% distributed as dividend. Retention is re-invested at 10% p.a.

	Yr 0		*Yr 1*		*Yr 2*
Earnings	100.00		100.00		106.00
		@10%	6.00	@10%	6.36
			106.00		112.36
Retained	60.00	(60%)	63.60		67.42
Dividend	40.00		42.40		44.94
		6%		6%	

Lower dividend; growth in dividends; growth in market value.

Growth rate = r × b = 10% × 60% = 6% p.a.

Example 5

Y plc retains 40% of earnings each year and is able to reinvest so as to earn a return of 20% p.a.

What is the expected growth rate in dividends?

Example 6

Z plc has in issue $1 shares with a market value of $2.80 per share. A dividend of 20c per share has just been paid (earnings per share were 32c).

The company is able to invest so as to earn a return of 18% p.a..

(a) Estimate the rate of growth in dividends
(b) Estimate the cost of equity
(c) Estimate the market value per share in 2 years time

4. The cost of debt

If we intend to raise debt to finance a project then we need to estimate the return that debt lenders will require. The best way we can estimate this is to look at existing debt in the company and calculate the current cost.

If the company has traded debt, we can do this by using the valuation theory backwards! We know the current market value and the future receipts and can therefore calculate the investors' required rate of return.

There is one additional problem however. Although it is the investors required rate of return that determines the rate of interest that the company has to pay, we assume that any debt interest payable attracts tax relief for the company and that therefore the actual cost of debt to the company is lower. (Note: throughout this examination we ignore the effect of income tax on the investor)

4.1. Irredeemable debt

Irredeemable debt is debt that is never repaid. It does not exist in practice, but in the examination you assume debt to be irredeemable unless told otherwise.

Example 7

F plc has in issue 8% irredeemable debentures quoted at 90 p.c. ex int.

(a) What is the return to investors (k_d) ?
(b) What is the cost to the company, if the rate of corporation tax is 30% ?

4.2. Redeemable debt

Example 8

G plc has in issue 6% debentures quoted at 85 ex int.

The debentures are redeemable in 5 years time at a premium of 10%

(a) What is the return to investors (k_d) ?
(b) What is the cost to the company if the rate of corporation tax is 30%?

5. The weighted average cost of capital (WACC)

In the previous sections we have seen how to calculate the cost of both equity and debt.

However, most company are financed using a mixture of both equity and debt.

It is useful for our later work to be able to calculate the average cost of capital to the company. We do this by calculating the cost of each source of finance separately (as in the previous sections) and then calculating a weighted average cost, using the ex div/int market values of the equity and debt.

Example 9

J plc is financed as follows:

Equity – 5 million $1 shares quoted at $2.50 cum div, on which a constant dividend of 32c per share is about to be paid.

Debt - $4M 8% debentures quoted at 92 ex int.

Corporation tax is 30%

Calculate the weighted average cost of capital

Example 10

K plc is financed as follows:

Equity – 10 million $1 shares quoted at $3.20 ex div, on which a dividend of 20c per share has just been paid. Dividends are growing at 8% p.a..

Debt - $6M 10% debentures quoted at 105 ex int. The debentures are redeemable in 6 years time at a premium of 10%

Corporation tax is 30%

Calculate the weighted average cost of capital

The weighted average cost of capital is often (but certainly not always) the rate that we use for the discounting of cash flows when we do investment appraisal. However, this chapter is simply about the arithmetic – we will discuss the relevance of the WACC in later chapters.

Chapter 7

PORTFOLIO THEORY

1. Introduction

In this and the following chapter on Capital Asset Pricing Model, we will look at what determines the return that shareholders require and therefore the cost of equity.

You cannot be asked for calculations on portfolio theory, but you are expected to be aware of the ideas involved, and this chapter is a vital lead-in to capital asset pricing model which certainly does involve calculations.

2. What determines the rate of return that shareholders require?

Why is it that shares in some companies are viewed as inherently more risky than shares in other companies? It is because the nature of their business is more risky. As a result, the potential fluctuations in profits (and hence dividends) in the future are greater. If things go well shareholders may well expect much higher dividends, but the risk is that things may go badly in which case they will receive much lower dividends. The greater the potential fluctuations in returns, the greater we say that the risk is.

3. What do we mean by risk?

The reason that we regard companies as risky is that their future earnings are not certain - they may increase or they may decrease. If we were certain that a company was going to earn $100,000 per year in the future then we would say that there was zero risk. However, this is obviously not the case in practice - we may be expecting an average of $100,000 a year, but clearly the actual earning may end up being higher or lower. That is the risk inherent in every company, and the more the potential fluctuations in earnings then the more risk there is in the company.

4. What creates the risk?

There are two reasons for the potential fluctuations in earnings and hence the risk.

The first reason relates to the industry within which the company operates. For example, the accountancy industry may be less risky that the oil industry. All companies are affected by the same general economic factors (such as the rate of inflation, the exchange rate) but different industries are affected to different degrees. Companies that import and export a lot will be affected by changes in exchange rates to a much greater degree than companies that do little or not importing and exporting.

This risk is known as **systematic** or **market risk**. Again, this is risk due to general economic factors, occurs in all companies, but the level of this risk differs between different types of businesses (different sectors).

So why therefore do not all oil companies have exactly the same level of risk?

This is because there is a second factor involved which is factors in the specific company. For example, a company (whatever sector it is in) may have just appointed a new managing director who may turn out to be excellent or may not. A company may have has poor labour relations in the past and lots of strikes - in the future things may get worse or, of course may improve. These are both examples of factors that create extra risk in the company over and above the systematic risk of the industry.

This risk is known as **unsystematic** or **company specific risk**.

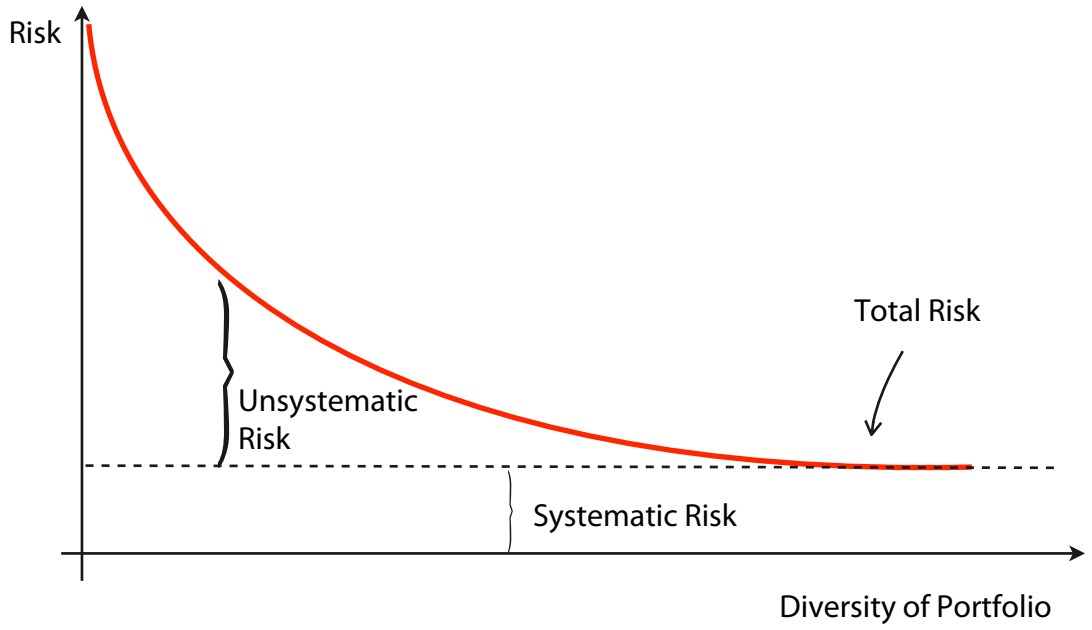
5. How can an investor minimise the risk?

Rather than invest all ones money just in one share (and therefore being subject to both the systematic and unsystematic risk), and investor should spread their money between several shares. In this way the unsystematic risk can be removed - some companies may do better, some may do worse, but they 'cancel' each other out. We call this diversifying away the risk by creating a portfolio of shares.

The systematic risk cannot be removed - all companies are affected by general economic factors and there is nothing we can do about this. We can choose the level of systematic risk that we want, by deciding which sectors (or mix of sectors) that we choose to invest in, and it is then the level of systematic risk that will determine the return required - more systematic risk then greater return, and vice versa.

This is the basis of the capital asset pricing model that we will look at in the next chapter. We assume that shareholders of large quoted companies are well-diversified, and have therefore diversified away the unsystematic risk. The only risk they are therefore concerned about is the level of systematic risk, and it is this that will determine the required return.

A well-diversified investor is one who has created a portfolio where the unsystematic risk has been fully diversified away. The only risk remaining will be systematic risk and it is the level of systematic risk that will determine the return required by the investor. It is this statement that forms the basis of the Capital Asset Pricing Model which will be covered in the next chapter.



Chapter 8

THE CAPITAL ASSET PRICING MODEL

1. Introduction

In the previous chapter on Portfolio Theory we looked at the nature of risk in share investments, and described what is meant by a well-diversified portfolio. In this chapter we will look at the importance of the systematic risk in relation to the return given by quoted shares and then discuss its relevance to project appraisal.

2. The return from quoted shares

Shareholders (as a whole) can get whatever return they require from a quoted share because they determine the market value of the share. The market value is determined by the expected future dividends and the investors' required rate of return.

We assume that the shareholders in a large quoted company are overall well-diversified (partly because there are many shareholders, but also because many of the shareholders will be pension funds and unit trusts that will have large portfolios).

If the shareholders' are well-diversified, then they will have diversified away all the unsystematic risk (portfolio theory) and will therefore only be concerned with the level of systematic risk. It is therefore the level of systematic risk that will determine the return that they require (and hence the return actually given) from the share.

Instead of measuring the systematic risk in isolation as a %, we normally measure it relative to the risk of the market as a whole (i.e. the stock exchange as whole). We call this the β of the share.

Since it is the level of the systematic risk in a share that determines the return required, we would expect that the higher the β the higher the required return (and the lower the β, the lower the required return!).

The most important formula of all in CAPM is the formula expressing the required return, which is as follows:

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

where: $E(r_i)$ = return from investment

R_f = risk free rate

r_m = return from the market

β_i = β of the investment

Example 1

Q plc has a beta of 1.5.

The market is giving a return of 12%,

The risk free rate is 5%.

What will be the required return from Q plc?

Example 2

T plc is giving a return of 20%.

The stock exchange as a whole is giving a return of 25%, and the return on government securities is 8%.

What is the β of T plc?

3. Calculating β in practice

In practice, it is assumed that CAPM 'works' and that therefore the return given by a share is determined by its β. It is therefore possible to calculate a β by working backwards (as in example 2 above).

However, even assuming that CAPM does work, it would be too perfect to assume that the formula works exactly from day-to-day – market imperfections will mean that on any one day the actual return may be slightly 'wrong'. In practice therefore the returns from a share are compared with those from the market over a long period and a β calculated in this way.

You will not be expected to do this in the examination.

4. Combining investments

If an investment is made in a combination of several shares with different levels of systematic risk, then the overall β will be the weighted average of the individual share β's.

Example 3

Matiss decides to invest his money as follows:

20% in A plc which has a β of 1.2

40% in B plc which has a β of 1.8

30% in C plc which has the same risk as the market

10% in government securities.

The market return is 20% and the risk free rate is 8%.

(a) What will be the overall β of his investments?
(b) What overall return will he be receiving?

5. Alpha values

We have already stated that even assuming that CAPM 'works' in practice, it would be unrealistic in the real world to expect that it works precisely at each moment in time. Even if it does work overall, it will not be surprising if some days the actual return is a little higher than it should be, and some days a little lower.

The alpha value is simply the difference between the actual return and the theoretical return (using CAPM).

Example 4

D plc has a β of 0.6 and is giving a return of 8%.

The market return is 10% and the risk free rate is 4%.

What is the alpha value of D plc?

6. Ungearing B's

Until now, we have been ignoring gearing and assuming that the companies in our examples have been all equity financed. In this case the risk of a share is determined solely by the risk of the actual business.

If, however, a company is geared, then a share in that company becomes more risky due to the gearing effect.

If, therefore, we are given the β of a share in a geared company, then the gearing in that company will have made the β higher than it would have been had there been no gearing. The β of a share measures not simply the riskiness of the actual business but also includes the gearing effect.

We therefore need to be careful when comparing the β's of shares in different companies. A higher β certainly means that the share is more risky, but it may be due to the fact that the company is more highly geared, or due to the fact that the business is inherently more risky, or a combination of the two!

The formula for removing the gearing effect is given in the examination and is:

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

where: β_a is the ungeared β (also knows as the asset β or earnings β)

β_e is the geared β (also known as the equity β or share β)

V_e and V_d are the market value of equity and debt

β_d is the β of debt

Note that although you are given this formula in full in the examination, we normally assume that debt is risk free and that therefore βd = 0, which makes the formula much shorter! In every relevant examination question so far we have been expected to make this assumption.

Example 5

P plc has a gearing ratio (debt to equity) of 0.4 and the β of its shares is 1.8.

Q plc has a gearing ratio of 0.2 and the β of its shares is 1.5.

The rate of corporation tax is 30%.

(a) Which is the more risky share?
(b) Which company has the more risky business activity?

7. The implications of CAPM for project appraisal

If the shareholders of a company are well-diversified, then their shares in this company are just part of their overall portfolio.

If the company is to invest the shareholders money in a new project, then the project should be appraised in the same way as the shareholders themselves would appraise the investment if they were invested their money in it directly.

If they were investing directly, then they would base their required return simply on the β of that investment (not on how it related to any particular other investment in their portfolio).

Therefore, when the company is appraising a new project they should calculate the β of the project, determine the required return for that β, and appraise the project at that required return.

How to calculate the β of a project? Find a similar quoted company and use the β of that company (ungeared if relevant).

We will illustrate the above with a full example:

Example 6

X plc is an oil company with a gearing ratio (debt to equity) of 0.4. Shares in X plc have a β of 1.48.

They are considering investing in a new operation to build ships, and have found a quoted shipbuilding company – Y plc. Y plc has a gearing ratio (debt to equity) of 0.2, and shares in Y plc have a β of 1.8.

The market return is 18% and the risk free rate is 8%.

Corporation tax is 25%

At what discount rate should X plc appraise the new project, if it is to be financed

(a) entirely from equity?

(b) by equity and debt in the ratio 50%/50%

Do note, however, that when there is a major change in gearing (as in the example) it is far better to take an Adjusted Present Value (APV) approach. This is commonly asked in the exam and will be explained in a later chapter.

Chapter 9

DISCOUNTED CASH FLOW TECHNIQUES

1. Introduction

Most of this chapter should be revision for you. It is however extremely important and so make sure that you revise it properly.

Of the few new items in this chapter, the most important is Modified Internal Rate of Return and you should make sure that you learn the technique involved.

2. Net present value calculations

Here is a list of the main points to remember when performing a net present value calculation. After we will look at a full example containing all the points.

- Remember it is **cash flows** that you are considering, and only cash flows. Non-cash items (such as depreciation) are irrelevant.
- It is only **future cash flows** that you are interested in. Any amounts already spent (such as market research already done) are sunk costs and are irrelevant.
- There is very likely to be **inflation** in the question, in which case the cash flows should be adjusted in your schedule in order to calculate the actual expected cash flows. The actual cash flows should be discounted at the actual cost of capital (the money, or **nominal** rate). (Note: alternatively, it is possible to discount the cash flows ignoring inflation at the cost of capital ignoring inflation (the **real** rate). We will remind you of this later in this chapter, but it is much less likely to be relevant in the examination.)
- There is also very likely to be **taxation** in the question. Tax is a cash flow and needs bringing into your schedule. There are two ways of dealing with tax (both giving the same end result). One way is to calculate the tax on the operating cash flows (an outflow) and then calculate the tax saving on the tax allowable depreciation (an inflow). The alternative is to subtract the tax allowable depreciation (capital allowances) to get the taxable profit. Then calculate the tax on the taxable profit, but then add back the capital allowances, because they are not a cash flow. For this exam, the second way is generally preferable for two reasons: firstly is is very common in the exam for the examiner to state that an investment is needed each year of an amount equal to the tax allowable depreciation for the maintenance of non-current assets - in which case we do not add back the tax allowable depreciation. Secondly, if there is a taxable loss, then there is no tax in that year but the loss is carried forward and subtracted from future taxable profits.
- You are often told that cash is needed to finance additional **working capital** necessary for the project. These are cash flows in your schedule, but they have no tax effects and, unless told otherwise, you assume that the total cash paid out is received back at the end of the project.

Example 1

Rome plc is considering buying a new machine in order to produce a new product.

The machine will cost $1,800,000 and is expected to last for 5 years at which time it will have an estimated scrap value of $1,000,000.

They expect to produce 100,000 units p.a. of the new product, which will be sold for $20 per unit in the first year.

Production costs p.u. (at current prices) are as follows:

Materials $8

Labour $7

Materials are expected to inflate at 8% p.a. and labour is expected to inflate at 5% p.a..

Fixed overheads of the company currently amount to $1,000,000. The management accountant has decided that 20% of these should be absorbed into the new product.

The company expects to be able to increase the selling price of the product by 7% p.a..

An additional $200,000 of working capital will be required at the start of the project.

Capital allowances: 25% reducing balance

Tax: 25%, payable immediately

Cost of capital: 10%

Calculate the NPV of the project and advise whether or not it should be accepted.

3. Internal rate of return

One problem with decision making using the Net Present Value is that the Cost of Capital is at best only an estimate and if it turns out to be different that the rate actually used in the calculation, then the NPV will be different. Provided that the NPV remains positive then the project will still be worthwhile, but if the NPV were to become negative that the wrong decision will have been made.

The Internal Rate of Return (IRR) is that rate of interest at which the NPV of the project is zero (i.e. breakeven).

In order to estimate the IRR we calculate the NPV at two different rates of interest, and then approximate between the two assuming linearity. (In fact, the relationship is not linear and so any estimate will only be approximate)

Example 2

For the project in example 1, calculate the Internal Rate of Return.

4. Problems with the use of the internal rate of return

Although the IRR is the 'breakeven' rate of interest for the project, and as such can be useful when we are not certain of the Cost of Capital for the company, it does have many drawbacks.

It is only a relative measure of wealth creation, it can have multiple solutions, and it does effectively assume that the cash flows produced by the project are re-invested at the IRR if it is used to choose between investments.

A possible better measure is the **Modified Internal Rate of Return (MIRR).**

5. Modified internal rate of return

The MIRR is quicker to calculate than the IRR and effectively assumes that the cash flows are re-invested at the Cost of Capital.

There are several ways of calculating it, but the method suggested by the examiner is to calculate the Present Value of the 'investment phase' (the flows in the years when the company is investing in the project); to calculate the Present Value of the 'return phase' (the flows in the years when the project is generating returns) and then to use the following formula (which is provided for you in the examination):

$$MIRR = \left[\frac{PV_R}{PV_1}\right]^{\frac{1}{n}}(1+r_e)-1$$

where: PV_R = the PV of the return phase

PV_I = the PV of the investment phase

n = the life of the project in years

and, r_e = the cost of capital

We will illustrate the calculation of the MIRR using the previous example.

Example 3

For the project in example 1, calculate the MIRR.

The MIRR is usually lower than the IRR, because it assumes that the proceeds are re-invested at the Cost of Capital. However in practice the proceeds are often re-invested elsewhere within the firm. It does however have the advantage of being much quicker to calculate than the IRR.

6. Foreign investment appraisal

One way in which the examiner can create more work in a NPV question is for it to be a company investing in a project in another country - the other country using a different currency. Although there are not really any extra techniques involved, we will work through an example in order to illustrate the approach needed.

Example 4

James plc, a company in the U.K, is considering investing in a project in Oblivia, a country that uses the Euro.

They have prepared the following forecasts over the 5 year planning horizon:

Year	*1*	*2*	*3*	*4*	*5*
Revenue (€'000's)	2,000	2,500	4,000	3,000	2,000
Operating costs (€'000's)	500	800	1,000	1,000	500

In addition. the subsidiary will pay royalties to James plc of £100,000 per year.

Tax in Oblivia is 20%, payable immediately, and tax allowable depreciation is at the rate of 20% p.a. straight line. An amount equal to the amount of the tax allowable depreciation is required each year for the maintenance of non-current assets.

The initial investment in the operation is €5,000,000 and there is no residual value at the end of the planning horizon.

All net cash surpluses will be remitted to the U.K. each year. The tax rate in the UK is 25%, payable immediately, and a double taxation treaty exists between the U.K. and Oblivia.

The forecast exchange rates are as follows (€'s per £):

Year	
0	1.10
1	1.15
2	1.20
3	1.20
4	1.25
5	1.25

James plc's cost of capital is 15%.

Calculate the NPV of the project and advise whether or not it should be accepted.

7. Inflating perpetuities

Although the majority of investment appraisal questions are over a fixed time period as in the previous examples, it is reasonably common to be required to calculate the present values of cash flows continuing into perpetuity. We can use the 'growth model' formula given on the formula sheet in order to deal with this.

Example 5

Cash flows have been forecast at $5,000 p.a. in perpetuity, inflating at 4% p.a..

The cost of capital is 20%.

Calculate the present value of the cash flows.

This example was perhaps a little bit too easy, and so to introduce a common 'complication', let us look at another example.

Example 6

Cash flows have been forecast as an actual $5,000 in the first year; an actual $6,000 in the second year; and an actual $7,000 in the third year, thereafter inflating at 5% per year.

The cost of capital is 20%.

Calculate the present value of the cash flows.

8. Multi-Period Capital Rationing

Capital rationing is the situation when the company has several projects that they wish to invest it, but only have a limited amount of capital available for investment.

You will remember that when there is limited capital in only one year (single-period capital rationing) then we rank the projects based on the NPV per $ invested (the profitability index).

However, it is more likely in practice that investment is needed in more than one year and that capital is rationed also in more than one year. This situation is known as multi-period capital rationing and the solution requires using linear programming techniques. As you will see in the example that follows, you will not be required to solve the problem, but you may be required to formulate the problem.

Example 7

Paris plc is has three projects available for investment with the following cash flows and NPV's (at a cost of capital of 10%):

Year	*A*	*B*	*C*
0	(5,000)	(8,000)	(6,000)
1	(4,000)	2,000	(6,000)
2	8,000	6,000	4,000
3	4,000	5,000	12,000
NPV at 10%	+976	+2529	+862

The projects are infinitely divisible *(note: this means we can invest in any fraction of a project and that all the cash flows (and therefore the NPV) will also be this fraction of those above).*

Paris plc has cash available for investment as follows:

Year 0	$14,000
Year 1	$5,000

You are required to formulate the linear programming model necessary to decide how best to invest the capital available. Any capital not used in Year 0 may be put on deposit for one year and earn interest at 7%.

As stated earlier, you will not be expected to solve the problem (it cannot be solved graphically because there are more than 2 variables, and therefore would need a more advanced technique).

Also, you should remember that there are two reasons why capital may be limited:

Hard capital rationing – which is where the company is unable to borrow more, and

Soft capital rationing – which is where the company can borrow more, but has chosen to limit the amount it is prepared to borrow.

The formulation of the problem is the same, whatever the reason for the capital rationing.

9. Free cash flows

The free cash flow is the cash available for distribution to lenders (shareholders and debt lenders).

When appraising a project (as in the first example in this chapter) the net cash flow that we calculated each year is the free cash flow.

However, it is also possible to use NPV techniques in exactly the same way to arrive at the value of the company and for this we need to estimate the net cash flows (or free cash flow) each year from the company as a whole.

In this situation we are more likely to be given the forecast profits of the company (as opposed to forecasts of each individual cash flow) in which case we can estimate the free cash flows as follows:

Free cash flow =	Earnings before interest and tax (EBIT)	
	less:	tax on EBIT
	plus:	non-cash items (depreciation)
	less:	cash required for capital expenditure
	less (or plus):	working capital changes

We will look at an example of this in a later chapter when we consider the valuation of a company.

Chapter 10

RISK AND UNCERTAINTY

1. Introduction

A major reservation of any investment appraisal decision is that the figures used in the calculations are only estimates and stand to be uncertain. Clearly if any of the cash flows used in the decision turn out to be different from what was estimated, the decision itself could be affected.

In this chapter we will revise three approaches that you should already be aware of from the earlier Financial Management exam, and then look at one more approach - Value at Risk.

2. Sensitivity analysis

Sensitivity analysis analyses the effect of changes made to variables in the problem in order to determine their effect on the decision.

First we calculate the NPV of the project on the basis of the best estimates.

Then we calculate what % change (or sensitivity) in each of the variables would result in a NPV of zero (i.e. the breakeven position – any further change would change the decision).

By considering the sensitivity of each variable we can ascertain which variables are the most critical and therefore perhaps need more work confirming our estimates.

Example 1

Daina has just set up a new company and estimates that the cost of capital is 15%.

Her first project involves investing in $150,000 of equipment with a life of 15 years and a final scrap value of $15,000.

The equipment will produce 15,000 units p.a. generating a contribution of $2.75 each. She estimates that additional fixed costs will be $15,000 p.a..

(a) Determine, on the basis of the above figures, whether the project is worthwhile

(b) Calculate the sensitivity to change of:

i. the initial investment

ii. the sales volume p.a

iii. the contribution p.u.

iv. the fixed costs p.a.

v. the scrap value

Comment on the results

3. Simulation

Simulation is a technique which allows more than one variable to change at the same time.

You will not be required in the examination to actually perform a simulation, but you should be aware of the principle involved.

Essentially, the stages are as follows:

- identify the major variables
- specify the relationship between the variables
- attach probability distributions to each variable and assign random numbers to reflect the distribution
- simulate the environment by generating random numbers
- record the outcome of each simulation
- repeat the simulation many times to be able to obtain a probability distribution of the possible outcomes

4. Expected values

With this approach, we identify the various possible outcomes for each uncertain variable, together with the associated probability.

We then use for each uncertain variable the weighted average outcome (or expected outcome), and use these figures in our investment appraisal calculation.

Example 2

Daiga plc is considering launching a new product.

This will require additional capital investment of $200,000.

The selling price of the product will be $10 p.u.. Daiga has ascertained that the probability of a demand of 50,000 units p.a. is 0.5, with a probability of 0.4 that it will be 20% higher, and a 0.1 probability that it will be 20% lower.

The company expects to earn a contribution of 50% and expects fixed overheads to increase by $140,000 per year.

The time horizon for appraisal is 4 years. The machine will be sold at the end of 4 years for $50,000.

The cost of capital is 20% p.a.

Calculate the expected NPV of the project

5. Value at Risk (VaR)

When we calculate the NPV of a project, the problem is, of course, that the cash flows are uncertain and that therefore the actual NPV may turn out to be higher or lower. We have looked at the sensitivity - the % changes that will result in an NPV of zero. However, Value at Risk is a method of calculating with a certain degree of confidence what the greatest fall in the NPV will be.

The VaR is the maximum amount that an investment might lose at a given level of confidence. For example, we might be able to say that the VaR is $100,000 at the 95% confidence level. This would mean that there would be only a 5% chance of losing more than $100,000.

Although we are able to calculate the VaR for a project, it is much more applicable to an institution (for example a bank) holding a portfolio of investments. The current value may be, say, $500,000, and obviously the value may increase or decrease over time. It will be of use to the bank to be able to calculate that they are 95% confident that the value will not fall by more than $300,000 (i.e. to less than $200,000) so as to be able gauge the amount of assets needed to be able to cover possible losses.

In order to be able to calculate the VaR, we need to know the volatility of the values (the standard deviation) and to assume that they values are normally distributed. We will explain the calculation with an example.

Example 3

James has estimated an annual standard deviation of $750,000 on one of its projects, based on a normal distribution of returns. The average annual return is $2,400,000.

Estimate the value at risk (VAR) at a 95% confidence level for one year, and also over the project's life of six years.

Chapter 11

THE VALUATION OF DEBT FINANCE, THE MACAULAY DURATION AND THE MODIFIED DURATION

1. Introduction

In your previous studies you have seen what factors determine the market price of debt finance (bonds). In this chapter we will revise this and also look at how future changes in interest rates effect the market prices.

2. The valuation of debt

In theory, the market value of debt will be determined by the returns that investors expect to receive, and the rate of interest that they require – it will be the present value of the expected receipts discounted at the investors' required rate of return.

Example 1

A company has 8% bonds in issue, redeemable in 5 years time at a premium of 10%.

The investors' required rate of return is 10%.

Calculate the market value of the bonds (for a nominal value of $100)

3. The redemption yield

You have also seen before that in the case of quoted debt, we can calculate the return that investors are receiving from a bond by effectively 'working backwards'. If we know the market value and we know the expected receipts, then we can calculate the return to investors by working out the internal rate of return (this is known as the gross redemption yield).

Example 2

A company has 8% bonds in issue, redeemable in 10 years time at a premium of 10%.

The market value (for $100 nominal) is currently $91.61.

Calculate the redemption yield.

(Note that in this example we calculated the gross return to the investor. The cost of debt to the company would be different because we would then take into account the tax relief on the interest payments.)

4. Comparing bonds

In the previous two examples, the bonds were both giving the same return to investors (gross redemption yield). This clearly need not be the case, and the gross redemption yield will be a factor for investors when choosing between different bonds.

However, since the bonds in both our examples are giving the same return, it is tempting to say that potential investors would be indifferent between them.

There is however one big problem in that interest rates may change in the future, and if they do change then investors' required returns will change, which will in turn effect the market price of the bonds.

Although required returns would change for all potential investments, the extent of the change in the market value will differ depending on the length of life of the bond.

Example 3

For each of the bonds in the two previous examples, calculate the new market value (for $100 nominal) if the gross redemption yield were to change to 15%. Hence calculate the %'age change in the market values of each.

5. The Macaulay Duration

The Macaulay duration measures the average time it takes for a bond to pay its interest and principal.

The calculation is as follows:

(1) Calculate the present value of the cash flows, and add them up.

(2) Multiply the present value of each cash flow by the time period, and add them up.

(3) Divide the result from (b) by the result from (a)

Example 4

A company has 8% bonds in issue, redeemable in 5 years time at a premium of 10%. The current market value is $98.63 (for $100 nominal)

Calculate:

(a) the gross redemption yield, and

(b) the Macaulay duration

If you look again at this example, the following should be clear for each of the variables:

- Time to maturity: as the time to maturity increases, the Macaulay duration will also increase
- Coupon rate: as the coupon rate increases, the Macaulay duration decreases
- Yield to maturity (or gross redemption yield): as the yield to maturity increases, the Macaulay duration decreases

Example 5

Calculate the Macaulay duration for the bond in Example 2.

6. The Modified Duration

The Modified Duration measures the sensitivity of the market value of a bond to changes in interest rate.

It is calculated by dividing the Macaulay duration by (1 + gross redemption yield).

Example 6

Calculate the modified duration for the bonds in Example 4

The equation linking modified duration (D), and the relationship between the change in interest rates (Δi) and change in price

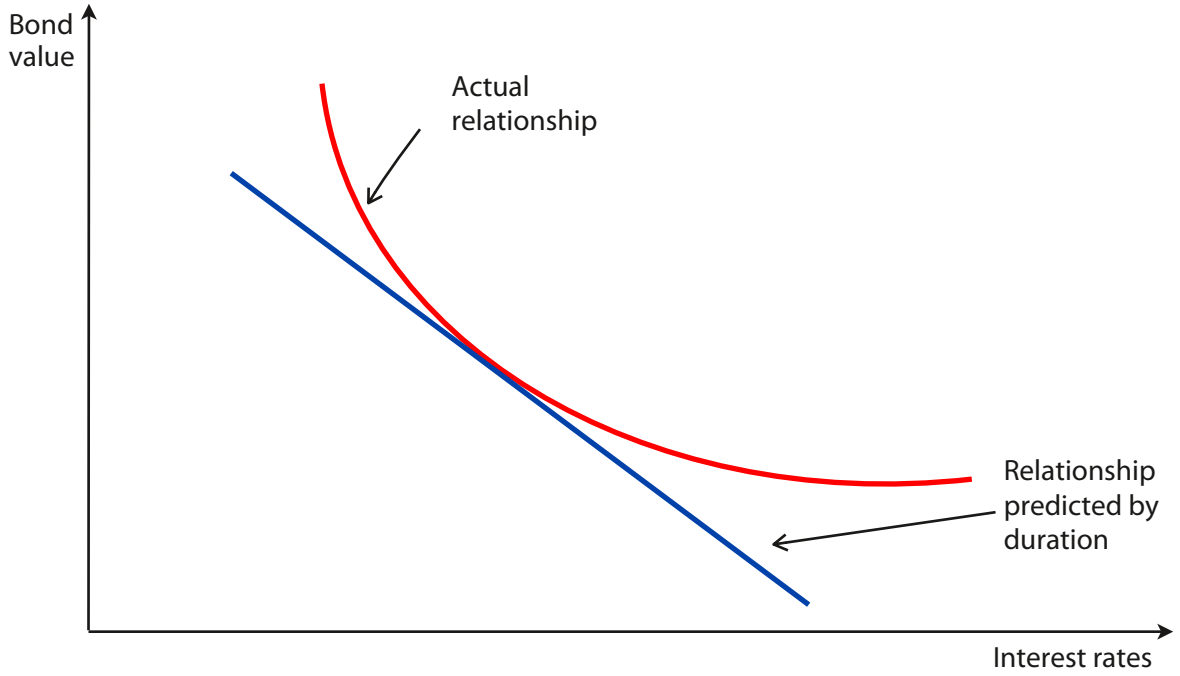
or value of a bond or loan (ΔP) is given as follows: $\Delta P = [-D \times \Delta i \times P]$

(P is the current value of a loan or bond and is a constant)

The size of the modified duration will determine how much the value of a bond or loan will change when there is a change in interest rates. A higher modified duration means that the fluctuations in the value of a bond or loan will be greater, hence the value of 3.94 means that the value of the loan or bond will change by 3.94 times the change in interest rates multiplied by the original value of the bond or loan.

7. Limitations of the modified duration

Duration is only useful in assessing small change in interest rates. This is because although as interest rates increase, bond prices will fall (and vice versa) the relationship is non-linear. In fact, the relationship between the changes in bond values and changes in interest rates is in the shape of a convex curve.



8. Project Duration

Although this chapter is primarily concerned with bonds, we can calculate the duration of a project using exactly the same was as we calculated the Macaulay Duration for a bond.

Example 7

Lola plc is considering a project which requires an initial investment of $240,000. Projected cash flows, discounted at Lola's cost of capital of 10% are as follows:

Year	*0*	*1*	*2*	*3*	*4*	*5*
Present Value	(240,000)	109,092	87,274	63,110	32,784	14,902

Calculate the project duration.

The project duration is a measure of the average time over which a project delivers it's value, and has the same duration as a project that delivers 100% of its cash inflows over the same period. The lower the duration the lower the risk of the project. This method looks at the cash flows over the whole life of the project, unlike the payback period which only considers the flows during the payback period.

Chapter 12

THE IMPACT OF FINANCING

1. Introduction

This chapter considers the fact that if a company changes the way in which it is financed (for example, raised more debt to finance a new project) then the cost of capital may change. This would of course affect the investment decision.

2. Modigliani And Miller

Modigliani and Miller did a lot of work on the effect of the financial structure of a company on the cost of capital.

You should already be aware of their conclusions from your previous studies, and you are not required to know their proofs – only their conclusions which are as follows:

2.1. M&M proposition without taxes:

M&M state that (ignoring tax) higher gearing will create more risk for shareholders and hence the cost of equity will increase, but that this is 'compensated' for by the fact that there is more debt which has a lower cost.

As a result, they stated that the weighted average cost of capital will stay constant for a company, however the company is financed.

2.2. M&M proposition with company taxes:

Debt interest gets tax relief, which makes the effective cost of debt to a company lower. As a result, even though the cost of equity will increase with higher gearing, the WACC will fall.

Therefore, a company should raise as much debt as possible.

They derived a formula for calculating how the cost of equity will change with changes in gearing. This formula is provided on the formula sheet in the examination, and is as follows:

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

where:

k_e = cost of equity (of a geared company)

k^i_e = cost of equity of the company if ungeared

V_e and V_d are the market values of equity and debt

K_d = pre-tax cost of debt

T = rate of corporation tax

Example 1

London plc is an ungeared company with a cost of equity of 15%.

They propose raising debt at 8% (pre-tax) and have estimated that the resulting gearing ratio (debt:equity) will be 0.4.

The rate of corporation tax is 30%.

You are required to calculate:

(a) the cost of equity after raising the debt, and

(b) the weighted average cost of capital before and after raising the debt.

3. Pecking order theory

Pecking order theory states that companies raise finance in the 'easiest' way (or the 'law of least effort') and that therefore they prefer to use internal funds (retained earnings) first, followed by debt finance, only raising new equity as a last resort.

4. Static trade-off theory

M&M proved that the WACC of a company will reduce as more debt is raised, and therefore a company should raise as much debt as possible.

However, their proof relies on many assumptions which are not completely realistic in real life (such as investors having perfect knowledge, and acting rationally with respect to risk).

Static trade-off theory states that the cost of equity certainly is likely to increase with higher gearing (although not necessarily in a predictable way) and that the cost of debt is certainly likely to be lower. However, because it is impossible in practice to estimate the changes precisely, all we can state it that the WACC is likely to change with different levels of gearing.

If the WACC is likely to change, then there must be a level of gearing at which the WACC is a minimum. The company should aim for this level of gearing and should then maintain this 'optimum' level of gearing. (The theory does not predict the 'optimum' level – this would be found by trial and error).

5. Adjusted Present Value

M&M stated that the only benefit of using debt (as opposed to equity) to finance a project was the fact that the company gains as a result of the tax saved on the debt interest (the tax shield).

We can use this to provide a way of calculating the gain from a project taking into account the method of financing used.

For adjusted present value calculations, there are two steps:

(1) Calculate the NPV of the project if all equity financed (the 'base case NPV)

(2) Calculate the PV of the tax benefit on any debt used

The total of the two is the overall gain (or loss) to the company and is known as the Adjusted Present Value (APV).

Example 2

A company is considering a project that has the following after-tax flows:

0	(100M)
1 – 5	40M p.a.

The asset β of the project has been calculated as 1.5.

The market is giving a return of 15% and the risk free rate is 5%.

The rate of corporation tax is 30%

Calculate the gain to shareholders if the project is to be financed:

(a) entirely from equity

(b) 70% from equity and 30% from irredeemable debt

(c) 70% from equity and 30% from debt redeemable in 5 years time.

5.2. Other issues in calculating the Adjusted Present Value

Although the most important parts of the calculation are those mentioned above, there are two other matters that commonly occur in exam questions and need taking into account - issue costs and subsidised loans.

- **Issue costs:**

If there are any issue costs mentioned in relation to the raising of the finance, then these need subtracting from the base-case NPV when arriving at the APV.

- **Subsidised loans:**

It may be that the government of the relevant country is prepared to lend some or all of the debt finance required at a lower than normal rate. This subsidy is obviously beneficial and so in arriving at the APV we need to add the after-tax amount of the benefit (i.e. the difference between the normal borrowing rate and the subsidised rate) to the base-case NPV.

Chapter 13

SHARE OPTIONS AND OPTION PRICING

1. Introduction

In this chapter we will explain what share options are, and explain the Black Scholes option pricing model which you can be expected to use to calculate the value of an option.

2. Share option

A share option gives the holder the right to buy or sell a share at a fixed price on a future date. A **call** option gives the holder the right to **buy** the share, whereas a put **option** gives the holder the right to **sell** a share.

An investor wanting an option will have to pay for it, whether or not they ultimately decide to exercise it.

Example 1

The share price of Madrid plc is currently $2.00.

Johnson holds a call option with an exercise price of $1.80, exercisable in 3 months time.

What will Johnson do if the share price in 3 months time is:

(a) $2.50

(b) $1.50

3. Option prices

As already stated, if an investor wishes to have an option to buy or sell shares, they will have to pay for it (whether or not they ultimately choose to exercise the option).

Several factors will determine the value of the option – the most obvious being the current share price and the exercise price.

Example 2

The share price of Lisbon plc is currently $2.50.

A call option is available with an exercise price of $2.00, exercisable immediately.

What will be the value of the option?

Although the last example should be very obvious, it is unrealistic in that options are not exercisable immediately but at some date in the future.

The full list of factors that will determine the price of an option is as follows:

- current share price
- the exercise price
- the time to expiry of the option
- the risk free interest rate
- the volatility of the share price

Although option prices in practice are determined by the dealers, in line with market forces, Black and Scholes developed a formula for determining the value which is very commonly used in practice.

4. The Black Scholes Option Pricing Model

The formulae that Black and Scholes developed are as follows:

4.1. Call option:

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

Where

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

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

4.2. Put option:

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

Where:

P_a = the current share price

P_e = the exercise price of the option

e = the exponential constant (2.7183)

r = the annual risk free rate of interest

t = the time (in years) until expiry of the option

S = the share price volatility

N(d) = the probability that a deviation of less than d will occur in a normal distribution. (You do not need to know this – you just need to know how to find the value using normal distribution tables).

Example 3

Current share price is $2.90.

Exercise price $2.60 in 6 months time.

Risk free rate of interest is 6% p.a.

Standard deviation of rate of return on share is 40%

(a) What is the value of a call option?

(b) What is the value of a put option?

Example 4

Current share price is $1.50

Exercise price $1.80 in 3 months.

Risk free rate of interest is 10% p.a.

Standard deviation of rate of return on share is 40%

(a) What is the value of a call option?

(b) What is the value of a put option?

Important:

Although it is important that you understand what the formula is doing, you can no longer be asked to calculate using the formula in the exam.

If the BSOP model is examined in your exam then you will be provided with a 'mini-spreadsheet' called the "BSOP calculator". You will just need to enter the variables (Pa, Pe, etc.) and the "BSOP calculator" will automatically calculate the values of both call and put options.

To see how it works, you must watch the ACCA video explaining it, which you can find here:

https://www.accaglobal.com/gb/en/student/exam-support-resources/professional-exams-study-resources/p4/cbe-question-practice/BSOPQuestions.html

5. The use of options

One use of options is as a way of rewarding managers of a company in a way that motivates them to increase the share price.

By giving call options to the managers, it becomes very much in their interest to take decisions that increase the share price.

Very often these options are not traded options and therefore the formula in the previous section can be used to place a value on them.

Speculators also deal in options. The reason for this is that if (for example) you expect the price of a share to increase, then you could make money simply by buying shares and then selling them at the later, higher, price. As alternative, however, would be to buy call options. As the share price increases then so too will the option price.

The financial manager is not a speculator. Consider, however, the following situation – the company currently has an investment in shares in another company. They intend to sell the shares in six months time, and expect the price to increase. The are however worried in case they are wrong and the price should fall. How can they protect the company against the possible fall?

If the share price were to fall, then so too would the value of call options. In order to profit out of the fall the company will need to sell call options now (and would be able to buy them later and make a profit, should the price fall).

This hedging is known as a 'delta hedge'. The slight problem is that the change in the option price will not be the same as the change in the share price and therefore we need to be able to calculate how many options to deal in. We will cover the arithmetic shortly, but first we need to consider the Greeks!

6. The Greeks

From day to day the price of an option will change. It will change due to changes in all the factors listed in section 3 of this chapter.

Black and Scholes also produced formulae to measure the rate of change in the options price with changes in each of the factors listed. You do not need to know the formulae, but you need to be aware of the names given to each of the measures, and they are as follows:

6.1. Delta

The rate at which the option price changes with the share price (=$N(d_1)$)

6.2. Theta

The rate at which the option price changes with the passing of time.

6.3. Vega

The rate at which the option price changes with changes in the volatility of the share

6.4. Rho

The rate at which the option price changes with changes in the risk-free interest rate

6.5. Gamma

The rate at which delta changes

Although you will not need the formulae for each of these, you may need to know about the relevance of delta. This is because in the very short term, delta enables us to predict the effect on the option price of movements in the share price. It will be equal to N(d1), and we can use it to decide how many options we need to trade in to protect ourselves against movements in the share price.

Note: you can no longer be expected to be aware of Vega or of Rho

7. The Delta Hedge

If you own shares and you are worried that the share price might fall, then sell some call options. As the share price falls, so will the value of the options. (You can buy back at a profit).

The problem is to decide how many call options we need to sell.

Example 5

Current share price is $1.50

Call option exercise price is $1.80 in 3 months

Risk free interest rate is 10% p.a.

Standard deviation of rate of return on share is 40%

Martin owns 1,000 shares.

Devise a delta hedge to protect against changes in the share price.

The problem with a delta hedge is that our answer to example 6 will only protect us in the very short term. The reason for this is that over a longer term changes in the other factors will also affect the option price. For this reason the delta hedge will have to be continuously reviewed and changes made (which is why the other Greeks are of importance to a trader in options). You will not be expected to deal with this but you can be expected to be aware of the problem (and therefore of the other Greeks).

8. 'Styles' of options

A European option can only be exercised at the date expiration, whereas an American option can be exercised at any time up to the date of expiration. The terms refer to the 'style' of option and have nothing to do with where the dealing in the options takes place.

In either case, options can be traded prior to expiration (i.e. you can buy an option and later sell the option, before the expiration date)

The Black Scholes formula applies to European options.

9. Long and short dealings

As mentioned in the last paragraph, it is perfectly possible to buy and sell options rather than simply buying, holding until expiration and then exercising.

An investor who buys an option (and later either sells it or exercises it) is said to be taking a **'long position'** (and so buying a call option can be referred to as a 'long call', and similarly buying a put option can be referred to as a 'long put')

Less obviously, it is possible to sell an option (that you do not own) and buy it later to finish the deal. This is known as taking a **'short position'** (leading to the terms 'short call' and 'short put')

Be aware of the terms in this paragraph, but they do not affect the arithmetic.

Chapter 14

REAL OPTIONS

1. Introduction

A real option relates to project appraisal. In previous questions we have assumed that the only choice available us is to accept or reject the project based on the expected cash flows.

However, as will be explained below, it may be possible to improve the potential return by having the right to change something about the project during its life. This would be a 'real' option. In the exam you are expected to be aware of the different types of 'real' options that might exist, and to be able to value them using the Black Scholes model.

2. Types of real options

In order to explain the different types of real options, we will list them in turn together with a brief illustration of the idea.

2.1. Option to delay

Suppose we are considering a project, but the returns are uncertain because of forecast general economic problems over the next few years.

The ability to delay starting the project could be attractive because if economic conditions turn out to be unfavourable we could cancel, whereas if they turn out to be favourable we could go ahead and maybe get even better returns.

The fact that we would be able to remove the 'downside' potential would mean that we had an option and this would be worth paying for.

It would effectively be a call option (the right to invest in the project at a future date) and we could use the formula to value it.

2.2. Option to expand

This would be similar to an option to delay in that we could invest a certain amount in the project now and decide later whether or not to invest more (when we find out how successful the project is).

Again, this right would be worth money to us and could be valued, as a call option.

2.3. Option to abandon

When appraising (for example) a 5 year project, we usually assume that the project lasts for the full 5 years. However, if the cash flows turned out to be lower than expected, we would clearly want to be able to consider stopping the project early.

Yet again, this right would effectively be an option – although this time a put option.

2.4. Option to redeploy

A firm may have decided to invest a considerable amount in equipment, staff, training etc. to commence teaching ACCA courses, on the basis that currently they appear to be the most profitable use of the resources. However, projections could turn out to be wrong and it could be beneficial to effectively stop the project earlier than planned and use the resources to teach some other qualification.

This ability would be a put option (and the option to abandon is a special case of this).

Example 1

Warsaw plc is considering a new project which requires an outlay of $10 million and has an expected net present value of $2 million.

However, the economic climate over the next few years is thought to be very risky and the volatility attaching to the net present value of the project is 20%.

Warsaw is able to delay commencing the project for three years.

The risk free rate of interest is 6% p.a..

Estimate the value of the option to delay the start of the project for three years, using the Black Scholes option pricing model.

Chapter 15

MERGERS AND ACQUISITIONS

1. Introduction

In this chapter we will discuss briefly the reasons why a company may wish to merge with, or take over, another company, and consider associated issues.

In the subsequent chapter we will look at the valuation of mergers and acquisitions.

2. The objectives of takeovers or mergers

Takeovers or mergers should increase shareholders wealth via:

(1) Acquiring the target company at an undervalue

(2) Synergistic benefits:

(a) Economic efficiency gains

i. economies of scale (volume related savings)

ii. economies of scope (complementary resources)

(b) Financial synergy

i. reduced total risk will not benefit well-diversified shareholders (the systematic risk is not reduced by diversification) but reducing total risk may reduce insolvency risks and hence borrowing costs

ii. increased asset backing may bolster borrowing capacity

iii. exploiting tax losses sooner

(c) Market power

i. acquiring monopolistic powers (e.g. eliminate competition)

ii. acquisition of a scarce resource

iii. dynamic management

iv. innovative product

v. cash mountain

vi. to enter a new market quickly

3. Predator issues on takeover

(1) The investment decision

(a) How much is the target worth to the predator?

(b) Are the target shareholders willing to sell?

(c) What economic / industry and company assumptions underline the valuation?

(2) The financing decision

(a) Matching

i. has the predator adequate surplus cash / borrowing capacity / ability to issue shares?

ii. can the group service the new finance required for the acquisition?

(b) Cost

i. will the use of cash or shares change the predator's capital structure for better or worse?

(c) Capital providers

i. will any existing debt covenants or existing shareholder expectations be affected?

ii. could the predator issue convertibles to delay control dilution issues?

iii. is the current dividend policy desirable / sustainable after the acquisition?

iv. will the EPS be affected, and does it matter?

(3) Market issues - often target companies are over-valued because of:

(a) Over optimism with regard to economies of scale

(b) The victim's share price anticipating synergistic gains

(c) The victim's share price may be 'bid up' in an auction

4. Target issues on takeover

(1) What is the target worth to the predator – can we extract maximum value?

(2) What is the target worth to us?

(3) Do we want to sell?

(4) What is the after personal tax value of the offer?

(5) If the offer is in shares, are they attractive?

4.1. Market issues

The target company shareholders are the ones who must approve the offer. Generally, most of the benefits on a takeover accrue to the target company shareholders.

4.2. Defensive tactics

(a) provide more information

i. contest the offer on terms of being a poor offer, having no obvious advantage, and / or employee opposition

ii. issue forecasts to indicate that the sale of the shares is not a good option

iii. revalue the assets

iv. advertise (subject to the City Code – see below)

(b) lobby to have the offer referred to the Competition Commission

(c) stop shares falling into the predators hands

i. find a White Knight (an alternative bidder who would be more acceptable)

ii. arrange a management buyout

(d) Poison Pill tactics: the target builds in a tripwire to make itself less attractive. E.g. create a new class of stock which automatically becomes redeemable at a high price in the event of a take-over.

Chapter 16

THE VALUATION OF ACQUISITIONS AND MERGERS

1. Introduction

In this chapter we will consider the various approaches to calculating the value of a business. Do appreciate that there is never one 'correct' valuation – if we are acquiring a business then we will look at a range of values when deciding how much to offer.

In the exam you may be told specifically which method to use, or alternatively you may be asked to write a report suggesting a value in which case you will need to look at several methods depending on the information available in the question.

All of the arithmetical techniques discussed in this chapter have been covered already in early chapters of these notes.

2. Asset based valuation methods

An asset-based valuation takes the value of the firm's assets less its liabilities.

The asset values used can be:

- **book values** – using the values in the Statement of Financial Position. However book values are unlikely to represent the true value of the assets
- **realisable values** – valuing the assets at the value at which they could be sold individually. This is likely to be the absolute minimum that the sellers would accept and therefore the absolute minimum worth offering
- **replacement values** – the cost of buying the assets individually. This would perhaps be the maximum that the acquirer would be prepared to pay except for the fact that there is almost certainly going to be some goodwill that can only be acquired if the whole business is purchased.

3. Cash based valuation methods

There are two main cash based methods to be aware of:

- Free cash flow to firm

  and

- Free cash flow to equity

3.1. The free cash flow to firm method

Here we take the expected future cash flows from the business and discount at the relevant cost of capital (which will be discussed separately).

The present value of the future cash flows will be the total value of the business. To arrive at a value for the equity we then subtract the market value of the debt.

Example 1

A company has prepared a forecast of the future cash flows. The cash flows are expected to be $4.5M in the first year, $8.1M in the second year, $11.7M in the third year, and thereafter to increase at the rate of 4% per year.

The company has debt with a market value of $50M, and the relevant cost of capital is 10%.

Calculate the value of the firm and the value of the equity.

3.2. Calculating the free cash flows

There are two ways in which you could be given the information needed to be able to arrive at the free cash flows.

One way is to be given details of the revenues and expenses in which case the free cash flows is calculated in exactly the same way as the net cash flow for a project.

The other way is to be given accounting information, in which case the free cash flow is arrived at as follows:

EBIT	X
Less: Taxation	(X)
Add: Depreciation	X
Operating cash flow	X
Less: Amounts needed to replace non-current assets (unless told otherwise, assume equal to the level of depreciation)	(X)
Less: Any additional non-current asset expenditure	(X)
Less: Incremental working capital expenditure	(X)
Free cash flow	X

Example 2

Calculate the free cash flow given the following information:

Operating profit (EBIT	720
Depreciation	288
Increase in working capital	120
Cost of new non-current assets	36
Interest paid	12
Loans repaid	48
Tax paid	336

3.3. What discount rate to apply?

The relevant discount rate depends on the business risk in the company being acquired and in the way in which the acquisition is to be financed (the gearing). The effect of changes in either or both of the business risk and the gearing risk have been discussed in earlier chapters (which you may need to revisit to remind yourself), but are summarised as follows:

(1) If the business risk of the company being acquired is the same as that of the acquiring company, and there is little or no change in the existing gearing of the acquiring company after the acquisition:

In this (unlikely) situation, then we discount at the current WACC of the acquiring company.

(2) If the business risk of the company being acquired is different from that of the acquiring company, but there is little or no change in the existing gearing of the acquiring company after the acquisition:

- calculate the asset beta for the company being acquired. (This will probably mean ungearing the equity beta of a company having a similar type of business, using the gearing of the similar company).
- calculate an equity beta by gearing up the asset beta just calculated, using the gearing of the acquiring company
- calculate a cost of equity using the equity beta just calculated
- calculate a WACC (using this cost of equity and the gearing of the acquiring company) and use this to discount the free cash flows

Example 3

A plc is company with a gearing ratio (debt to equity) of 0.4. Shares in A plc have a β of 1.48. .

They are considering acquiring another company - B plc. Shares in B plc have a β of 1.8 and B plc has a gearing ratio (debt to equity) of 0.2. A plc is raising more debt in order to partly finance the acquisition of B plc, but their overall gearing ratio is not expected to change substantially. A plc has a cost of debt of 7%.

The market return is 15% and the risk free rate is 8%.

Corporation tax is 25%

Calculate the discount rate that should be applied to the free cash flows of B plc in order to arrive at a value of B plc.

(3) If the business risk of the company being acquired is different from that of the acquiring company, and there is a substantial change in the existing gearing of the acquiring company after the acquisition (i.e. a leveraged buyout where substantial debt is being issued to help finance the acquisition)

Take an adjusted present value approach (APV).

- Calculate the ungeared equity beta for the company being acquired (which will be the same as the asset beta for the company)
- Calculate a cost of equity using this beta
- Discount the free cash flows at this cost of equity
- Add the tax benefit on the debt raised to arrive at the APV

3.4. Synergy benefits?

All of the above ignore the fact that there may well be synergy benefits from the acquisition of the other company and that as a result the total free cash flow may be higher than the sum of the current cash flows in the individual companies.

In this situation, instead of valuing separately the company being acquired, we should value the new 'enlarged' company (using the free cash flows of the 'enlarged' company) and subtract the current value of the acquiring company to arrive at an estimate of the amount worth paying for the acquisition.

3.5. The free cash flow to equity method.

In the previous section we were using the free cash flow of the firm to arrive at a total market value of the business as a whole. To get a market value of the equity we then subtracted the market value of the debt.

The alternative is to calculate the market value of the equity directly by calculating the free cash flows to equity and discounting them at the cost of equity.

The free cash flow to equity is arrived at as follows:

EBIT	X
Less: Taxation	(X)
Add: Depreciation	X
Operating cash flow	X
Less: Amounts needed to replace non-current assets (unless told otherwise, assume equal to the level of depreciation)	(X)
Less: Any additional non-current asset expenditure	(X)
Less: Incremental working capital expenditure	(X)
Free cash flow	X
Less: Debt interest and repayments	(X)
Add: Cash raised from debt issues	X
Free cash flow to equity	X

Example 4

Using the information in example 2, calculate the free cash flow to equity,

4. Market based valuation methods

4.1. Market value on the stock exchange

If the company being acquired is quoted on the stock exchange, then the market value is clearly the minimum that the shareholders in the company would be prepared to accept (and that therefore there is any point in the acquiring company offering).

If, however, the acquiring company is buying a controlling interest then one would normally expect they would have to pay a premium over the current market value.

4.2. The Price-Earnings Ratio method

This is the most common market based method in practice - especially when valuing an unquoted company(and you should be familiar with it from your Paper F9 studies).

We take the PE ratio of a similar quoted company (or the average PE for the industry) and apply this to the earnings available for shareholders (i.e. profits after tax) of the company being valued.

If we are valuing an unquoted company then we would reduce the PE ratio (and thus arrive at a lower value) to reflect the fact that the shares are not currently marketable. There is no fixed reduction - you would simply need to make the point were it relevant in the exam.

4.3. The earnings yield approach

Whereas the PE ratio is Market value / EPS, the earnings yield is simply the inverse of the PE ratio and is EPS / Market value.

So just as with the PE approach, we take the earning yield of a similar quoted company and apply this to the company that we are valuing.

5. Using the Black-Scholes option pricing model for business valuation

Holding shares in a company is similar to holding a call option because if the debt in the company exceeds the asset value then the shareholders can walk away (due to limited liability) whereas if the assets exceed the debts then the shareholders will continue in the business in order to get the surplus.

Therefore Black-Scholes may be used to value this 'option'. We would use the formula as normal, with

Pa = the fair value of the firms assets

Pe = the amount owing to lenders

r = the risk free rate of interest

t = the time until the debt is redeemed

s = the standard deviation of the value of the assets

6. Over-valuation

Here we are referring to the situation where a market value of a share on the stock exchange is higher than it reasonably should be.

This can occur for two main reasons:

- the market does not fully understand the business and is over-estimating the expected future returns, or
- the management of the company are conveying misleading information about the business

7. High growth, start-up businesses

Be aware of the problems that exist in attempting to value a new business, especially one with high- growth potential.

- there are likely to be losses in the early years
- there are no past results on which to base estimates of expected returns in the future
- management is often inexperienced
- these businesses are often unlike existing businesses due to the nature of the product or service, and so it is difficult to find comparable companies.

These problems make it very difficult to come up with any reliable valuation, using any of the methods detailed earlier in this chapter.

Chapter 17

CORPORATE REORGANISATION AND CAPITAL RECONSTRUCTION SCHEMES

1. Introduction

This chapter examines the financial restructuring possibilities open to UK companies. These include divestments, MBOs and more general schemes of reconstruction.

2. Demergers, sell-offs, unbundling and asset stripping

All of these involve splitting a company into two or more businesses. With a demerger existing shareholders are given shares in each of the two separate businesses – control is maintained.

Under a 'sell-off', at least part of the business will be sold to a third party. - control of part of the business is lost.

'Unbundling' means to take apart the components of a company with the intention of disposing of part or all of the parts separately at a higher price than the whole. This would usually be done via a 'sell-off'. When done following a takeovers it is termed 'asset stripping'.

3. Management buyouts

A management buyout is the purchase of all or part of a business from its owners by one or more of its executive managers

A management buy-in is where a team (usually assembled by a venture capitalist) identify a target company to take-over.

A buy-in / buy-out is where a team is drawn from a combination of the existing management and experts appointed via the venture capitalist.

Parties to a buyout

(1) the management team

(2) the directors of the company

(3) the financial backers of the management team (often including a venture capitalist)

Reasons for a buyout

(1) from the buyout teams' point of view:

  (a) to obtain ownership of the business rather than remain as employee

  (b) to avoid redundancy when the business is threatened with closure

(2) from the seller's point of view

(a) to dispose of part of the company that does not fit in with the overall strategy of the company

(b) to dispose of a loss-making segment of the business which the directors do not have time or inclination to turn around

(c) in order to raise cash

(d) it is often easier to arrange a management buyout than to try and sell off parts of a business in the open market

(e) it may well avoid redundancy costs, strike action, etc. if closure if the only alternative

Why may buyouts generate shareholder value?

- personal motivation of the buyout team
- a more hands-on approach to management
- keener decision making on such areas as pricing, debt collection etc.
- savings in head office overheads

4. Capital reconstruction schemes

Restructuring a company is corporate surgery to enable a company to continue in business or to go into liquidation.

Legal framework

(1) the company must receive the court's permission to launch a scheme

(2) compromises must be agreed by all parties – classes of creditors should meet separately so that substantial minorities are not voted down. Every class must vote in favour for the scheme to succeed.

(3) Under the Insolvency Act a reconstruction can be achieved by transferring assets of the company to a new company in exchange for shares, these new shared being distributed to the existing shareholders. Creditors do not lose their rights in this arrangement.

Why restructure?

(1) to write off large debit balances in the profit and loss accounts, so allowing the company to pay dividends in the future, and therefore encouraging the injection of new finance.

(2) To rearrange the capital structure. Ordinary shares may be worth very little so that small monetary changes in value represent significant relative movements.

Approach to reconstructions

(1) evaluate the position of each party if liquidation were to go ahead. This will represent the minimum acceptable payment for each group.

(2) Assess sources of finance e.g. selling assets, issuing shares, raising loans.

(3) Design the reconstruction (often given in the question)

(4) Calculate and assess new position / marginal costs and returns to each group separately, and compare with (a). Do not forget the non-financial stakeholders.

(5) Check the company is financially viable after the reconstruction.

5. Going private

All the listed shares of a company are bought by a small group of investors, and the company is de-listed.

(1) both direct and indirect listing costs are saved

(2) a hostile takeover bid is impossible

(3) a small number of shareholders reduces the agency problem

6. 'Calculation' questions in the exam

You may be given a Statement of Financial Position prior to any reconstruction, and asked to redraft the statement after the reconstruction. This is primarily a Financial Accounts exercise and does not require any specific Financial Management techniques - it is mainly following the instructions given in the question.

To illustrate what is required, and the approach to the questions, the lecture will work through the following past exam question:

Fluffort (from the Sep/Dec 2015 sample questions). You should find this question in your Revision/Exam Kit, or alternatively you can download it from the ACCA website.

Chapter 18

FOREIGN EXCHANGE RISK MANAGEMENT (1)

1. Introduction

Globalisation has served to increase the amount of foreign trade which has in turn increased the amount of foreign currency transactions that companies have. Any dealing in foreign currency presents the problem of the risk of changes in exchange rates. The adoption in most of Europe (but notably not the UK) of a single currency – the euro – has removed the problem for companies trading within Europe, but for trading with companies in other countries an important role of the financial manager is to look for ways of removing or reducing this risk.

This chapter and the next chapter look in detail at the different ways available for the removal or reduction of the risk of changes in exchange rates.

2. Types of risk

(a) Transaction risk

This is the risk that a transaction in a foreign currency at one exchange rate is settled at another rate (because the rate has changed). It is this risk that the financial manager may attempt to manage and forms most of the work in the rest of this chapter.

(b) Translation (or accounting) risk

This relates to the exchange profits or losses that result from converting foreign currency balances for the purposes of preparing the accounts.

These are of less relevance to the financial manager, because they are book entries as opposed to actual cash flows.

(c) Economic risk

This refers to the change in the present value of future cash flows due to unexpected movements in foreign exchange rates. E.g. raw material imports increasing in cost.

3. The foreign exchange market

The foreign exchange market is known as FOREX. The biggest centre is the London FOREX market, although since the market is very competitive virtually no differences exist between one FOREX market and another.

4. Exchange rates

The exchange rate on a given day is known as the **spot rate** and two prices are quoted, depending on whether we are buying or selling the currency – the difference is known as the spread.

In the examination, the way exchange rates are quoted is always the amount of the first mentioned currency that is equal to one of the second mentioned currency.

For example, suppose we are given an exchange rate as follows:

$/£ 1.6250 – 1.6310

In this quote, the first number (1.6250) is the exchange rate if **we** are buying the first mentioned currency ($'s), and (1.6310) is the rate if **we** are selling the first mentioned currency ($'s).

(Alternatively, if you prefer, the first number is the rate at which the bank will sell us $'s and the second number the rate at which the bank will buy $'s from us. It is up to you how you choose to remember it, but it is vital that you get the arithmetic correct!)

Example 1

A plc receives $100,000 from a customer in the US.

The exchange rate is $/£ 1.6250 – 1.6310.

How many £'s will A plc receive?

Usually the questions in the examination relate to real currencies (such as dollars and euros). However, occasionally the examiner invents currencies which makes the answer a little less obvious – it becomes even more important that you know the rules.

Example 2

Jimjam is a company based in India, where the currency is the Indian Rupee (IR). They owe money to a supplier in Ruritania, where the currency is Ruritanian Dollars (R$). The amount owing is R$ 240,000.

The current exchange rate is IR/R$ 8.6380 – 9.2530

How many Indian Rupees will Jimjam have to pay?

5. Methods of hedging transaction exposure

In the above examples, our answers are (hopefully!) correct provided that we convert the money at the spot rate. The problem is that if the transaction is not going to take place until some time in the future, the exchange rate stands to change. We obviously have no idea what the rate will be – it may change to our advantage or to our disadvantage – and therefore there is risk.

The following methods of removing or reducing this risk are the methods of which you must be aware for the examination:

(a) Invoicing in home currency

(b) Leading and lagging

(c) Netting

(d) Matching

The above methods do not require any special techniques, but in addition you must have knowledge (and be able to perform detailed calculations) of the following:

(e) forward contracts

(f) money market hedges

(g) currency futures

(h) currency options

(i) currency swaps

It is these last five methods that we will go through in this and the following chapters.

6. Forward contracts

If a company wishes to buy or sell foreign currency at some date in the future, then they can obtain a quote from the bank today which will apply on a fixed date in the future. Once the quote has been accepted, that rate is then fixed (on the date, and on the amount specified) and what happens to the actual (or spot) rate on the date of the transaction is then irrelevant.

An alternative way in which you might see forward rates quoted is as follows:

$/£ 1.2845 ± 0.0015

This means that the forward rates are: $/£ 1.2830 – 1.2860

Example 3

X is due to pay $200,000 in 1 months time.

Spot	$/£ 1.4820 – 1.4905
1 month forward	$/£ 1.4910 – 1.4970

If X contracts 1 month forward, how much will he have to pay in 1 months time (in £'s)?

More often, forward rates are quoted as difference from spot. The difference is expressed in the smaller units of currency (e.g. cents, in the case of the US), and is expressed as a premium or a discount depending on whether we should deduct or add the discount to the spot rate.

Example 4

Y is due to receive $150,000 in 3 months time.

Spot	$/£ 1.5326 – 1.5385
3m forward	0.62 – 0.51 c pm

How much will Y receive?

Example 5

Z is due to pay $200,000 in 2 months time.

Spot	$/£ 1.6582 – 1.6623
2m forward	0.83 – 0.92 dis

How much will Z pay?

Advantages and disadvantages of using forward contracts:

7. Money market hedging

This approach involves converting the foreign currency at the current spot, which therefore makes future changes in the exchange rate irrelevant. However, if we are (for example) not going to receive the foreign currency for 3 months, then how can we convert the money today? The answer is that we borrow foreign currency now at fixed interest, on the strength of the future receipt.

Example 6

P is due to receive $5M in 3 months time.

Spot: $/£ 1.5384 – 1.5426

Current 3 month interest rates: US prime 5.2% – 5.8%

UK LIBOR 3.6% – 3.9%

Show how P can use the money markets to hedge the risk.

Example 7

Q is due to pay $8M in 3 months time.

Spot: $/£ 1.6201 – 1.6283

Current 3 month interest rates: US prime 6.4% – 6.9%

UK LIBOR 9.2% – 9.9%

Show how Q can use the money markets to hedge the risk.

Advantages and disadvantages of using the money markets:

8. Currency futures

If we buy a sterling futures contact it is a binding contract to buy pounds at a fixed rate on a fixed date. This is similar to a forward rate, but there are two major differences:

(1) delivery dates for futures contracts occur only on 4 dates a year – the ends of March, June, September and December.

(2) futures contracts are traded and can be bought and sold from / to others during the period up to the delivery date.

For these two reasons, most futures contracts are sold before the delivery date – speculators use them as a way of gambling on exchange rates. They buy at one price and sell later – hopefully at a higher price. To buy futures does not involve paying the full price – the speculator gives a deposit (called the margin) and later when the future is sold the margin is returned plus any profit on the deal or less and loss. The deal must be completed by the delivery date at the latest. In this way it is possible to gamble on an increase in the exchange rate. However, it is also possible to make a profit if the exchange rate falls! To do this the speculator will sell a future at today's price (even though he has nothing to sell) and then buy back later at a (hopefully) lower price. Again, at the start of the deal he has to put forward a margin which is returned at the end of the deal plus any profit and less any loss.

The role of the financial manager is not to speculate with the company's cash, but he can make use of a futures deal in order to 'cancel' (or hedge against) the risk of a commercial transaction.

Here is a simple example (note that there are more limitations that are ignored in this example but will be explained later – this example is just to illustrate the basic principle.).

Example 8

R is in the US and needs £800,000 on 10 August.

Spot today (12 June) is: $/£ 1.5526 – 1.5631

September $/£ futures are available. The price today (12 June) is 1.5580.

Show the outcome of using a futures hedge (assuming that the spot and the futures prices both increase by 0.02).

Note:

(1) the futures price on any day is not the same as the spot exchange rate on that date. They are two different things and the futures prices are quoted on the futures exchanges – in London this is known as LIFFE (the London International Financial Futures Exchange). More importantly, the movement in the futures price over a period is unlikely to be exactly the same as the movement in the actual exchange rate. The futures market is efficient and prices do move very much in line with exchange rates, but the movements are not the same (unlike in the simple example above). We will illustrate the effect of this shortly.

(2) In practice any deal in futures must be in units of a fixed size (you will be given the size in the examination). It is therefore not always possible to enter into a deal of precisely the same amount as the underlying transaction whose risk we are trying to hedge against.

Example 9

It is 10 September 2004.

T plc expects to receive $1,200,000, on 12 November 2004

The spot rate (on 10 September) is $/£ 1.5020 – 1.5110

Futures prices (on 10 September) are:

	$/£ (£62,500) contracts.
September	1.5035
December	1.5045
March	1.5054

On 12 November 2004:

Spot: $/£ 1.5100 – 1.5190

December futures: 1.5120

Show the outcome of the futures hedge.

Notes:

(1) When deciding whether to 'buy' or to 'sell' futures, look at the underlying transaction. If the underlying transaction involves buying the contract currency, then we need to buy futures. If the underlying transaction involves selling the contract currency, then we need to sell futures. The contract currency is the currency in which the contract size is quoted.

(2) The fact that the movement in the futures price does not exactly equal the movement in the exchange rate does leave us exposed to a little risk. This risk is known as the **basis risk**. We will investigate this more shortly.

8.1. Estimating futures prices

Unless you are told otherwise in the examination, we assume that the difference between the futures price and the mid-market spot rate (the basis risk), falls linearly to zero over the life of the future.

Example 10

On 1 July:

Spot $/£ 1.5050 – 1.5150

September $/£ futures: 1.4900.

On 31 August:

Spot $/£ 1.5250 – 1.5370

What will be the futures price on 31 August?

Now let us look at a full example with everything included!

Example 11

It is 20 June 2004.

S plc owes an American supplier $500,000 payable on 12 September.

Spot rate on 20 June $/£ 1.4821 – 1.4896

Futures prices on 20 June:

	$/£ (£62,500 contracts)
June	1.4800
September	1.4840
December	1.4860

On 12 September, spot rate is $/£ 1.4791 – 1.4812

Show the outcome of using a futures hedge.

8.2. Ticks

In the previous examples we have calculated the profit on futures by looking at the change in the futures price, and multiplying this by the amount of the futures deal.

In practice, the movement is expressed slightly differently (although the resulting figures will be exactly the same).

Instead of referring to a change in futures price of (for example) 0.0135, it is referred to in practice as a change of 135 ticks. 1 tick = 0.0001, which is the smallest possible movement.

We can use this to calculate the profit or loss on futures as we will illustrate by repeating part of example 11.

Example 12

In example 11 re-calculate the profit making use of ticks.

8.3. Lock-in rate

In the previous examples, we were told the spot rate on the date of the transaction and therefore we were able to calculate what the futures price would be. In practice we obviously would not know in advance what the spot rate would be on the future date., but we would be in a position to calculate in advance what the net effect would be of using futures because we know what will happen to the basis.

The lock-in rate is a rate that we can calculate in advance, that when applied to the contract amount will give us the net result on the date of the transaction, whatever actually happens to the spot rate.

It is calculated as either the current futures price as adjusted by the unexpired basis on the date of the transaction, or as the current spot rate as adjusted by the change in the basis between 'now' and the date of the transaction (both approaches result in the same answer).

Example 13

Now is 1 January.

A transaction is due to take place in 2 months time and March futures are to be used to hedge the risk.

The current spot rate is $/£ 1.20, and the current futures price is $/£ 1.16.

Calculate the lock-in rate applicable to this transaction.

8.4. Under or Over hedging

As previously explained, futures can only be dealt in fixed-size contracts. As a result it is unlikely that the exact amount of the transaction can be hedged using futures and that there will be an amount 'missing'. This over or under hedge has therefore to be converted at whatever the spot rate turns out to be, which means that there is risk attached. However, since we know in advance how much the over or under hedge will be, we can eliminate the risk by the used of forward rates on the amount.

Advantages and disadvantages of using futures

Chapter 19

FOREIGN EXCHANGE RISK MANAGEMENT (2)

1. Introduction

In the previous chapter we looked at various ways of reducing the risk due to changes in exchange rates. In this chapter we will look at three more, rather different, possibilities – options, swaps, and swaptions!

2. Options

If we know that we are going to need to convert currency at a future date but we think that the exchange rate is going to move in our favour, then it would be more sensible to leave the transaction to be converted at spot on the relevant date, rather than hedge against the risk and therefore not receive the benefit of the exchange rate movements.

The above would be perfectly sensible if we were certain that the rate was going to move in our favour, but of course it is impossible to be completely certain and therefore there would still be a risk that we were wrong and that the rate moved against us.

In this situation – where we are reasonable confident that the rate will move in our favour – then it might be worthwhile considering a currency option. With a currency option we have the right (or option) to convert at a fixed rate on a future date (as with the use of a forward rate), but we do not have to exercise the right.

As a result, if the exchange rate does move in our favour then we will throw away the option and simply convert at whatever the spot rate happens to be. If, however, the exchange rate moves against us then we will use the option and convert at the fixed rate.

Since we will get the benefit of any movement in our favour, but not suffer if the exchange rate moves against us, options do not come free! We will have to pay (now) for the option whether or not we eventually decide to use it. The amount we have to pay is called the option **premium**.

2.1. OTC options

OTC stands for 'over-the-counter' and refers to the buying of an option as a private deal from a bank. The company will approach the bank stating the amount, the future date, and the exchange rate required, and the bank will quote a premium. It is then up to the company whether or not to accept the quote and purchase the option.

Example 1

It is 1 April and X plc expects to receive $2 million on the 30th June.

The current spot rate is $/£ 1.5190 and X expects that this rate will move in their favour.

They have purchased from the bank an option to sell $2 million on 30 June at an exercise price of $/£ 1.5200, and the bank have charged a premium of £50,000.

Show the outcome on 30 June if the exchange rate on that date is:

(a) $/£ 1.5180

(b) $/£ 1.6153

2.2. Traded options

As an alternative to buying a 'tailor-made' OTC option from a bank, it is possible to buy and sell currency option on the currency exchanges. A benefit of this is that the premiums are driven by market forces and the company can therefore be more certain of paying a fair price. However, traded options are only available between major currencies, at various quoted exchange rates, exercisable on various quoted dates, and for fixed size units.

The option premia are published in a table which you must be able to interpret in the examination. The table will appear as in the following illustration:

$/£ Options £31,250 (cents per £1)

	Calls			*Puts*		
Strike price	*Mar*	*Apr*	*May*	*Mar*	*Apr*	*May*
1.425	6.29	6.32	6.49	0.02	0.14	0.45
1.450	3.81	4.17	4.54	0.03	0.48	0.98
1.475	1.53	2.45	2.92	0.13	1.20	1.84

Example 2

Using the above table, explain the following:

(a) what is the 'strike price'?

(b) what do 'call' and 'put' mean?

(c) what do the months above each column mean?

(d) what do the numbers in the columns mean?

(e) what does the '£31,250 (cents per £)' mean?

2.3. European and American options

European options can only be exercised on the last day of the relevant month. American options can be exercised at any time up to the last day of the relevant month. This makes American options more flexible (and therefore generally more expensive!). (Although do appreciate that as these options are traded they can always be sold at any time.)

The terms European and American refer to the style of the option and are nothing to do with where they are actually sold.

Example 3

A UK company owes a US supplier $1,000,000 payable in April.

The spot rate is $/£ 1.4850 – 1.4870 and the UK company is concerned that the $ might strengthen.

Traded options are available at prices as shown in the following table:

$/£ Options £31,250 (cents per £1)

		Calls			*Puts*	
Strike price	*Mar*	*Apr*	*May*	*Mar*	*Apr*	*May*
1.425	6.29	6.32	6.49	0.02	0.14	0.45
1.450	3.81	4.17	4.54	0.03	0.48	0.98
1.475	1.53	2.45	2.92	0.13	1.20	1.84

(a) Show how traded $/£ currency options can be used to hedge the risk at 1.475

(b) Show what will happen if the spot rate in April is $/£1.4100 – 1.4120

3. Currency swaps

Currency swaps are much less popular than interest rate swaps (which will be explained in a later chapter).

They are best explained by way of a short illustration:

A UK company is intending to invest in the US and will therefore be earning income in $'s. They need to borrow money for the investment and have decided to borrow $'s (as a way of reducing the impact of changes in exchange rate – the closer their interest payments are to their receipts the less the effect on them of exchange rate movements).

Another company in the US is intending to invest in the UK and for the same reasons as above they wish to borrow £'s.

Both companies can organise their borrowing independently, but a US company is likely to be able to borrow $'s at a lower interest rate than a UK company (and vice versa).

A solution which stands to benefit both companies is as follows:

(1) The UK company borrows £'s and the US company borrows an equivalent amount of $'s. The two parties then swap funds at the current spot rate.

(2) The UK company agrees to pay the US company the annual cost of the interest on the $ loan. In return the US company pays the £ interest cost of the £ borrowing by the UK company.

(3) At the end of the period the two parties then swap back the principal amounts. This could be at the prevailing spot rates or at a predetermined amount in order to reduce foreign exchange transaction exposure.

Swaps are generally arranged by banks (who act as a 'dating agency' finding the parties to a swap). The bank will arrange guarantees, but they will charge commissions for their service.

More recently there has been a tendency for large companies to arrange swaps directly with each other (and not using banks, thus saving costs). The tendency is known as 'disintermediarisation'(!!).

4. Swaption

Suppose a company wants to borrow money on a future date and might want a swap to be arranged on that date. However, they are not sure and do not want to make the decision until the date on which they want to borrow the money.

In this situation it is possible to arrange with the bank to have the right (or option) to swap on a future date. This is known as a swaption (and obviously the bank will charge a premium, whether or not the option is exercised).

Chapter 20

INTEREST RATE RISK MANAGEMENT (1)

1. Introduction

In this chapter we will consider the nature of interest rate risk and ways in which this risk can be managed.

Note that throughout this chapter we will be considering a company wishing to borrow money. All of the techniques dealt with are equally available for a company wishing to deposit money.

2. The nature of interest rate risk

Interest rates on borrowing have fluctuated greatly over the past. Companies can borrow money at either floating interest rates or at fixed interest rates. If they have floating rate borrowing, then clearly they are subject to the risk of future interest rate changes. We will consider the possible advantages and disadvantages of this form of borrowing later.

However, more important for the examination is fixed interest borrowing. It would appear that this carries no risk in that any later changes in the interest rate are irrelevant. However, there can still be a problem which is illustrated below.

Illustration

It is now 1 June. A company has decided that they will wish to take out a loan of £100,000 for six months, starting in 3 months time on 1 September.

If they were to take the loan today then the rate of interest that they would be charged is 10% p.a. (fixed).

The problem is that they are not taking the loan today but in 3 months time. If they do nothing then there is a risk that by the time they actually take the loan the rate of interest will have changed.

The risk that we are concerned about is therefore the risk of interest rates changing between now and the date the loan starts (not the risk of interest rates changing after the start of the loan – the loan will be taken at a fixed rate).

3. Methods of managing interest rate risk

The methods with which you must be familiar for the examination are the following:

- forward rate agreements
- interest rate guarantees
- interest rate futures
- interest rate options

The above are all ways of managing the risk involved with fixed interest borrowing, and will be dealt with in this chapter.

In addition you must be familiar with swaps, which are rather different (and deal with a somewhat different situation). These will be dealt with in the next chapter.

4. Forward rate agreements

A forward rate agreement (FRA) is the fixing of an interest rate now to apply to a loan starting at a fixed future date.

It is an OTC (over-the-counter) transaction and effectively involves asking the bank to quote an interest rate now to apply to a specified amount of borrowing, for a specified period, the loan to start at a specified future date. Once the interest rate has been agreed, then if the actual rate at the start of the loan is any different the bank and the company will settle up for the difference.

Terminology

If we ask the bank to quote an FRA 3-9 on £100,000 then it means that we want a fixed interest rate to be quoted for a loan of £100,000 starting in 3 months time and ending in 9 months time (i.e. for a 6 month loan).

Example 1

It is now 1 June and X plc will need a fixed interest rate loan of £500,000 for 9 months starting on 1 September.

The bank quotes a rate of 10% p.a. to apply to the loan.

(a) State what FRA is required

(b) Calculate the result of the FRA and the effective interest rate if the actual interest rate for 9 month loans on 1 September is:

i. 13%

ii. 8%

5. Interest Rate Guarantees

An interest rate guarantee (IRG) is an arrangement with the bank whereby the bank fix a maximum interest rate to be applied to a loan of a specified amount, for a specified period, starting on a specified future date.

It is effectively an option, in that if interest rates rise above the agreed rate then the company is protected whereas if interest rates should fall then the company gets all the benefit. Since the company can only benefit, and not lose, the bank will charge a premium for the IRG which is payable immediately, whether or not the option is eventually exercised.

It is an OTC instrument and can not be traded.

Example 2

It is now 1 August and Y plc will need a fixed interest rate loan of $200,000 for 6 months starting on 1 December.

They ask the bank for an IRG at a rate of 12% p.a.. The bank quotes a premium of $1,500

Calculate the result of the IRG and the effective interest rate if the actual interest rate for 6 month loans on 1 December is:

(a) 13%

(b) 8%

6. Interest rate futures

Interest rate futures operate in a similar way to currency futures in that they are instruments that change as interest rates change, that an investor can buy today and sell later (or sell today and buy later). At the end of the deal any profit or loss is calculated and settled between the investor and the dealer. A company intending to borrowing money on a future date can leave the borrowing at risk but use a futures 'gamble' to create an opposite risk that will net off against the risk of the underlying transaction.

Interest rate futures are not quoted as actual interest rates, but as a number which is 100 – interest rate.

For example, a futures price of 92.00 is equivalent to an interest rate of 8% p.a.

Similarly, an interest rate of 12% p.a. has an equivalent future price of 88.00.

It is important to note two things.

Firstly, if a company is borrowing money, then they will suffer if interest rates rise between now and the date the loan will start. If interest rates do rise, then the futures price will fall. They need to make a profit from the future to cover against the increased interest, and the way in which they can make a profit from a falling futures price is to sell futures today and buy them back later at a lower price. **A borrower will always SELL futures.**

Secondly, the futures available are what are called 3 month futures. This means that any profit or loss is always calculated for 3 months even though the equivalent interest rate is quoted on a 12 month basis. This means that if the futures price changes by 2.00, this is equivalent to a change of 2% p.a., but any profit or loss is only calculated for a 3 month period and so will be 0.5% (2% divided by 4). This is always 3 months and has nothing to do with the length of the loan. It does however mean that we have to be careful to match the amount of the 'gamble' taking account of the length of the loan.

You will see how we deal with these two points in the following example. This example is intended to demonstrate how we use interest rate futures in a simple way – we will bring in the additional 'rules' afterwards.

Example 3

Today is 3 October, and interest rates are 8% p.a.. X plc will wish to borrow $6M for 6 months starting on 1 January.

3 month January interest rate futures are available at 92.00.

Show how interest rate futures may be used to hedge the risk, and calculate the outcome on 1 January.

(Assume that on 1 January interest rates have changed to 10% and the futures price to 90.00)

Additional points:

(1) Futures can only be dealt in contracts of fixed amounts – you will be told the contract size in the examination

(2) In practice the change in futures prices will not exactly equate to the change in interest rates – the difference being the basis risk. If you are not told the futures price at the start of the loan then you will be expected to estimate it in the same way as we estimated the prices of currency futures – we assume that the basis risk falls linearly to zero over the life of the future.

Example 4

Barbara plc intends to borrow $40M for 6 months starting on 1 January.

Today is 1 November, LIBOR is 6% and Barbara can borrow at 1% above LIBOR.

Interest rate futures are available at the following prices: (contract size is $1M):

January	93.50
February	93.40
March	93.35

(The contracts expire at the end of the relevant month.)

(a) Illustrate how futures may be used to hedge the interest rate risk.
(Assume that on 1 January LIBOR has risen to 9%.)

(b) Calculate the effective interest rate

7. Interest rate options

In section 5 of this chapter we looked at Interest Rate Guarantees, which are effectively options but are OTC.

In this section we will look at traded options, which have the advantage that the premia are determined by market forces and therefore we can be more certain that we will be paying a 'fair' price. Also they have the advantage that they are traded and that therefore the options can be sold.

There is one enormous difference from currency options in that the options here are not on interest rates themselves, but are the option to buy or sell interest rate futures at a fixed price.

The option premia are given in the form of a table which you need to be able to interpret.

Example 5

Dollar options. $500,000. Points of 100%

	Calls			*Puts*		
Strike price	*Sep*	*Dec*	*Mar*	*Sep*	*Dec*	*Mar*
94.25	0.18	0.08	0.04	0.19	0.83	1.42
94.50	0.10	0.04	0.01	0.21	1.24	1.68
94.75	0.03	0.01	0.01	0.48	1.48	1.92

(a) What does the strike price mean?
(b) What do the headings 'calls' and 'puts' mean?
(c) What do the months at the top of each column mean?
(d) What does the 'dollar options $500,000. Points of 100%' mean?
(e) What do the numbers in each column mean?

Example 6

Agne intends to borrow $5.6M for 8 months starting in September, and wishes to protect herself against LIBOR rising above 5.75%.

LIBOR is currently 5% and Agne can borrow at 6.4%.

It is now 13 August, and options are available at the following prices:

Short Dollar options. $500,000. Points of 100%

	Calls			*Puts*		
Strike price	*Sep*	*Dec*	*Mar*	*Sep*	*Dec*	*Mar*
94.25	0.18	0.08	0.04	0.19	0.83	1.42
94.50	0.10	0.04	0.01	0.21	1.24	1.68
94.75	0.03	0.01	0.01	0.48	1.48	1.92

Futures prices on 13 August are:

September	94.30
December	94.20
March	94.10

(a) Show how the options can be used to hedge against the risk.

(b) Show the outcome of the hedge if the loan is negotiated on 18 September and LIBOR is 6.5% on that date.

(c) Calculate the effective interest rate.

8. Interest Rate collars

As you have seen in the previous sections, if we are borrowing money, then we can fix a maximum interest rate by buying a put option.

So, for example, if we buy a put option at a strike price of 92.00 then we will be fixing a maximum interest rate of 8%.

So…. if the actual interest rate turns out to be only 5% we do not exercise the option and we just pay 5%. But if the actual interest rate turns out to be 10% then we pay the interest at 10% but exercise the option and effectively 'claim back' 2% from the seller of the option. (For details of how exactly this works see the Course Notes and lectures on options).

The benefit of buying the option is obvious – we fix a maximum rate but we get the benefit if rates are lower. However the downside is that we have to pay a premium for the option – whether or not we end up exercising it.

Similarly, there are people who are depositing money and therefore will be wanting to fix a minimum interest rate. They will buy a call option. If the interest rate falls then they will 'claim' from the seller of the option, but if the interest rate rises then they will get the benefit of the higher rates and will not exercise the option.

Back to the borrower!

They fix a maximum rate, but the downside is they have to pay the premium.

What they can do to reduce the cost is to also sell a call option (effectively becoming a dealer) and will therefore receive a premium from the person buying it.

This means they still have the benefit of fixing a maximum rate (a 'cap') but the net cost of it is reduced because although they still pay the premium for the put option, they will also be receiving a premium from selling the call option.

However, selling a call option will mean that they are accepting a minimum interest rate (a 'floor').

Illustration

Suppose we buy a put option with a strike price of 92.00 (fixing a maximum interest rate of 8%).

Suppose we also sell a call option with a strike price of 96.00 (fixing a minimum interest rate for the buyer of 4%).

Let us see what happens for different actual interest rates that might apply when they actually start the loan.

Suppose the actual interest rate turns out to be:

a) 10%; b) 6%; and c) 3%

Solution

a) If the actual interest is 10% then we will 'claim' on the put option and get 2% back from the seller. The person who bought the call option will not 'claim' because they are getting higher interest on their deposit. So the net cost to us is 8% – this is the most we will ever end up paying.

b) If the actual interest is 6% then we will not 'claim' on the put option. Also the person who bought the call option will not 'claim' from us. So we will end up paying 6% – we have got the benefit of the lower rate.

c) If the actual interest is 3% then we will not 'claim' on the put option. However, the person who bought the call option from us (because they wanted to fix a minimum interest rate on their deposit of 4%) will 'claim' 1% on us because we sold it to them. So we will end up paying 4% in total (3% on the loan, and 1% to the buyer of the call option).

The end result means that whatever the interest rate turns out to be, the maximum that we will end up paying will be 8% (fixed by buying the put option of 92.00), but it will also mean that the minimum we will end up paying is 4% (fixed by selling the call option at 96.00).

The reason that we might wish to do this is that we are still able to fix the maximum interest we will pay, but by accepting a minimum interest the net cost of the premium will be reduced (we pay for the put option, but receive a premium from selling the call option).

Having a maximum rate is a 'cap'. Having a minimum rate is a 'floor'.

Having a maximum and a minimum is a 'collar'.

Example 7

Use the previous example (example 6) to show how Agne could use a collar to hedge her borrowing.

Chapter 21

INTEREST RATE RISK MANAGEMENT (2)

1. Introduction

In the previous chapter we looked at the risk involved in fixed interest rate borrowing, and methods of dealing with this risk.

In this chapter we look at interest rate swaps which involve the choice between borrowing at fixed or floating rate interest. It is unlikely that this topic will be in the compulsory part of the paper, but it has been reasonably common in the choice section.

2. Fixed or floating?

The advantage of fixed rate borrowing is that once the loan has been taken out, the interest payments are then certain and there is no risk due to future movements in interest rates.

However, a company may prefer to borrow at floating rate for two reasons:

(1) they think that interest rates are going to fall and thus borrowing at floating rate will enable them to get the benefit of the fall (although clearly there is still a risk that they are wrong and that interest rates will rise)

(2) more importantly, if they are in a type of business whose income rises and falls as interest rates rise and fall then it makes good sense to borrow at floating rate so that their expense falls as their income falls.

3. Interest rate swaps

Whether a company chooses to borrow fixed or floating, some companies can borrow at better rates than other companies depending on their credit rating.

Because of this, it is potentially (but not always) possible for two companies to swap their borrowings in a way that saves money for both of them.

This is illustrated in the following examples:

Example 1

Company X can borrow at a fixed rate of 10% or at a floating rate of LIBOR + 3%.

Company Y can borrow at a fixed rate of 12% or at a floating rate of LIBOR + 6.5%.

Company X wishes to borrow at fixed rate, whereas company Y wishes to borrow at floating rate.

Show how a swap can benefit both companies.

Example 2

Company A and Company B can borrow as follows:

	Fixed	*Floating*
Company A	10%	LIBOR + 1%
Company B	11%	LIBOR + 1.5%

LIBOR is currently 9%

Company A's income fluctuates with interest rates, whereas B's does not. They both wish to borrow the same amount.

You are required to suggest a solution.

Chapter 22

EXCHANGE RATE DETERMINATION

1. Introduction

In this chapter we consider what factors are involved in the determination of foreign exchange rates, and also the different types of exchange rate system.

Most of this chapter is only for written questions, but in addition we look at how (in theory) we may attempt to predict future exchange rates – a topic which can form part of a calculation question.

2. Influences on exchange rate

(1) Rates of inflation in different countries

(2) Interest rates in different countries

(3) Economic and political prospects

(4) The balance of payments

Importantly, expectations concerning changes to the above will affect the exchange rate before changes actually occur.

3. Government approaches to exchange rate management

3.1. Fixed exchange rate systems

The government and the monetary authorities operate in the foreign exchange markets to ensure that the rate of exchange remains fixed.

This approach reduces the currency risk faced by companies and hence encourages a higher level of international trade.

However, keeping the exchange rate fixed places constraints on government policy.

3.2. Floating exchange rate systems

Under this approach the government has no obligation to maintain the rate of exchange and leaves its determination to market forces.

(a) **Free floating exchange rates**

Here, the exchange rate is left entirely to market forces. However, governments do not like to leave it entirely up to market forces due to the effect of the exchange rate on other economic factors. More common is managed floating.

(b) **Managed floating**

Under this approach the government allows the exchange rate to fluctuate between very large bands but intervenes if the currency looks like moving outside of these bands.

From 1944 to 1971, a system of fixed exchange rates existed (known as the Bretton Woods system). This collapsed in 1971 and most countries moved to a system of floating exchange rates. The G7 group of countries now operate to manage their exchange rates and attempt to endure reasonable stability.

4. Predicting future exchange rates

One important influence on exchange rates is the relative inflation rates between two countries.

The Purchasing Power Parity theory uses inflation rates to predict the future movement in exchange rates. It states that identical goods should sell at the same price when converted into the same currency. As the local currency prices changes with inflation then the exchange rate should change to keep the relative price the same.

Illustration

An item currently costs £100 in the UK.

The current exchange rate is $/£ 1.50.

The rates of inflation are 2% p.a. in the UK and 4% p.a. in the US.

(a) what will be the price of the item in 1 years time in the UK and in the US

(b) as a result, what will be the exchange rate in 1 years time?

The above can be expressed as a formula that gives the percentage change in the spot rate as:

$$S_1 = S_0 \times \frac{(1+h_c)}{(1+h_b)}$$

Example 1

The exchange rate is currently $/£ 1.70

The inflation rate in the US is 5% p.a. and in the UK is 2% p.a..

What will the exchange rate be in:

(a) one years time

(b) two years time

Example 2

The exchange rate is currently ¥ / £ 2030

The inflation rate in Japan is 4% p.a. and in the UK is 8% p.a..

What will the exchange rate be in:

(a) one years time

(b) two years time

Chapter 23

INTERNATIONAL OPERATIONS

1. Introduction

In this chapter we briefly consider the different ways in which a company can conduct overseas operations, and also examine the nature of political risk of overseas investments and ways of attempting to manage it.

2. Forms of international operations

- **export from the home country**
  - low risk; low capital needs
  - little local knowledge
  - slow response to market
- **set up overseas branch**
  - profits of branch treated as profit of parent company
  - cheap to run
- **set up overseas subsidiary**
  - may be able to claim local grants / tax advantages
  - local profile may be better for subsidiary
  - takes longer to form; less flexible
- **joint venture**
  - access to new markets at comparatively low cost
  - use of partner's expertise and local knowledge
  - easier access to government incentives and local capital markets
  - but, cultural difference / finding partner may be difficult
- **licensing**
  - rapid penetration of local markets
  - low investment
  - regular licensing fee income (often regardless of profitability)

3. Ways of remitting income from overseas investments

(1) Dividends
(2) Loan interest
(3) Royalties
(4) Management charges
(5) Transfer prices
(6) Countertrade

4. Political risk

Political risk is the risk that political action will affect the position and value of a company.

Examples of macro (country specific) political risk:

- outbreak of war / civil unrest
- confiscation of assets (nationalisation) / restrictions on foreign ownership
- import quotas / tariffs
- exchange controls

Examples of micro (firm specific) political risk

These are risks that affect only certain firms in certain industries, rather than all foreign firms.

- minimum wage legislation
- pollution controls
- product legislation
- health and safety legislation

Chapter 24

SOURCES OF FINANCE – ISLAMIC FINANCE

1. Introduction

Under the principles of Islamic law, wealth must be generated from legitimate trade and asset-based investment. Also, investments must have a social and ethical benefit. Speculative investments are not allowed, and investments in such areas as alcohol and gambling are forbidden.

2. Riba

As a consequence of the laws regarding the generation of wealth, it is strictly forbidden to use money for the purpose of making money – i.e. it is forbidden to charge interest **(riba)**.

Financial institutions cannot therefore make money by charging interest, but instead provide services for a fee or enter into a form of agreement with the client in which the risk and the profits or losses are shared between the institution and the client.

3. Islamic financial instruments

You should be aware of the following Islamic financial instruments and be able to briefly discuss them:

(a) Murabaha

This is effectively a form of **credit sale**, where the customer receives the goods but pays for them later on a fixed date.

However, instead of charging interest, a fixed price is agreed before delivery – the mark-up effectively including the time value of money.

(b) Ijara

This is effectively **a lease**, where the lessee pays rent to the lessor to use the asset.

Depending on the agreement, at the end of the rental period the lessor might take back the asset (effectively an operating lease) or might sell it to the lessee (effectively a finance lease – Ijara-wa-Iqtina).

Whatever the agreement, the lessor remains the owner of the asset and is responsible for maintenance and insurance, thus incurring the risk of ownership.

(c) Muduraba

This is similar to **equity finance**, or a special kind of partnership. The investor provides capital and the business partner runs the business. Profits are shared between both parties, but all losses are attributable to the investor (limited to the capital provided).

(d) Musharaka

This again is similar to a partnership, but here both parties provide both capital and expertise. Profits are shared between the parties according to whatever ratio is agreed in the contract, but losses are shared in proportion to the capital contributions.

It is regarded as being similar to **venture capital.**

(e) Sukuk

This is the equivalent of **debt finance** (Islamic bonds).

Sukuk must have an underlying tangible asset, and the holders of the Sukuk certificates have ownership of a proportional share of the asset, sharing revenues from the asset but also sharing the ownership risk.

An example may be where the financial institution purchases a property financed by Sukuk certificates and rents it out at fixed rent. The certificate holders receive a share of the rent (instead of interest) and a share of the eventual sale proceeds.

The Sukuk manager is responsible for managing the assets on behalf of the Sukuk holders (and can charge a fee). The Sukuk holders have the right to dismiss the manager.

(Although there can be a secondary market as with conventional debt (the purchase and sale of certificates on the stock exchange) it is currently very small. Most Sukuk are bought and held – virtually all of any trading is done by institutions.)

EMPLOYABILITY AND TECHNOLOGY SKILLS

1. Introduction

The ACCA has introduced this new section into the syllabus for all of the Applied Skills and Strategic Professional examinations now that all the examinations in all locations will be computer based.

However, it does not require the same sort of learning as for other syllabus areas because it is primarily focussed on ensuring that students are capable of using the Computer Based Exam software.

The level of skill needed to be able to use the CBE software can also be beneficial for your employment.

Many students will already have a high level of skill on computers and be familiar with the use of word processors and spreadsheets. However, those provided in the exam software might not be identical to those that you are familiar with and, in addition, it is essential that you are able to navigate the software efficiently so as not to waste time in the exam.

There are many excellent resources available on the ACCA website to assist you, and so in this chapter we will direct you to some of the relevant ACCA pages and explain their importance.

2. Navigating the exam and the tools available

The exam screen has a top bar and a bottom bar.

On the **top bar** there are options to call up an 'online calculator', to call up the 'scratch pad', and to 'flag for review'.

The online calculator is used in the normal way and can be switched at any time between a basic mode and a scientific mode. You can use your own calculator instead provided that it does not store or display text.

The scratch pad can be used to make notes and do your own rough workings, but nothing written on the scratchpad will actually be marked. You will also be provided with paper if sitting the exam in an exam centre and so you can use this for workings instead - the paper will be collected in at the end of the exam but, again, nothing on this rough paper will be marked. (Note: if you are sitting the exam remotely then paper is not allowed and you can only use the scratchpad.)

The 'flag for review' option enables you to put a mark against a question to enable you to quickly come back to it again later. This is for questions where you are unsure about your answer and want to do more work on it later should there be time.

On the **bottom bar** are the arrows for moving forwards or backwards through the questions. In addition there is a 'navigator' option which when chosen displays a list of all of the questions enabling you to go straight to a particular question.

Finally there is the option of calling up the formula sheet and tables (which are online copies of the sheet that is printed at the front of these lecture notes).

You can watch a video illustrating the use of all these features by visiting the following page:

https://www.accaglobal.com/gb/en/student/exam-support-resources/professional-exams-study-resources/p4/cbe-preparation.html

and clicking on the link to "CBE workspace management video".

3. Section A of the exam

This section comprises one 50 mark case study in which you will be required to prepare a report or similar business document and perform calculations on the information given in the question.

For calculations the program provides a spreadsheet in which to enter your calculations. For efficiency you should make use of the functions and formulae available in the spreadsheet (you do not need to type out separately the formulae used - the marker will be able to see them).

You can find details of the functions and formulae that are available in the ACCA booklet linked in section 5 of this chapter.

For the report you are provided with a word processor and, again, details of the functions available such as underlining and 'copy and paste' are in the ACCA booklet.

4. Section B of the exam

This section comprises two 25 mark questions and each question will contain a combination of calculation and written parts.

As with Section A you will be provided with a word processor and a spreadsheet.

5. ACCA Resources

You will find many resources on the ACCA website and the more you refer to the better.

Go first to the following page:

https://www.accaglobal.com/gb/en/student/exam-support-resources/professional-exams-study-resources/p4/introduction.html

On this page, under the heading "Resources" you will find a link to download "AFM essentials on one page". Clicking on this will download a useful small chart headed up "How to approach

Financial Management". One of the headings on this chart is 'Links to support resources' and clicking on each of the items listed in turn will take you to more detail. Each of these 'Key Resources' is worth reading.

In addition it is important to visit the following page:

https://www.accaglobal.com/gb/en/student/exam-support-resources/professional-exams-study-resources/p4/cbe-preparation.html

On this page you will find useful information, but also towards the bottom of the page you will find a link to "CBE Guidance Document". This will download a leaflet which details everything about the CBEs including, importantly, a list of the functions and formulae available in the spreadsheet and the word processor (and how to input the formulae in the spreadsheet).

On the same webpage, there is information on how to access the CBE specimen and practice exams - it is essential to use these resources in your exam preparation.

6. Revision Kit Live

On our main Paper AFM page you will find a link to a section called 'Revision Kit Live' in which you will find lectures working through several past exam questions. It includes a lecture working through the whole of question 1 from a computer based exam, not just explaining the answers but importantly the approach to CBE.

PROFESSIONAL SKILLS

1. Introduction

From September 2022, the AFM exam will include 20 Professional Skills marks: 10 in the case study Q1 in Section A and 5 in each of the 25-mark questions in Section B. The four professional skills relevant to AFM are: Communication; Analysis and Evaluation; Scepticism; Commercial Acumen.

All four skills will be examined in Section A

Each question in Section B will examine a minimum of two professional skills but **not** communication.

2. Communication

Q1 will always ask for a **report** to address key financial management matters facing the organisation.

Professional marks will be available for:

- General report format and structure – use of headings/sub-headings and an introduction
- Style, language and clarity – includes:
  - appropriate layout
  - tone of report response
  - presentation of calculations
  - appropriate use of the CBE tools
- Effectiveness of communication - answer is relevant, specific rather than general and focused to the requirement
- Adherence to the specific requests made by the requested of the report (e.g. the chief executive) in the **scenario.**

3. Analysis and Evaluation

All questions will include this professional skill. It is common for AFM questions to include significant amounts of calculation consisting of the use of models or methods to evaluate financial strategy decisions.

Remember: Any analysis or evaluation must be in **context** of the organisation's situation.

Analysis can be demonstrated by:

- Appropriate use of the data:
  - to determine suitable calculations and/or
  - to support discussion and draw appropriate conclusions
- Appraisal of information objectively to make a recommendation
- Identifying where data appears to be omitted or where further analysis is needed to make a recommendation

An evaluation is a **balanced** appraisal to determine the impact of a course of action (e.g. changing a company's organisational or capital structure). Part of that is to demonstrate reasoned judgement to consider relevant factors, decide what to prioritise and then come to a suitable and justified conclusion.

4. Scepticism

Having a questioning approach is key for this skill; it leads to effective challenges of information, evidence provided and assumptions stated. This includes the ability to identify contradictory evidence and remaining sceptical about information that has been provided in the scenario.

In the real world, effective challenge is the backbone of risk management for financial institutions. It provides a framework for performing critical analysis by utilising informed individuals who can objectively identify limitations and assumptions, as well as produce appropriate changes.

AFM often uses theoretical models which include assumptions and also can include stakeholders in question scenarios making statements about their beliefs and perceptions – you need to be able to challenge those statements. These challenges, however, cannot simply be in the abstract. Reasons for issues and problems with any assumptions/statements are needed before challenges can be upheld and deemed appropriate.

All of this means that you need to apply professional judgement to draw conclusions and make properly informed decisions which are appropriate to the organisation.

5. Commercial Acumen

All questions are set within a commercial scenario – most will be for-profit organisations, but they can include public sector organisations and also not-for-profit organisations. Whatever the context, you need to understand what will and will not work; any advice or recommendations have to be **practical** and **plausible** in the given situation.

To demonstrate this skill you must **use** examples from the **scenario information** and/or other practical commercial considerations to illustrate the points being made.

Organisations do not operate in a vacuum so you need to be able to recognise **external constraints and opportunities** where relevant and also consider the validity/reasonableness of any assumption that the organisation may be working under, given the external environment. Awareness of internal constraints within an organisation should also be accounted for.

6. Resources

In the Practice Platform on the ACCA website you will find the following:

- AFM Specimen from September 2022 onwards
- AFM Practice Exam 1 from September 2022 onwards
- AFM Practice Exam 2 from September 2022 onwards

FINANCIAL MANAGEMENT TERMS

Accounting rate of return

The ratio of the average operating profit generated by a project (net operating flows less depreciation) to the average capital employed.

Alternative Investment Market (AIM)

A UK market (similar ones in other countries) which exist for the issue and trading in equity of small and intermediate size companies. The AIM has lower admission costs and regulatory requirements than the full market.

American option

An option that can be exercised at any time up until the exercise date.

Asset beta

Measures the sensitivity of the underlying business to market risk. It is the beta we would expect to observe if the firm was financed solely from equity.

Basis point

is equal to 1/100th of a percentage point.

E.g. a change in interest rates of 0.10% is equivalent to a change of 10 basis points.

Basis risk

The variability in the prices of two related securities in the hedging arrangement. For example, if changes in the price of a currency future do not perfectly match the change in the price of the underlying security then a profit (or loss) may occur on the hedged position. This potential variability in the outcome of a hedge is basis risk.

Bills

Money market securities issued by the government and others. They are normally offered to the market at a discount and do not carry interest, but are repaid at par.

Call option

An option to purchase the underlying asset at a stated price on or before a given date from another party, the option 'writer'.

Capital market

The market for the purchase and sale of securities which have longer than one year to maturity.

Certificates of Deposit (CD)

In exchange for a deposit of funds the issuer writes a receipt (the CD) offering a one-off interest payment plus repayment of the face value of the deposit at maturity. The CDs are negotiable and can be traded.

Commercial paper

Corporate 'IOUs' against borrowed funds. They are issued at a discount and repaid at their face value and no extra interest is paid. They are the short term equivalent of corporate bonds and can be asset backed or 'credit backed' where the issuing firm has a weak credit rating but can obtain credit support from another company. A CP is not normally traded but is usually held until maturity once issued.

Coupon

The fixed rate of interest paid on a bond at regular (usually annual or semi-annual) intervals.

Credit risk (or default risk)

The risk borne by a lender that the borrower will default either on interest payments, the repayment of the borrowing at the due date, or both.

Derivative security

A security whose value is derived from the value of some other security such as a share, bond, money market bill or foreign exchange.

Discounted payback

The time taken for a firm to recover with its discounted cash flows the initial capital investment on a capital project.

Disintermediarisation

The removal of intermediaries such as banks and other financial institutions in the borrowing and lending process whereby borrowers issue securities in exchange for loan finance directly with investors.

Dividend cover

The ratio of earnings per share to dividend per share

Dividend yield

The ratio of dividend per share to price per share

Dynamic Delta hedging

The continuous adjustment of the balance between options and shares so as to ensure the maintenance of a risk neutral position.

Efficient markets hypothesis

The hypothesis that share prices respond instantly and without bias to new information such that an investor with access to that information cannot expect to make a systematic return greater than that offered by the market for the level of risk to which they are exposed. The EMH is traditionally presented in three forms: weak form (the information in past share prices), semi-strong form (publicly available information), and strong form (private information).

Eurobonds

Debt denominated in any currency (dollars, yen, euros etc) which are traded on the international capital markets.

European option

An option that can be exercised only on the exercise date.

Financial risk

The alteration in the volatility of the residual earnings to the equity investor caused by an alteration in the firm's gearing.

Fisher effect

The proposition that real rates of interest are constant between countries which implies that there is a direct relationship between changes in nominal interest rates and inflation rates in different countries.

FOREX

Foreign exchange

Free cash flow to equity

Operating cash flow less interest and tax paid. The free cash flow to equity is potentially distributable to shareholders as dividend or can be retained in the form of net capital investment.

Future

An exchange traded forward agreements to buy or sell some underlying security at some future date for a currently agreed price.

Gilts (gilt edged security)

Bonds issued by the UK Government (also known as Treasury Bonds)

Hedging

Taking positions in two or more securities which by their nature are designed to create perfectly counter varying returns. A short sale in a futures contract, for example, can offset the risk associated with a long position on an underlying asset. A perfect hedge is one where all chance of loss is eliminated.

Hostile bid

A bid to acquire another company that is opposed by the company's directors.

Initial margin

A deposit of cash or securities required by an exchange by parties to derivative agreements to underwrite any early losses that may be made on the position. Initial margin is about 20% of the value of the position in the underlying.

Interest rate futures

These are notional securities traded on the futures markets whose prices depend on the prevailing interest rates. The value of the future is (100 – implied interest rate). Thus the greater the interest rate the lower the value of the future, and vice versa.

Interest rate swaps

Where two partied agree to swap their liabilities for interest rate payments on a given capital sum. This is usually, but not necessarily, a fixed for variable interest rate swap.

Internal Rate of Return

The rate of discount which gives a zero Net Present Value when applied to an investment's cash flows. The IRR assumes that all cash flows throughout the life of the project are reinvested at the IRR.

International Fisher Effect

If the Fisher Effect holds then changes in the spot rate are directly related to changes in interest rate.

Intrinsic value (of an option)

The payoff if an option could be exercised immediately.

LIBOR

London Inter-Bank Offered Rate. The average overnight rate of interest offered by deposit accepting banks as complied on a daily basis by the British Bankers Association. A LIBOR is quoted for sterling, dollar, yen, euro and other currency deposits.

LIFFE

London International Financial Futures Exchange.

Mezzanine debt

Low grade debt issued by fast expanding businesses (often as a result of leveraged buyouts) which promises high rates of return and usually some form of equity participation through the attachment of warrants.

Money market

The market for securities which normally have less than one year to maturity.

Monte Carlo simulation

A mathematical modelling process where random numbers are drawn from assumed distributions attaching to the variables within a given model. By repeated trials using random numbers the performance of the model can be examined under different assumptions about the nature of the underlying distribution.

NOPAT

Net operating profit after tax

OTC

Over the counter – the term relating to private agreements between counterparties to by or sell a security (normally, but not always, referring to derivatives).

Pecking order hypothesis

This is the hypothesis that there is a natural progression in the way that a manager will use the capital resources with the most preferred being retained earnings followed by debt followed by new equity issue.

Perfect capital market

This is a market characterized by unrestricted access to capital at the current market rate of return, perfect certainty, zero information costs and an absence of transaction costs and taxes.

Price/earnings (P/E) ratio

The ratio of a company's price per share divided by its earnings per share. This ratio is commonly used as a valuation metric by the multiple method.

Put option

An option to sell the underlying asset at the stated price on or before a given date to another party, the option 'writer'.

Put call parity

A formal relationship between the value of a European call and put option in the same underlying security.

Real option

An option attaching to the future cash flows derived from an investment in a capital asset by a firm. Real options include managerial discretion to delay, expand, withdraw, or redeploy resources within an investment project.

Securitisation

The process of converting claims upon an entity such as a government or a firm, or its assets, into negotiable certificates of entitlement that can be traded between individuals and where the holder at any point in time has the same rights as were held by the person to whom they were originally issued.

Senior debt

Unsubordinated debt, i.e. debt which takes priority in the event of liquidation.

Swap

An agreement between two counterparties to swap a liability to interest payments or to swap an asset such as foreign currency.

Synergy

The concept that mergers and acquisitions can create value that would not be available to either company independently. Synergy can be either: revenue, cost, or financially induced and is often used by management to justify mergers or acquisitions.

Tick

The smallest price movement on an exchange traded derivative contact . A tick is defined as the number of basis point movement in the value of the derivative times the unit of trading multiplied by the fraction of the year that the movement has occurred over.

Treasury Bills

Government 'IOUs' of usually one or three months' maturity.

Value at risk (VAR)

The value that can be attached to the downside of a value or price distribution of known standard deviation and within a given confidence level.

Value at risk and related measures give an indication of the potential loss in monetary value which is likely to occur with a given level of confidence. The setting of the confidence level is necessary because in principle, if a price distribution is normally distributed for example, the downside loss is potentially infinite.

Variation margin

Further calls of cash or other securities from traders to underwrite any losses that may have accumulated against their position in a given derivative contract.

Venture capital

High risk finance for start-ups and other business ventures which is normally achieved through equity participation in the company concerned. Providers of venture capital are commonly backed by private equity finance.

Volatility

This is the measurement of the change in security price over time. It is normally calculated as the annualised standard deviation of the change in share price taken over time intervals (t). In finance it is the most common measure of risk.

Yield curve

The relationship between the yield that investors require upon risk-free bonds and the time to maturity.

Yield (with respect to bonds and other fixed interest securities)

The discount rate which equates the present value of the future stream of coupon payments and redemption value with the current market value of the bond concerned.

ANSWERS TO EXAMPLES

Chapter 1

No examples

Chapter 2

No examples

Chapter 3

Answer to Example 1

Begin with a review of the summary information - notable points

- Growth in turnover
- Growth in PBIT
- Growth in PAT
- Growth in total assets, debtors approx. in line with turnover, creditors at a higher rate.
- Reduction of gearing (result of rights issue?) and reduced interest charge
- Dividend growth
- P/E ratio has overtaken industry average.

Profitability	*Year 1*	*Year 2*	*Year3*	*Year 4*
ROCE	26%			22%
Profit Margin	19.86%			19.15%
Asset Turnover	1.29			1.17
Gearing				
Gearing (book values)	50%	34.6%	6%	3.9%
Interest cover (times)	7.25	9.5	48.5	75.3
Liquidity				
Debtor days	73			70
Creditor days	68			83
Investor ratios				
Share Price	9.63	11.40	9.66	11.95
Market Capitalisation	86.67			143.4
Divi per share (p)	22.2	24.4	21.65	30.0
Divi yield	2.3%	2%	2.2%	2.5%

Chapter 4

No examples

Chapter 5

No examples

Chapter 6

Answer to example 1

$k_e = \frac{30}{240} = \mathbf{12.5\%}$

Answer to example 2

$k_e = \frac{40\ (1.06)}{420} + 0.06 = \mathbf{16.10\%}$

Answer to example 3

$k_e = \frac{30\ (1.08)}{360} + 0.08 = \mathbf{17\%}$

Answer to example 4

$1+g = \sqrt[4]{\frac{33,000}{28,000}} = 1.042$

$g = 0.042 = \mathbf{4.2\% p.a.}$

Answer to example 5

$g = r\ b$

$= 0.20 \times 0.40$

$= 0.08$ / 8% p.a.

Answer to example 6

$r = 18\%$

$b = \frac{12}{32} = 37.5\%$

(a) $g = r\ b = 18\% \times 37.5\% =$ **6.75% p.a.**

(b) $k_e = \frac{20(1.0675)}{280} + 0.0675 = 0.14375$ / **14.375%**

(c) MV in 2 years $= 280\ (1.0675)^2 = 319$ / **$3.19**

Answer to example 7

(a) $k_d = \frac{8}{90} 8.89\%$

(b) Cost to company $\frac{8(1-03)}{90} = \mathbf{6.22\%}$

(or $k_d = (1-t) = 8.89\% \times (1-0.3) = 6.22\%$)

Answer to example 8

(a)

		df @ 10%	*PV @ 10%*	*df @ 15%*	*PV @ 15%*
0	(85)	1	(85)	1	(85)
1 – 5	6 p.a.	3.791	22.75	3.352	20.11
5	110	0.621	68.31	0.497	54.67
			6.06		(10.22)

$$k_d = IRR = 10\% + \left(\frac{6.06}{6.06 \times 10.22} \right) \times 5\% = \mathbf{11.86\%}$$

(b)

		df @ 10%	*PV @ 10%*
0	(85)	1	(85)
1 – 5	4.20 p.a.	3.791	15.92
5	110	0.621	68.31
			0.77 (= nearly 0!)

(a) Cost of debt = 10%

Answer to example 9

Cost of equity = k_e = 14.68%

Cost of debt = $8.70 \times 0.7 = 6.09\%$

$$W.A.C.C. = 14.68 \times \frac{10.9}{10.9+3.68} + 6.09 \times \frac{3.68}{10.9+3.68} = \mathbf{12.51\%}$$

Answer to example 10

$$\text{Cost of equity} = k_e = \frac{20(1.08)}{320} + 0.08 = \mathbf{14.75\%}$$

Cost of debt

		df @ 10%	*PV @ 10%*	*df @ 5%*	*PV @ 5%*
0	(105)	1	(105)	1	(105)
1 – 6	7 p.a.	4.355	30.49	5.076	35.53
6	110	0.564	62.04	0.746	82.06
			(12.47)		12.59

$$\text{Cost of debt} = \text{IRR} = 5\% + \left(\frac{12.59}{12.59 + 12.47} \times 5\%\right) = \mathbf{7.51\%}$$

$$\text{WACC} = 14.75\% \times \frac{32}{32+6.3} + 7.51\% \times \frac{6.3}{32+6.3} = \mathbf{13.56\%}$$

Chapter 7

No examples

Chapter 8

Answer to example 1

return = 5% + (12% – 5%)1.5 = **15.5%**

Answer to example 2

$$20\% = 8\% + (25\% - 8\%)\beta$$

$$\beta = \frac{12}{17} = \mathbf{0.71}$$

$$\sigma_{sys} = 0.71 \times 8\% = \mathbf{5.68\%}$$

Answer to example 3

(a) (0.2 × 1.2) + (0.4 × 11.8) + (0.3 × 1) + (0.1 × 0) = **1.26**

(b) Return = 8% + (20% - 8%) 1.26 = **23.12%**

Answer to example 4

Theoretical return = 4% + (10% – 4%)0.6 = 7.6%

Actual return = 8%

α = 8 – 7.6 = **+ 0.4%**

Answer to example 5

(a) P's shares have the highest β and so are the more risky shares.

(b) Ungeared β's:

$$\text{P plc} = \beta_a = 1.8 \times \frac{100}{100 + (40 \times 0.7)} = \mathbf{1.41}$$

$$\text{Q plc} = \beta_a = 1.5 \times \frac{100}{100 + (20 \times 0.7)} = \mathbf{1.32}$$

1.41 > 1.32 so P is the more risky business

Answer to example 6

For Y plc:

$$\beta_a = \beta_e \frac{E}{E + D(1-t)} = 1.8 \times \frac{100}{100 + (20 \times 0.75)} = 1.57$$

(a) Required return = 8% (18% – 8%) 1.57 = 23.7%

Chapter 9

Answer to example 1

	0	*1*	*2*	*3*	*4*	*5*
Sales		2,000	2,140	2,290	2,450	2,622
Materials		(864)	(933)	(1,008)	(1,088)	(1,175)
Labour		(735)	(772)	(810)	(851)	(893)
Net operating flow		401	435	472	511	554
Tax on operating flow		(100)	(109)	(118)	(128)	(139)
Cost	(1,800)					
Scrap						1,000
Tax on saving on capital allowed		113	84	63	47	(107)
Working Capital	(200)					200
Net cash flow	(2,000)	414	410	417	430	1,508
d.f. @ 10%	1	.909	0.826	0.751	0.683	0.621
P.V.	(2,000)	376	339	313	294	936

NPV = $258

The NPV is positive and so the project should be accepted.

Answer to example 2

	0	1	2	3	4	5
Net cash flow	(2,000)	414	410	417	430	1,508
d.f. @ 10%	1	.870	0.756	0.658	0.572	0.497
P.V.	(2,000)	360	310	274	246	749

NPV = $ (61) at 15%

NPV @ 10% = $258 (from example 1)

$$IRR = 10\% + \left(\frac{258}{258+61} \times 5\%\right) = \mathbf{14.04\%}$$

Answer to example 3

	0	1	2	3	4	5
Net cash flow	(2,000)	414	410	417	430	1,508
d.f. @ 10%	1	.909	0.826	0.751	0.683	0.621
P.V.	(2,000)	376	339	313	294	936
PV_I	(2,000)					
PV_R				2,258		

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

$$= \sqrt[5]{\frac{2,258}{2,000}} \times (1.10) - 1$$

$$= 0.1270 \text{ or } \mathbf{12.70\%}$$

Answer to example 7

a be the proportion of project A
b be the proportion of project B
c be the proportion of project C
x be the amount put on deposit at time 0
N be the total NPV

Constraints

$5{,}000a + 8{,}000b + 6{,}000\,c + x \leq 14{,}000$

$4{,}000\,a - 2{,}000b + 6{,}000c \leq 5{,}000 + 1.07\,x$

$1 \geq a, b, c \geq 0$

$x \geq 0$

Objective

$$\text{Maximise } N = 976\,a + 2{,}596b + 862\,c + \left(\frac{1.07}{1.1}x - x\right)$$

Chapter 10

Answer to Example 1

(a)

		d.f. @ 15%	P.V.
0 cost	(150,000)	1	(150,000)
1 – 15 Contribution	41,250 p.a.	5.847	241,189
1 –15 Fixed costs	(15,000) p.a.	5.847	(87,705)
15 scrap	15,000	0.123	1,845
		NPV	+5,329

ACCEPT PROJECT

(b) (i) sensitivity of initial investment = $\frac{5{,}329}{150{,}000} \times 100\% = +3.55\%$

(ii) sensitivity of sales volume = $\frac{5{,}329}{241{,}189} \times 100\% = -2.21\%$

(iii) sensitivity of contribution p.u. = $\frac{5{,}329}{241{,}189} \times 100\% = -2.21\%$

(iv) sensitivity of fixed costs = $\frac{5{,}329}{87{,}705} \times 100\% = +6.08\%$

(v) sensitivity of scrap value = $\frac{5{,}329}{1{,}845} \times 100\% = -289\%$

(c) No answer

Answer to Example 2

(a) Expected demand = (50,000 ×0.5) + (60,000 × 0.4) + (40,000 ×0.1) = 53,000 units

Expected contribution = 53,000 × 50% ×$10 = $265,000 p.a.

		d.f. @ 20%	P.V.
0	(200,000)	1	(200,000)
1 – 4	265,000 p.a.	2.589	686,085
1 – 4	(140,000) p.a.	2.589	(362,460)
4	50,000	0.482	24,100
		Expected NPV	$147,725

Answer to Example 3

For 95% confidence, VAR is 1.645 standard deviations from the mean.

i.e. for one year = 1.645 x $750,000 = $1,233,750

This means that James can be 95% certain that the returns will be $1,166,250 or more every year ($2,400,000 – $1,233,750).

Over six years, the total standard deviation is square root of (6 x ($750,000 squared)) = $1,837,117

Therefore the VAR = 1.645 x 1,837,117 = $3,022,057

This means that James can be 95% certain that the returns will be $11,377,943 or more in total over the six year period ($14,400,000 – $3,022,057).

Chapter 11

Answer to example 1

Time	1	2	3	4	5
Receipt	8	8	8	8	118
d.f. at 10%	0.909	0.826	0.751	0.683	0.621
P.V.	7.27	6.61	6.01	5.46	73.28

Market value = total P.V. = 7.27 + 6.61 + 6.01 + 5.46 + 73.28 = 98.63

Answer to example 2

Guess at 10%:

Time	0	1	2	3	4	5	6	7	8	9	10
Cash	(91.61)	8	8	8	8	8	8	8	8	8	118
d.f.	1	.909	.826	.751	.683	.621	.564	.513	.467	.424	.386
P.V.	(91.61)	7.27	6.61	6.01	5.46	4.97	4.51	4.10	3.74	3.39	45.55

NPV = 0, therefore Gross Redemption Yield = IRR = 10%.

(Normally we would have needed to make two guesses as usual when calculating the IRR)

Answer to example 3

First bond:

Time	1	2	3	4	5
Receipt	8	8	8	8	118
d.f. at 15%	.870	.756	.658	.572	.497
P.V.	6.96	6.05	5.26	4.58	58.65

Market value = total PV = 6.96 + 6.05 + 5.26 + 4.58 + 58.65 = 81.50
Fall in value: (98.63 – 81.50) / 98.63 = 17.4%

Second bond:

Time	1	2	3	4	5	6	7	8	9	10
Cash	8	8	8	8	8	8	8	8	8	118
d.f.	.870	.756	.658	.572	.497	.432	.376	.327	.284	.247
P.V.	6.96	6.05	5.26	4.58	3.98	3.46	3.01	2.62	2.27	29.15

Market value = total PV = 67.34
Fall in value = (91.61 – 67.34) / 91.61 = 26.5%

Answer to example 4

The gross redemption yield is 10% (see example 1)

Time	1	2	3	4	5
Receipt	8	8	8	8	118
d.f. at 10%	0.909	0.826	0.751	0.683	0.621
P.V.	7.27	6.61	6.01	5.46	73.28

The total present value = market value = 98.63

Macaulay duration = ((7.27 x 1) + (6.61 x 2) + (6.01 x 3) + (5.46 x 4) + (73.28 x 5)) / 98.63 = 426.76 / 98.63 = 4.33 years

Answer to example 5

((7.27 x 1) + (6.61 x 2) + (6.01 x 3) + (5.46 x 4) + (4.97 x 5) + (4.51 x 6) + (4.10 x 7) + (3.74 x 8) + (3.39 x 9) + (45.55 x 10)) / 91.61 = 7.17 years)

Answer to example 6

The modified duration = 4.33 / 1.10 = 3.94 years)

Chapter 12

Answer to example 1

Gearing ratio:

Equity	100
Debt	40
	140

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

$= 15 + 0.7\ (15 - 8) \times 40/100$

$=$ **16.96%**

Cost of equity $= 16.96\%$

Cost of debt $= k_d\ (1 - T) = 8 \times 0.7 =$ **5.6%**

WACC **before** raising debt $= k_e = 15\%$

WACC **after** raising debt $= (16.96 \times 100/140) + (5.6 \times 40/100)$

$=$ **13.71%**

Answer to example 2

(a) If all equity, required return $= 5\% + (15\% - 5\%)\ 1.5 =$ **20%**

		df @ 20%	*PV @ 20%*
0	(100M)	1	(100M)
1 – 5	40M p.a.	2.991	119.64
			19.64M

(b) Tax benefit $= tD = 0.3 \times 30M = 9M$

(or: tax saving on interest $= 0.3 \times 5\% \times 30M = 0.45M$ p.a.

Discount for perpetuity at risk free rate: $0.45M \times \frac{1}{0.05} = 9M$

Gain from project	19.64M
Gain from debt	9 M
Total gain	28.64M

(c) Tax benefit = present value of tax saving on interest.

		df @ 5%	*PV @ 5%*	
1 – 5	0.45M p.a.	4.329	1.9481	M

Gain from project	19.64M
Gain from debt	1.95M
Total gain	21.59M

Chapter 13

Answer to example 1

(a) \$2.50 > \$1.80 so exercise

(b) \$1.50 < \$1.80 so do not exercise

Answer to example 2

Value of option = \$2.50 – \$2.00 = \$0.50

Answer to example 3

$$d_1 = \frac{\ln\left(\frac{290}{260}\right) + 0.06 \times 0.5}{0.4\sqrt{0.5}} + 0.5 \times 0.4\sqrt{0.5} = 0.4921 + 0.1414 = 0.6335$$

$$d_2 = 0.6335 - 0.4 \times \sqrt{0.5} = 0.3507$$

$N(d_1) = 0.5 + 0.2357 = 0.7357$

$N(d_2) = 0.5 + 0.1368 = 0.6368$

Option price = $290 \times 0.7357 - 260e^{-0.06 \times 0.5} \times 0.6368 = 213 - 161 = 52c$

Answer to example 4

$$d_1 = \frac{\ln\left(\frac{150}{180}\right) + 0.1 \times 0.25}{0.4\sqrt{0.25}} + 0.5 \times 0.4\sqrt{0.25} = -0.7866 + 0.1 = -0.6886$$

$$d_2 = 0.6866 - 0.4 \times \sqrt{0.25} = -0.8866$$

$N(d_1) = 0.5 - 0.2549 = 0.2451$

$N(d_2) = 0.5 - 0.3133 = 0.1867$

Option price = $150 \times 0.2451 - 180e^{-0.1 \times 0.25} \times 0.1867 = 37 - 33 = 4c$

Answer to example 5

$N(d_1) = 0.2451$ (as in example 4)

$$\text{Number of options} = \frac{1{,}000}{0.2451} = 4{,}080$$

Chapter 14

Answer to example 1

P_a = current P.V. of project = \$12 M
P_e = capital expenditure = \$10M
t = 3 years
r = 6%
s = 20%

$$d_1 = \frac{\ln(\frac{12}{10}) + (0.06 + 0.5 \times (0.2)^2) \times 3}{0.20 \times \sqrt{3}}$$

$$= \frac{0.1823 + 0.24}{0.3464} = \mathbf{1.22}$$

$$d_2 = 1.22 - 0.2 \times \sqrt{3} = 0.87$$

$N(d_1)$ = 0.5 + 0.3888 = 0.8888

$N(d_2)$ = 0.5 + 0.3078 = 0.8078

$c = 12 \times 0.8888 - 10 \times 0.8078 \times e^{-0.18}$

= **\$3.92M**

The value of the project without the option is the NPV of \$2M, and therefore the value added by the option is \$1.92M (3.92 – 2)

Chapter 15

No examples

Chapter 16

Answer to example 1

	1	*2*	*3*	*4 - ∞*
Free cash flow	4.5	8.1	11.7	
D.F @ 10%	0.909	0.826	0.751	
P.V.	4.091	6.691	8.787	152.303 (see note below)

Value of the firm = total P.V. = \$171.872M

Value of the equity = 171.872 - 50 = \$121.872M

Calculation of 4 - ∞ :

Using the dividend valuation formula (which can be used for any inflating perpetuity) PV at time 3 = 11.7 x 1.04 / (0.10 - 0.04) = 202.8

Discounting 3 years at 10% gives a PV at time 0: 202.8 x 0.751 = 152.303

Answer to example 2

EBIT	720
Depreciation	288
Taxation	(336)
Operating cash flow	672
Less: replacement of existing non-current assets	(288)
Less: cost of new non-current assets	(36)
Less: increase in working capital	(120)
Free cash flow	228

Answer to example 3

Asset β of B = 1.8 x 100/(100 + (20 x 0.75)) = 1.57

Equity β using A's gearing = ((100 + (40 x 0.75)) / 100) x 1.57 = 2.041

Cost of equity to use for B = 8% + 2.041 x (15% - 8%) = 22.29%

WACC for B = (100/140 x 22.29%) + (40/140 x 7%) = 17.92%

Answer to example 4

EBIT	720
Depreciation	288
Taxation	(336)
Operating cash flow	672
Less: replacement of existing non-current assets	(288)
Less: cost of new non-current assets	(36)
Less: increase in working capital	(120)
Free cash flow	228
Less: interest paid	(12)
Less: loans repaid	(48)
Free cash flow to equity	168

Chapter 17

No examples

Chapter 18

Answer to example 1

$100,000 ÷ 1.6310 = £61,312

Answer to example 2

240,000 ×9.2530 = IR 2,220,720

Answer to example 3

200,000 ÷ 1.4910 = £134,138

Answer to example 4

Forward rate = 1.5385 – 0.0051 = 1.5334

150,000 ÷ 1.5334 = £97,822

Answer to example 5

Forward rate = 1.6582 + 0.0083 = 1.6665

200,000 ÷ 1.6665 = 120,012

Answer to example 6

Borrow $'s:	5M ÷ 1.0145	=	$4,928,536
Convert at spot	4,928,536 ÷ 1.5426	=	£3,194,954
Invest £'s	3,194,954 × 1.009	=	£3,223,709

Answer to example 7

Invest $'s:	8M ÷ 1.0116	=	$7,874,016
Convert at spot	7,874,016 ÷ 1.6201	=	£4,860,204
Borrow £'s	4,860,204 × 1.02475	=	£4,980,494

Answer to example 8

If converted at spot on 10 August:

800,000 × 1.5631= $1,250,480

In 3 months time,	spot	=	1.5726 – 1.5831
	futures:		1.5780

Underlying transaction at spot:

800,000 × 1.5831 = 1,266,480

Profits on futures

800,000 × (1.5780 – 1.5580) = 16,000

Net payments $1,250,480

Answer to example 9

Converting at current (12 Nov) spot: 1,200,000 ÷ 1.5110 = £794,176

Futures: BUY

December (at 1.5045)

Number of contracts = 1,200,000 ÷ 1.5045 ÷ 62,500 = **13**

On 10 September:

Underlying transaction at spot:	
1,200,000 ÷ 1.5190 =	£789,993
Profits on futures	
13 × £62,500 × (1.5120 – 1.5045) = $6,094 ÷ 1.5190	4,012
Net receipt	£794,005

Answer to example 10

	1 July	*31 August*	*30 September*
Mid-market spot	1.5100	1.5310	
Futures	1.4900	1.5243	
Difference	0.0200	0.0067	0

$\frac{1}{3} \times 0.02$

Answer to example 11

(a) If converted at current spot rate on 20 June:

500,000 ÷ 1.4821 = £337,359

(b) Futures SELL

September (at 1.4840)

Contracts = 500,000 ÷ 1.4840 ÷ 62,500 = 5

(c) Futures price on 12 September

	20 June	*12 September*	*30 September*
Mid-market spot	1.48590	1.4802	
Futures	1.44840	1.4799	
Difference	0.02000	0.0003	0

$\frac{18}{102} \times 0.0019$

(d) Illustration on 12 September:

Underlying transaction at spot:	
500,000 ÷ 1.4791 =	£338,043
Profits on futures	
5 × £62,500 × (1.4840 – 1.4799) = $1,281 ÷ 1.4812	£865
Net receipt	£337,178

Answer to example 12

Profit / loss per tick = £62,500 × 0.0001 = $6.25

Movement in futures price = 1.4840 – 1.4799 = 41 ticks

Profit = 5 × 41 × $6.25 = $1,281.25

Chapter 19

Answer to example 1

(a) Do not exercise option:

$2M ÷ 1.5180 =	£1,317,523
less: premium	50,000
Net receipt	£1,267,523

(b) Exercise option

$2M ÷ 1.5200 =	£1,315,789
less: premium	50,000
Net receipt	£1,265,789

Answer to example 2

No answer

Answer to example 3

(a)
- Put options
- April
- Strike of 1·475
- Contracts: 1,000,000 ÷ 1·475 ÷ 31,250 = 22
- 22 × 31,250 × 0.0120 = $8,250

  8,250 ÷ 1·4850 = £5,556 (payable now)

(b) In April:

Underlying transaction	
$1,000,000 ÷ 1·4100 =	709,220
Profits on options:	
22 × 31,250 × (1·4750 – 1·4100) = $44,688 ÷ 1·4120 =	31,649
	677,571
Add: premium	5,556
Total payment	£683,127

Chapter 20

Answer to example 1

(a) FRA 3–12 $500,000

(b) (i)

Interest: 500,000 × $^{9}/_{12}$ × 13% =	500,000
FRA: 500,000 – $^{9}/_{12}$ × (13% – 10%)	11,250
	37,500

$$\text{Effective rate} = \frac{37{,}500}{500{,}000} \times {}^{12}/_{9} = \mathbf{10\%}$$

(ii)

Interest: 500,000 × $^{9}/12$ × 8% =	30,000
FRA: 500,000 – $^{9}/12$ × (10% – 8%)	7,500
	37,500

$$\text{Effective rate} = \frac{37{,}500}{500{,}000} \times {}^{12}/9 = \mathbf{10\%}$$

Answer to example 2

(a)	Interest: 200,000 × 6/12 × 13% =	13,000
	IRG: 200,000 – 6/12 × (13% – 12%)	1,000
		12,000
	Premium	1,500
		13,500
(b)	Interest: 200,000 × 6/12 × 8% =	8,000
	IRG	–
	Premium	1,500
		9,500

Effective rate = $\frac{9{,}500}{200{,}000} \times {}^{12}/_{6} = \mathbf{9.5\%}$

Answer to example 3

Interest at current interest rates: 6M × 8% × 6/12 =	240,000

Futures 'gamble' required = 6M × 6/3 = 12M

On 1 January:

Interest 6M × 10% × 6/12 =	300,000
Profit in futures:	60,000
NET COST	240,000

Answer to example 4

(a) Interest at current interest rates: 40M × 6/12 × 7% = £1,400,000

Futures: SELL

January

Contracts: 40M × 6/3 ÷ 1M = **80**

Future price on 1 January:

	1 November	*1 January*	*31 January*
Interest	94.00	91.00	
Futures	93.50	90.83	
Difference	0.50	0.17	0

$\frac{1}{3} \times 0.50$

Illustration on 1 January:

Interest at current interest rates: 40M × 6/12 × 10% =	$2,000,000
Profit in futures:	534,000
NET COST	1,466,000

Answer to example 5

No answer

Answer to example 6

(a)
- PUT
- September
- Strike price 94.25
- Contracts: 5.6M × 8/3 ÷ 0.5M = 30
- Premium $30 \times 0.5M \times \frac{0.19}{400} = \textbf{£7.125}$

(b) On 18 September

	13 August	*18 September*	*30 September*
Interest	95.00	93.50	
Futures	94.30	93.32	
Difference	0.70	0.18	0

$\frac{12}{48} \times 0.70$

Interest on loan: 5.6M × 7.9% × 8/12 =	294,933
Profit on options:	34,875
	£260,058
Premium	£7,125
Net payment	£267,183

(c) Effective interest rate = $\frac{267,183}{5.6M} \times \frac{12}{8} \times 100\% = \textbf{7.16\%}$

Chapter 21

Answer to example 1

	X	*Y*	*Total*
Own borrowing	10%	L + 6.5%	L + 16.5%
Swap	L + 3%	12%	L + 15%
		Benefit	1.5%

Answer to example 2

	A	*B*	*Total*	
Own borrowing	L + 1%	11%	L + 12%	
Swap	10%	L + 15%	L + 11.5%	
		Saving	0.5%	
			Split equally	= 0.25% each
	L + 15%	10%		
B pays A 0.75%	(0.75%)	0.75%		
NET INTEREST	L + 0.75%	10.75%		

Chapter 22

Illustration

(a) U.K.: £100 × 1.02 = £102 in 1 year

U.S.: currently 100 × 1.50 = $150

$150 × 1.04 = $156 in 1 year

(b) Exchange rate in 1 year = $\frac{1.04}{1.02}$ x 1.50 = $/£ 1.5294

Answer to example 1

In 1 year: $1.70 \times \frac{1.05}{1.02} = \$/£1.75$

In 2 year: $1.70 \times \left(\frac{1.05}{1.02}\right)^2 = \$/£1.80$

Answer to example 2

In 1 year: $2{,}030 \times \frac{1.04}{1.08} = ¥/£\ 1{,}955$

In 2 year: $2{,}030 \times \left(\frac{1.04}{1.08}\right)^2 = ¥/£\ 1{,}882$

Chapters 23 to 24

No examples