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ACCA Paper

P4

Advanced Financial Management

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EXAM FORMULAE & MATHS TABLES

Formulae

Modigliani and Miller Proposition 2 (with tax)

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

Two asset portfolio

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

The Capital Asset Pricing Model

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

The asset beta formula

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

The Growth Model

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

Gordon's growth approximation

$$g = br_e$$

The weighted average cost of capital

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

The Fisher formula

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

Purchasing power parity and interest rate parity

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

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	0·941	0·837	0·766	0·703	0·645	0·592	0·544	0·500	0·460	0·424	9
10	0·905	0·820	0·744	0·676	0·614	0·558	0·508	0·463	0·422	0·386	10
11	0·896	0·804	0·722	0·650	0·585	0·527	0·475	0·429	0·388	0·305	11
12	0·887	0·788	0·701	0·625	0·557	0·497	0·444	0·397	0·356	0·319	12
13	0·879	0·773	0·681	0·601	0·530	0·469	0·415	0·368	0·326	0·290	13
14	0·870	0·758	0·661	0·577	0·505	0·442	0·388	0·340	0·299	0·263	14
15	0·861	0·743	0·642	0·555	0·481	0·417	0·362	0·315	0·275	0·239	15

(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1	0·901	0·893	0·885	0·877	0·870	0·862	0·855	0·847	0·840	0·833	1
2	0·812	0·797	0·783	0·769	0·756	0·743	0·731	0·718	0·706	0·694	2
3	0·731	0·712	0·693	0·675	0·658	0·641	0·624	0·609	0·593	0·579	3
4	0·659	0·636	0·613	0·592	0·572	0·552	0·534	0·516	0·499	0·482	4
5	0·593	0·567	0·543	0·519	0·497	0·476	0·456	0·437	0·419	0·402	5
6	0·535	0·507	0·480	0·456	0·432	0·410	0·390	0·370	0·352	0·335	6
7	0·482	0·452	0·425	0·400	0·376	0·354	0·333	0·314	0·296	0·279	7
8	0·434	0·404	0·376	0·351	0·327	0·305	0·285	0·266	0·249	0·233	8
9	0·391	0·361	0·333	0·308	0·284	0·263	0·243	0·225	0·209	0·194	9
10	0·352	0·322	0·295	0·270	0·247	0·227	0·208	0·191	0·176	0·162	10
11	0·317	0·287	0·261	0·237	0·215	0·195	0·178	0·162	0·148	0·135	11
12	0·286	0·257	0·231	0·208	0·187	0·168	0·152	0·137	0·124	0·112	12
13	0·258	0·229	0·204	0·182	0·163	0·145	0·130	0·116	0·104	0·093	13
14	0·232	0·205	0·181	0·160	0·141	0·125	0·111	0·099	0·088	0·078	14
15	0·209	0·183	0·160	0·140	0·123	0·108	0·095	0·084	0·074	0·065	15

Annuity Table

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

Where r = discount rate
n = number of periods

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
1	0·990	0·980	0·971	0·962	0·952	0·943	0·935	0·926	0·917	0·909	1
2	1·970	1·942	1·913	1·886	1·859	1·833	1·808	1·783	1·759	1·736	2
3	2·941	2·884	2·829	2·775	2·723	2·673	2·624	2·577	2·531	2·487	3
4	3·902	3·808	3·717	3·630	3·546	3·465	3·387	3·312	3·240	3·170	4
5	4·853	4·713	4·580	4·452	4·329	4·212	4·100	3·993	3·890	3·791	5
6	5·795	5·601	5·417	5·242	5·076	4·917	4·767	4·623	4·486	4·355	6
7	6·728	6·472	6·230	6·002	5·786	5·582	5·389	5·206	5·033	4·868	7
8	7·652	7·325	7·020	6·733	6·463	6·210	5·971	5·747	5·535	5·335	8
9	8·566	8·162	7·786	7·435	7·108	6·802	6·515	6·247	5·995	5·759	9
10	9·471	8·983	8·530	8·111	7·722	7·360	7·024	6·710	6·418	6·145	10
11	10·37	9·787	9·253	8·760	8·306	7·887	7·499	7·139	6·805	6·495	11
12	11·26	10·58	9·954	9·385	8·863	8·384	7·943	7·536	7·161	6·814	12
13	12·13	11·35	10·63	9·986	9·394	8·853	8·358	7·904	7·487	7·103	13
14	13·00	12·11	11·30	10·56	9·899	9·295	8·745	8·244	7·786	7·367	14
15	13·87	12·85	11·94	11·12	10·38	9·712	9·108	8·559	8·061	7·606	15

(n)	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	
1	0·901	0·893	0·885	0·877	0·870	0·862	0·855	0·847	0·840	0·833	1
2	1·713	1·690	1·668	1·647	1·626	1·605	1·585	1·566	1·547	1·528	2
3	2·444	2·402	2·361	2·322	2·283	2·246	2·210	2·174	2·140	2·106	3
4	3·102	3·037	2·974	2·914	2·855	2·798	2·743	2·690	2·639	2·589	4
5	3·696	3·605	3·517	3·433	3·352	3·274	3·199	3·127	3·058	2·991	5
6	4·231	4·111	3·998	3·889	3·784	3·685	3·589	3·498	3·410	3·326	6
7	4·712	4·564	4·423	4·288	4·160	4·039	3·922	3·812	3·706	3·605	7
8	5·146	4·968	4·799	4·639	4·487	4·344	4·207	4·078	3·954	3·837	8
9	5·537	5·328	5·132	4·946	4·772	4·607	4·451	4·303	4·163	4·031	9
10	5·889	5·650	5·426	5·216	5·019	4·833	4·659	4·494	4·339	4·192	10
11	6·207	5·938	5·687	5·453	5·234	5·029	4·836	4·656	4·486	4·327	11
12	6·492	6·194	5·918	5·660	5·421	5·197	4·988	4·793	4·611	4·439	12
13	6·750	6·424	6·122	5·842	5·583	5·342	5·118	4·910	4·715	4·533	13
14	6·982	6·628	6·302	6·002	5·724	5·468	5·229	5·008	4·802	4·611	14
15	7·191	6·811	6·462	6·142	5·847	5·575	5·324	5·092	4·876	4·675	15

Standard normal distribution table

	0·00	0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09
0·0	0·0000	0·0040	0·0080	0·0120	0·0160	0·0199	0·0239	0·0279	0·0319	0·0359
0·1	0·0398	0·0438	0·0478	0·0517	0·0557	0·0596	0·0636	0·0675	0·0714	0·0753
0·2	0·0793	0·0832	0·0871	0·0910	0·0948	0·0987	0·1026	0·1064	0·1103	0·1141
0·3	0·1179	0·1217	0·1255	0·1293	0·1331	0·1368	0·1406	0·1443	0·1480	0·1517
0·4	0·1554	0·1591	0·1628	0·1664	0·1700	0·1736	0·1772	0·1808	0·1844	0·1879
0·5	0·1915	0·1950	0·1985	0·2019	0·2054	0·2088	0·2123	0·2157	0·2190	0·2224
0·6	0·2257	0·2291	0·2324	0·2357	0·2389	0·2422	0·2454	0·2486	0·2517	0·2549
0·7	0·2580	0·2611	0·2642	0·2673	0·2704	0·2734	0·2764	0·2794	0·2823	0·2852
0·8	0·2881	0·2910	0·2939	0·2967	0·2995	0·3023	0·3051	0·3078	0·3106	0·3133
0·9	0·3159	0·3186	0·3212	0·3238	0·3264	0·3289	0·3315	0·3340	0·3365	0·3389
1·0	0·3413	0·3438	0·3461	0·3485	0·3508	0·3531	0·3554	0·3577	0·3599	0·3621
1·1	0·3643	0·3665	0·3686	0·3708	0·3729	0·3749	0·3770	0·3790	0·3810	0·3830
1·2	0·3849	0·3869	0·3888	0·3907	0·3925	0·3944	0·3962	0·3980	0·3997	0·4015
1·3	0·4032	0·4049	0·4066	0·4082	0·4099	0·4115	0·4131	0·4147	0·4162	0·4177
1·4	0·4192	0·4207	0·4222	0·4236	0·4251	0·4265	0·4279	0·4292	0·4306	0·4319
1·5	0·4332	0·4345	0·4357	0·4370	0·4382	0·4394	0·4406	0·4418	0·4429	0·4441
1·6	0·4452	0·4463	0·4474	0·4484	0·4495	0·4505	0·4515	0·4525	0·4535	0·4545
1·7	0·4554	0·4564	0·4573	0·4582	0·4591	0·4599	0·4608	0·4616	0·4625	0·4633
1·8	0·4641	0·4649	0·4656	0·4664	0·4671	0·4678	0·4686	0·4693	0·4699	0·4706
1·9	0·4713	0·4719	0·4726	0·4732	0·4738	0·4744	0·4750	0·4756	0·4761	0·4767
2·0	0·4772	0·4778	0·4783	0·4788	0·4793	0·4798	0·4803	0·4808	0·4812	0·4817
2·1	0·4821	0·4826	0·4830	0·4834	0·4838	0·4842	0·4846	0·4850	0·4854	0·4857
2·2	0·4861	0·4864	0·4868	0·4871	0·4875	0·4878	0·4881	0·4884	0·4887	0·4890
2·3	0·4893	0·4896	0·4898	0·4901	0·4904	0·4906	0·4909	0·4911	0·4913	0·4916
2·4	0·4918	0·4920	0·4922	0·4925	0·4927	0·4929	0·4931	0·4932	0·4934	0·4936
2·5	0·4938	0·4940	0·4941	0·4943	0·4945	0·4946	0·4948	0·4949	0·4951	0·4952
2·6	0·4953	0·4955	0·4956	0·4957	0·4959	0·4960	0·4961	0·4962	0·4963	0·4964
2·7	0·4965	0·4966	0·4967	0·4968	0·4969	0·4970	0·4971	0·4972	0·4973	0·4974
2·8	0·4974	0·4975	0·4976	0·4977	0·4977	0·4978	0·4979	0·4979	0·4980	0·4981
2·9	0·4981	0·4982	0·4982	0·4983	0·4984	0·4984	0·4985	0·4985	0·4986	0·4986
3·0	0·4987	0·4987	0·4987	0·4988	0·4988	0·4989	0·4989	0·4989	0·4990	0·4990

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

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.

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 50 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 having 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 fixed 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.

The 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

THE IMPLICATIONS OF CORPORATE GOVERNANCE FOR ORGANISATIONS

1 Introduction

Corporate governance is concerned with how companies are directed and controlled.

The purpose of this chapter is to briefly compare how this is approached in different countries, and to consider in more detail the approach in the UK.

2 Differing approaches to corporate governance

UK

In the UK there is a mix of legislative (Companies Acts) and institutionally endorsed voluntary codes. Institutional investor input to boards is generally weak, although recent years have seen a greater emphasis on strong non-executives and better corporate reporting.

US

In the US there is far more legislation and detailed reporting requirements concerning corporate governance. Major creditors and other company CEO's are often on the board.

Europe

Although European legislation applies within the UK and also throughout the rest of the EU, in other European countries a dual board system is far more common. There is greater stakeholder involvement than in the UK, largely representing the importance of bank rather than equity finance.

Japan

In Japan the system works on consensus, with all stakeholders expected to work together in the best interests of the company. A very close relationship exists between the banks and companies, with banks commonly represented on the board of directors.

3 Corporate governance in the UK

During the 1990's in the UK, there were three separate committees set up to consider aspects of corporate governances which each produced a report.

These were:

The Cadbury Report in 1992, which focussed on the control functions of boards and on the role of auditors

The Greenbury Report in 1995, which focussed on the setting and disclosure of directors' remuneration

The Hampel Report in 1998, which brought together the previous recommendations and submitted a proposed code to the Stock Exchange which listed companies should comply with.

The Stock Exchange published the final version of its 'Principles of good governance and code of best practice' (known as the **Combined Code**) in June 1998. Listed companies now have to disclose how they have applied the principles and complied with the Code's provisions in their annual report and accounts. The auditors have to express an opinion on this statement.

4 The UK Combined Code

There are 45 'code provisions' which include the following:

(a) Board members

- the roles of Chair of the Board and Chief Executive should be separated unless the company publicly justifies reasons for not doing so
- the identification of a senior independent director
- not less than one-third of the board comprises non-executive directors
- the majority of non-executive directors should be independent

(b) Board structure and function

- there should be a nominations committee (unless the board is small)
- the formalisation of the role of Chairman in ensuring that all directors are properly briefed on issues arising at board meetings
- the audit and remuneration committees must only be of non-executive directors
- directors should, at least annually, conduct a review of the effectiveness of the group's system of internal controls and should report to shareholders that they have done so

(c) Remuneration of directors

- performance related elements should form a significant proportion of the total remuneration package

(d) Conduct of AGMs

- announcement of proxy votes at AGMs
- unbundling of resolutions
- sending out the notice of the AGM and the related voting papers at least 20 working days before the meeting

(e) There is also a requirement that companies consider:

- a reduction of the notice period of directors to one year or less
- early termination arrangements
- the extent to which the principal shareholders should be contacted about directors' remuneration
- whether the remuneration report should be voted on at the AGM

Chapter 4

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 and the next 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.

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.

3.1 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.

Profitability ratios

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

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

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

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

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

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

Liquidity ratios

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

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

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

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

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

Gearing ratios

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

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

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

Investor ratios

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

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

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

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 5

EXPANSION AND MARKET MAINTENANCE STRATEGIES

1 Introduction

In this chapter we briefly consider different long-term strategies that the company may adopt.

Again, this chapter is covered in much greater detail in your other studies. Do not be frightened of using your knowledge where appropriate in this examination.

2 Growth strategies

Growth can be via:

- ***Expansion***: existing products and/or existing markets
- ***Horizontal integration***: new products to existing markets / new markets for existing products
- ***Vertical integration***: expansions up (backwards) or down (forwards) the supply chain
- ***Concentric diversification***: new products / markets with technological / marketing synergy with existing products / markets
- ***Conglomerate diversification***: apparently unrelated expansion

Conglomerate mergers may create value via:

- ***Economic 'efficiency'*** via, for example,
  - (i) reciprocal buying agreements within the group
  - (ii) dumping / predatory pricing, backed by group
  - (iii) tie-in sales agreements (forcing purchasers of one product to also buy another product)
  - (iv) exclusive dealing agreements (e.g. car dealerships)
  - (v) cross subsidisation within the group
- ***Financial synergy*** via:
  - (i) Utilisation of tax losses within the group
  - (ii) Increase in borrowing capacity as a percentage of group assets

Withdrawal or abandonment

Exit barriers preventing withdrawal or abandonment include:

- Economic barriers such as redundancy / labout unrest elsewhere in the group
- Political barriers
- Marketing considerations: loss leaders / firm's reputation
- Desire to sell subsidiary as a going concern

3 Internal (organic) growth versus external (acquisition) growth

Key strategic dimensions for organic growth

- available finance
- consideration of impact on existing staff (enhanced career opportunities, greater workload)
- easier to plan organic growth (known environment / incremental change)
- greater economies of scale – one head office

External growth – criteria

The clear identification of how acquisition will add value is essential, What specific role will the acquisition perform?

Examples of acquisition objectives and alternative methods for achieving them:

◆ sales growth	internal expansion / joint venture
◆ use spare cash	invert in marketable securities
	share buy-back
◆ improve management skills	increase training
◆ eliminate competitor	aggressive marketing
	market positioning

Intermediate strategies

- licensing
- joint ventures

Chapter 6

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.

(c) 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.

4 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 7

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:

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		100		106
		@10%	6	@ 10%	6.36
			106		112.36
Retained	60	(60%)	63.6		67.416
Dividend.	40		42.4		44.944
		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%

(a) Calculate the returns to investors on equity and on debt

(b) Calculate the WACC of the company

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 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 relevant of the WACC in later chapters.

Chapter 8

THE VALUATION OF DEBT FINANCE, AND 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:

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

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

c) 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

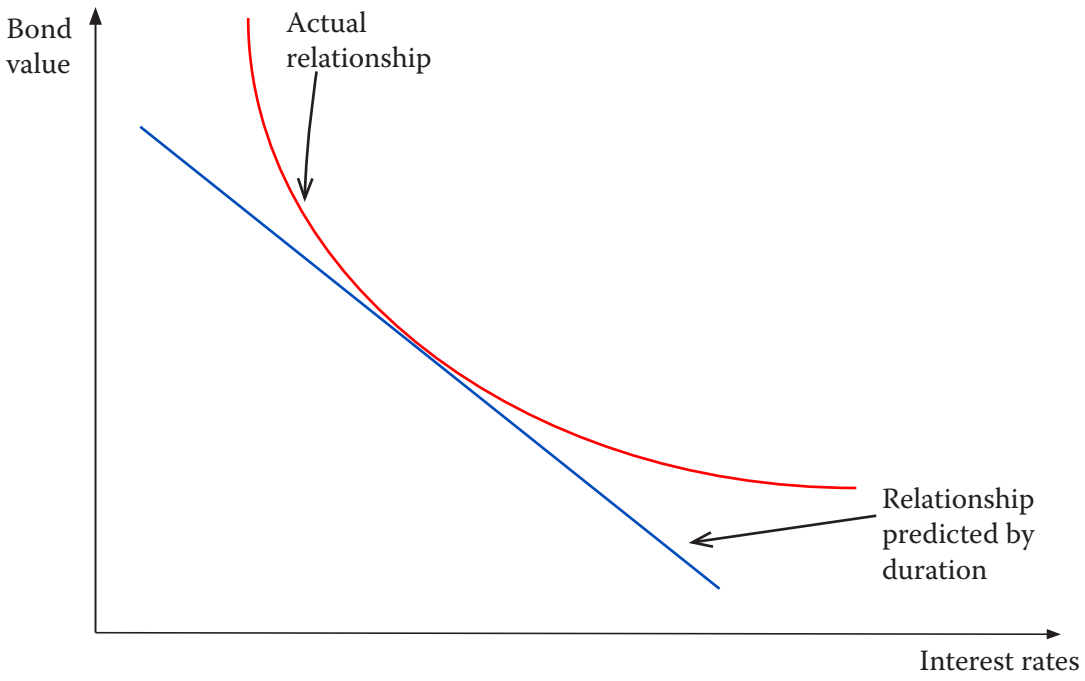
The equation linking modified duration (D), and the relationship between the change in interest rates (Δi) and change in price or value of a bond or loan (ΔP) is given as follows: $\Delta P = [-D \times \Delta i \times P]$

(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.



Chapter 9

PORTFOLIO THEORY

1 Introduction

This is the first of two chapters looking at the effect of changes in the risk of a company on the shareholders.

In this chapter we are not interested in the risk due to gearing in the company, but purely the risk due to the nature of the business.

This chapter also serves as a 'lead-in' to Capital Asset Pricing Model, which is very important for the exam.

Please note that you will not be required to perform portfolio theory calculations in the exam, nor will you be required to use formulae mentioned in this chapter. However, you can be expected to explain the principle involved and the small arithmetical examples in this chapter are there to help make the principles clear.

2 What is business risk?

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 How to measure risk

Any measure of risk needs to measure the extent of the fluctuations in the potential returns. There are several measures that we could use, but the normal measure is the standard deviation.

The formula for the standard deviation is:

$$\sigma = \sqrt{\frac{\bullet\ (x - \bar{x})^2}{n}}$$

where:

σ = standard deviation

x = observation

$\bar{x}$ = average (mean) of the observations

n = number of observations

(Remember that you will not be expected to calculate the standard deviation in the examination.)

Example 1

The following are the likely returns from Z plc, and the associated probability of each of the returns:

Return	*Probability*
10%	0.2
15%	0.5
20%	0.3

Calculate the average return, and the total risk.

Note that the square of the standard deviation is also called the variance. On occasions you have been given the variance and been expected to calculate the standard deviation from it.

4 Choosing between share investments

When an investor is choosing between different shares to invest in, they take into account both the return from the shares and the level of risk associated with these returns.

If two shares were to have the same level of risk, then they would select the share giving the highest expected return. On the other hand, if two shares were to give the same expected return then they would choose the one with the lowest risk.

If one share had more risk than the other, but at the same time were giving a higher return, then it would be up to the individual shareholder to decide whether or not the higher risk was compensated for by the higher return. This would depend on the individual shareholders attitude to risk and we could not be expected to make the choice in the exam.

Is is however important to appreciate that investors will accept higher risks provided that there is sufficient extra return to compensate for that higher risk.

Example 2

An investor has the choice of the following share investments:

Share	*Expected return*	*Risk (σ)*
A	20%	8%
B	25%	6%
C	23%	4%
D	20%	2%
E	22%	2%

Which share (or shares) will the investor definitely not choose?

Note that although we can reject A and D, we are not in a position to decide which is better of the remaining three. It depends on the attitude to risk of the individual involved and as to whether he regards the additional return as being sufficient or not for the extra risk. (We could perhaps base a decision on the ratio of the risk to the return, but this would at best only be a guide – it is the attitude of the investor that matters, and we are not in a position to know this.)

5 Combining share investments

In the previous section we were looking at the criteria for choosing between investments, and we said that we want higher returns, but only if the level of risk is acceptable.

It is potentially possible, however, to reduce the risk without suffering a reduction in the return, by investing in a combination of 2 or more investments. If we are able to reduce risk without a reduction in return then this must be worthwhile.

Consider the following simple, illustrative, example:

Example 3

The following are the likely returns from investments in ice-cream and in umbrellas, together with the associated probabilities:

Weather	*Return from ice-cream*	*Return from umbrellas*	*Probability*
Sun	20%	10%	⅓
Cloud	15%	15%	⅓
Rain	10%	20%	⅓

a) what is the average return and the total risk for each investment separately?
b) what is the average return and the total risk if an equal amount were to be invested in each?

Although this example is very simplistic, it does illustrate the principle that by mixing investments together we are potentially able to reduce risk. The reason in this example that we are able to eliminate the risk completely is that the returns from the two investments moved in exactly opposite directions to each other. The measure of how closely two investments move with each other is known as the coefficient of correlation (ρ). If two investments move in exactly the same way, then the coefficient of correlation will be +1 (perfect positive correlation), whereas if they move in exactly opposite directions then the coefficient of correlation will be -1 (perfect negative correlation). These are the two extremes – in any situation the coefficient of correlation will lie between +1 and -1.

If we know the coefficient of correlation between two investments, and the risk of the two investments, then we are able (using a formula) to calculate the risk of any combination of the two investments.

The formula is:

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

(Note that again you cannot be expected to use this formula in the examination.)

Example 4

Juris currently has a portfolio of shares giving a return of 20% with a risk of 10%. He is considering a new investment which gives a return of 20% with a risk of 12%. The coefficient of correlation of the new investment with his existing portfolio is +0.2. The new investment will comprise 40% of his enlarged portfolio.

Should he invest in the new investment?

Example 5

Janis currently has a portfolio of shares giving a return of 18% with a risk of 10%. He is considering investing in one of the following additional investments.

	A	*B*
Return	8%	8%
Risk	5%	3%
Coefficient of correlation with existing portfolio	-0.7	+0.4

The new investment will comprise 20% of his enlarged portfolio.

Which of the two investments should he choose?

6 Well-diversified portfolios

In the previous examples, we only considered combining two investments. This is all that you will be expected to do in the examination. However, it is not difficult to imagine combining more and more investments into a portfolio.

As the number of shares in a portfolio increases, one would expect the level of risk to fall. For the risk to fall to zero would require negative correlation and this does not occur in practice with share investments. What will happen is that provided shares are chosen sensibly, the level of risk will fall to a minimum.

The reason for this effect is that there are two types of risk in a share investment:

Systematic risk (or market risk):

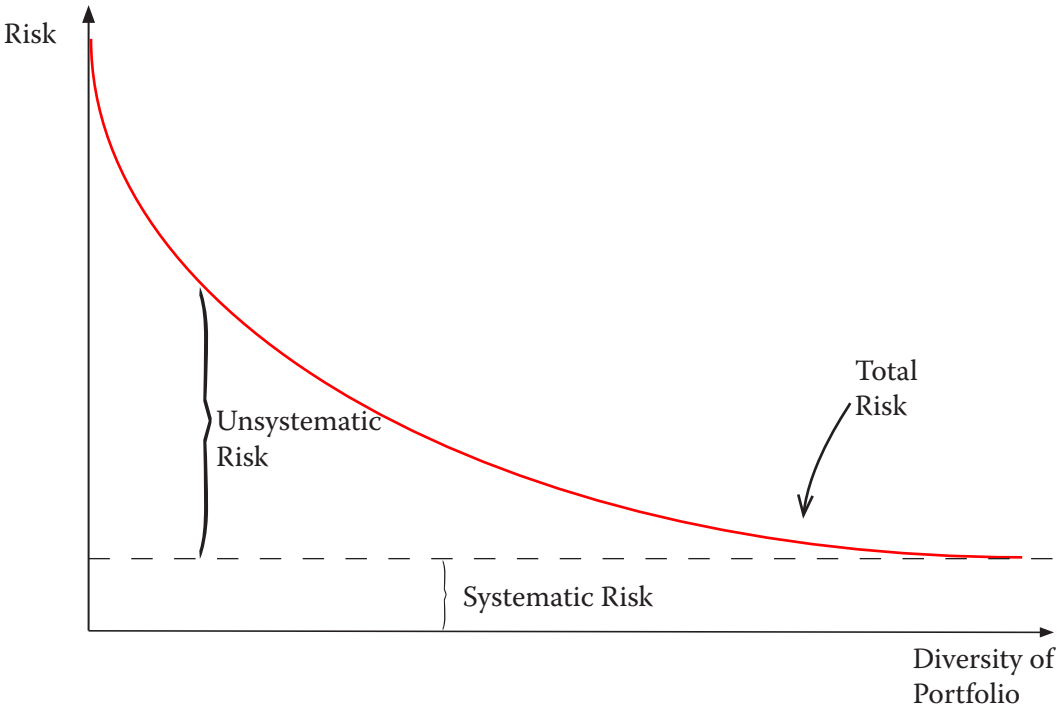
This is the risk due to general economic factors (such as the level of inflation in the country). It exists in all shares, but different business sectors have different levels of systematic risk. All shares in a particular business sector will have the same level of systematic risk.

Unsystematic risk (or company specific risk):

This is the extra risk in each individual company due to factors specific to that company such as the quality of management or labour relations.

It is the unsystematic risk that can be diversified away within in portfolio. What cannot be diversified away is the systematic risk. The level of systematic risk depends on the business sector, and the level of systematic risk remaining in a portfolio will depends on the sector or sectors invested in.

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 10

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.

There are a lot of formulae relevant to this topic – most of which are not given in the examination and that you will therefore need to learn.

2 Systematic and unsystematic risk

In the previous chapter we explained what is meant by systematic and unsystematic risk and the fact that the total risk in a share is a combination of the two.

There is a formula that relates these:

$$\sigma_{total}^{2} = \sigma_{sys}^{2} + \sigma_{unsys}^{2}$$

EXAMPLE 1

Shares in X plc have a total risk of 18%.
The unsystematic risk in the company has been identified as being 5%.

Calculate the systematic risk.

3 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.

$$\beta = \frac{\sigma_{sys}}{\sigma_{mkt}}$$

Example 2

Y plc has systematic risk of 8% and the market has risk of 10%.

What is the β of Y plc?

Example 3

Z has total risk of 15%, which includes unsystematic risk of 4%.
The variance of the market is 30.

What is the β of Z plc?

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 4

Q plc has systematic risk of 6%.
The market is giving a return of 12% with a risk of 4%.
The risk free rate is 5%.

What will be the required return from Q plc?

Example 5

T plc is giving a return of 20%.
The stock exchange as a whole is giving a return of 25% with a risk of 8%, and the return on government securities is 8%.

What is the β of T plc, and what is the systematic risk of T plc?

4 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 5 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.

5 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 6

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?

6 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 7

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?

7 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 8

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?

8 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 9

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%
(c) by debt and equity in the same ratio as that currently existing in X plc?

Chapter 11

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. It is usually easier to deal with tax in two stages – to calculate the tax payable on the operating cash flows (ignoring capital allowances) and then to calculate separately the tax saving on the capital allowances.
- 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, it is difficult to calculate, and it does effectively assume that the cash flows produced by the project are re-invested at the IRR.

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 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 4

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.

7 Inflation revisited

In the example at the start of this chapter, there was inflation. We dealt with the problem by inflating the cash flows to arrive at the actual expected cash flows, and then discounting at the actual expected (or **nominal**) cost of capital.

An alternative general approach is to take the cash flows at current prices (i.e. without any inflation) and then discount at the cost of capital ignoring inflation (i.e. the '**real**' cost of capital).

However this approach is much less likely to be relevant in the examination and is only useful if all cash flows are expected to inflate at the same, general, rate of inflation.

The 'real' cost of capital may be calculated using the Fisher equation (which is given to you on the formula sheet in the examination):

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

where: i = the actual / money / nominal rate

r = the real rate

h = the inflation rate

Example 5

A new machine will cost $120,000 and is expected to last 3 years with no scrap value.

It is expected that production will be 10,000 units p.a.

The selling price is $20 p.u. and the variable production costs $14 p.u. (both quoted in current prices).

Inflation is expected to be 5% p.a., and the cost of capital is 15% p.a..

Calculate the NPV of the project

(a) inflating each flow and discounting at the cost of capital

(b) discounting the current price flows at the effective rate.

(c) why, in theory, will the decision remain the same whatever the actual rate of inflation turns out to be

As stated earlier, it is unlikely that you will be expected to use this approach – usually you will inflate the cash flows and then discount at the nominal rate. However do watch for the situation where you are given the real cost of capital and the general rate of inflation. In this case you will still inflate the cash flows to get the actual cash flow, but will need to use the Fisher equation to calculate the nominal cost of capital.

8 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 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 Paper F9 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 lower cost of debt.

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.

As a result, 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 starts 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

(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 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.

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:

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

Where

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

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

Put option:

Value of a put + Current value of underlying security = Value of a call + Present value of exercise price

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

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).

Note that you will be given the option formulae in the examination.

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 $35.00
Exercise price $35.00 in 1 yrs time.
Risk free rate of interest is 10% p.a.
Standard deviation of rate of return on share is 20%

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

Example 5

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?

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:

Delta

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

Theta

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

Vega

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

Rho

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

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.

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 6

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..

You are required to 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 Merger and acquisition activity in different countries

- Due to the existence of well-developed capital markets it is comparatively easy to launch takeovers in the UK and the US
- To prevent monopolies forming, the US has strong anti-trust legislation and the UK has the Competition Commission
- In continental Europe and Japan, banks (rather than shareholders) have traditionally taken a more direct role in financing and directing corporate activity. Other stakeholders such as employees and suppliers have also been more influential.
- However, the growth of global capital markets has seen the market for corporate control expand into Europe and the Far East. If capital is to be attracted to markets then there must be attractive investment opportunities available to it.

4 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

5 Target issues on takeover

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

(b) What is the target worth to us?

(c) Do we want to sell?

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

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

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.

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.

City Code

The following are examples of the general principles of the code:

(a) all shareholders of the same class must be treated the same and given the same information

(b) sufficient relevant information and time must be given to shareholders

(c) once an offer is made, directors cannot frustrate it without shareholders approval

(d) a general offer to all other shareholders is required if the predator acquires control (30%).

6 Debtholder versus shareholder interests

Debtholders may benefit from a merger of two firms if this results in a 'co-insurance effect'. – i.e. the larger firm is less liable to insolvency than the separate firms. This will increase the value of that debt at the expense of shareholders.

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
- 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 $50, 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	(X)
(unless told otherwise, assume that this is equal to the level of depreciation)	
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.

Example 4

Nairobi plc is considering the acquisition of Delhi plc.

The projected cash flows of the two companies over the next 5 years are as follows:

	1	2	3	4	5	including terminal value
Nairobi	20	25	30	35	150	
Delhi	8	10	10	10	50	

Synergistic benefits of 10 p.a. (before tax) are expected to result from the acquisition.

The current market values are as follows:

	Nairobi	Delhi
Equity	170	55
Debt	–	–
	170	55

Nairobi will pay 80 to acquire all the share capital of Delhi. The acquisition will be financed entirely by the issue of more debt.

Nairobi and Delhi have asset betas of 0.8 and 1.1 respectively.

The risk free rate is 5%, the market return is 12%, and the rate of tax is 30%.

The cost of debt in the combined company is 8%

Calculate the market value of the new (enlarged) company

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	(X)
(unless told otherwise, assume that this is equal to the level of depreciation)	
Less: Any additional non-current asset expenditure	(X)
Less: Incremental working capital expenditure	(X)
Free cash flow	X
Less: debit interest and repayments	(X)
Add: cash raised from debt issues	X
Free cash flow to equity	X

Example 5

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 easier 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 (which became increasingly popular in the 1980's) 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 is lost, but funds are raised.

'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'.

Why demerge or sell?

(a) to focus on core competence

(b) to react to changes in strategic focus

(c) to sell off unwanted asswets

(d) to capture 'revers synergy' resulting from an existing 'conglomerate discount'

(e) to remove 'co-insurance benefits' from debtholders

(f) to meet regulatory requirements

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

(a) the management team

(b) the directors of the company

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

Reasons for a buyout

(a) from the buyout teams' point of view:
   i. to obtain ownership of the business rather than remin as employee
   ii. to avoid redundancy when the business is threatened with closure

(b) from the seller's point of view
   i. to dispose of part of the company that does not fit in with the overall strategy of the company
   ii. to dispose of a loss-making segment of the business which the directors do not have time or inclination to turn around
   iii. in order to raise cash
   iv. it is often easier to arrange a management buyout than to try and sell off parts of a business in the open market
   v. it may well avoid redundancy costs, strike action, etiii. if closure if the only alternative

Why may buyouts generate shareholder value?

(a) personal motivation of the buyout team

(b) a more hands-on approach to management

(c) keener decision making on such areas as pricing, debt collection etiii.

(d) savings in head office overheads

Possible problems

(a) the main problem is likely to be the lack of experience of the management team in actually running all aspects of the business

   Obviously the more experience they have the better, and the more likely they are to be able to find financial backing.

(b) other problems include:
   i. tax and legal complications
   ii. motivation of other employees not party to the buyout
   iii. the lack of additional finance once the buyout has taken place
   iv. the maintenance of previous commitments made by the company to the workforce or other parties
   v. the loss of key employees

Providers of capital

(a) the clearing banks (usually 'senior debt')

(b) merchant banks

(c) pension funds

(d) venture capital (who require a high return!)

(e) government agencies

Post acquisition

Company problems post-acquisition can be related back to the three key decisions: investment / financing / dividend decisions.

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

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

(b) 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.

(c) 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?

(a) 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.

(b) 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

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

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

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

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

(e) 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.

(a) both direct and indirect listing costs are saved

(b) a hostile takeover bid is impossible

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

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 of the 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:

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

(a) 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.

(b) 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:

(a) 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.

(b) 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.

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.

Hedging efficiency

It should be clear from the above example that a deal in futures in unlikely to give a perfect hedge. The reasons for this are two-fold:

(a) deals have to be made in contracts of a fixed size, thus the exact amount may not be able to be hedged

(b) the movements in the futures price will not be exactly equal to the movements in the spot rate.

Whenever we use futures to hedge risk, the profit or loss on the futures will largely compensate for the loss of profit on the underlying transaction. If the profit on one is exactly equal to the loss on the other, then we are said to have a perfect hedge. However, it is likely that we will end up with a small net profit or a small net loss.

We can measure the efficiency of the hedge as follows:

$$\text{Hedging efficiency} = \frac{\text{Profit on one deal}}{\text{Loss on other deal}} \times 100\%$$

Example 12

Calculate the hedging efficiency for the futures deal in Example 11.

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 13

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

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**.

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

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?

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:

(a) 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.
(b) 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.
(c) 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:

(a) forward rate agreements

(b) interest rate guarantees

(c) interest rate futures

(d) 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 and swaptions, 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 months 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:

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

(b) 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.

(c) The previous two points mean that it is unlikely that we will end up with a prefect hedge. We can measure the hedging efficiency in the same way as we did for currency futures:

$$\text{Hedging efficiency} = \frac{\text{Profit on one deal}}{\text{Loss on other deal}} \times 100\%$$

Now we will look at a full example.

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 hedging efficiency.
(c) 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

Sterling 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 'sterling 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 Sterling 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').

To illustrate with a very simple example.

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:

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

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:

a) 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)

b) 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

THE GLOBAL ECONOMIC ENVIRONMENT

1 Introduction

Globalisation has increased enormously in recent years due to the increased free trade between countries. In this chapter we examine briefly the reasons for the increase in free trade.

2 Multinational companies

A multinational company is one that owns or controls production or service facilities outside the country in which it is based.

The US, Europe and Japan are the major sources of Foreign Direct Investment (FDI), whereas the main recipients are in SE Asia, South America, Canada, and Europe.

More globalisation has been facilitated by deregulation, free movement of capital, and telecommunications. Multinationals benefit in various ways, including:

(a) economies of scale

(b) access to specialist labour

(c) access to cheaper labour and other resources

(d) closer to customers

(e) closer to suppliers

(f) access to grants / tax breaks

Most countries welcome multinationals because they bring employment, capital, and technology. However, it can involve a loss of political and economic sovereignty, and undermine cultural values.

3 Free trade

The advantages of free trade between countries include:

(a) specialisation

countries can specialise in producing goods / services in which they have expertise and trade these for goods / services from other countries where they have the expertise.

(b) competition

free trade results in more competition hence increasing efficiency and resulting in lower prices for consumers

(c) economies of scale

increased specialisation results in economies of scale

4 Protectionism

Protectionism is the opposite of free trade and involves a country restricting imports. The reasons for this include:

(a) protecting home industries

(b) protecting domestic employment

(c) protecting strategic industries

(d) protecting against dangerous, unhealthy, or undesirable goods

Methods of protectionism

(a) tariffs or customs duties

(b) quotas

(c) embargos

(d) administrative controls

(e) exchange controls

(f) subsidies for exporters and domestic producers

(g) trade blocs (to encourage trade between similar countries)

5 Common markets / customs unions

A free trade area is where there are no restrictions on the movement of goods and services between countries.

A customs union is where there are also common external tariffs for goods from non-members.

A common (or single) market further incorporates the free movement of factors of production and the achievement of stronger economic and political links.

The major example of a common market is the European Union.

6 The World Trade Organisation (WTO)

The WTO was formed to implement the General Agreement on Tariffs and Trade (GATT).

The aims include:

(a) the reduction of existing barriers to free trade

(b) the elimination of discrimination in international trade

(c) the prevention of growth in protectionism by requiring consultation before taking protectionist measures.

The principle exists that all WTO members should treat each other the same with respect to tariffs and trade. The greatest threat to this is the setting up of rich nation free trade areas such as the EU and NAFTA (North American Free Trade Association).

Chapter 23

THE INTERNATIONAL FINANCIAL SYSTEM

1 Introduction

This chapter covers the major international financial institutions. It then moves on to consider the global debt problem.

2 Major international financial intstitutions

2.1 International Monetary Fund (IMF)

The IMF aims to:

(a) promote international monetary co-operation and facilitate international payments
(b) provide support to countries with temporary balance of payments problems
(c) provide for the orderly growth of international money through the Special Drawing Rights (SDR) scheme

The IMF achieves (b) by short to medium term loans financed by quota contributions from all members. The IMF only makes loans if deflationary policies are followed. IMF facilities are often a pre-requisite to help from the World Bank and private banks.

2.2 The International Bank for Reconstruction and Development (the World Bank)

This was created to rebuild Europe after World War 2. The World Bank provides long-term loans to government on commercial terms for capital projects. The major source of funds is borrowing via commercial bond issues.

2.3 The Bank for International Settlements

This is the Central Bankers Bank, based in Basle. It takes deposits and provides loans to central banks on commercial terms. It's major achievement has been to co-ordinate internationally agreed world capital adequacy standards for commercial banks.

3 The debt crisis

3.1 The origins:

(a) a desire by developing countries to develop quickly by borrowing heavily and investing in large infrastructure projects

(b) the increase in oil prices in the 70's which caused balance of payments problems and spiralling inflation. A recession in the industrialised world at the same time caused a reduction in imports from less developed countries.

(c) An increase in real interest rates

3.2 Solutions to the debt crisis

(a) rescheduling debts

(b) selling debt at a discount to recoup capital and avoid bad publicity

(c) substituting commercial debt with government bonds

(d) writing off debt

(e) The Baker Plan (1985) suggested lending more to 15 countries, requiring these countries to follow policies advocated by the IMF. The main problems with this were the reluctance of banks to lend more, and reluctance of third world governments to adopt IMF policies.

(f) The Brady Package (1989) suggested swapping loans for long term bonds at a discount (65%) while agreeing to make new loans. Less developed countries were to offer, in return, better security and undertake economic reforms. The reluctance of banks to lend new money remained a problem.

3.3 The impact of the debt crisis on multinationals

(a) Less developed countries often devalue their currency to improve the balance of payments, but increase import costs of raw materials so reducing profits of local industry

(b) Little overseas investment means local financing is required, increasing local interest rates

(c) Governments may insist that the multinational uses local inputs to help the balance of payments

(d) Governments will welcome foreign direct investment and may offer grants and tax benefits

Chapter 24

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

(a) Rates of inflation in different countries

(b) Interest rates in different countries

(c) Economic and political prospects

(d) 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

(a) 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.

(b) 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.

(i) 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.

(ii) 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 Monetary co-operation in Europe

The single currency for the EU (the Euro) was introduced on 1 January 1999 and has been adopted by all of the 'old' EU members with the exception of Denmark, Sweden and the UK. The 'new' entrants are all obliged to adopt the Euro is the reasonably near future.

There remains considerable debate in the UK as to whether or not they should adopt the Euro.

The main advantages are easier trade within Europe, and the attraction of foreign investments by companies who prefer the stability of having the same currency throughout Europe.

The main disadvantage is that it is not possible for countries in the Eurozone to operate an independent monetary policy resulting in more political power moving from the individual country to Brussels.

5 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 25

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

(a) export from the home country

- low risk; low capital needs
- little local knowledge
- slow response to market

(b) set up overseas branch

- profits of branch treated as profit of parent company
- cheap to run

(c) 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

(d) 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

(e) licensing

- rapid penetration of local markets
- low investment
- regular licensing fee income (often regardless of profitability)

3 Ways of remitting income from overseas investments

(a) Dividends
(b) Loan interest
(c) Royalties
(d) Management charges
(e) Transfer prices
(f) 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

Managing political risk

(a) negotiate the environment prior to investing
  (i) negotiate an investment agreement
  (ii) obtain insurance (either privately or through the home government)
  (iii) gain local government support e.g. grants
(b) select risk reducing operating strategies
  (i) control distribution channels / transportation / technology (e.g. oil refining away from politically sensitive oil fields)
  (ii) ensure that some components are imported from the home country
(c) marketing strategy
  (i) branding
  (ii) control of final product markets
(d) financial strategy
  (i) low equity base / large local debt
  (ii) multiple source (and therefore pressure) borrowing
  (iii) shared ownership / join venture with strong local partner

Chapter 26

RAISING CAPITAL OVERSEAS

1 Introduction

This chapter covers very briefly international banking and the capital markets

2 International banking

International banking covers two broad types of banking activity:

(a) traditional foreign banking involving transactions in the domestic currency with non-resident organisations (e.g. a foreign company borrowing pounds from a UK-based bank)

(b) Eurocurrency banking which involves transactions in currencies other than the domestic currency (e.g. a company taking a loan in dollars from a UK bank). (Note: in this context the word 'euro' equals 'foreign')

3 The Euromarkets

Eurocurrency loans

These are short term floating rate loans taken in a foreign currency.

Eurobonds

This is long-term borrowing, again in a foreign currency. They are usually between 3 and 20 years duration and are issued and sold in more than one country simultaneously. They are denominated in a single currency, which is not that of the country of origin of the borrower. They can be fixed or floating rate.

Euroequity

These are shares placed on a stock market in a country other than that of the country of origin of the company. E.g. a US company issuing shares on the UK stock exchange denominated in pounds.

Chapter 27

THE MANAGEMENT OF INTERNATIONAL TRADE

1 Introduction

This is another very short chapter (involving no calculations!) which considers the risks and rewards of international trade, and explains the nature of 'countertrade'.

2 Rewards and risks of international trade

2.1 Rewards:

(a) growth when domestic market is exhausted

(b) may extend the product life cycle

(c) reduction of risk

(d) economies of scale

2.2 Risks:

(a) exchange rate risk (transaction risk)

(b) credit / commercial risk

(c) trade risk (importer may refuse ownership or payment)

(d) political risk

(e) physical risk (theft of goods en route)

(f) cultural risk

2.3 Insurance against risks

Commercial and political risk can be insured against in the UK as follows:

(a) Export Credit Guarantee Department (ECGD) – a self financing government departments offering medium to long term insurance for large schemes or those judged to be in the public interest.

(b) Private insurance companies offer short term (up to 180 days) insurance for similar risks.

2.4 Methods of payment for foreign trade:

(a) open an account
(b) deposit on order (combined with one of the other methods for collection of the balance)
(c) payment on shipment
(d) Bills of exchange
(e) Promissory note (importer promises to pay the exporter on a future date)
(f) Documentary letter of credit (issued by the importer and guaranteed by the importer's bank)
(g) Payment in advance

3 Countertrade

This is a trade deal in which none (or only a part) of the value of the trade is paid in cash. Instead, payment is made in goods or services.

Countertrade represents approximately 25% of international trade.

3.1 Attractions of countertrading:

(a) foreign currency may be unavailable or in short supply
(b) exchange controls are avoided
(c) medium / long term agreements provide price stability
(d) can avoid risk of exchange rate movements

3.2 Types of countertrade:

(a) barter: either a direct swap of a swap via a third party who makes payment to the supplier
(b) counterpurchase: an agreement by the supplier to buy goods from another foreign company
(c) buy back: a UK company agrees to buy goods produced with supplied plant and machinery
(d) industrial offset: the supplier of equipment agrees to buy components from the buyer country

Chapter 28

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 ot he 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.)

Chapter 29

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.

Currency future

An exchange traded forward contract for the sale or purchase of currency.

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.

Economic Value Added (EVA)

A measure of the 'super' profit generated by a firm. It can be defined as net operation profit after tax (NOPAT) less the value of the firms' invested capital multiplied by its weighted average cost of capital.

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

Forward agreement

An over-the-counter agreement to by or sell an asset on a specified date at an agreed price.

Forward Rate Agreements (FRAs)

An agreement by the bank to enter into a notional loan or accept a deposit with a customer for a specified period of time and to settle with the customer the difference between the rate of interest agreed when the agreement is made and the rate prevailing when the notional loan/deposit is deemed to start.

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.

FX swap

An agreement to swap currencies without a commitment to swap interest rate liabilities.

GEMMS

Gilt edged market makers

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.

LIBID

The London Inter-Bank Bid Rate. The effective lending rate in the interbank market representing the spread against LIBOR.

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.

Market to book ratio

The ratio of the market value of a firm (or on a per share basis, its share price) to its book value (or net assets divided by the number of shares in issue).

Matching and netting

A process where interfirm indebtedness in different currencies are netted (with group companies) or matched (with trading partners) with the purpose of reducing the requirement for funds to move across international borders and suffer transaction costs on conversion.

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

NYBOT

The New York Board of Trade (the parent body for the New York options and futures exchange).

Options on Forward Rate Agreements (caps and floors)

The bank as write of the option agrees to cap the interest rate charged on a loan over a set period of times such that if the interest rate rises above the cap the difference is paid to the holder. If the interest rate does not reach the cap the holder does not have to reimburse the bank (as with the FRA). A floor is exactly the opposite where a minimum interest rate is set on a deposit.

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.

Primary capital/money market

The market for the issue of new capital or money market securities by governments, corporates or other organizations.

Profitability index

The ratio of a project's Net Present Value to the capital outlay.

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.

Repo agreements and reverse repos

An agreement to sell a security at a given price with a simultaneous agreement with the purchaser to buy the security back at a given future date and price. A reverse repo is simply an agreement to purchase a security with a simultaneous agreement to resell.

Scenario planning

A general methodology which allows managers to speculate upon, analyze and prepare for a range of alternative futures.

Secondary capital/money market

The market for trading in existing securities.

Securitization

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 even of liquidation.

STRIPS

The separate trading of interest and principal. This is where (normally) government bonds are decomposed into a coupon element and a redemption element which are traded separately in the market.

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.

Tobin's Q

The ratio of the market capitalization of a firm to the replacement cost of its assets.

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 annualized standard deviation of the change in share price taken over time intervals (t). In finance it is the most common measure of risk.

Warrant

A long term call option to purchase equity in a company (usually) issued with debt to enhance its marketability.

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.

Paper P4

ANSWERS TO EXAMPLES

Chapter 1

No Examples

Chapter 2

No Examples

Chapter 3

No Examples

Chapter 4

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 5

No Examples

Chapter 6

No Examples

Chapter 7

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) $g = r\ b = 18\% \times 37.5\% = \mathbf{6.75\%\ p.a.}$

(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) $k_d = \frac{8}{90} = \mathbf{8.89\%}$

(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)

$$k_d = IRR = 10\% + \frac{6.06}{6.06 \times 10.22} \times 5\% = \mathbf{11.86\%}$$

(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!)

Cost of debt = **10%**

Answer to Example 9

(a) $k_e = \frac{32}{250 - 32} = \mathbf{14.68\%}$

$k_d = \frac{8}{92} = \mathbf{8.70\%}$

(b) Cost of equity = k_e = 14.68%

Cost of debt = 8.70 × 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

$$\text{Cost of debt} = IRR = 5\% + \frac{12.59}{12.59 + 12.47} \times 5\% = \mathbf{7.51\%}$$

$$WACC = 14.75\% \times \frac{32}{32 + 6.3} + 7.51\% \times \frac{6.3}{32 + 6.3} = \mathbf{13.56\%}$$

Chapter 8

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 9

Answer to Example 1

x	p	px	$x - \bar{x}$	$p(x - \bar{x})^2$
10	0.2	2	– 5.5%	6.05
15	0.5	7.5	– 0.5%	0.125
20	0.3	6	+ 4.5%	6.075
		15.5%		12.25
		$\bar{x}$		

Standard deviation=$\sqrt{12.25}$ = 3.5%

Answer to Example 2

Investors will not choose:

A - lower return, higher risk than C

D - lower return, same risk as E

Answer to Example 3

(a)

x	p	px	$x - \bar{x}$	$p(x - \bar{x})^2$
20%	⅓	6.67	5	8.33
15%	⅓	5	0	0
10%	⅓	3.33	-5	8.33
		15%		16.66
		$\bar{x}$		

risk = σ=$\sqrt{16.66}$ = **4.08%**

(b)

	Overall return
Sun	15%
Cloud	15%
Rain	15%

average return = 15%

Risk = 0%

Answer to Example 4

New return = 20%

$$\sigma_\rho = \sqrt{10^2 0.6^2 + 12^2 0.4^2 + 2 \times 0.4 \times 0.6 \times 0.2 \times 10 \times 12} = \sqrt{36 + 23.04 + 11.52} = \mathbf{8.4\%}$$

Answer to Example 5

A : New return $= 0.8 \times 18\% + 0.2 \times 8\% = 16\%$

$\sigma = \sqrt{5^2 0.2^2 + 10^2 0.8^2 - 2 \times 0.2 \times 0.8 \times 0.7 \times 5 \times 10} = \sqrt{1 + 64 - 11.2} = \mathbf{7.33\%}$

B : New return $= 16\%$ (as before)

$\sigma = \sqrt{3^2 0.2^2 + 10^2 0.8^2 + 2 \times 0.2 \times 0.8 \times 0.4 \times 3 \times 10} = \sqrt{0.36 + 64 + 3.84} = \mathbf{8.25\%}$

Chapter 10

Answer to Example 1

$18^2 = 5\% + \sigma_{sys}^2$

$\sigma_{sys} = \sqrt{324 - 25}$

$= 17.29\%$

Answer to Example 2

$\beta = \frac{8}{10} = 0.8$

Answer to Example 3

$15^2 = 4^2 + \sigma_{sys}^2$

$\sigma_{sys} = \sqrt{225 - 16} = \mathbf{14.46\%}$

$\sigma_{mkt} = \sqrt{30} = \mathbf{5.48\%}$

$\beta = \frac{14.46}{5.48} = \mathbf{2.64}$

Answer to Example 4

$\beta = \frac{6}{4} = 1.5$

return $= 5\% + (12\% - 5\%)1.5 = \mathbf{15.5\%}$

Answer to Example 5

$20\% = 8\% + (25\% - 8\%)\beta$

$\beta = \frac{12}{17} = \mathbf{0.71}$

$\sigma_{sys} = 0.71 \times 8\% = \mathbf{5.68\%}$

Answer to Example 6

(a) $(0.2 \times 1.2) + (0.4 \times 11.8) + (0.3 \times 1) + (0.1 \times 0) = \mathbf{1.26}$

(b) Return $= 8\% (20\% - 8\%)1.20 = \mathbf{23.12\%}$

Answer to Example 7

Theoretical return $= 4\% + (10\% - 4\%)0.6 = 7.6\%$

Actual return $= 8\%$

$\alpha = 8 - 7.6 = + \mathbf{0.4\%}$

Answer to Example 8

(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 9

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 11

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		

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

$$= \sqrt[5]{\frac{2,258}{2,000}} \times (1.10) - 1$$

$$= 0.1270 \quad or \quad \mathbf{12.70\%}$$

Answer to Example 4

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

$5{,}000a + 8{,}000b + 6{,}000c + x \leq 14{,}000$

$4{,}000a - 2{,}000b + 6{,}000c \leq 5{,}000 + 1.07x$

$1 \geq a, b, c \geq 0$

$x \geq 0$

Objective

Maximise $N = 976a + 2{,}596b + 862c + \left(\frac{1.07}{1.1}x - x\right)$

Answer to Example 5

(a)

	Current prices			*Cash flows*		*d.f. @ 15%*		*P.V.*
0	(120,000)			(120,000)		1	=	(120,000)
1	60,000 ×	1.05	=	63,000	×	0.870	=	54,810
2	60,000 ×	$(1.05)^2$	=	66,150	×	0.756	=	50,009
3	60,000 ×	$(1.05)^3$	=	69,457	×	0.658	=	45,703
						NPV		+30,522

(b)

$$1 + r = \frac{1+m}{1+i}$$

$$= \frac{1.15}{1.05} = 1.0952$$

r = 9.52% (use 10% in the tables)

	Current prices	*d.f. @ 10%*		*P.V.*
0	(120,000)	1	=	(120,000)
1 – 3	60,000	2.487	=	149,200
		NPV		+29,220

(Note: the difference is due to using an effective rate of 10% instead of 9.52%)

(c) In theory, higher inflation would lead to higher cost of capital. The real (or effective) rate would stay unchanged.

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) × 40/100

= **16.96%**

Cost of equity = 16.96%

Cost of debt = k_d (1 – T) = 8 × 0.7 = **5.6%**

WACC **before** raising debt = k_e = 15%

WACC **after** raising debt = (16.96 × 100/140) + (5.6 × 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
			19.64 M

(b) Tax benefit = tD = 0.3 × 30M = 9M

(or: tax saving on interest = 0.3 × 5% × 30M = 0.45M p.a.

Discount for perpetuity at risk free rate: $0.45\text{M} \times \frac{1}{0.05} = 9\text{M}$

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

$$d_1 = \frac{\ln \frac{290}{260} + 0.06 \times 0.5}{0.4\sqrt{0.5}} + 0.5 \times 0.4\sqrt{0.5} = 0.4921 + 0.1414 = 0.6335$$

$$d_2 = 0.6335 - 0.4 \times \sqrt{0.5} = 0.3507$$

$N(d_1) = 0.5 + 0.2357 = 0.7357$

$N(d_2) = 0.5 + 0.1368 = 0.6368$

Option price = $290 \times 0.7357 - 260e^{-0.06 \times 0.5} \times 0.6368 = 213 - 161 = 52c$

Answer to Example 4

$$d_1 = \frac{\ln \frac{35}{35} + 0.1}{0.2\sqrt{1}} + 0.5 \times 0.2\sqrt{1} = 0.5 + 0.1 = 0.6$$

$$d_2 = 0.6 - 0.2 \times \sqrt{1} = 0.4$$

$N(d_1) = 0.5 + 0.2257 = 0.7257$

$N(d_2) = 0.5 + 0.1554 = 0.6554$

Option price = $35 \times 0.7257 - 35e^{-0.1} \times 0.6554 = 25.40 - 20.76 = \$4.64$

Answer to Example 5

$$d_1 = \frac{\ln \frac{150}{180} + 0.1 \times 0.25}{0.4\sqrt{0.25}} + 0.5 \times 0.4\sqrt{0.25} = -0.7866 + 0.1 = -0.6886$$

$$d_2 = 0.6866 - 0.4 \times \sqrt{0.25} = -0.8866$$

$N(d_1) = 0.5 - 0.2549 = 0.2451$

$N(d_2) = 0.5 - 0.3133 = 0.1867$

Option price = $150 \times 0.2451 - 180e^{-0.1 \times 0.25} \times 0.1867 = 37 - 33 = 4c$

Answer to Example 6

$N(d_1) = 0.2451$ (as in example 5)

$$\text{Number of options} = \frac{1,000}{0,2451} = 4,080$$

ANSWERS TO EXAMPLES

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

New asset β of enlarged company:
(weight β's by market values)
(0.8 × 170/225) + (1.1 × 55/225) = 0.87
Equity β of enlarged company:

$$\beta_a = \beta_e \frac{V_e}{V_e + V_d(1-t)}$$

$$0.87 = \beta_e \times \frac{170}{170 + (80 \times 0.7)}$$

$$\beta_e = \mathbf{1.16}$$

Cost of equity = 5% + (12% –5%) 1.16 = **13.12%**
Cost of debt = 8% × 0.7 = **5.6%**

$$WACC = (\frac{170}{170+80} \times 13.12\%) + (\frac{80}{170+80} \times 5.6\%) = \mathbf{10.71\%} \quad (say\ 11\%)$$

Discount total cash flows:

	1	*2*	*3*	*4*	*5*
	35	42	47	52	207
d.f. @ 11%	0.901	0.812	0.731	0.659	0.593
P.V.	32	34	34	34	123

Total P.V = **$257**

New M.V's of enlarged company:

Debt	80
Equity (balance)	177
	257

Shareholders of Nairobi will therefore gain 4 if the acquisition goes ahead
BUT in the calculations, we assumed that the ratio of market values of equity to debt was 170:80. However, the final answer gives a ratio of 177:80
Strictly therefore we should go back and rework the answer on the basis of 177:80. The answer will again be different but by keep repeating we will eventually arrive at a final answer.
This is knows as an **iterative** approach. You will not be required to keep repeating in the examination

ANSWERS TO EXAMPLES

Answer to Example 5

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
		⅓ × 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	1.4859	1.4802	
Futures	1.44840	1.4799	
Difference	0.0200	0.0003	0
		$^{18}/_{102} \times 0.0019$	

(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

Hedging efficiency = $\frac{865}{338{,}043 - 337{,}359} \times 100\% =$ **126%**

Answer to Example 13

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 ÷ 1.5190 =		£1,316,656
less: premium		50,000
	Net receipt	£1,266,656

(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

$$\text{Efficient rate} = \frac{37{,}500}{500{,}000} \times {}^{12}/_{9} = \mathbf{10\%}$$

(ii)

Interest: 500,000 × 9/12 × 8% =	£30,000
FRA: 500,000 – 9/12 × (10% – 8%)	7,500
	37,500

$$\text{Efficient rate} = \frac{37{,}500}{500{,}000} \times {}^{12}/_{9} = \mathbf{10\%}$$

Answer to Example 2

(a)

Interest: 200,000 × 9/12 × 13% =	13,000
IRG: 200,000 – 9/12 × (13% – 12%)	1,000
	12,000
Premium	1,500
	13,500

Efficient rate = $\frac{13{,}500}{200{,}000} \times {}^{12}/_{6} = \mathbf{13.5\%}$

(b)

Interest: 200,000 × 9/12 × 8% =	8,000
IRG	–
Premium	1,500
	9,500

Efficient 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: $12\text{M} \times \frac{92.00 - 90.00}{40}$	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
		1/3 × 0.50	

Illustration on 1 January:

Interest at current interest rates: 40M × 6/12 × 10% =	£2,000,000
Profit in futures: $80 \times 1\text{M} \times \frac{93{\cdot}50 - 90{\cdot}83}{400}$	534,000
NET COST	1,466,000

(b) Hedging efficiency $= \frac{534{,}000}{2{,}000{,}000 - 1{,}400{,}000} \times 100\% = \mathbf{89\%}$

Effective interest rate $= \frac{1{,}466{,}000}{40\text{M}} \times \frac{12}{6} \times 100\% = \mathbf{7.33\%}$

Answer to Example 5

No answer

Answer to Example 6

(a)
- PUT
- September
- Strike price 94.25
- Contracts: 5.6M × ⅔ ÷ 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% × ⅝ =	294,933
Profit on options: $30 \times 0.5M \times \frac{94.25 - 93.32}{400}$ =	34,875
	£260,058
Premium	£7,125
Net payment	£267,183

(c) Effective interest rate $= \frac{267,183}{5.6M} \times \frac{12}{8} \times 100\% = \textbf{7.16\%}$

Answer to Example 7

No answer

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%		

ANSWERS TO EXAMPLES

Chapter 22

No Examples

Chapter 23

No Examples

Chapter 24

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 = $\frac{156}{10}$ = $/£ 1.5294

Answer to Example 1

In 1 year: $1.70 \times \frac{1.05}{1.02} = \$ / £1.75$

In 2 year: $1.70 \times (\frac{1.05}{1.02})^2 = \$ / £1.80$

Answer to Example 2

In 1 year: $2{,}030 \times \frac{1.04}{1.08} = ¥/£\ 1{,}955$

In 2 year: $2{,}030 \times (\frac{1.04}{1.08})^2 = ¥/£\ 1{,}882$

Chapter 25

No Examples

Chapter 26

No Examples

Chapter 27

No Examples