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Paper F9

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$$= \sqrt{\frac{2C_oD}{C_H}}$$

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$$\text{Spread} = 3\left[\frac{\frac{3}{4} \text{ x transaction cost x variance of cash flows}}{\text{interest rate}}\right]^{\frac{1}{3}}$$

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

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$$S_1=S_0x\frac{(1+h_c)}{(1+h_b)} \qquad F_0=S_0x\frac{(1+i_c)}{(1+i_b)}$$

Present Value Table

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

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

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
1	0·990	0·980	0·971	0·962	0·952	0·943	0·935	0·926	0·917	0·909	1
2	0·980	0·961	0·943	0·925	0·907	0·890	0·873	0·857	0·842	0·826	2
3	0·971	0·942	0·915	0·889	0·864	0·840	0·816	0·794	0·772	0·751	3
4	0·961	0·924	0·888	0·855	0·823	0·792	0·763	0·735	0·708	0·683	4
5	0·951	0·906	0·863	0·822	0·784	0·747	0·713	0·681	0·650	0·621	5
6	0·942	0·888	0·837	0·790	0·746	0·705	0·666	0·630	0·596	0·564	6
7	0·933	0·871	0·813	0·760	0·711	0·665	0·623	0·583	0·547	0·513	7
8	0·923	0·853	0·789	0·731	0·677	0·627	0·582	0·540	0·502	0·467	8
9	0·914	0·837	0·766	0·703	0·645	0·592	0·544	0·500	0·460	0·424	9
10	0·905	0·820	0·744	0·676	0·614	0·558	0·508	0·463	0·422	0·386	10
11	0·896	0·804	0·722	0·650	0·585	0·527	0·475	0·429	0·388	0·350	11
12	0·887	0·788	0·701	0·625	0·557	0·497	0·444	0·397	0·356	0·319	12
13	0·879	0·773	0·681	0·601	0·530	0·469	0·415	0·368	0·326	0·290	13
14	0·870	0·758	0·661	0·577	0·505	0·442	0·388	0·340	0·299	0·263	14
15	0·861	0·743	0·642	0·555	0·481	0·417	0·362	0·315	0·275	0·239	15

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

Annuity Table

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

Where r = discount rate
n = number of periods

Discount rate (r)

Periods (n)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	
1	0·990	0·980	0·971	0·962	0·952	0·943	0·935	0·926	0·917	0·909	1
2	1·970	1·942	1·913	1·886	1·859	1·833	1·808	1·783	1·759	1·736	2
3	2·941	2·884	2·829	2·775	2·723	2·673	2·624	2·577	2·531	2·487	3
4	3·902	3·808	3·717	3·630	3·546	3·465	3·387	3·312	3·240	3·170	4
5	4·853	4·713	4·580	4·452	4·329	4·212	4·100	3·993	3·890	3·791	5
6	5·795	5·601	5·417	5·242	5·076	4·917	4·767	4·623	4·486	4·355	6
7	6·728	6·472	6·230	6·002	5·786	5·582	5·389	5·206	5·033	4·868	7
8	7·652	7·325	7·020	6·733	6·463	6·210	5·971	5·747	5·535	5·335	8
9	8·566	8·162	7·786	7·435	7·108	6·802	6·515	6·247	5·995	5·759	9
10	9·471	8·983	8·530	8·111	7·722	7·360	7·024	6·710	6·418	6·145	10
11	10·37	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

Chapter 1

FINANCIAL MANAGEMENT OBJECTIVES

1 Introduction

The purpose of this chapter is to explain the nature of financial management and it's importance, both for profit making and for not-for-profit organisations.

2 The nature and scope of financial management

The role of the Financial Manager is to make the right decisions in order to achieve the objectives of the company in the future.

The three key areas that the Financial Manager is concerned with are as follows:

(a) The raising of long-term finance:

The company needs finance for investment and in order to expand. Finance can be raised from shareholders or from debt – it is the job of the Financial Manager to be aware of the different sources of finance and to decide which source to use.

(b) The investment decision:

Decisions have to be made as to where capital is to be invested. For example, is it worth launching a new product? Is it worth expanding the factory? Is it worth acquiring another company?

It is the Financial Manager's role to decide on which criteria to employ in making this kind of investment decision.

(c) The management of working capital:

In order for the company to operate, it will have to accept a certain level of debtors and it will have to carry a certain level of stock.

Although these are needed to operate the business successfully, they require long-term investment of capital that is not directly earning profits.

Debtors and stock are just two components of working capital (working capital = current assets less current liabilities) and it is a job of the Financial Manager to ensure that the working capital is managed properly i.e. that it is high enough to enable to company to operate efficiently, but that it does not get out of control and end up wasting money for the company.

3 The relationship between financial management, management accounting and financial accounting

3.1 Management Accounting

As outlined in the previous paragraph, Financial Management is mainly concerned with making decisions for the long-term future of the company.

It tends to be long-term decision making, involves making forecasts for the future and needs much external information (e.g. knowledge of competitors). The purpose is to make decisions which end up achieving the objectives of the company.

Once the long term decisions have been made, they need to be implemented and controlled. This is Management Accounting.

- Management Accounting involves making short-term decisions as to how to implement the long-term strategy and involves the setting up of a control system in order to measure how well objectives are being achieved in order that corrections may be made if necessary.
- It tends to be short-term (the coming year), and involves both past information and forecasts for the future.

3.2 Financial Accounting

- Financial Accounting is the reporting to stakeholders – primarily shareholders – of how the company has performed and therefore effectively how well the Financial Manager and Management Accountant are doing their jobs.
- The Financial Accountant is fulfilling a legal requirement to report the profits, and it is not their role to look for ways of performing better – that is the job of the Financial Manager.
- The Financial Accountant is only looking at past information and information internal to the company.

4 The relationship of financial objectives and organisational strategy

4.1 A strategy is the course of action taken in order to attempt to achieve an objective.

The Financial Manager needs to decide on strategies for the raising of finance, for the investment of capital, and for the management of working capital.

However, before he can decide on these strategies he needs to identify what the objectives of the company are.

All private sector companies will have the objective of being profitable, but this objective can be stated in various ways (e.g. maximising the return on capital employed; maximising the dividend payable to shareholders). The objectives are different for the various stakeholders in a company (e.g. the shareholders, the debt lenders, the employees) and it is the objectives that will determine the strategies to be followed.

4.2 Maximising and Satisficing

One problem for the Financial Manager (as discussed more in the next paragraph) is to satisfy the objectives of several stakeholders at the same time. For example, reducing wages might increase profits and might satisfy shareholders, but would be unlikely to satisfy employees!

It is up to the Financial Manager to consider the various stakeholders and their objectives and decide on a strategy to achieve the relevant objectives. It is however obviously often difficult to satisfy everyone at the same time.

Maximising is finding the best possible outcome, whereas **satisficing** is finding simply an acceptable or adequate outcome.

5 Multiple stakeholders.

As stated in the previous paragraph, there are several stakeholders in a company and this presents a problem for the Financial Manager in deciding which stakeholder objectives are the more important and how to satisfy several different types of stakeholder at the same time.

5.1 *Examples of stakeholders are as follows:*

Internal:

- Employees
- Managers

Connected:

- Shareholders
- Debt Lenders
- Customers
- Bankers
- Suppliers

External:

- Government
- Local communities
- The community at large

The influence of the various stakeholders results in many firms adopting **non-financial objectives** in addition to financial ones.

5.2 ***These might include objectives such as:***

- Maintaining a contented workforce
- Showing respect for the environment
- Providing a top quality service to customers

6 Objectives (financial and otherwise) in *not-for-profit* organisations

6.1 'Not-for-profit'

- 'Not-for-profit' organisations include organisations such as charities, which are not run to make profits but to provide a benefit to specific groups of people.
- 'Not-for-profit' also includes such things as the state health service and police force, where again they are not run to make profits, but to provide a benefit.
- Although good financial management of these organisations is important, it is not possible to have financial objectives of the same form as for companies. This is partly because it is not so clear-cut as to in whose interest the organisation is run. Also, the most obvious financial measures – those related to profitability – are clearly not appropriate. Costs may be measured relatively easily, but the benefits – such as better healthcare – are intangible.
- The focus therefore for these organisations in on **value for money** i.e. attempting to get the maximum benefits for the least cost.

6.2 *The fundamental components of Value for Money are:*

(a) Economy i.e. obtaining resources at a 'fair' price.

Ways of achieving this are:

» putting out to tender (in the case of equipment)

» benchmarking i.e. comparing with private sector organizations (in the case of wages)

(b) Effectiveness i.e. obtaining good results

» In the case of a hospital (for example) one way of attempting to measure this could be to calculate the death rate per 1000 patients.

(c) Efficiency i.e. making good use of resources

» Again, in the case of a hospital one way of attempting to measure this could be to calculate the number of patients per nurse.

Chapter 2

THE FINANCIAL MANAGEMENT ENVIRONMENT

1 Introduction

One of the main areas of importance for the financial manager is the raising of finance.

In this chapter we look at the framework within which he operates and the institutions and markets than can help him in this respect.

2 Financial intermediation

Companies need to raise money in order to finance their operations. However, it is often difficult for them to raise money directly from private individuals and therefore they often turn to institutions and organisations that match firms that require finance with individuals who want to invest.

One example of a **financial intermediary** is a bank. They make loans to companies using the money that has been deposited with them by individuals.

2.1 The features of the service that they are providing are as follows:

(a) Aggregation:

Individuals are each depositing relatively small amounts with the bank, but the bank is able to consolidate and lend larger amounts to companies.

(b) Maturity Transformation:

Most individuals are depositing money for relatively short periods, but the bank is able to transform this into longer term loans to companies in the knowledge that as some individuals withdraw their deposits, others will take their place.

(c) Diversification of risk:

Many individuals may be scared of lending money directly to one particular company because of the risk of that company going bankrupt. However, a bank will be lending money to many companies and will therefore be reducing the risk to themselves and therefore to the individuals whose money they are using.

Ordinary banks (or **clearing banks**) are one example of a financial intermediary, as explained above.

2.2 Other examples of financial intermediaries include:

- Pension funds
- Investment Trusts / Unit Trusts
- State Savings Banks

3 Credit Creation by clearing banks

Although banks will receive lots of deposits from customers, they only need to keep a small proportion of their assets in the form of cash because only a small proportion of their customers will want to take out their money on any particular day. The rest of the cash can be invested by the bank.

A major form of investment for the bank is the giving of loans to customers.

However, if they do give loans to customers, then customers can spend this extra money and it will end up being deposited again with the banks. This means the bank has yet more cash to lend!

Illustration 1

Suppose a bank has $10,000 deposited with it , and suppose it only needs to maintain 10% of its funds as cash.

The bank is then able to invest $9,000. If we assume that this investment is in the form of loans to customers, then customers have available for spending a total of $19,000 – the initial 10,000 plus the extra 9,000 that has been lent to them.

The extra $9,000 is likely to be spent and finally deposited back with a bank, which will then be able to lend another $8,100, thus creating addition credit.

This process is known as the multiplier effect.

The proportion of deposits that a bank retains as cash (in this example 10%) is known as the 'liquidity ratio' or 'reserve asset ratio'. Where the liquidity ratio is known, the following formula can be used to determine the total final depostits and hence the credit created from an initial deposit:

$$\text{Final deposits} = \text{Initial deposit} \times \frac{1}{\text{Liquidity ratio}}$$

Credit created = Final deposits – Initial deposit

Using the figures from our illustration:

Final deposits = $10,000 x 1/0.1 = $100,000

Credit created = $100,000 - $10,000 = $90,000

4 The financial markets

The financial markets include both the capital markets and the money markets. The following activity takes place on these markets:

Primary market activity – the selling of new issues to raise new funds. Secondary market activity – the trading of existing financial instruments.

4.1 The main capital markets are:

- The Official List at the London Stock Exchange.
- The Alternative Investment Market (AIM), which has fewer regulations and less cost than the Official List and is therefore attractive to smaller companies.
- The Eurobond market where bonds denominated in any currency other than that of the national currency of the issuer are traded. Eurobonds are generally issued by large international companies and have a 10 to 15 year term.

These markets provide long-term capital in the form of equity capital, ordinary and preference shares for example, or loan capital such as debentures. Companies requiring funds for five years or more will use the capital markets.

4.2 The money markets.

The money market is not actually a physical market but is the term used to describe the trading between financial institutions, primarily done over the telephone.

The main areas of trading include:

The discount market	where bills of exchange are traded.
The inter-bank market	where banks lend each other short-term funds.
The eurocurrency market	where banks trade in all foreign currencies, usually in the form of certificates of deposit. The need for this trading arises when, for instance, a UK company borrows funds in a foreign currency from a UK bank.
The certificate of deposit market	where certificates of deposit are traded.
The local government market	where local authorities trade in debt instruments.
The inter-company market	where companies lend directly between themselves.
The finance house market	where short-term loans raised by finance houses are traded.

These markets are for short-term lending and borrowing where the maximum term is normally one year.

Companies requiring medium term (one to five years) capital will generally raise these funds through banks.

5 Stock exchange operations

5.1 The functions and purpose of the Stock Exchange

The main function of the Stock Exchange is to ensure a fair, orderly and efficient market for the transfer of securities, and the raising of new capital through the issue of new securities. In order to do this the Stock Exchange has stringent regulations which are designed to ensure that:

(a) Only suitable companies are allowed to have their securities traded on the Stock Exchange;

(b) All relevant information is made publicly available as soon as possible – in this way investors can make informed decisions.

(c) All investors deal on the same terms and at the same prices.

(d) The more efficient and fair the Stock Exchange is seen to be, the more willing people will be to invest their money in the Exchange and the more successful it will become.

5.2 How are shares bought and sold?

If an investor wants to buy or sell shares he contacts a "broker". The broker will either act as an agent and deal through a "market maker" or he may deal himself, in which case he is known as a "broker dealer". The broker will charge a fee for his services, whilst a market maker will generate a profit through the "bid – offer spread", which is simply the difference between the price he is willing to pay for a share and the price at which he is willing to sell it.

Most trading is done over the telephone and once a market maker strikes a bargain, that bargain falls due for settlement in ten days' time. This is known as the rolling settlement system.

5.3 How are shares valued?

Shares are valued by market forces at the price at which there are as many willing sellers as there are willing buyers. For instance, if a share is overvalued there will be more people keen to sell their holding than there will be willing to buy, and this will inevitably depress the market price.

(a) Some trading will be done for speculative reasons:

» A "bull" is someone who believes that prices will rise. He buys shares in the hope of selling them in the future for a profit.

» A "bear" is someone who believes prices will fall. He sells shares in the belief he will be able to buy them back later for less.

When there are more bulls than bears prices will rise, and when there are more bears than bulls prices will fall.

(b) Such speculative dealing has an important role as:

» it reduces fluctuations in the market; for instance, as the market falls and prices fall, more and more speculators will become "bullish" and start to buy again, thus arresting the fall in the market

» it ensures that there is always a ready market in all shares; in other words, there will always be someone willing to buy or sell at the right price.

6 Financial market efficiency

An **efficient market** is one in which the market price of all securities traded on it reflects all the available information. A **perfect market** is one which responds immediately to the information made available to it.

An efficient and perfect market will ensure that quoted share prices are as fair as possible, in that they accurately and quickly reflect a company's financial position with respect to both current and future profitability.

6.1 The Efficient Market Hypothesis

The Efficient Market Hypothesis (EMH) considers whether market prices reflect all information about the company. Three potential levels of efficiency are considered.

(a) Weak-form efficiency:

Share prices reflect all the information contained in the record of past prices. Share prices follow a random walk and will move up or down depending on what information about the company next reaches the market.

If this level of efficiency exists it should not be possible to forecast price movements by reference to past trends.

(b) Semi-strong form efficiency:

Share prices reflect all information currently publicly available. Therefore the price will alter only when new information is published.

If this level of efficiency has been reached, price movements could only be forecast if unpublished information were known. This would be known as insider dealing.

(c) Strong-form efficiency:

Share prices reflect all information, published and unpublished, that is relevant to the company.

If this level of efficiency has been reached, share prices cannot be predicted and gains through insider dealing are not possible as the market already knows everything!

Given that there are still very strict rules outlawing insider dealing, gains through such dealing must still be possible and therefore the stock market is at best only semi-strong form efficient.

6.2 The level of efficiency of the stock market has **implications for financial managers:**

(a) The timing of new issues:

Unless the market is fully efficient the timing of new issues remains important. This is because the market does not reflect all the relevant information, and hence advantage could be obtained by making an issue at a particular point in time just before or after additional information becomes available to the market.

(b) Project evaluation:

If the market is not fully efficient, the price of a share is not fair, and therefore the rate of return required from that company by the market cannot be accurately known. If this is the case, it is not easy to decide what rate of return to use to evaluate new projects.

(c) Creative accounting:

Unless a market is fully efficient creative accounting can still be used to mislead investors.

(d) Mergers and takeovers:

Where a market is fully efficient, the price of all shares is fair. Hence, if a company is taken over at its current share value the purchaser cannot hope to make any gain unless economies can be made through scale or rationalisation when operations are merged. Unless these economies are very significant an acquirer should not be willing to pay a significant premium over the current share price.

(e) Validity of current market price:

If the market is fully efficient, the share price is fair. In other words, an investor receives a fair risk/return combination for his investment and the company can raise funds at a fair cost. If this is the case, there should be no need to discount new issues to attract investors.

7 Money market interest rates

Different financial instruments offer different interest rates. In order to understand why this is, it is necessary to appreciate the factors which determine the appropriate interest rate for a particular financial instrument.

7.1 The factors which determine interest rates:

(a) The general level of interest rates in the economy.

(b) The level of risk:

The higher the level of risk the greater return an investor will expect. For instance, an investor in a building society is taking very little risk and hence receives only a small return. Conversely, a purchaser of shares is taking a significant risk and hence will expect a greater return. This is known as the risk-return trade off.

The additional return required before someone would be indifferent between investing in an equity share or a deposit account will differ from individual to individual, as we all have a different attitude to risk. Therefore the relationship between risk and return is different for each individual.

(c) The duration of a loan:

If it is assumed that in the long-term interest rates are expected to remain stable then the longer the length of the loan the higher the interest rate will be. This is quite simply because lending money in the longer term has additional risk for the lender as for instance the risk of default increases.

(d) The need for the financial intermediaries to make a profit:

For instance, a depositor at a building society will receive a lower rate of interest than a borrower will be charged.

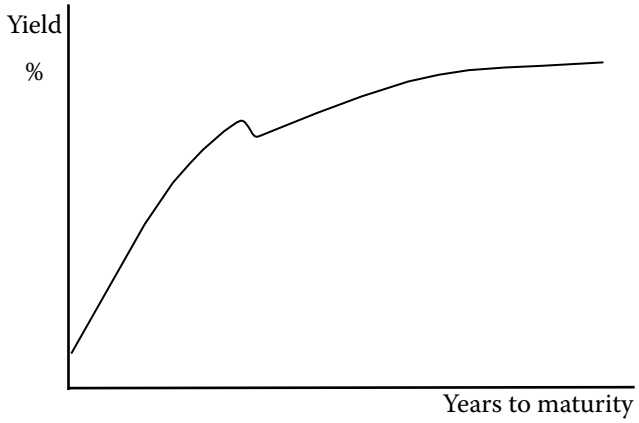
(e) Size:

If a large sum of money is lent or borrowed, there are administrative savings; hence a higher rate of interest can be paid to a lender and a lower rate of interest can be charged to a borrower than would normally be the case.

7.2 Yield curves

The yield of a security will alter according to the length of time before the security matures. This is known as the term structure of interest rates.

If, for example, a graph were drawn showing the yield of various government securities against the number of years to maturity, a yield curve such as the one below might result.



It is important for financial managers to be aware of the shape of the yield curve, as it indicates to them the likely future movements in interest rates and hence assists in the choice of finance for the company.

7.3 The shape of the curve can be explained by the following:

(a) Expectations theory:

If interest rates are expected to increase in the future, a curve such as that above may result. The curve may invert if interest rates are expected to decline. Everything else being equal, a flat curve would result if interest rates are not expected to change.

(b) Liquidity preference theory:

Yields will need to rise as the term to maturity increases, as by investing for a longer period the investor requires compensation for deferring the use of cash invested. The longer the period for which they are deprived of cash, the more compensation they require

(c) Segmentation theory:

Different investors are interested in different segments of the yield curve. Short-term yields, for example, are of interest to financial intermediaries such as banks. Hence the shape of the yield curve in that segment is a reflection of the attitudes of the investors active in that sector. Where two sectors meet there is often a disturbance or apparent discontinuity in the yield curve as shown in the above diagram.

Chapter 3

MANAGEMENT OF WORKING CAPITAL (1)

1 Introduction

The purpose of this chapter is to explain the nature of working capital and the importance of it to the financial manager. We will also consider various ratios and measures which may be useful to the financial manager in assessing how well it is being controlled.

2 What is working capital?

Working capital is the name given to net current assets which are available for day-to-day operating activities.

It normally includes inventories, receivables, cash (and cash equivalents), less payables.

Working capital = receivables + cash + inventory – payables

3 Investment in working capital

Working capital needs financing, just as does the investment in machines.

However, it is the investment in fixed assets that (hopefully!) earns profits for the company. Investment in working capital does not directly earn profits.

If this were the only consideration, then it would be better to invest all the finance available in fixed assets and to keep working capital to an absolute minimum.

On the other hand, all companies need some working capital in order to keep the business running

- they need to allow customers to buy on credit (and therefore have receivables) otherwise they would lose business to competitors.
- they need to carry inventories of finished goods in order to be able to fulfil demand
- they need to have a short-term cash balance in order to be able to pay their bills.

The company therefore faces a trade-off between profitability and liquidity, and it is up to the financial manager to decide on the optimal level of working capital and to ensure that it is managed properly

4 The financing of working capital

Whatever level of working capital the business decides to hold, it has to be financed from somewhere.

The business must decide whether to use **short-term** or **long-term** finance.

Long-term finance is either raised from equity in the form of share issues etc., or from long-term borrowing.

Short-term finance generally involves overdraft borrowing and/or delaying payment to payables.

Short-term finance is often cheaper (although not always – interest rates on overdrafts can be very high, and delaying payment to payables can involve the loss of discounts).

However, short-term finance is risky as it is repayable on demand.

In the past it was generally thought that since working capital involved short-term assets it should be financed by short-term finance, whereas fixed assets – being long-term – should be financed by long-term finance.

A more modern view is that in fact the overall level of working capital remains fixed in the long-term **(permanent working capital)** and that there are day-to-day fluctuations above this permanent level **(temporary working capital)**.

Permanent working capital, being long-term, should be financed by long-term sources of finance.

Temporary working capital should be financed by short-term sources of finance.

5 Working capital ratios

5.1 Liquidity ratios:

$$\textbf{Current ratio} = \frac{\textbf{Current assets}}{\textbf{Current liabilities}}$$

We would normally expect this to be > 1.

A current ratio of less than 1 could indicate liquidity problems.

$$\textbf{Quick ratio} = \frac{\textbf{Current assets – inventory}}{\textbf{Current liabilities}}$$

The same idea as the current ratio, but without inventory on the basis that it is inventory that will take the longest time to turn into cash.

Clearly the Quick Ratio will be lower than (or equal to!) the Current Ratio, and a Quick Ratio of slightly less than 1 is not necessarily dangerous – it very much depends on the type of business.

5.2 Efficiency ratios:

$$\textbf{Inventory turnover} = \frac{\textbf{Cost of goods sold p.a.}}{\textbf{Average inventory}}$$

This shows how quickly inventory is being sold

$$\textbf{Receivables' turnover} = \frac{\textbf{Credit sales p.a.}}{\textbf{Average receivables}}$$

This shows how quickly debts are being collected

$$\textbf{Payables' turnover} = \frac{\textbf{Credit purchases p.a.}}{\textbf{Average payables}}$$

This shows how quickly payables are being paid

5.3 Problems with the use of ratios:

(a) The use of statement of financial position is dangerous in that they represent only one point in time which may be unusual (due to, for example, seasonal factors)

(b) There may be window-dressing

(c) They only look at the past – not the future

(d) They are of little value unless used in comparisons.

6 The Operating Cycle

The **operating cycle** (or **cash operating cycle** or **working capital cycle**) of a business is the length of time between the payment for materials entering into inventory and the receipt of the proceeds of sales.

It is useful to compare the operating cycle of a company from year to year, or with similar companies – a lengthening operating cycle will normally be cause for concern.

Example 1

The table below gives information extracted from the annual financial statements of Management plc for the past year.

Management plc - Extracts from annual accounts

Inventories:	raw materials	$108,000
	work in progress	$75,600
	finished goods	$ 86,400
Purchases of raw materials		$518,400
Cost of production		$675,000
Cost of goods sold		$756,000
Sales		$864,000
Receivables		$172,800
Payables		$ 86,400

Required

Calculate the length of the working capital cycle (assuming 365 days in the year).

Solution

				Days
1	Receivables days	$\frac{\text{Average receivables}}{\text{Credit sales}}$	× 365	
2	Inventory days			
	(a) Finished goods	$\frac{\text{Average finished goods}}{\text{Cost of sales}}$	× 365	
	(b) W.I.P	$\frac{\text{Average WIP}}{\text{Cost of production}}$	× 365	
	(c) Raw material	$\frac{\text{Average raw material}}{\text{Raw material purchases}}$	× 365	
	LESS:			
3	Payables days	$\frac{\text{Average payables}}{\text{Credit purchases}}$	× 365	( )
		Net operating cycle =		

7 Overcapitalisation and Overtrading

Overcapitalisation is where the overall level of working capital is too high.

The solution is to reduce the level of working capital by better management of receivables, cash and inventory.

As a result the company will need less financing, or alternatively will have more finance available for profit-earning investment in fixed assets.

Overtrading (or under-capitalisation) is where the level of working capital is too low.

Consider the following example:

Illustration 1

		Current year	*Next year*
Non-current Assets		500	
Current Assets			
Inventory	100		
Receivables	200		
Cash	50		
	350		
Current liabilities			
Payables	150		
		200	
		$700	
Long term Capital		$700	

The company intends to double in size over the next year. They raise $500 long-term capital and invest it all in fixed assets

In this situation the company has severe liquidity problems, even though they may well be trading very profitably.

The solution is to raise additional long-term finance. Assuming the company is trading profitably then this should be possible.

Chapter 4

MANAGEMENT OF WORKING CAPITAL (2) – INVENTORY

1 Introduction

The purpose of this chapter to is examine approaches to managing inventory efficiently. The two most important approaches are the EOQ model and the 'Just-in-time' approach.

2 The EOQ model

There are many approaches in practice to ordering inventory of goods from suppliers. Here we will consider one particular approach – that of ordering fixed quantities each time.

For example, if a company needs a total of 12,000 units each year, then they could decide to order 1,000 units to be delivered 12 times a year. Alternatively, they could order 6,000 units to be delivered 2 times a year. There are obviously many possible order quantities.

We will consider the costs involved and thus decide on the order quantity that minimises these costs (the **economic order quantity**).

3 Costs involved

3.1 The costs involved in a inventory ordering systems are as follows:

- the purchase cost
- the reorder cost
- the inventory-holding cost

3.2 Purchase cost

This is the cost of actually purchasing the goods. Over a year the total cost will remain constant regardless of how we decide to have the items delivered and is therefore irrelevant to our decision.

(Unless we are able to receive discounts for placing large orders – this will be discussed later in this chapter)

3.3 Re-order cost

This is the cost of actually placing orders. It includes such costs as the administrative time included in placing an order, and the delivery cost charged for each order.

If there is a fixed amount payable on each order then higher order quantities will result in fewer orders needed over a year and therefore a lower total reorder cost over a year.

3.4 Inventory holding cost

This is the cost of holding items in inventory. It includes costs such as warehousing space and insurance and also the interest cost of money tied up in inventory.

Higher order quantities will result in higher average inventory levels in the warehouse and therefore higher inventory holding costs over a year.

4 Minimising costs

One obvious approach to finding the economic order quantity is to calculate the costs p.a. for various order quantities and identify the order quantity that gives the minimum total cost.

Example 1

Janis has demand for 40,000 desks p.a. the purchase price of each desk is $25. There are ordering costs of $20 for each order placed. Inventory holding costs amount to 10% p.a. of inventory value.

Calculate the inventory costs p.a. for the following order quantities, and plot them on a graph:

(a) 500 units
(b) 750 units
(c) 1000 units
(d) 1250 units

5 The EOQ formula

A more accurate and time-saving way to find the EOQ is to use the formula that will be provided for you in the exam, if needed.

The formula is:

$$EOQ = \sqrt{\frac{2C_oD}{C_H}}$$

Where C_o = fixed costs per order

D = annual demand

C_H = the stockholding cost per unit per annum

(**Note:** you are not required to be able to prove this formula)

Example 2

For the information given in Example 1,

(a) use the EOQ formula to calculate the Economic Order Quantity.

(b) calculate the total inventory costs for this order quantity.

6 Quantity discounts

Often, discounts will be offered for ordering in large quantities. The problem may be solved using the following steps:

(1) Calculate EOQ ignoring discounts
(2) If it is below the quantity which must be ordered to obtain discounts, calculate total annual inventory costs.
(3) Recalculate total annual inventory costs using the order size required to just obtain the discount
(4) Compare the cost of step 2 and 3 with the saving from the discount and select the minimum cost alternative.
(5) Repeat for all discount levels

Example 3

For the information given in Example 1 the supplier now offers us discounts on purchase price as follows:

Order quantity	discount
0 to < 5,000	0 %
5,000 to < 10,000	1 %
10,000 or over	1.5 %

Calculate the Economic Order Quantity.

7 The Just-in-time system

Under this approach, minimum inventories are held of Finished Goods, Work-in-Progress, and Raw Materials.

The conditions necessary for the business to be able to operate with minimum inventories include the following:

7.1 Finished Goods:

- a short production period, so that goods can be produced to meet demand ('demand-pull' production)
- good forecasting of demand
- good quality production, so that all production is actually available to meet demand

7.2 Work-in-Progress:

- a short production period. If the production is faster, then the level of WIP will automatically be lower.
- the flexibility of the workforce to expand and contract production at short notice

7.3 Raw Materials:

- the ability to receive raw materials from suppliers as they are needed for production (instead of being able to take from inventory). This requires the selection of suppliers who can deliver quickly and at short notice.
- guaranteed quality of raw material supplies (so that there are no faulty items holding up production).
- the flexibility of suppliers to deliver more or less at short notice.
- tight contracts with suppliers, with penalty clauses, because of the reliance placed on suppliers for quality and delivery times.

A 'just-in-time' approach is a philosophy affecting the whole business. The benefits are not just cost savings from lower inventory-holding costs and less risk of obsolete inventory, but benefits in terms of better quality production (and therefore less wasteage), greater efficiency, and better customer satisfaction.

Chapter 5

MANAGEMENT OF WORKING CAPITAL (3) – RECEIVABLES AND PAYABLES

1 Introduction

The purpose of this chapter is to look at ways in which companies may manage receivables and payables more efficiently and thus reduce the level of working capital.

2 Receivables

The reason for the existence of receivables is that the business is prepared to sell to customers on credit. The higher the receivables, the more cost there is for the company – both in terms of the interest cost and in terms of the greater risk of losses through bad debts.

An easy solution would be to stop selling on credit and to insist on immediate cash payment, but this would risk the losing of customers if competitors offer credit.

There is no 'best' level for receivables – it depends very much on the type of business and the credit terms offered by competitors – but it is in the interest of all companies to keep the level of receivables as low as possible in the circumstances.

2.1 Points to consider as part of efficient management:

(a) Credit checks and credit limits - before granting credit customers should be assessed as to their ability to pay, and credit limits set for all accounts

- use credit rating agencies (e.g. Dunn and Bradstreet)
- ask for trade and bank references from new customers
- analyse the payment record of existing customers
- assess the financial statements of large customers
- review credit limits regularly

(b) Credit terms and settlement discounts:

- these will be greatly influenced by competition and trade custom
- the company must quantify the cost of any settlement discounts and decide whether the benefits outweigh the cost
- ensure that customers are aware of the terms and settlement discounts by printing them on orders, invoices and statements
- ensure that any discount policy is enforced – most customers will attempt to take the discount as a matter of course, whether or not they have paid on time.

(c) Collection procedures:

- Set clearly defined procedures to be followed. Set timings for issuing demand letters, making chasing telephone calls, and stopping deliveries.
- Decide when outside assistance is needed (e.g. the use of collection agencies or lawyers)
- Compare the cost of taking direct legal action with that of using outside help.

(d) Charge interest on overdue invoices:

- In the UK, large powerful companies have a bad reputation for paying their small suppliers very slowly. As a result, the government introduced the 'Late Payment Act' in 1998 which allows small companies to charge large companies interest at 8% over base rate on invoices unpaid after 30 days.

2.2 Invoice discounting and factoring

Invoice discounting is the selling of an invoice to a third party (usually a bank) for a lower (discounted) amount. This way the supplier gets cash immediately and it is the bank who has to wait for payment (hence the lower or discounted amount).

Factoring is paying another company to administer all or part of the receivables ledger.

Depending on the fee paid to the factor, different facilities may be bought.

The basic level of factoring involves paying the factor to handle all the administration – maintaining the sales ledger and collecting the debts.

For a higher fee, the factor will advance money to the company before the debts have been collected. For example, the factor may advance 80% of the value of sales immediately on invoicing.

For a higher fee still, the factor may accept responsibility for any bad debts – the company is effectively insured against bad debts. This is known as 'non-recourse factoring'. (Normal factoring, where the company keeps the responsibility for any bad debts, is known as 'with-recourse factoring')

2.3 Examination arithmetic on receivables management

Most arithmetical questions in the examination relating to receivables management involve consideration as to whether or not a change in collection policy is worthwhile.

There are two techniques that you must be aware of – being able to consider whether or not it is worthwhile offering a simple settlement discount, and being able to consider whether or not a change in collection policy (either by using discounts or using a factor) is worthwhile.

(a) Simple settlement discount

EXAMPLE 1

Customers currently take three months credit. We are considering offering a discount of 4% for payment within one month.

Sales are $12,000,000 p.a..

We are paying overdraft interest of 20% p.a..

Calculate the effective % cost p.a. of the discount.

Should we offer the discount?

(b) Change of policy

Example 2

A company has sales of $20,000,000 p.a..

Customers currently take credit as follows:

Days	*%'age*
30	20%
60	50%
90	30%

They are considering offering a discount of 1% for payment within 30 days. It is estimated that 60% of customers will take advantage of the discount (and that the remainder will take a full 90 days).

The company's bank overdraft rate is 15% p.a..

Calculate the net cost or benefit of the change of policy.

Should they offer the discount?

(assume 365 days in a year)

Example 3

Our sales are $10,000,000 p.a. and customers currently pay as follows:

Month	*% of time*
1	20%
2	30%
3	50%

We are considering whether or not to factor our debts. The factor will pay us 100% of debts after 1 month. The fee is 2% of turnover. As a result we will be able to lose some credit control staff at a saving of $20,000 p.a..

The company's bank overdraft rate is 18% p.a.

Calculate the net cost or benefit p.a. of changing to the new policy.

Should we employ the factor?

3 Payables

Payables may be used as a source of short-term finance. If a company delays payment by a further month then they now have a further months use of the cash.

However, delaying payment may lose the company it's credit status with the supplier and could result in supplies being stopped.

Additionally, the company could lose the benefit of any settlement discount offered by the supplier for early payment.

In exactly the same way as for receivables, we can calculate the annual effective cost of refusing any settlement discount offered, and compare this with the cost of financing working capital.

Example 4

A supplier offers a 2% discount if invoices are paid within 10 days of receipt. Currently we take 30 days to pay invoices and therefore do not receive the discount.

Calculate the annual % effective cost of refusing the discount.

Example 5

A company currently takes 40 days credit from suppliers on the basis that this is 'free' finance.

Annual purchases are $100,000 and the company pays overdraft interest of 13%.

Payment within 15 days would attract a 1.5% quick settlement discount.

Should the company pay sooner in order to take advantage of the discount?

Chapter 6

MANAGEMENT OF WORKING CAPITAL (4) – CASH

1 Introduction

The purpose of this chapter is to discuss the reasons for the holding by a company of short-term cash balances, and to consider ways of managing these cash balances effectively.

2 Reasons for holding cash:

- Transaction motive
- Precautionary motive
- Speculative motive

3 Methods of dealing with cash shortages:

- Reduce inventories
- Defer capital expenditure
- Defer or reduce dividends
- Chase receivables to pay earlier
- Postpone the payment of payables
- Use short-term borrowing (overdraft)
- Sell surplus assets
- Sale and leaseback

4 Cash surpluses

A cash surplus may arise over the short term, medium term, or long term.

Possible uses of surplus cash include:

4.1 Short term

- Reduce overdraft
- Invest in short-term Treasury Stock
- Invest in bank deposit account
- Invest in 'blue-chip' shares

4.2 Long term:

- Invest in new projects
- Acquire other companies
- Increase dividends
- Buy back shares
- Repay long term loans

5 Cash Management models

5.1 Cash budgets

Cash budgets are probably the most important tool in practice for the management of any company's cash position. They are vital to identifying in advance a likely deficit or surplus in order that appropriate action can be taken to avoid any problem or profit from any opportunity.

6 Cash budgets

6.1 Proforma

Period	*1*	*2*	*3*	*4*	*5*
	$	*$*	*$*	*$*	*$*
Receipts					
Cash sales	x	x	x	x	x
Receipts from credit customers	x	x	x	x	x
Other income		x			x
	x	x	x	x	x
Payments					
Cash purchases	x	x	x	x	x
Payments for credit purchases	x	x	x	x	x
Rent and rates	x			x	
Wages	x	x	x	x	x
Light and heat		x			x
Salaries	x	x	x	x	x
Telephone	x			x	
Insurance			x		
	x	x	x	x	x
Surplus/(deficit)	(x)	(x)	x	x	x
Balance b/f	–	(x)	(x)	(x)	x
Balance c/f	(x)	(x)	(x)	x	x

Additionally, cash flows relating to fixed assets or financing should be included as appropriate.

Example 1

You are presented with the following flow forecasted cash flow data for your organisation for the period November 20X1 to June 20X2. It has been extracted from functional flow forecasts that have already been prepared.

	NovX1	*DecX1*	*JanX2*	*FebX2*	*MarX2*	*AprX2*	*MayX2*	*JuneX2*
	$	*$*	*$*	*$*	*$*	*$*	*$*	*$*
Sales	80,000	100,000	110,000	130,000	140,000	150,000	160,000	180,000
Purchases	40,000	60,000	80,000	90,000	110,000	130,000	140,000	150,000
Wages	10,000	12,000	16,000	20,000	24,000	28,000	32,000	36,000
Overheads	10,000	10,000	15,000	15,000	15,000	20,000	20,000	20,000
Dividends		20,000						40,000
Capital expenditure			30,000			40,000		

You are also told the following.

(a) Sales are 40% cash 60% credit. Credit sales are paid two months after the month of sale.

(b) Purchases are paid the month following purchase.

(c) 75% of wages are paid in the current month and 25% the following month.

(d) Overheads are paid the month after they are incurred.

(e) Dividends are paid three months after they are declared.

(f) Capital expenditure is paid two months after it is incurred.

(g) The opening cash balance is $15,000.

The managing director is pleased with the above figures as they show sales will have increased by more than 100% in the period under review. In order to achieve this he has arranged a bank overdraft with a ceiling of $50,000 to accommodate the increased inventory levels and wage bill for overtime worked.

Required

(a) Prepare a cash flow forecast for the six-month period January to June 20X2.

(b) Comment on your results in the light of the managing director's comments and offer advice.

6.2 The Baumol model

The Baumol model is very similar to the EOQ model for managing inventory, and uses the same formula.

Suppose that a company has forecast that its cash requirement over the coming year is $1.5m and that the cash use is constant throughout the year. They have the cash available, but it is currently invested and is earning interest. To transfer the entire amount immediately would lose interest for the whole year and it would therefore be more sensible to transfer amounts throughout the year as required. However, each time cash is transferred there is a fee payable (to sell investments) and therefore the more transfers the greater the cost.

The Baumol model gives a formula for the optimum amount to be transferred each time:

$$\text{Economic quantity of cash} = \sqrt{\frac{2 \times \text{Annual cash required} \times \text{cost of ordering cash}}{\text{Net interest cost of holding cash}}}$$

Example 2

Next year a company forecasts a cash requirement of $1,500,000, the use being constant throughout the year.

The company has investments in excess of this amount which are earning 9.5% p.a..

The company earns interest of 5% on their current account bank balance.

The cost of selling investments is $150 per transaction

(a) If the company sells $150,000 of investments each time, calculate the total cost p.a. to the company.

(b) What is the optimal economic quantity of cash to transfer each time in order to minimise costs?

(c) At the EOQ, what is the total cost p.a. to the company?

6.3 The Miller Orr model

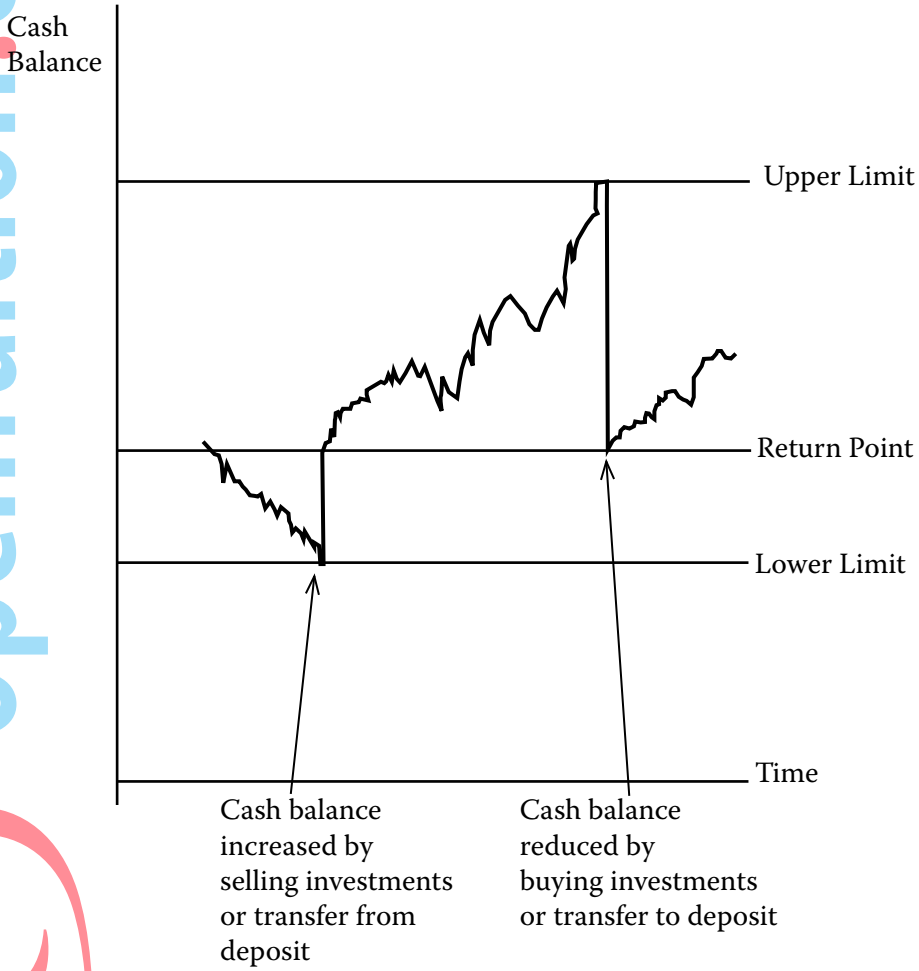
The Miller Orr model does manage to achieve a reasonable degree of realism without being too elaborate.

In practice cash flows are likely to fluctuate considerably from day-to-day. There is also a likelihood that the balances are likely to 'wander' upwards or downwards over a period.

The Miller Orr model fixes limits on the upper and lower levels.

The basic steps involved are as follows:

(1) A safety level or lower limit of cash is decided upon.
(2) A statistical calculation is made based on the variations of the cash flows, in order to agree an allowable range of fluctuations.
(3) Using this calculated range, an upper limit of cash is fixed.
(4) The cash balance is managed to ensure that the balance is always kept between the upper and lower limits.



Miller Orr produced formulae as follows:

Return point = Lower limit + (⅓ × spread)

$$\text{Spread} = 3\left(\frac{\frac{3}{4} \times \text{transaction cost} \times \text{variance of cash flows}}{\text{interest rate}}\right)^{\frac{1}{3}}$$

(these formulae are given in the examination)

Example 3

A company has decided it needs a minimum balance of $10,000. The transaction cost (of making transfers to/from deposit) is $5 per transaction. The standard deviation of cash flows is $2,000 per day, and the interest rate is 5.11% p.a. (or 5.11/365 = 0.014% per day)

What should be the upper and lower limits, and the return point?

Chapter 7

INVESTMENT APPRAISAL – METHODS

1 Introduction

In this and the following chapters we will be looking at how the Financial Manager should go about making capital investment decisions. For example, they may have to decide whether or not it is worthwhile investing $1,000,000 in a new factory. Alternatively they may have to make the choice between several available investments.

2 Discounted Cash Flow – Net Present Value

This approach looks at the expected cash flows from the investment in question. If over the life of the investment there is an expected cash surplus, then the project will be accepted, whereas if an expected cash deficit the project will be rejected.

To account for the fact that money will be tied up in the project over a period of years (and will therefore either result in interest being paid on money borrowed for the investment, or interest lost on the money invested), the cash flows are discounted at the cost of money (or cost of capital) to the company before calculating the net surplus or deficit and making the decision.

Example 1

A machine will cost $80,000.

It has an expected life of 4 years with an anticipated scrap value of $10,000.

Expected net operating cash inflows each year are as follows:

1	20,000
2	30,000
3	40,000
4	10,000

The cost of capital is 10% p.a..

Calculate the Net Present Value of the investment and determine whether or not it should be accepted.

- Make sure that you remember the terminology (discount factor; present values; net present value), and that you remember how to use the tables given in the examination for the discount factors.
- Note that we usually assume that operating cash flows arise at the ends of years. In practice it is more likely that the flows are spread over each year, but assuming ends of years not only makes the arithmetic simpler, but also looks at a 'worse-case scenario' with regard to the timing.

Example 2

In the previous example, what reservations might you have about your investment decision?

3 Discounted Cash Flow – Internal Rate of Return

One problem in practice with using a Discounted Cash Flow approach to investment appraisal is that it is virtually impossible to calculate accurately the Cost of Capital for a company.

In the previous example, we decided that using a Cost of Capital of 10% the project was worthwhile. However, suppose the Cost of Capital was not 10% but 11%. With a higher rate of interest we would expect the NPV to be lower. If still positive then we would still be happy to accept, but if it were negative then we should reject.

Even if it is positive at 11%, what about 12%? What about 13%?

Because of the uncertainty regarding the Cost of Capital it would be useful to know the breakeven rate of interest i.e. the rate of interest at which the project would have an NPV of zero.

The rate of interest at which the NPV of the project is zero is known as the Internal Rate of Return (IRR).

In order to estimate the IRR, we calculate the NPV of the project at two different rates of interest and estimate a rate giving an NPV of zero assuming linearity. (In fact the relationship of the NPV to the rate of interest is not linear but curvilinear. However, the approximation resulting from an assumption of linearity is sufficient for our purposes.

Example 3

For the project in example 1:

(a) Calculate the NPV of the project at an interest rate of 15%

(b) Estimate the IRR of the project using your results from part (a) and from Example 1.

(c) Interpret the result of (b).

4 Discounted Cash Flow – annuities and perpetuities

Most examples in the examination are like the one in example 1 - with differing cash flows each year, each of which needs to be discounted separately.

However, you will sometimes be presented with cash flows that are equal each year, in which case there is a faster and simpler approach to discounting.

An equal cash flow each year (e.g. $10,000 p.a. for 10 years) is known as an annuity.

If the annuity were expected to continue for ever, it is known as a perpetuity.

4.1 Annuities

The discount factor for an annuity may be calculated using the following formula:

$$\text{Annuity discount factor} = \frac{1-(1+r)^{-n}}{r}$$

Where r = discount rate
n = number of periods

Example 4

A machine will cost $45,000 and is expected to generate $8,000 for each of the following 8 years.

The cost of capital is 15% p.a..

Calculate the NPV of the investment.

Example 5

The cost of capital is 12% p.a.

What is the present value of $20,000 first receivable in 4 years time and thereafter each year for a total of 10 years?

4.2 Perpetuities

The discount factor for a perpetuity is: $\frac{1}{r}$

Where r = rate of interest

(These are not provided in tables for you – you must remember the discount factor)

Example 6

A machine costs $100,000 and is expected to generate $12,000 p.a. in perpetuity.

The cost of capital is 10% p.a.

What is the NPV of the project?

Example 7

The rate of interest is 5%. p.a.

What is the present value of $18,000 first receivable in 5 years time and thereafter annually in perpetuity?

5 Other approaches to investment appraisal

In theory, the discounted cash flow approach is the best method of appraisal. This is because it considers the cash flows and the timing of these flows. It is cash that is needed to pay dividends to the shareholders, and cash that is needed to expand the company by the acquisition of new investments.

However, in practice, whatever may be best in theory, shareholders and managers will be interested in other things – in particular the affect that a new investment will have on the profits of the business.

For this reason, there are many other criteria employed for investment decisions in addition to (or instead of) discounted cash flow.

In your examination, you will be required almost always to use the DCF approach. However, do be aware of two other approaches that are common in practice – Accounting Rate of Return and Payback Period.

5.1 Accounting Rate of Return

This approach is an accounts based measure and considers the expected profitability of an investment.

The Accounting Rate of Return (ARR) is defined as:

$$\frac{\text{the average profits p.a. from an investment}}{\text{the average book value of the investment}} \times 100\%$$

The ARR is compared with a target rate of return to decide whether or not the investment is worthwhile.

The target rate of return will normally be the current Return on Capital Employed for the company.

Example 8

A machine will cost $80,000.

It has an expected life of 4 years with an anticipated scrap value of $10,000.

Expected net operating cash inflows each year are as follows:

1	20,000
2	30,000
3	40,000
4	10,000

Calculate the ARR of the project.

5.2 Payback period

The payback period is defined as being the number of years it takes for a project to recoup the original investment in cash terms.

The payback period is compared with a target period – if the project pays for itself sooner then it should be accepted, if not then it should be rejected.

The payback period is useful when the future flows have a high level of uncertainty. The further into the future we are forecasting, then the more uncertain the flows are likely to be. By choosing projects with faster payback periods, we are more certain that the projects will indeed end up making a surplus.

Payback period and DCF techniques are often combined by calculating a discounted payback period – this involves discounting the cash flows and then calculating how many years it takes for the discounted cash flows to repay the initial investment.

Example 9

A machine will cost $80,000.

It has an expected life of 4 years with an anticipated scrap value of $10,000.

Expected net operating cash inflows each year are as follows:

1	20,000
2	30,000
3	40,000
4	10,000

Calculate the payback period of the project.

Chapter 8

RELEVANT CASH FLOWS FOR DCF

1 Introduction

In the previous chapter we looked at the arithmetic involved in investment appraisal using the Discounted Cash Flow approach.

However, the main problem in examination questions is arriving at the cash flows in the first place. In this chapter we will consider how to establish the cash flows of investments in order to be then able to apply the DCF techniques.

2 Relevant costs

The general rule is that we are interested in all **future**, **incremental** (or extra), **cash flows** to the company as a result of undertaking the investment.

We are not interested in the following:

- money already committed (or sunk costs)
- historic costs
- non-cash flows (especially depreciation)
- book values
- interest costs (because these are dealt with by the discounting)

We are interested in both direct and opportunity cash costs and revenues.

Direct costs are those costs directly related to the investment e.g. the new machine will incur running costs of $10,000 p.a..

Opportunity costs are costs that occur elsewhere in the company due to acceptance of an investment e.g. buying a new machine will result in losing revenue of $10,000 p.a. that is currently being earned by the company from another machine.

Example 1

A research project which to date has cost the company $150,000 is currently under review.

If the project were allowed to proceed, it will be completed in approximately one year, when the results would be sold to a government agency for $300,000.

Shown below are the additional expenses which the managing director estimates will be necessary to complete the work.

Materials:

The materials required have just been purchased at a cost of $60,000. They are toxic and, if not used in this project must be disposed of at a cost of $5,000.

Labour:

Skilled labour is hard to recruit. The workers concerned have been transferred to this project from a production department, and the production manager claims that if the men were returned to him they could generate sales of $150,000 in the next year. The prime cost of these sales would be $100,000 including $40,000 for the

labour cost itself. The overhead absorbed into this production would amount to $20,000.

Research staff:

It has already been decided that when work on this project ceases, the research department will be closed. Research wages for the year are $60,000, and redundancy and severance pay has been estimated at $15,000 now, or $35,000 in one years time.

Equipment:

The project utilises a special microscope which cost $18,000 three years ago. It has a residual value of $3,000 in another two years, and a current disposal value of $8,000. If used in the project it is estimated that the disposal value in a years time will be $6,000.

Share of general building services:

The project is charged with $35,000 p.a. to cover its share of general building expenses. Immediately the project is discontinued, the space occupied by the project could be sub-let for an annual rental of $7,000.

Advise the managing director as to whether or not the project should be allowed to proceed, explaining your reasons for the treatment of each item.

(Ignore the time value of money)

3 Working capital

It is very common in questions to be told that in addition to the cash needed to buy a machine, cash is also needed immediately to finance working capital requirements.

The working capital requirements relate to such things as the carrying of inventory of raw materials and the financing of receivables resulting from the sales.

Unless told differently, we always assume that the working capital results in a cash outflow at the time it is needed, that the requirement remains for the life of the investment, but that it is released (and therefore results in a cash inflow) at the end of the project.

Example 2

A machine costs $100,000 to purchase. In addition a further $20,000 working capital will be required at the start of the project.

The project is expected to last 4 years and to have a scrap value of $20,000 at the end of its useful life.

Net operating cash flows are expected to be $30,000 p.a. for the first two years and $40,000 p.a. for the following two years.

All operating flows are to be assumed to occur at the ends of year.

Calculate the net cash flow for each of the years in question (you are not required to discount or arrive at an investment decision).

4 Taxation

If a company undertakes a new investment which generates higher profits, then there will be extra tax payable as a result. This extra tax payable is an extra cash flow resulting from the project and therefore needs including on our table of cash flows. (Note that if a new investment were to make a loss, then the company would as a result pay less tax than before. This tax saving is effectively a cash receipt (or cash inflow) resulting from the project.)

There are two tax affects on our appraisal.

In each year, any extra profit will result in extra tax payable.

Additionally, the initial capital investment will result in additional capital allowances being available to the company which will result in less tax payable (a tax saving).

In the examination you will be told the rate of tax, when the tax is payable and also the way in which capital allowances are given. Your task it to read the question carefully, perform the relevant calculations, and include the resulting tax cash flows in your table of cash flows.

When dealing with tax in this examination we make the following simplifying assumptions:

- tax is calculated on operating cash flows (in practice it is on adjusted operating profits)
- there is no advance tax payable
- there is no tax on working capital (either the outflow or the inflow)
- there is no 'pool' of assets for capital allowance calculations – capital allowances are calculated in isolation for the investment in question
- no other taxes are relevant (e.g. capital gains tax)

Example 3

A company has a year end of 31 December each year.

It is considering the purchase of a new machine on 1 January 2003 at a cost of $10,000.

The machine is expected to generate net operating cash flows of $5,000 during the first year and $7,000 during the second year.

It is intended to sell the machine at the end of the second year for $6,000.

Additional working capital of $1,000 will be required at the start of the project.

Corporation tax is 30% payable one year in arrears.

Capital allowances are available at 25% p.a. on a reducing balance basis.

The cost of capital is 10%

Calculate the NPV of the project and advise as to whether it should be accepted or rejected.

5 Inflation

In order to calculate an NPV we need to estimate the cash flows which we expect will occur for each year of the investments life.

In practice (and, more importantly, in the examination) it is often the case that some cash flows would be expected to be constant each year were it not for the effect of inflation. E.g. we might need to pay rent for new premises of $10,000 each year. We do not expect to need different premises and therefore the rent would remain at $10,000 for each year subject to inflationary increases.

As a result it is often the case that future cash flows are quoted at the current amount together with an estimate for inflation. E.g. rent of $10,000 p.a. inflating at 5% p.a..

For our DCF calculations we need to discount the actual forecasted cash flows, and therefore it is often necessary for us to do the arithmetic inflating the cash flows by the rate of inflation in order to complete our cash flow table.

Example 4

Ventspils plc are considering buying a new machine in order to produce a new product.

The machine will cost $2,800,000 and is expected to last for 3 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 p.u. 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%, 1 year in arrears

Cost of Capital: 10%

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

6 Inflation – effective rates

The method of dealing with inflation covered in the previous section is normally the most sensible and efficient approach, and is normally the approach expected in the examination.

However, very occasionally you might be presented with the situation where all flows are expected to inflate at the same rate of inflation. In these circumstances you can still use the method already discussed, but alternatively there is a 'short-cut' approach that can save time.

Instead of having to inflate each flow using the rate of inflation and then having to discount each at the cost of capital, the same result can be achieved by discounting the current price flows at an effective cost of capital.

The effective cost of capital is calculated using the formula:

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

where e = effective cost of capital

m = actual cost of capital (or money rate)

i = 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.

Chapter 9

DISCOUNTED CASH FLOW – FURTHER ASPECTS

1 Introduction

This chapter deals with three specific situations of investment appraisal which are occasionally asked in the examination – capital rationing; replacement decisions; and, lease v buy decisions.

For each of these situations it is important to understand the nature of the problem and the way in which the standard techniques, which we have already covered, are applied.

2 Capital Rationing

Capital rationing is the term used to cover the situation when the company has limited funds available for investment. This can either be because there is only a limited amount available to be borrowed (**hard** capital rationing) or alternatively the company decides to itself place a limit on the amount that it is prepared to borrow (**soft** capital rationing).

The object of the exercise is to decide how best to invest a limited amount of capital available when there are several investments available.

The best solution will be the one giving the greatest total NPV.

The approach to be used depends on whether or not the projects are infinitely divisible.

2.1 Infinitely divisible projects

If projects are said to be **infinitely divisible**, it means that it is possible to invest in any fraction of a project (up to a maximum of 100% of the project). We also assume that is we invest in (say) 10% of a project then all the flows will be 10% of the full project flows and that therefore the resulting NPV will be 10% of the full project NPV.

The approach is as follows:

- calculate the NPV per $ of initial investment (**the profitability index**)
- rank the projects in terms of their profitability indexes
- invest as much as possible in the project with the highest profitability index, then go to the project with the next highest, and so on until the capital available is exhausted.

2.2 Non-infinitely divisible projects

If projects are not infinitely divisible it is only possible to invest in whole projects.

In this situation there is no 'quick' method – the only approach is to look at all possible combinations of projects that are possible using the limited amount of capital available, and choose the combination that gives the highest total NPV.

Example 1

A company has the following 4 projects available:

	A	B	C	D
0	(500)	(600)	(300)	(400)
1	221	207	194	181
2	221	207	194	181
3	221	207	–	181
4	–	207	–	–
NPV @ 10%	50	57	36	50

What should the company's investment decision be if:

(a) There is no capital rationing

(b) Capital is restricted to $1,600 at time 0 and the projects are infinitely divisible

(c) Capital is restricted to $1,600 at time 0 and the projects are not infinitely divisible.

3 Replacement

We have looked in previous chapters at many examples where the decision was whether or not to invest in a new machine.

However, very often we may have decided to purchase a machine, but knowing that it will not last forever we have to decide how often to replace it.

For example, you might own a car which you expect will continue to work for 10 years before needing to be scrapped and replaced. However, the older it becomes the more expensive it will become to maintain and the lower price you will get for it when you sell it.

As a result, you may decide that it is better to replace it (say) every three years. By doing this you will avoid paying very high maintenance costs and will receive a higher sales price. The downside of course is that you would have to pay the price of a new one more frequently.

The purpose of the exercise is to determine the optimal replacement policy.

The approach will be illustrated using the following example.

Example 2

A machine costs $72,000 and has a maximum life of 3 years.

The running costs each year are as follows:

Year	
1	7,200
2	9,600
3	12,000

The estimated scrap values are as follows:

Year	
1	24,000
2	16,600
3	9,600

The cost of capital is 15%

How often should the machine be replaced?

4 Lease versus Buy

When deciding whether or not an investment is worthwhile, we usually assume that we will be purchasing the asset.

However, having made the acquisition decision we could be required to consider financing the machine by way of leasing it rather than buy outright purchase.

In order to make this financing decision we need to calculate the PV of the costs of buying the assets with the PV of the costs of leasing the asset. In both cases we will discount at the after-tax cost of borrowing and choose that method which gives the lower PV (and hence least cost).

Example 3

A company is considering whether to buy a new machine at a cost of $100,000 or alternatively to lease it for $35,000 p.a. (lease payments payable at the start of each year).

Buying it will involve borrowing money at an after tax interest cost of 7% p.a.

If the machine is bought, it will be bought on the last day of current financial year.

The machine will be needed for 4 years, and (if purchased) will have a scrap value after 4 years of $10,000.

Corporation Tax is 30% (payable one year after the end of the financial year)

Capital allowances are 25% (reducing balance).

Should the machine be leased or purchased?

Chapter 10

INVESTMENT APPRAISAL UNDER UNCERTAINTY

1 Introduction

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

In this chapter we will look at four approaches that attempt to either reduce the problem or quantify the possible effect of the problem.

2 Sensitivity analysis

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

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

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

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

Example 1

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

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

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

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

(b) Calculate the sensitivity to change of:

- **i. the initial investment**
- **ii. the sales volume p.a.**
- **iii. the contribution p.u.**
- **iv. the fixed costs p.a.**
- **v. the scrap value**
- **vi. the cost of capital**

(c) comment on the results

3 Simulation

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

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

3.1 Essentially, the stages are as follows:

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

4 Expected values

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

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

Example 2

Daiga plc is considering launching a new product.

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

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

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

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

The cost of capital is 20% p.a.

(a) Calculate the expected NPV of the project

(b) Assuming that the demand is certain at 50,000 units p.a. what is the NPV of the project if fixed overheads are uncertain as follows:

Fixed overheads	*Probability*
100,000	**0.20**
140,000	**0.35**
180,000	**0.25**
220,000	**0.20**

5 Risk-adjusted discount rate

Although it is easy enough to identify that the estimated returns from a project are uncertain, it is not normally realistic in practice to identify the various possible outcomes and then attach probabilities to each of them.

The risk inherent in a project depends very much on the type of activity involved. For example, investing in a new project to sell solar-powered vehicles is perhaps more risky than a new project to sell accountancy services.

(Note that higher risk does not mean that the project is automatically worse – solar-powered vehicles might give a much higher return, but equally there is the possibility of them giving a much lower return).

Although all people have different attitudes to risk, it is generally the case that people will be prepared to accept projects with higher risk provided that the expected return is higher.

One approach to dealing with this is to discount higher risk projects using a higher rate of interest – effectively adding a premium to the interest rate for risk, or using a risk-adjusted discount rate.

We will discuss this approach in a later chapter - the idea forms the basis for a technique known as the capital asset pricing model.

Chapter 11

SOURCES OF FINANCE – EQUITY

1 Introduction

In order to finance long-term investments and the overall working capital, the company needs to raise long-term capital. It is part of the role of the Financial Manager to decide how best to raise this capital. Overall the choice is between equity finance (from shareholders) and debt finance (from lenders). In this chapter we consider the different ways of raising equity finance and in the following chapter the different ways of raising debt finance. In the third chapter on this topic we consider the factors involved in choosing between equity and debt finance.

2 Methods of issuing shares

2.1 New shares – quoted companies

If a company is already quoted on a stock exchange then the following methods are available for the issue of new shares:

Public issue (offer for subscription)

A sale direct to the general public. Shares are advertised at a fixed offer price and the public are invited to buy them.

Public offer for sale by tender

A sale direct to the general public. However a price for the shares is not fixed and the public are invited to bid for shares.

Placing

With a placing, a sponsor (usually a merchant bank) arranges for its clients to buy shares. However, at least 25% of the shares placed must be made available to the general public.

Rights issue

An offer to existing shareholders to buy new shares in proportion to their existing shareholdings. You can be asked to perform calculations regarding rights issues and these are explained later in this chapter.

2.2 New shares – unquoted companies

If a company is unquoted, then they essentially have two choices:

Remain unquoted

In this case new shares can only be issued by way of a rights issue or a private placing

Become quoted

If they choose (and are able) to become quoted on a stock exchange, then the methods listed above become available to them.

It is difficult for a small company to become quoted on a stock exchange and have access to more finance because it is necessary that the company is already of a certain size before it will be accepted on to a stock exchange.

To help smaller companies, there exist two stock exchanges in the UK – the full exchange (or Official List) which is for large companies, and the AIM (Alternative Investment Market) which is for smaller companies.

You are not required to learn the detailed requirements for the two exchanges but the purpose of the AIM is to enable smaller companies to get their shares traded on a stock exchange so that they can then raise more share finance more easily and become bigger.

3 Rights issues

A rights issue is an issue of shares to existing shareholders.

The number of shares that each shareholder is offered is in proportion to their existing shareholding. The shares are offered at a relatively low price and the effect of the issue is to reduce the market value of all the shares in issue.

Example 1

Current share price is $5 per share.

The company makes a rights issue of 1 for 4 at $3.

(a) What is the theoretical ex-rights value per share?

(b) What is the value of a right?

Example 2

The current share price is $8 per share.

The company makes a rights issue of 1 for 3 at $6 per share.

(a) What is the ex-rights market value?

(b) What is the value of a right?

(c) Mrs X owns 1,200 shares. She takes up half her rights and sells the other half.

Calculate the effect on her wealth.

4 Bonus issues / Stock splits / Scrip dividends

4.1 Bonus issues

Bonus issues (or **scrip issues**) are the turning of reserves into share capital and issuing free shares to existing shareholders. The new shares are issued in proportion to shareholders' existing shareholdings.

They are issued free and are therefore not a source of finance.

They have the effect of reducing the market value per share of all the shares in issue, and can thus make the shares more marketable.

4.2 Stock splits

Stock splits occur when shares are split in value. For instance each existing $1 share might be split into two 50p shares.

The total share capital of the company is unchanged, but there will be more shares in issue.

No cash is raised and therefore this is not a source of finance. It will have the effect of reducing the market value per share of all the shares in issue, and can thus make the shares more marketable.

4.3 Scrip dividends

This is the offering to shareholders of new shares instead of a cash dividend.

Shareholders are given the choice of whether to take the dividend in the form of cash or new shares. The incentive for shareholders is that it is a cheaper way of acquiring new shares then buying them on the stock exchange, and also there can be tax advantages.

For the company, this is a source of new finance in that new shares are issued (effectively) for cash. It is a cheap way of raising finance and does not risk upsetting the shareholders in the same way that a reduction in dividend may do.

5 Internally generated finance

The most common source of finance for most companies is to use retained earnings. This is equity finance in that all the earnings of the company belong to the shareholders. However, most companies do not pay out all their earnings as dividends, but instead retain a proportion of them as a source of finance in order to expand the company.

Retained earnings are the best source of finance in that they avoid issue costs and the cash is immediately available.

5.1 Dividend irrelevancy theory

In theory it is irrelevant whether a company pays out all its earnings to shareholders as dividend, or retains all the earnings for investment (or any combination of the two).

The reason for this is that although a lower dividend obviously means less immediate cash for the shareholders, this is compensated for by the fact that the extra investment by the company will increase the value of the company (and its share value).

In theory the shareholders will be indifferent because the increase in the value of their shares will compensate them for the lower dividend.

5.2 Dividend policy in practice

Although in recent years it has become common for companies to have high retention of earnings and pay low dividends (or even to pay no dividends – e.g. Microsoft), it is risky for a company to change its dividend policy without considering the consequences.

In particular they need to consider the following:

5.3 The Clientele effect

A constant dividend policy (e.g. always distributing 20% of earnings, or always increasing dividend by 5% p.a..) will attract a group of shareholders to whom the policy is suited (in terms of, for example, their tax position, or their need for income). Changing the dividend policy will upset these shareholders.

5.4 The Signalling effect

A reduction in dividend might be seen by the financial markets as a sign of company weakness.

Chapter 12

SOURCES OF FINANCE – DEBT

1 Introduction

In this chapter we will look at the various ways available to a company of raising debt finance.

2 Types of long-term debt

2.1 Preference shares

These are shares with a fixed rate of dividend having a prior claim on profits available for distribution (unlike ordinary shares where the dividend can fluctuate).

Although legally equity, these are often treated as debt because they carry a fixed rate of dividend.

Dividends are only payable if there are sufficient distributable profits. If not sufficient, then the right to dividend is carried forward if they are **cumulative** preference shares. Otherwise the right to dividend for that year is lost.

The dividends are not tax deductible to the company.

On liquidation of a company, preference shares rank before ordinary shareholders.

(a) Advantages:

- they do not carry voting rights and there is therefore no loss of control
- unlike debt, dividends do not have to be paid if not enough profits and the shares are not secured on the company's assets

(b) Disadvantages:

- dividends are not tax allowable, unlike debt interest
- to attract investors there will be a need to pay a higher rate of interest because of the extra risk for shareholders.

2.2 Debentures (Loan Stock or Bonds)

A debenture is a written acknowledgement of a debt containing provisions for the payment of interest and repayment of the principal.

The debentures may be **secured** or **unsecured**. Secured means that if the company goes into liquidation then the debenture holders have first charge on the assets that are used as security. Unsecured debentures do not have this benefit and therefore usually need a higher rate of interest to compensate lenders.

Debentures can be traded on a stock exchange, normally in units of $100 nominal. They carry a fixed rate of interest and the interest is expressed as a % of nominal value.

Irredeemable debentures are never repaid (and do not exist in practice!). Redeemable debentures are repayable at a fixed date (or during a fixed period) in the future. They are usually repaid at their nominal value (at par) but may be issued as repayable at a premium on nominal value.

E.g. 10% Debentures 2005 quoted at 96 p.c.

(a) Advantages

» The interest paid by the company is usually less than the dividend the company would have to pay to shareholders. This is because investors find them less risky than shares and therefore require a lower return.

» The interest paid is tax allowable to the company and therefore the net cost to the company is reduced.

(b) Disadvantage

» The higher the amount of debt finance, the more fixed interest has to be paid out of profits that would otherwise be available to shareholders. This makes the dividends more risky as far as the shareholders are concerned. This point will be explained in more detail in the next chapter.

2.3 Deep discount bonds (or debentures)

These are debentures which are issued at a large discount on nominal value, but are repayable at par on maturity.

Investors will receive a large 'bonus' on maturity and will therefore be prepared to accept a lower rate of interest from year to year.

The advantage to companies which are growing is that they pay low interest during the life of the debentures. Hopefully, when the time comes to redeem the debentures the company will be in a position to redeem them at par (possibly issuing more conventional debentures to finance the redemption).

2.4 Zero coupon bonds

These are bonds or debentures which are issued at an extremely large discount on their nominal value, but are redeemable at par on maturity.

Just as before, the investors will receive a large 'bonus' on maturity, but because the discount is so large they are prepared to receive no interest at all during the life of the bond.

3 Returns on debt

3.1 Interest yield:

$$\text{Interest yield} = \frac{\text{Annual interest payment}}{\text{Market value of debt}} \times 100\%$$

This measures the return to investors each year ignoring any 'profit' or 'loss' on redemption.

3.2 Redemption yield:

This is the overall return earned by investors taking into account both the annual interest and the gain or loss on redemption.

(Note that you will not be required to calculate the redemption yield in Paper F9 – you are only expected to understand what it represents)

4 Convertibles and Warrants

4.1 Convertibles

Convertibles are debentures that give the investor the choice on redemption of either taking cash or taking a pre-determined number of shares in the company.

Example 1

A company has in issue 8% debentures 2010.

On maturity the debentures may be redeemed at par or converted to 20 ordinary shares in company for every $100 nominal.

The share price is currently $4.50 per share.

(a) What will debenture holders choose to do on maturity if the share price of the company in 2010 is

(i) $4 per share

(ii) $6 per share

(b) Investors required return on debentures is 10%

If "now" is end of 2007 and the share price is expected to grow at 7% p.a.

(i) calculate the current market value.

(ii) calculate the conversion premium

The advantage of convertibles to investors is that they allow the shareholders to gain if the company does well (and the share price increases), but they do not lose if the company does badly (provided that the company does not collapse completely!).

The advantage to the company is that they will pay a lower rate of interest (because investors find them attractive). Also, provided the company does well and investors do convert, the company will avoid any cash flow problem associated with repaying the debentures.

4.2 Warrants

A warrant is a right given to investors to subscribe for new shares at a future date at a fixed price.

They are sometimes issued with debentures in order to make them more attractive to investors (and therefore allow the company to pay lower interest).

The warrants may be bought or sold separately from the debentures during the exercise period.

5 Short - Term Finance

- **Bank overdraft**
- **Bank Loans**
- **Mortgage loans**
- **Leasing**
- **Sale and lease back**
- **Trade credit**

Chapter 13

CAPITAL STRUCTURE AND FINANCIAL RATIOS

1 Introduction

The purpose of this chapter is to consider the choice between raising finance from equity or from debt and discuss the best capital structure for a company. In addition we will summarise various key financial ratios .

2 Financial Gearing

2.1 Definition

Financial gearing measures the proportion of a company's financing that comes from debt as opposed to equity.

The attraction of debt finance is that lenders are likely to require a lower return than shareholders because an investment in debt is less risky than an investment in shares. In addition, debt interest payable by the company is normally allowable for tax which makes the net cost even lower.

However, the reason that company's do not automatically raise as much of their finance from debt as possible is that increasing the amount of debt in a company (or increasing the gearing) creates more risk for the shareholders.

The reason for the increase in risk to shareholders is that fixed interest must be paid each year before the company is able to pay dividends.

Example 1

Two companies, U and G, are both generating operating profits (before interest) of $100. U is an ungeared company (with no debt finance) whereas G is a geared company and has to pay debt interest of $30 p.a..

Tax is payable at 30%, and both companies distribute all available earnings as dividend.

	U	G
Profits	100	100
Debt Interest	–	30
	100	70
Tax @ 30%	(30)	(21)
Available for shareholders	70	49

Calculate the % change in dividends that will result in both companies, if profits were to fall by:

(a) 20%

(b) 40%

Measures of financial gearing

There are two standard ways of calculating the gearing ratio.

It can be defined as either:

- $\frac{\text{Debt borrowing + preference share capital}}{\text{Ordinary share capital + reserves}}$

(this measure is sometimes known as equity gearing)

or alternatively:

- $\frac{\text{Debt borrowing + preference share capital}}{\text{Total long term capital}}$

(this measure is sometimes known as total gearing)

Either measure can be used (unless the examination specifies one measure). The result will differ depending on which measure is used, but in both cases the figure will increase with higher proportions of debt.

Gearing is best measured using market values for debt and for equity. If, however, market values are not available then use statement of financial position values.

Example 2

Lavetal plc has the following summarised Statement of Financial Position:

Non-current assets	200,000
Current assets	50,000
	250,000
Share Capital (10p shares)	10,000
Reserves	130,000
	140,000
Debentures	100,000
Current liabilities	10,000
	250,000

The market values at date of the Statement are:

Shares: $2.20 per share

Debentures: 95 p.c.

Calculate the (total) gearing ratio of Lavetal using:

(a) book values

(b) market values

3 Operating Gearing

3.1 Fixed operating costs

With financial gearing, it is the fixed interest payments that create the extra risk for shareholders.

However, company's may have fixed operating costs due to the way they have structured their operating costs between fixed costs and variable costs. More fixed operating costs increase the risk for the shareholders in exactly the same way as do fixed interest costs.

Example 3

Companies A and B both have sales of $100,000 p.a. and costs of $60,000 p.a..

However company A has structured it's costs such that $50,000 are variable and $10,000 are fixed, whereas B has variable costs of $20,000 and fixed costs of $40,000.

	A	B
Sales	100,000	100,000
Variable costs	50,000	20,000
Fixed costs	10,000	40,000
	60,000	60,000
Profit	40,000	40,000

Calculate the % change in profits in both companies that results from:

(a) an increase in sales volume of 10%

(b) a reduction in sales volume of 20%

As with financial gearing, the profits of the company with the higher proportion of fixed costs is more risky than the other.

A company has flexibility as to how to structure its costs. For example, staff costs can be fixed by employing staff on annual contracts, or can be variable by employing staff on a day-to-day basis.

In times of growth it will be advantageous to have a high proportion of fixed costs and a low proportion of variable costs. However, in times of recession the opposite is true.

3.2 Measures of operating gearing

There is no standard measure of operating gearing.

Two suggested measures are as follows:

- $\frac{\text{\% change in earnings before interest and tax}}{\text{\% change in sales}}$
- $\frac{\text{fixed costs}}{\text{variable costs}}$

4 Other financial ratios

EXAMPLE 4

Statement of Financial Position at 31 December

	2002	2001
Non-current assets	300,000	320,000
Current assets	80,000	70,000
	380,000	390,000
Ordinary Share capital (10p shares)	60,000	60,000
7% Preference shares ($1 shares)	40,000	40,000
Reserves	160,000	140,000
	260,000	240,000
6% Debentures	100,000	100,000
Current liabilities	20,000	50,000
	380,000	390,000

Income Statement for the year ended 31 December

	2002	2001
Sales	510,000	480,000
Profit before interest and tax	52,000	49,000
Interest	6,000	6,000
Profit before tax	46,000	43,000
Tax	12,000	10,000
Net profit after tax	34,000	33,000
Dividends:		
Ordinary shares	20,000	15,000
Preference shares	2,800	2,800
Retained profit	11,200	15,200

The market values at 31 December:

	2002	2001
ordinary shares	$0.83	$0.72
preference shares	$0.90	$1.01
6% debentures	$110	$118

Calculate (for each of the two years) the following ratios:

Debt holder ratios:

- Interest cover

- Interest yield

Shareholder ratios:

- Dividend per share

- Dividend cover

- Dividend yield

- Return on equity

- Earnings per share (EPS)

- Price earnings ratio (P/E ratio)

Chapter 14

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 15

THE VALUATION OF SECURITIES – THEORETICAL APPROACH

1 Introduction

In this chapter we will look at what, in theory, determines the market value of equity and of debt. It is this theory which forms the basis for most of the arithmetic that is generally required in the examination in questions on this area.

In practice many other factors are likely to be relevant. These will be covered in the next chapter, and although important they are more relevant for discussion questions than for computations.

2 The valuation of equity – constant dividends

The market value of a share is effectively determined by the shareholders – it is the price that shareholders are prepared to pay for a share on the stock exchange.

In theory, the amount that shareholders are prepared to pay depends on two factors:

- the dividends that they expect to receive in the future
- the rate of return that shareholders require

Example 1

Alpha plc has in issue $1 shares and has just paid a dividend of 20c per share. Dividends are expected to remain constant. Shareholders required rate of return is 10% p.a.

What will be the current market value per share?

Example 2

Beta plc has in issue $0.50 shares and has just paid a dividend of 15c per share. Dividends are expected to remain constant. Shareholders required rate of return is 12%.

What will be the current market value per share?

3 Cum div / ex div values

In both the above examples, the company had just paid a dividend, and therefore anyone buying the share would have to wait for a year until they were to receive their first dividend (in the examination we ignore the possibility of interim dividends).

We call this situation an 'ex div' valuation.

Suppose, however, that the company was about to pay a dividend. This would mean that someone buying the share would receive a dividend virtually immediately (in addition to all the future dividends). Therefore the price that they will be prepared to pay will be higher by the amount of the dividend about to be paid.

We call this situation a 'cum div' valuation.

Market value cum div = market value ex div + dividend about to be paid

Example 3

Beta plc has in issue $0.50 shares and is about to pay a dividend of 15c per share. Dividends are expected to remain constant. Shareholders required rate of return is 12%.

What will be the current market value per share?

In the examination you will only be asked to deal with the situation where a dividend has either just been paid (ex div) or is about to be paid (cum div). In practice, the next dividend might be due in 3 months time – this would make the arithmetic a little more involved, but will not be required in the examination.

In the examination, you always assume that market values are ex div, unless you are told otherwise.

4 The valuation of equity – non-constant dividends

The arithmetic in the previous section is very simple, but in practice it is unlikely that the shareholders will be expecting constant dividends in the future. They will usually be expecting them to change – hopefully to grow!

The full dividend valuation model, which copes with any expected future stream of dividends is the following:

> The **market value** of a share is the present value of future expected dividends, discounted at the shareholders required rate of return.

This will deal with any future dividend stream – including of course the simple situation in the previous section of constant dividends.

Example 4

Beta plc has in issue $0.50 shares and has just paid a dividend of 15c per share. Dividends are expected to remain constant. Shareholders required rate of return is 12%.

Calculate the current market value per share.

Although we can use this model for any future dividend stream, you will only be expected to deal with constant dividends, or (more likely) the situation where dividends are expected to grow at a constant rate.

5 The valuation of equity – constant growth rate in dividends

In this situation it is possible to use the dividend valuation model to derive a formula for the market value of a share. The proof of this is not in the examination syllabus – you are only expected to be able to use the formula. (If you are interested in the proof, then you can find it in the Study text).

The formula is:

$$\text{Market Value} = \frac{D_0(1+g)}{(r_e - g)}$$

where: D_0 = the current dividend

r_e = the shareholders required rate of return

g = the expected rate of growth in dividends p.a.

Example 5

Gamma plc has just paid a dividend of 30c per share. Dividends are growing at the rate of 4% p.a.. The shareholders required rate of return is 15% p.a..

Calculate the market value per share.

Example 6

Epsilon plc has just paid a dividend of 40c per share. Dividends are growing at the rate of 6% p.a.. The shareholders required rate of return is 20% p.a..

Calculate the market value per share.

In practice, it is unlikely that dividends will grow at a constant rate. However, appreciate that the market value is based on the dividends that shareholders expect to receive. Shareholders are perhaps more likely to expect an average rate of growth p.a. than expect that the dividends will grow at different specific rates each year.

In the examination you will only be expected to deal with constant rate of growth and therefore to use the formula.

6 The valuation of debt

Here we are talking about traded debt. This is debt borrowing that is traded on a stock exchange and therefore has a market value.

Unless you are told otherwise, debt is traded in units of $100 nominal and is referred to as 'debentures', 'loan stock', or 'bonds' – they are different words for the same thing.

Debt (in the examination) carries a fixed rate of interest, but this is based on the nominal value of the debt. This rate of interest is known as the coupon rate. The market value at any time will depend on the rate of return that investors are currently requiring.

The basis of valuation is, in theory, exactly the same as for equity:

The market value of debt is the present value of future expected receipts discounted at the investors required rate of return.

7 The valuation of debt – irredeemable debt

Irredeemable debt is debt that is never repaid. The holder of this debt will simply receive interest each year for ever (unless they choose to sell it on the stock exchange, in which case the purchase will continue to receive the interest).

Example 7

P plc has in issue $500,000 10% irredeemable debentures.

Investors currently require a return of 8% p.a..

What will be the market value of the debt?

The answer that we have calculated is an ex int market value – as before, the cum int value would be the ex int value plus any interest about to be received. However, again, we always assume values to be ex int unless told otherwise.

The market value of irredeemable debt can be expressed as a formula as follows:

$$\text{Market Value} = \frac{I}{k_d}$$

where: I = the interest p.a. on £100 nominal

k_d = the investors required rate of return

Example 8

Q plc has in issue $1,000,000 6% irredeemable debentures.

Investors currently require a return of 12% p.a..

What will be the market value of the debt?

8 The valuation of debt – redeemable debt

In practice, debt is not irredeemable but redeemable which means that the company will repay the borrowing at some specified date in the future.

The valuation of redeemable debt is the one place where there is no formula and where we have no choice but to use first principles.

Example 9

R plc has in issue $400,000 8% debentures redeemable in 5 years time at a premium of 10%.

Investors require a return of 12% p.a.

Calculate the market value of the debt.

Example 10

S plc has in issue $1,000,000 7% debentures redeemable in 4 years time at par.

Investors require a return of 10% p.a.

Calculate the market value of the debt.

Chapter 16

THE VALUATION OF SECURITIES – PRACTICAL ISSUES

1 Introduction

We have looked at the theoretical valuation of securities but for various reasons the theory does not work perfectly in practice.

In this chapter we look at the limitations of the theory and consider practical issues.

2 Limitations of the dividend valuation model

Although expected future dividends and the shareholders required rate of return certainly do impact upon the market value of shares, it would be unrealistic to expect the theory to work perfectly in practice.

2.1 Main reasons for this include:

- The stock exchange is not perfectly efficient, and therefore the market value of a share may be distorted from day-to-day by factors such as rumours about a takeover bid.
- In practice, market values do not change instantly on changes in expectations – the speed at which the market value changes depends on the volume of business in the share.
- The model only deals with constant growth in dividends. In practice this may not be the case. However, do appreciate that the growth used in the model is the future growth that shareholders are expecting – this is perhaps more likely to be at a constant rate. The big problem is determining the rate of growth that shareholders expect! It is clearly impossible to ask them and to any estimate that we make for our calculations is only an estimate and course be completely different from the rate of growth that shareholders are in fact expecting.

3 Financial Accounts based valuations of equity

Other common, practical approaches to valuing shares in unquoted companies are:

3.1 net assets basis

on this approach the value per share is calculated as:

$$\frac{\text{Value of net assets}}{\text{Number of shares}}$$

A problem is on what basis to value the net assets:

- realisable value – this would only be sensible if the company was about to be wound up
- replacement value – this would be more sensible from the point of view of another company considering making an offer for the shares in our company. However, it would be ignoring the value of any goodwill.
- Book value – this is normally of little relevance, since the book values of assets are unlikely to even approximate to the actual values.

3.2 Earnings basis

- This approach uses the price earnings ratio of a similar quoted company.

$$\text{PE ratio} = \frac{\text{Market value per share}}{\text{Earnings per share}}$$

- For example, if the latest set of accounts for a publishing company show earnings per share of 50p, and quoted publishing companies currently have PE ratios of 18, then the price per share for our company would be 50p x 18 = $9

Chapter 17

THE COST OF CAPITAL

1 Introduction

In an earlier chapter we looked at the theoretical valuation of equity and of debt. In this chapter we will apply the same principles to the calculation of the cost of equity and the cost of debt.

This is much more important, in that in order to appraise investments the company needs to know the cost of capital to use. The calculations in this chapter will start to help us to calculate this cost of capital.

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.

The only 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 principles described in the earlier chapter when we calculated the market value of shares. We said 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 (ke), (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 discussed before, it is more likely that they are expecting growth in dividends.

When there is growth in dividends we use exactly the same formula as in Chapter 15, but rearranged.

2.1 The formula

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

where: r_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 50p 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 (from Chapter 15) 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

Remember from Chapter 7 that 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 to 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 relevance of the WACC in the following chapters.

Chapter 18

WHEN (AND WHEN NOT!) TO USE THE WACC FOR INVESTMENT APPRAISAL

1 Introduction

In the previous chapter we looked at the calculation of the Weighted Average Cost of Capital. This is often used as the discount rate for investment appraisal, but as we will consider in this chapter, it is only suitable in certain circumstances.

In this chapter we will discuss the factors involved in determining an appropriate discount rate, and in the following chapters look at the calculations involved.

2 The Weighted Average Cost of Capital

In the last chapter we looked at the following example:

- J plc is financed as follows:
- Equity – 5 million $1 shares quoted at $2.50 cum div, on which a dividend of 32c per share is about to be paid.
- Debt - $4M 8% debentures quoted at 92 ex int.
- Corporation tax is 30%
- Calculate the WACC to the company

We calculated the Return to Shareholders, and hence the Cost of Equity to be 14.68%,.

We also calculated the Return to Debt lenders as being 8.70%, and therefore the Cost of Debt (after tax) as 6.09%.

It is not surprising that the Cost of Equity is higher than the Cost of Debt.

There are two reasons for this:

(a) Equity lenders require a higher return (14.68%) than Debt lenders (8.70%) because equity lenders accept more risk than debt lenders. They accept the risk that their dividends stand to fluctuate, whereas debt lenders are guaranteed a fixed interest receipt each year (provided of course that the company does not perform too badly).

(b) Debt interest attracts corporation tax relief, whereas dividends do not. This makes debt borrowing cheaper still for the company.

We then calculated a Weighted Average Cost of Capital of 12.51%. This is certainly the current overall cost of capital to the company, but what we require, for the purposes of investment appraisal, is the cost of the extra finance to be raised for the new investment.

There are two reasons why the cost of this additional finance raised is likely to be different from the current cost of capital.

- **Changes in the level of gearing**

  If, for example, the new finance is to be raised entirely from equity, then two things will happen.

  Firstly, the level of gearing in the company will change, and this clearly will effect the weightings when we come to calculate the WACC.

  Secondly, higher gearing will increase the level of risk for the shareholders (you will remember this from your previous studies) and therefore shareholders are likely to require a higher rate of return, which will in turn increase the cost of equity.

  As a result, the WACC is likely to change as a result of the way in which the new finance is raised.

- **Changes in the level of business risk**

  One factor that will influence the current cost of equity (and hence the current WACC) is the level of risk of the business of the company. Shareholders of a company engaged in a risky type of business are likely to require a higher return than shareholders in a less risky business.

  If more finance is to be raised in order to invest in a new project, then the riskiness of the project will effect the shareholders' required rate of return. The more risky the project the higher return that they are likely to demand. As a result, the WACC is again likely to change depending as to how risky the new project is.

3 When to use the WACC for investment appraisal

As a result of the above discussion, it is only reasonable to use the current WACC when we can be sure that the cost of the new finance will be the same as the current WACC. We can only be sure of this if two conditions apply:

- **The level of gearing in the company will remain unchanged**

  If the new project is financed part equity and part debt, in such a way as to keep the level of gearing unchanged, then the first of the two factors in the previous section becomes irrelevant.

and,

- **The new investment carries the same level of risk as the existing activities of the company**

  If both of these factors apply, then it is reasonable to assume that the WACC of the company will remain unchanged and that therefore the cost of the additional finance will be equal to the existing WACC. We can therefore appraise the project at the existing WACC.

4 What if the conditions for using the current WACC do not exist?

If either the level of gearing changes, or the level of business risk changes, then it is not valid to use the current WACC as the discount rate for the new investment. We need to know the cost of the additional finance for the project and therefore need to be able to measure the effect of changes in gearing and changes in business risk.

We will consider these in the following chapters.

In the next chapter we will look at the work of Modigliani and Miller who investigated the effect of gearing. In the following chapters we will look at Portfolio Theory and (more importantly) the Capital Asset Pricing Model, which consider the effect of business risk. We will then put the two together and develop an overall model for determining how to appraise projects.

Do however make sure that you are happy with the logic of this chapter. In an examination, if you are given no information about how a project is financed and about the business risk of the project, then you assume that both remain unchanged and you do discount at the current WACC as calculated in the previous chapter. If, on the other hand, one or both of the factors do change then you will need the theories presented in the following chapters.

Chapter 19

THE COST OF CAPITAL – THE EFFECT OF CHANGES IN GEARING

1 Introduction

In this chapter we will look at the effect of gearing on the cost of capital for a company, and the implications of it for the way in which a company raises finance and the way in which it should appraise investments.

Importantly, in this chapter we will not consider the effect of investing in projects that are more or less risky than the current activities of the company – we will consider this separately in the following chapters. We will therefore assume in all examples that any new projects have the same level of business risk as the current activities of the company.

2 The 'Traditional Theory' of gearing.

2.1 It has long been accepted that:

(a) equity borrowing is more expensive than debt borrowing (for the reasons stated in the previous chapter)

and,

(b) that higher levels of gearing increase the risk to shareholders, and therefore result in higher costs of equity.

It would seem sensible therefore that if the level of gearing in a company changes, then so to will the WACC.

Example 1

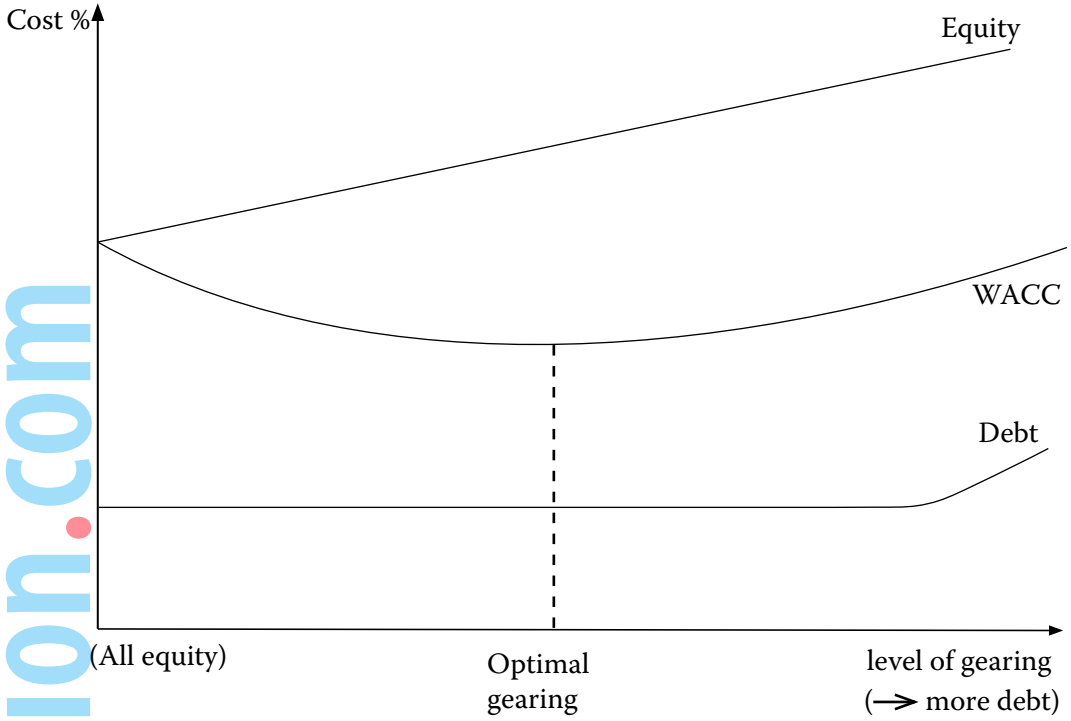
Complete the following table by calculating the WACC at each level of gearing.

Equity / Debt	100%/0%	80%/20%	60%/40%	40%/60%	20%/80%
Cost of Equity	20%	22%	25%	30%	35%
Cost of Debt	10%	10%	10%	12%	16%
WACC					

The figures above are only invented in order to illustrate what seems an obvious proposition – that as the level of gearing changes, the WACC stands also to change.

If it is the case that the WACC changes with gearing, then there must be a level of gearing at which the WACC is a minimum.

2.2 This can be illustrated on a simple graph:



Note that the above graph is only illustrative. The actual way in which the cost of equity reacts to changes in gearing does not matter – all that matters is that as gearing increases, the cost of equity will increase and the weighted changes. As a result it seems sensible that the WACC will change in some way and that therefore there must be a level of gearing at which the WACC is at a minimum – the optimal level of gearing.

2.3 The implications of the above are as follows:

(a) Since a company should always wish to borrow in the cheapest possible way, it should raise debt finance until it achieves the optimal level of gearing

(b) Once the company has reached its optimal level of gearing, it should maintain that level of gearing by raising future finance part equity/part debt in such a way as to keep the optimal level of gearing unchanged.

(c) Whilst gearing up, the company should appraise projects at the cost of the extra finance raised (the marginal cost of capital).

(d) Once optimal gearing has been achieved (and is maintained) then projects should be appraised at the cost of the extra finance raised. However, since the WACC will remain unchanged, the cost of the extra finance will be equal to the WACC.

All of the above is really an expression of common sense rather than any theory.

Certainly, in an examination and in the absence of any additional information, we assume that the company has reached its optimal level of gearing and is maintaining it. We do therefore appraise projects at the WACC.

However, although the above does illustrate the fact that it is important that a company thinks carefully about how to raise additional finance, it would be useful if a company were able to know in advance as to what their optimal level of gearing were in order that they could go straight to it!

The traditional theory only illustrates the importance of gearing, it does not attempt to quantify the effect of changes in gearing.

In the 1950's, two academics – Modigliani and Miller – decided to try and quantify it on the basis

that the risk to shareholders through higher gearing is something that is quantifiable. As a result we should be able to predict the effect of the cost of equity of higher gearing, and therefore predict the WACC.

3 Modigliani and Millers' theory of gearing – ignoring taxes

Modigliani and Miller did not argue with the traditional view that higher gearing created more risk for shareholders, and that therefore the cost of equity would increase. What they did was quantify the effect that higher gearing would have on the cost of equity (making various assumptions regarding a 'perfect world' – these will be listed later).

They produced a formula that would give the cost of equity for any level of gearing (the formula is not in the syllabus for your examination), but when they used this to calculate the WACC, they found (in the absence of taxation) that in fact the WACC would remain constant for all levels of gearing.

If you are wondering how this can be possible, consider the following example.

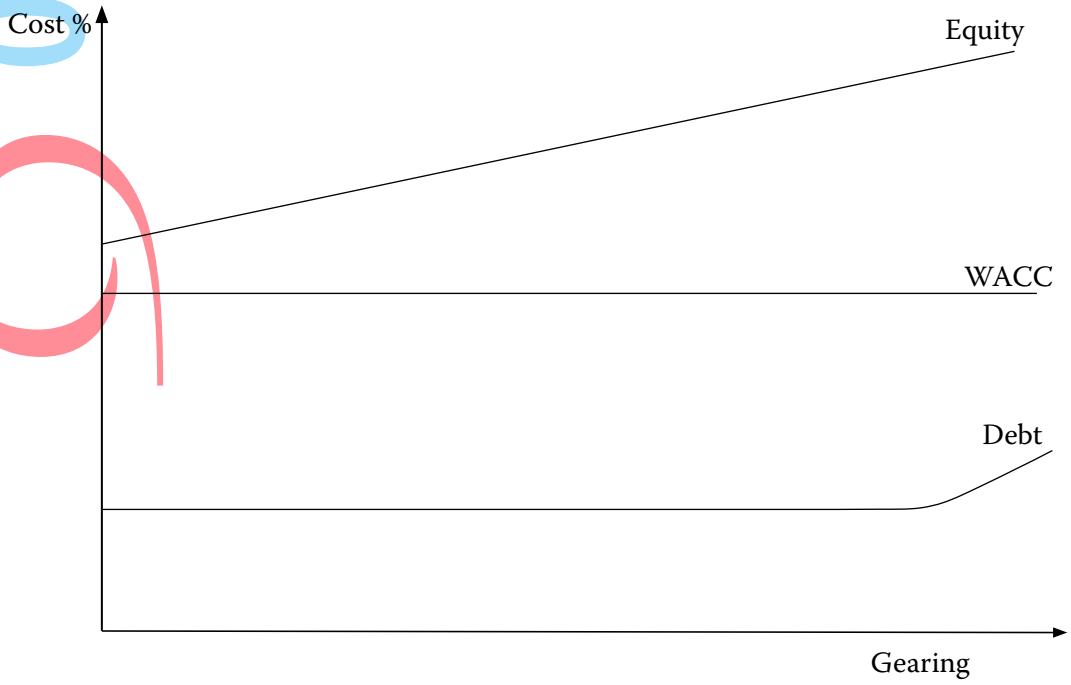
Example 2

Complete the following table by calculating the WACC at each level of gearing.

Equity / Debt	100%/0%	80%/20%	50%/50%	40%/60%
Cost of Equity	20%	22.5%	30%	35%
Cost of Debt	10%	10%	10%	10%
WACC				

They proved that although the cost of equity does indeed increase with higher gearing, it does not increase in a random way but in such a precise way as to keep the WACC constant.

3.1 A simple graphical illustration of their results is as follows:



3.2 The implications of their results are as follows:

(a) it is irrelevant how a company raises finance – the overall cost of borrowing will be unaffected

(b) all investments should be appraised at the WACC, however they are actually financed.

A further implication is that the total market value of the company (equity plus debt) will be unaffected by changes in gearing. This is to an extent logical, because whichever way in which the company is financed, the total available for distribution will be unchanged – if more goes to debt then there is less to equity, and vice versa, but the total must be the same. Therefore, why should the total value of the company be any different?

Modigliani and Millers' proof is outside your syllabus and is therefore not reproduced in these notes. If you are interested in seeing it then you can find it in the Study Text, although you do not need to learn the proof.

Although the above caused a lot of interest at the time, it had limited practical relevance because it ignored all taxes.

They therefore went further and developed their model for a world with tax. They introduced Corporation Tax into their model (but initially ignored Personal Taxes) and it is this model (and the associated formulae) that you need to learn for the examinations.

4 Modigliani and Millers' theory of gearing – with corporation tax

As we saw in the previous chapters, the effect of corporation tax is to reduce the cost of debt to the company (because of tax relief on interest payments). However, corporation tax has no effect on the cost of equity because dividends are not tax allowable.

Let us repeat Example 2, but introduce corporation tax at 30%. This will reduce the cost of debt to only 70% of the previous figures.

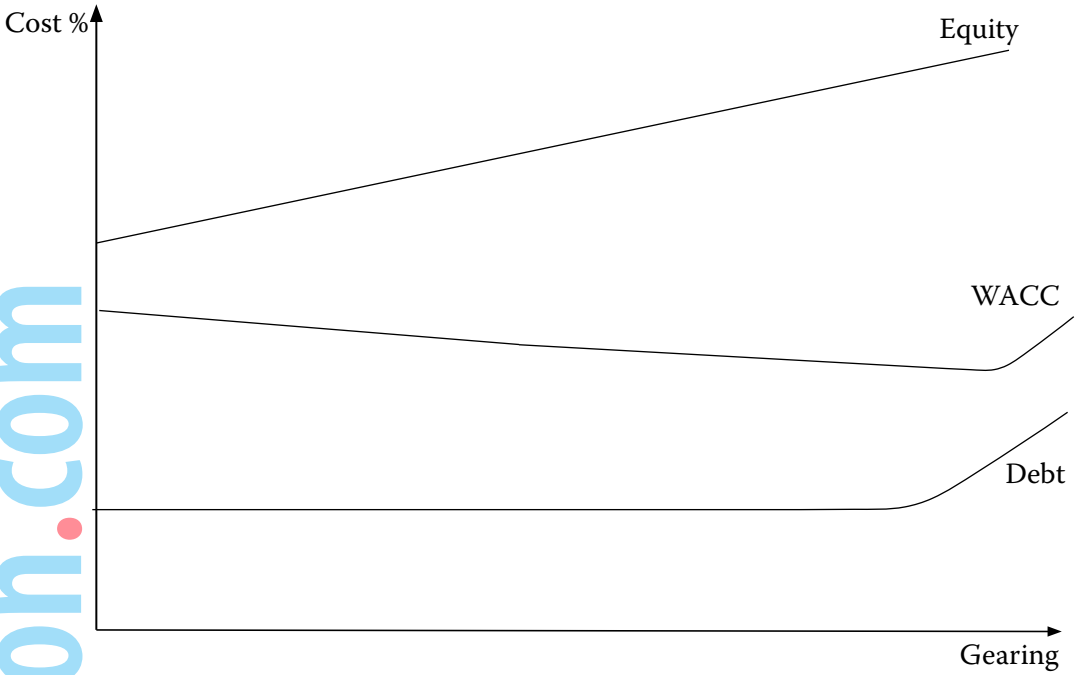
EXAMPLE 3

Complete the following table by calculating the WACC at each level of gearing.

Equity / Debt	100%/0%	80%/20%	50%/50%	40%/60%
Cost of Equity	20%	22.5%	30%	35%
Cost of Debt	7%	7%	7%	7%
WACC				

They proved that with corporation tax, higher levels of gearing resulted in a lower WACC (because of the benefit of the tax relief on debt interest).

4.1 A simple graphical illustration of their results is as follows.



4.2 The implications of the above are as follows:

(a) the WACC will fall with higher levels of gearing

(b) a company should raise as much debt as possible (in order to get as much tax relief as possible)

A further implication of the above is that as the level of gearing increases, the total market value of the company (equity plus debt) will also increase. This is in fact logical because as the company has more debt borrowing and therefore pays more interest, they will pay less tax on the same (before interest) profits and therefore be able to distribute more in total (to equity and debt together). If they are able to distribute more then certainly the total value of the company should be higher.

Again, Modigliani and Miller produced formulae expressing how the WACC and the total market value of the company are affected by the level of gearing.

Although the introduction of corporation tax did make the model more practical, it did still ignore personal tax. They did do further work on the effect of personal taxation, but this is not in your syllabus and is not therefore in these notes. If you do wish to read about it you can find it in the Study Text.

5 Modigliani and Millers' assumptions

Although you are not expected to know the proof of Modigliani and Millers' theory, you are expected (for written parts to questions) to be aware of the main assumptions that they made in producing their theory.

5.1 Their main assumptions are as follows:

- shareholders have perfect knowledge
- shareholders act rationally with regard to risk
- a perfect market exists
- debt interest is tax allowable (and the company is able to get the benefit of it)
- investors are indifferent between corporate gearing and personal gearing
- the debt borrowing is irredeemable

6 Pecking order theory

Pecking order theory has been developed as an alternative to traditional theory. It states that firms will prefer retained earnings to any other source of finance, and then will choose debt, and last of all equity

6.1 The order of preference will be:

- Retained earnings
- Straight debt
- Convertible debt
- Preference shares
- Equity shares

Chapter 20

CAPITAL ASSET PRICING MODEL

1 Introduction

In the previous chapter we looked at the effect of gearing and Modigliani and Millers hypothesis.

In this chapter we will ignore gearing and look at the effect of changes in business risk on the shareholder.

Please note that for the whole of this chapter we will ignore the effect of gearing and therefore assume throughout that we are dealing with companies that are financed entirely from equity.

2 What is business risk?

Why is it that some 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 receive 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 Two types of business risk

There are two different reasons why one company may be more risky than another.

(a) **Unsystematic risk** (or company specific risk)

This is risk due to factors within the particular company, such as poor labour relations or the appointment of a new management director.

(b) **Systematic risk** (or market risk)

This is risk due to general economic factors, such as the level of inflation or changes in the exchange rate.

A shareholder can 'remove' the unsystematic risk by creating a portfolio of shares on the basis that although each share individually has unsystematic risk, it 'cancels out' with the risk of other shares in the portfolio. We say that a well-diversified portfolio is one where the unsystematic risk has been completely removed. (i.e. diversified away)

Systematic risk exists in all companies and cannot be removed – all companies will be affected by, for example, the level of inflation. However, the level of systematic risk depends on the type of business and will be different for different types of business.

Although each individual shareholder may not hold a well-diversified portfolio of shares, we assume that shareholders overall are well-diversified and that it is shareholders overall who determine the return given by a share (because it is they who determine the market value of the share). Capital Asset Pricing Model assumes therefore that it is the level of systematic risk that determines the required return from an investment.

4 Measurement of systematic risk

There are several ways in which we could attempt to measure the systematic risk of an investment, but the standard way is to measure it relative to the risk of the stock exchange as a whole. The stock exchange index is the average of all the shares on the stock exchange, and is risky (in that it fluctuates). Some shares fluctuate more that the average, whereas some fluctuate less that the average.

We use β to measure the systematic risk, and β is defined as being the systematic risk of the investment as a proportion of the risk of the market (or stock exchange) as a whole.

(Calculating β's is not examined in Paper F9 – where needed, the β will be given. In practice the β's for large companies are regularly published in financial management journals.)

If an investment has a β of 1,	it has 1 times the risk of the market – i.e. it has the same risk as the market.
If an investment has a β > 1,	then it is more risky that the market.
If an investment has a β < 1,	then it is less risky than the market.
If an investment has a β of 0,	then it has zero risk, or we say that it is risk-free.

In practice, no investment is completely without risk, but we assume that short-term government securities are effectively risk-free.

5 The determination of the required return from an investment

As stated earlier, we assume that investors overall are well-diversified, and that therefore it is the level of systematic risk that will determine the required return.

The following formula is given to you in the examination:

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

where: R_f = the risk-free rate, and

$E(r_m)$ = the return from the market

Example 1

Q plc has a β of 1.5

The market is giving a return of 12% and the risk free rate is 5%

What will be the required return from Q plc?

Example 2

R plc has a β of 0.8.

The market is giving a return of 16% and the risk free rate is 8%.

What will be the required return from R plc?

Example 3

S plc is giving a return of 20%.

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

What is the β of S plc?

6 Using CAPM for investment appraisal

If the financial manager is considering an investment in a new project, then since it is shareholders money that is being invested, he should appraise the investment in the same way as would shareholders if they were investing their money directly.

As a result the required return from the project (and hence the discount rate) should be calculated from the β of the project.

Example 4

T plc is all equity financed. It wishes to invest in a project with an estimated β of 1.4, which is significantly different from the business risk characteristics of T's current operations.

The project requires an outlay of $100,000 and is expected to generate returns of $15,000 p.a. in perpetuity.

The market return is 11% and the risk free rate is 6%.

Estimate the minimum return that T will require from the project and assess whether or not the project is worthwhile.

7 The limitations of CAPM

7.1 The two main limitations of CAPM are as follows:

- it is difficult to estimate the β of a project accurately. Generally we use the β of a company operating in the same type of business as the project, which restricts it to large projects
- the theory of CAPM was developed as just a single period model, whereas in practice most investment projects will be expected to continue for more than one year.

Chapter 21

CAPM AND MM COMBINED

1 Introduction

In the two previous chapters we have discussed the effect of gearing on a company and then the effect of different levels of business risk.

Most companies will have some gearing and therefore the shareholders required return will be affected by both factors.

Similarly, if the financial manager is considering an investment in a new project, then the required return will be affected both by the business risk of the project and by the way in which the project is financed.

In this chapter we will put the two parts together and decide how a project should be appraised.

2 The effect of gearing on the β

In the previous chapter we ignored gearing completely and so the only risk was the business risk.

However, any gearing in a company makes a share in that company more risky.

Published β's are for shares and therefore measure not just the business risk of the company but, in addition, the effect of any gearing in the company – we call this the share β, or the equity β, or the geared β.

There is a formula, which is given to you in the examination, which allows us to remove the effect of the gearing and calculate what the β would be if there was no gearing – we call this β the asset β, or the earnings β, or the ungeared β.

The formula is as follows:

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

where:

β_a is the asset or ungeared β

β_e is the equity or geared β

β_d is the β of debt in the geared company

V_e is the market value of equity in the geared company

V_d is the market value of debt in the geared company

T is the rate of corporation tax

Note that unless told otherwise, we assume that debt is risk-free and therefore the second part of the formula disappears.

Example 1

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?

3 Estimating a discount rate for an investment

We are now in a position to estimate a discount rate to use for a project with any level of business risk, financed in any way.

3.1 The steps are as follows:

(a) determine the β for the project. If necessary use the β of a similar company. If the β is a share β then it will need to be ungeared using the gearing of the similar company.

(b) if the project is to be financed entirely from equity, then the required return (and hence the discount rate) will be determined directly from the β calculated in step (a).

Example 2

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 entirely from equity (i.e. the project specific cost of equity)

Note: this example does raise the problem as to what the discount rate should be if the project is to be financed partly by debt. However this is not in the syllabus for F9 and is covered in Paper P4.

Chapter 22

FORECASTING FOREIGN CURRENCY EXCHANGE RATES

1 Introduction

If the currency of a country is allowed to float, then the exchange rate against other currencies will fluctuate.

In this chapter we will consider the factors that affect exchange rates and look at two arithmetical approaches to attempting to forecast a future exchange rate.

2 Factors affecting the exchange rate

The exchange rate between two currencies is primarily determined by supply and demand for the currencies.

The supply and demand are in turn influenced by factors including:

- the rates of inflation in the two countries
- the level of interest rates in the two countries
- economic and political prospects
- the balance of payments

3 Purchasing Power Parity

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

The Purchasing Power Parity theory uses inflation rates to predict the future movements 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 change with inflation, then the exchange rates 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, which is given to you in the examination:

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

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

4 The Fisher effect

The Fisher effect looks at the relationship between interest rates and expected inflation rates.

The actual rate of interest is said to be made up of two parts – the real required rate of return (or the real interest rate), together with a premium for inflation.

The actual interest rate will therefore increase or decrease with increases or decreases in the rate of inflation.

The following formula relates the interest rate to the inflation rate, and is given to you in the examination:

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

where:

i is the actual interest rate (or nominal or money rate)

r is the real interest rate

h is the inflation rate

5 Interest Rate Parity

This theory uses relative interest rates to predict the future exchange rate.

The formula is given in the exam and is as follows:

$$F_0 = S_0 \times \frac{(1+i_c)}{(1+i_b)}$$

You will see that it is exactly the same as the Purchasing Power Parity formula, except that it uses interest rates instead of inflation rates.

The formula is used in exactly the same way.

It is, of course, unlikely that either Purchasing Power Parity or Interest Rate Parity will predict the exchange rate exactly, because there are so many other factors that will influence it.

However, you will see in the next chapter that forward exchange rates are calculated using the Interest Rate Parity formula.

Chapter 23

FOREIGN EXCHANGE RISK MANAGEMENT

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 looks at the different ways available for the removal or reduction of the risk of changes in exchange rates.

2 Types of risk

2.1 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.

2.2 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.

2.3 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 of the following:

(a) forward contracts

(b) money market hedges

(c) currency futures

(d) currency options

(e) currency swaps

You can be required to perform calculations for the first two methods. For the other three you will not be required to do calculations but are required to understand the idea behind them.

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.

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?

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.

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 just to illustrate the basic principles.

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).

8.1 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).

(b) In practice any deal in futures must be in units of a fixed size. 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.

For both the above reasons, the use of futures is unlikely to result in a perfect hedge.

9 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 reasonably 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**.

9.1 OTC options

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

Example 9

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 spot exchange rate on that date is:

(a) $/£ 1.5180

(b) $/£ 1.6153

9.2 Traded options

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

10 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).

10.1 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' (!!).

Chapter 24

INTEREST RATE RISK MANAGEMENT

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 which are rather different.

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.

4.1 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).

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.

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 borrow 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.

6.1 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.

Example 1

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)

6.2 Additional points:

(a) Futures can only be dealt in contracts of fixed amounts.

(b) In practice the change in futures prices will not exactly equate to the change in interest rates – the difference being the basis risk.

(c) The previous two points mean that it is unlikely that we will end up with a perfect hedge.

7 Interest rate options

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

Traded options are also available – these are traded which means that the premia payable are determined by market forces and therefore we can be more certain that we are paying a fair price.

The effect of them is (for borrowers) to limit the maximum interest payable.

8 Caps, Floors, and Collars

A borrower will use options to fix a maximum interest rate – we refer to a maximum rate as being an interest rate cap.

Similarly, a depositor will be interested in fixing a minimum interest rate, and could use options to do so. We refer to a minimum interest rate as an interest rate floor.

A collar is the name we give to the situation where we fix a maximum and a minimum interest rate. A borrower would achieve this by buying an interest rate cap, and selling (to a depositor) an interest rate floor.

The reason the borrower might do this is that they would have to pay a premium for the cap, but would receive a premium for the floor. In this way they end up paying a lower net premium but still having a cap (but in return, having to accept a floor).

9 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.

10 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 example:

Example 2

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.

Paper F9

ANSWERS TO EXAMPLES

Chapter 1

No Examples

Chapter 2

No Examples

Chapter 3

Answer to Example 1

			Days
Receivables days	=	$\frac{172,800}{864,000} \times 365 =$	73
Inventory days			
(a) Finished goods	=	$\frac{86,400}{756,000} \times 365 =$	42
(b) W.I.P	=	$\frac{75,600}{675,000} \times 365 =$	41
(c) Raw materials	=	$\frac{108,000}{518,400} \times 365 =$	76
			232
Less:			
Payables days	=	$\frac{86,400}{518,400} \times 365 =$	(61)
		Net operating cycle	171 days

Chapter 4

Answer to Example 1

Order Quantity	*Number of orders*	*Average stock*	*Reorder cost p.a.*	*Stockholding cost p.a.*	*Total stock cost p.a.*
500	80	250	1600	625	2225
750	53.33	375	1067	938	2005
1000	40	500	800	1250	2050
1250	32	625	640	1563	2203

An order quantity of 750 units is the cheapest of the four options.

Answer to Example 2

(a) E.O.Q. = $\sqrt{\frac{2 \times 20 \times 40{,}000}{2.50}} = 800$ units

(b)

Number of orders	*Average stock*	*Reorder cost p.a.*	*Stockholding cost p.a.*	*Total stock cost p.a.*
50	400	1000	1,000	$2,000

Answer to Example 3

Order Quantity	*Average stock*	*Number of orders*	*Reorder cost p.a.*	*Stockholding cost p.a.*	*Purchase cost p.a.*	***Total cost p.a.***
800	400	50	1000	1,000	1,000,000	1,002,000
5,000	2,500	8	160	6,188	990,000	996,348
10,000	5,000	4	80	12,313	985,000	997,393

The best option would be to order in quantities of 5,000 units each time and therefore receive a 1% discount.

Chapter 5

Answer to Example 1

Consider an invoice of $100 (any amount will do)

With discount: 1 month 96

Without discount: 3 months 100

Effective cost = $\frac{4}{96} \times 100\%$ over 2 months

$= \frac{4}{96} \times \frac{12}{2} \times 100\%$ p.a.

$= 25\%$ p.a.

25% > 20% therefore better to **not** offer discount

Answer to Example 2

Current position:

Average receivable days: (30 × 0.20) + (60 × 0.50) + (90 × 0.30) = 63 days

Average receivables: 63/365 × $20,000,000 = **$3,452,054**

New policy:

Average receivable days: (30 × 0.60) + (90 × 0.40) = 54 days

Average receivables: 54/365 × $20,000,000 = **$2,958,904**

		$ p.a.
Cost of new policy:		
Discount (1% × 60% × $20,000,000)		120,000
Benefits of new policy:		
Old receivables:	3,452,054	
New receivables:	2,958,904	
Fall in receivables	493,150	
Interest saving: 15%p.a. × $493,150 =		$73,973
Net cost of offering discount		$46,027p.a.

Therefore do not offer discount.

ANSWERS TO EXAMPLES

Answer to Example 3

Current position:

Average receivable period: $(1 \times 0.20) + (2 \times 0.30) + (3 \times 0.50) = 2.3$ months

Average receivables: $\frac{2.3}{12} \times £10{,}000{,}000 = \textbf{£1,916,666}$

New position:

Average receivable period: 1 month

Average receivables: $\frac{1}{12} \times £10{,}000{,}000 = \textbf{£833,333}$

Cost of new policy:

Cost of factor (2% × $10,000,000)		$200,000 p.a.
Benefits of new policy:		
Staff saving		20,000
Old receivables:	1,916,666	
New receivables:	833,333	
Fall in receivables	1,083,333	
Interest saving: 18% × 1,083,333 =		195,000
Total benefit of using a factor		$215,000 p.a.
Net benefit		$15,000 p.a.

Do employ the factor.

Answer to Example 4

Effective cost $= \frac{2}{98} \times 100\%$ over 20 days (30-10)

$= \frac{2}{98} \times \frac{365}{20} \times 100\%$ p.a.

$= \textbf{37\% p.a.}$

Answer to Example 5

Effective cost $= \frac{1.5}{98.5} \times 100\%$ over 25 days (40-15)

$= \frac{1.5}{98.5} \times \frac{365}{25} \times 100\%$ p.a $= \textbf{22\% p.a.}$

22% > 13% therefore do take the discount

[alternative approach:

Current payables: $\frac{40}{365} \times \$100{,}000 = 10{,}959$

New payables: $\frac{15}{365} \times \$100{,}000 = 4, 110$

Fall in payables: **$6,849**

Interest cost of paying early:

13% × 6,849 = **$890 p.a.**

Benefit of discount:

1.5% × $100,000 = **$1,500 p.a.**

There is a net benefit, so do take the discount]

Chapter 6

Answer to Example 1

(a)

	January $	*February* $	*March* $	*April* $	*May* $	*June* $
Cash receipts						
Cash sales	44,000	52,000	56,000	60,000	64,000	72,000
Credit sales	48,000	60,000	66,000	78,000	84,000	90,000
	92,000	112,000	122,000	138,000	148,000	162,000
Cash payments						
Purchases	60,000	80,000	90,000	110,000	130,000	140,000
Wages: 75%	12,000	15,000	18,000	21,000	24,000	27,000
Wages: 25%	3,000	4,000	5,000	6,000	7,000	8,000
Overheads	10,000	15,000	15,000	15,000	20,000	20,000
Dividends			20,000			
Capital expenditure			30,000			40,000
	85,000	114,000	178,000	152,000	181,000	235,000
b/f	15,000	22,000	20,000	(36,000)	(50,000)	(83,000)
Net cash flow	7,000	(2,000)	(56,000)	(14,000)	(33,000)	(73,000)
c/f	22,000	20,000	36,000	(50,000)	(83,000)	(156,000)

(b) The overdraft arrangements are quite inadequate to service the cash needs of the business over the six-month period. If the figures are realistic then action should be taken now to avoid difficulties the near future. The following are possible courses of action.

(i) Activities could be curtailed.

(ii) Other sources of cash could be explored, for example a long-term loan to finance the capital expenditure and a factoring arrangement to provide cash due from accounts receivable more quickly.

(iii) Efforts to increase the speed of debt collection could be made.

(iv) Payments to accounts payable could be delayed.

(v) The dividend payments could be postponed (the figures indicate that this is a small company, possibly owner-managed).

(vi) Staff might be persuaded to work at a lower rate in return for, say, an annual bonus or a profit-sharing agreement.

(vii) Extra staff might be taken on to reduce the amount of overtime paid.

(viii) The stock holding policy should be reviewed; it may be possible to meet demand from current production and minimise cash tied up in inventories.

Answer to Example 2

		$ p.a.
(a)	Order cost: $\frac{1,500,000}{150,000} \times \$150$	1,500
	Interest lost on investments $\frac{150,000+1,500,000}{2} \times 9.5\%$	78,375
	less: Interest earned on bank balance $\frac{150,000}{2} \times 5\% =$	(3,750)
		$76,125

(b) $EOQ = \sqrt{\frac{2 \times 1,500,000 \times 150}{(0.095 - 0.05)}} =$ **£100,000** each time

		$ p.a.
(c)	Order cost: $\frac{1,500,000}{100,000} \times \$150 =$	2,250
	Interest lost on investments $\frac{150,000 + 1,500,000}{2} \times 9.5\%$	76,000
	less: Interest earned on bank balance $\frac{100,000}{2} \times 5\% =$	(2,500)
		$75,750

Answer to Example 3

$$\text{Spread} = 3 \times \left[\frac{\frac{3}{4} \times 5 \times 400,000}{0.00014}\right]^{\frac{1}{3}}$$

$= 3 \times 4,750 =$ **14,250**

Upper limit = lower limit + spread
= 10,000 + 14,250
= **24,250**

Return point = 10,000 + ⅓ × 14,250
= **14,750**

Chapter 7

Answer to Example 1

		df @ 10%	*P.V.*
0	(80,000)	1	(80,000)
1	20,000	0.909	18,180
2	30,000	0.826	24,780
3	40,000	0.751	30,040
4	20,000	0.683	13,660
		N.P.V	+ 6,660

+ 've – Accept

Answer to Example 2

No Answer

Answer to Example 3

(a)

		df @ 15%	*P.V.*
0	(80,000)	1	(80,000)
1	20,000	0.870	17,400
2	30,000	0.756	22,680
3	40,000	0.658	26,320
4	20,000	0.572	11,440
		N.P.V	(2,160)

– 've – Reject

(b) $\text{IRR} = 10\% + \frac{6,660}{6,660 + 2,160} \times 5\% =$ **13.78%**

(c) no answer

Answer to Example 4

		df @ 15%	*P.V.*
0	(45,000)	1	(45,000)
1–8	8,000	4.487	35,896
		N.P.V	(9,104)

– 've – Reject

Answer to Example 5

		df @ 12%
	1 – 13	6.424
Less:	1 – 3	2.402
	4 – 13	4.022

4 – 13 20,000 × 4.022 = **80,440**

Answer to Example 6

		df	*P.V.*
0	(100,000)	1	(100,000)
1– ∞	12,000	$\frac{1}{0.1} = 10$	120,000
		N.P.V	20,000

Answer to Example 7

		df @5%	
	1– ∞	$\frac{1}{0.05}$	20.000
less:	1– 4		3.546
			16.454

5 – ∞ 18,000 × 16.454 = **296,172**

Answer to Example 8

Total cash flows:	100,000
Total depreciation:	(70,000)
Total profit	30,000

Average annual profit = $\frac{30,000}{4}$ = **7,500**

Average book value = $\frac{80,000 + 10,000}{2}$ = **45,000**

A.R.R. = $\frac{7,500}{45,000} \times 100\%$ = **16.67%**

Answer to Example 9

		Total net cash flows
0	(80,000)	(80,000)
1	20,000	(60,000)
2	30,000	(30,000)
3	40,000	10,000
4	20,000	30,000

Payback period is between 2 and 3 years.

Either: is within 3 years

or is 2¾ years (assuming cash received evenly over third year)

Chapter 8

Answer to Example 1

Materials		(5,000)
Labour		
	($150,000 –$60,000)	90,000
Research	– wages	60,000
	– severance ($35,000 – $15,000)	20,000
Equipment	($8,000 – $6,000)	2,000
Lost rental		7,000
		$174,000
Sales price		$300,000

Project should be allowed to proceed.

Answer to Example 2

	0	*1*	*2*	*3*	*4*
Machine	(100,000)				
Working capital	(20,000)				20,000
Scrap					20,000
Operating flows		30,000	30,000	40,000	40,000
Net cash flow	(120,000)	30,000	30,000	40,000	80,000

Answer to Example 3

Capital allowance calculations:

				Tax savings
y/e 31.12.03:	Cost	10,000		
	CA (25%)	2,500	× 30%	750
		7,500		
y/e 31.12.04:	Sale	6,000		
	CA	1,500	× 30%	450

Cash flows:

	0	*1*	*2*	*3*
Operating flows		5,000	7,000	
Tax on op. flows			(1,500)	(2,100)
Cost	(10,000)			
Sale			6,000	
Tax savings on Cap. Allowances			750	450
Working Capital	(1,000)		1,000	
Net cash flow	(11,000)	5,000	13,250	(1,650)
d.f @ 10%	1	0.909	0.826	0.751
P.V.	(11,000)	4,545	10,944	(1,239)
			NPV = +3,251	Accept

Alternative layout of cash flows:

	0	*1*	*2*	*3*
Operating flows		5,000	7,000	
Cap. Allowances		(2,500)	(1,500)	
Taxable profit		2,500	5,500	
Tax on profit			(750)	(1,650)
Add: Capital Allowances		2,500	1,500	
Cost	(10,000)			
Sale			6,000	
Working Capital	(1,000)		1,000	
Net cash flow	(11,000)	5,000	13,250	(1,650)

Answer to Example 4

Capital allowances calculations:

				Tax savings
Year 1	Cost	2,800,000		
	CA (25%)	700,000	× 25%	175,000
		2,100,000		
Year 2	CA (25%)	525,000	× 25%	131,250
		1,575,000		
Year 3	Sale	1,000,000		
	CA	575,000	× 25%	143,750

Cash flows:

	0	*1*	*2*	*3*	*4*
Operating flows					
Revenue		2,000	2,140	2,290	
Materials		(864)	(933)	(1,008)	
Labour		(735)	(772)	(810)	
		401	435	472	
Tax on op. flows			(100)	(109)	(118)
Cost	(2,800)				
Sale				1,000	
Tax saving on CA's			175	131	144
Working Capital	(200)			200	
Net cash flow	(3,000)	401	510	1,694	26
d.f @ 10%	1	0.909	0.826	0.751	0.683
P.V.	(3,000)	365	421	1,272	18
			NPV =	(924)	REJECT

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 9

Answer to Example 1

(a) With no capital rationing invest in all projects giving a positive N.P.V. In this example invest in all 4 projects.

(b)

	A	*B*	*C*	*D*
N.P.V	50	57	36	50
Time 0 investment	500	600	300	400
N.P.V per $	$0.10	$0.095	$0.12	$0.125
Ranking	③	④	②	①

Investment	*Capital*	*N.P.V.*
100% of D	400	50
100% of C	300	36
100% of A	500	50
⅔ of B	400	38
	1,600	174

(c) Either N.P.V.

	A + B + C	143
or	A + B + D	157
or	B + C + D	143

Highest NPV is A + B + D

Answer to Example 2

1 year replacement cycle:		*d.f. @ 15%*	*P.V.*
0	(72,000)	1	(72,000)
1	(7,200)	0.870	(6,264)
1	24,000	0.870	20,880
		NPV	(57,384)

Equivalent Annual cost = $\frac{57,384}{\text{1 year annuity df}} = \frac{57,384}{0.870}$ = $65,959 p.a.

2 year replacement cycle:		*d.f. @ 15%*	*P.V.*
0	(72,000)	1	(72,000)
1	(7,200)	0.870	(6,264)
2	(9,600)	0.756	(7,258)
2	16,600	0.756	12,550
		NPV	72,972)

E. A. C. = $\frac{72{,}972}{1.626}$ = \$44,878 p.a.

3 year replacement cycle:		*d.f. @ 15%*	*P.V.*
0	(72,000)	1	(72,000)
1	(7,200)	0.870	(6,264)
2	(9,600)	0.756	(7,258)
3	(12,000)	0.658	(7,896)
3	9,600	0.658	6,317
		NPV	(87,101)

E. A. C. = $\frac{87{,}101}{2.283}$ = \$38,152 p.a.

The machine should be replaced every 3 years.

Answer to Example 3

Capital allowances (if bought):

				Tax saved
Year 0	Cost	100,000		
	C.A.	25,000		
		75,000	× 30%	7,500
Year 1	C.A.	(18,750)		
		56,250	× 30%	5,625
Year 2	C.A.	(14,062)		
		42,188	× 30%	4,219
Year 3	C.A.	(10,547)		
		31,641	× 30%	3,164
Year 4	Scrap	10,000		
	C.A.	21,641	× 30%	6,492

Cash flows: BUY

	0	*1*	*2*	*3*	*4*	*5*
Cost	(100,000)					
Scrap					10,000	
Tax saved on CA's		7,500	5,625	4,219	3,164	6,492
Net cash flow	(100,000)	7,500	5,625	4,219	13,164	6,492
d.f @ 7%	1	0.935	0.873	0.816	0.763	0.713
P.V.	(100,000)	7,012	4,911	3,443	10,044	4,629

NPV = (69,961)

Cash flows: LEASE

	0	*1*	*2*	*3*	*4*	*5*
Lease	(35,000)	(35,000)	(35,000)	(35,000)		
Tax saved			10,500	10,500	10,500	10,500
Net cash flow	(35,000)	(35,000)	(24,500)	(24,500)	10,500	10,500
d.f	1	0.935	0.873	0.816	0.763	0.713
P.V.	(35,000)	(32,725)	(21,388)	(19,992)	8,011	7,486

NPV = (93,608)

The decision should therefore be to **buy** the machine.

ANSWERS TO EXAMPLES

Chapter 10

Answer to Example 1

(a)

		d.f. @ 15%	*P.V.*
0 cost	(150,000)	1	(150,000)
1 – 15 Contribution	41,250 p.a.	5.847	241,189
1 –15 Fixed costs	(15,000) p.a.	5.847	(87,705)
15 scrap	15,000	0.123	1,845
		NPV	+5,329

ACCEPT PROJECT

(b) (i) sensitivity of initial investment = $\frac{5,329}{150,000} \times 100\% = +3.55\%$

(ii) sensitivity of sales volume = $\frac{5,329}{241,189} \times 100\% = -2.21\%$

(iii) sensitivity of contribution p.u. = $\frac{5,329}{241,189} \times 100\% = -2.21\%$

(iv) sensitivity of fixed costs = $\frac{5,329}{87,705} \times 100\% = +6.08\%$

(v) sensitivity of scrap value = $\frac{5,329}{1,845} \times 100\% = -289\%$

(vi)

		d.f. @ 20%	*P.V.*
0	(150,000)	1	(150,000)
1 – 15	41,250	4.675	192,844
1 – 15	(15,000)	4.674	(70,110)
15	15,000	0.065	975
		NPV	(26,291)

IRR = $15\% + \frac{5,329}{5,329 + 26,291} \times 5\% = 15.84\%$

Sensitivity of cost of capital = $\frac{0.84}{15} \times 100\% = +5.6\%$

(c) No answer

Answer to Example 2

(a) Expected demand = (50,000 × 0.5) + (60,000 × 0.4) + (40,000 × 0.1) = 53,000 units

Expected contribution = 53,000 × 50% × $10 = $265,000 p.a.

		d.f. @ 20%	*P.V.*
0	(200,000)	1	(200,000)
1 – 4	265,000 p.a.	2.589	686,085
1 – 4	(140,000) p.a.	2.589	(362,460)
4	50,000	0.482	24,100
		Expected NPV	$147,725

(b) Expected fixed overheads = (100,000 × 0.20) + (140,000 × 0.35) + (180,000 × 0.25) + (220,000 × 0.20) = 158,000 p.a.

		d.f. @ 20%	*P.V.*
0	(200,000)	1	(200,000)
1 – 4	250,000	2.589	647,250
1 – 4	(158,000)	2.589	(409,062)
4	50,000	0.482	24,100
		Expected NPV	$62,288

Chapter 11

Answer to Example 1

Consider a holding of 4 shares

	shares		$
Current shares	4	Current value	20
New share	1	Price period	3
	5		23

New market share = $\frac{23}{5}$ = **$4.60** per share

New market value:	$4.60
Rights price	$3.00
Value of a right	$1.60

Answer to Example 2

	shares		*$*
Current holding	3	Value	24
Rights	1	Cost	6
	4		30

New market value = $\frac{30}{4}$ = $7.50 per share

Value of rights:

Market value	7.50
Cost	6.00
	$1.50

Mrs X: current wealth (1,200 × $8)		$9,600
New wealth:		
Shares: (1,200 + (½ × ⅓ × 1,200)) = 1,400 at $7.50 =		10,500
Cash:		
Sales of rights (200 × $1.50)	300	
Cost of rights (200 × $6)	(1,200)	
		(900)
New net wealth		$9,600

Chapter 12

Answer to Example 1

(a) (i) Take cash of $100 or 20 shares worth $80

Take cash

(ii) Take cash of $100 or 20 shares worth $120

Take shares.

(b) (i) Expected share price is 3 years time = $4.50 ×$(1.07)^3$ = **$5.51**

Debenture holders will therefore be expected to convert and receive $110.20 (20 × $5.51) in 3 years time.

Market value (per $100 nominal)

			d.f. @ 10%		*P.V.*
1 – 3	Interest	8 p.a.	2.577	=	20.62
3	Redemption	110.20	0.794	=	87.50
			NPV		$107.12

(ii) Market value 107.12

Parity value (ie value of converting at current share price) 20 × $4.50 90.00

Conversion premium $17.12

Chapter 13

Answer to Example 1

(a)

	U	*G*
Profits	80	80
Debt Interest	–	30
	80	50
Tax @ 30%	(24)	(15)
	56	35

Fall in dividend of

U: $\frac{70-56}{70} = \mathbf{20\%}$

G: $\frac{49-35}{49} = \mathbf{29\%}$

(b)

	U	*G*
Profits	60	60
Debt Interest	–	30
	60	30
Tax @ 30%	(18)	(9)
	42	21

Fall in dividend of

U: $\frac{70-42}{70} = \mathbf{40\%}$

G: $\frac{49-21}{49} = \mathbf{57\%}$

Answer to Example 2

(a) Book values:

$$\text{Gearing} = \frac{100{,}000}{100{,}000 + 140{,}000} = \mathbf{42\%}$$

(b) Market values:

$$\text{Gearing} = \frac{95{,}000}{95{,}000 + 220{,}000} = \mathbf{30\%}$$

Answer to Example 3

(a)

	A	*B*
Sales	110,000	110,000
Variable costs	55,000	22,000
Fixed costs	10,000	40,000
	65,000	62,000
Profit	45,000	48,000

Increase in profit:

A: $\frac{5{,}000}{40{,}000}$ = **12.5%**

B: $\frac{8{,}000}{40{,}000}$ = **20%**

(b)

	A	*B*
Sales	80,000	80,000
Variable costs	40,000	16,000
Fixed costs	10,000	40,000
	50,000	56,000
Profit	30,000	24,000

Decrease in profit:

A: $\frac{10{,}000}{40{,}000}$ = **25%**

B: $\frac{16{,}000}{40{,}000}$ = **40%**

Answer to Example 4

		2002		*2001*
Interest cover	$\frac{52{,}000}{6{,}000}$	= 8.67	$\frac{49{,}000}{6{,}000}$	= 8.17
Interest yield	$\frac{6{,}000}{110{,}000}$	= 5.45%	$\frac{6{,}000}{118{,}000}$	= 5.08%
Dividend per share	$\frac{20{,}000}{600{,}000}$	= $0.03	$\frac{15{,}000}{600{,}000}$	= $0.025
Dividend cover	$\frac{34{,}000 - 2{,}800}{20{,}000}$	= 1.56	$\frac{33{,}000 - 2{,}800}{15{,}000}$	= 2.01
Dividend yield	$\frac{20{,}000}{498{,}000}$	= 4%	$\frac{15{,}000}{432{,}000}$	= 3.5%
Return on equity	$\frac{34{,}000 - 2{,}800}{498{,}000}$	= 6.3%	$\frac{33{,}000 - 2{,}800}{432{,}000}$	= 7%
Earnings per share	$\frac{34{,}000 - 2{,}800}{600{,}000}$	= 5.2p	$\frac{33{,}000 - 2{,}800}{600{,}000}$	= 5.03p
P/E ratio	$\frac{83}{5.2}$	= 16	$\frac{72}{5.03}$	= 14

ANSWERS TO EXAMPLES

Chapter 14

No Examples

Chapter 15

Answer to Example 1

$$\text{Market value} = \frac{20p}{10\%} = 200p\ (\$2.00)$$

Answer to Example 2

$$\text{Market value} = \frac{15p}{12\%} = 125p\ (\$1.25)$$

Answer to Example 3

$$\text{Market value (ex div)} = \frac{15p}{12\%} = 125p\ (\$1.25)$$

Market value (cum div) = 125 + 15
= 140p ($1.40)

Answer to Example 4

		df	*PV @ 12%*
1 – ∞	15p p.a.×	$\frac{1}{0.12}$	= 125

Answer to Example 5

$$\text{Market value} = P_0 = \frac{30(1.04)}{0.15 - 0.04} = 284p\ (\$2.84)$$

Answer to Example 6

$$MV_{ex\ div} = P_0 = \frac{40(1.06)}{0.20 - 0.06} = 303p\ (\$3.03)$$

Answer to Example 7

For $100 nominal:

		df	*PV @ 8%*
1 – ∞	10p.a.×	$\frac{1}{0.08}$	= 125

(= $125 p.c. ex int.)

Answer to Example 8

$$\text{Market value} = \frac{6}{0.12} = \$50\ \text{p.c. ex. int.}$$

Answer to Example 9

For $100 nominal:

		df @ 12%	PV @ 10%
1 – 5	8 p.a.	3.605	28.84
5	110	0.567	62.37
			$91.21 p.c. ex. int.

Answer to Example 10

		df @ 10%	PV @ 10%	
1 – 4	7 p.a.	3.170	22.19	
4	100	0.683	68.30	
			$90.49	p.c. ex. int.

Chapter 16

No Examples

Chapter 17

Answer to Example 1

$k_e = \frac{30}{240} = \mathbf{12.5\%}$

Answer to Example 2

$k_e = \frac{30\ (1.06)}{420} + 0.06 = \mathbf{16.10\%}$

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 $\frac{8(1 - 0.30)}{90} = \mathbf{6.22\%}$

(or $k_d = (1 - t) = 8.89\% \times (1 - 0.3) = 6.22\%$)

ANSWERS TO EXAMPLES

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	22.11
5	110	0.621	68.31	0.497	54.67
			6.07		(10.22)

$$k_d = IRR = 10\% + \frac{6.07}{6.07 \times 10.22} \times 5\% = \mathbf{11.86\%}$$

(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%

$$W.A.C.C. = 14.68 \times \frac{10.9}{10.9 + 3.68} + 6.09 \times \frac{3.68}{10.9 + 68} = \mathbf{12.51\%}$$

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

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

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

Chapter 18

No Examples

Chapter 19

Answer to Example 1

Equity / Debt	100%/0%	80%/20%	60%/40%	40%/60%	20%/80%
Cost of Equity	20%	22%	25%	30%	35%
Cost of Debt	10%	10%	10%	12%	16%
WACC	20%	19.6%	19%	19.2%	19.8%

Answer to Example 2

Equity / Debt	100%/0%	80%/20%	50%/50%	40%/60%
Cost of Equity	20%	22.5%	30%	35%
Cost of Debt	10%	10%	10%	10%
WACC	20%	20%	20%	20%

Answer to Example 3

Equity / Debt	100%/0%	80%/20%	50%/50%	40%/60%
Cost of Equity	20%	22.5%	30%	35%
Cost of Debt	7%	7%	7%	7%
WACC	20%	19.4%	18.5%	18.2%

New: $E_g + D_G = 35 + 10 \times 0.3 = 38M$

Chapter 20

Answer to Example 1

Required return = 5% +(12% – 5%) 1.5 = **15.5%**

Answer to Example 2

Required return = 8% +(16% – 8%) 0.8 = **14.4%**

Answer to Example 3

20% = 8% + (25% – 8%) β
17β = 12
β = $^{12}/_{17}$ = **0.706**

Answer to Example 4

Required return = 6% + (11% – 6%) 1.4 = **13%**

		df @ 10%	*PV @ 10%*
0	(100,000)	1	(100,000)
1 – ∞	15,000 p.a.	$^{1}/_{0.13}$	115,385
			NPV +15,385

The NPV is positive and so the project is worthwhile.

Chapter 21

Answer to Example 1

(a) P is the more risky share (because it has higher share of β)

(b) P plc: $\beta_a = \dfrac{100}{100 + 40 \times 0.7} \times 1.8 = \mathbf{1.406}$

Q plc: $\beta_a = \dfrac{100}{100 + 20 \times 0.7} \times 1.5 = \mathbf{1.316}$

P has a higher asset β and so P has the more risky business activity.

ANSWERS TO EXAMPLES

Answer to Example 2

(i) determine a β for the project: $\frac{100}{100+20\times0.75}\times1.8 = \mathbf{1.57}$

(ii) required return if all equity financed
= 8% + (18% – 8%) × 1.57 = **23.7%**

Chapter 22

Answer to Example 1

(a) Exchange rate in 1 year $= 1.70\times\frac{1.05}{1.02} = \mathbf{1.75}$

(b) Exchange rate in 2 years $= 1.75\times\frac{1.05}{1.02} = \mathbf{1.80}$

Answer to Example 2

(a) exchange rate in 1 year $= 2{,}030\times\frac{1.04}{1.08} = \mathbf{1{,}955}$

(b) exchange rate in 2 years $= 1{,}955\times\frac{1.04}{1.08} = \mathbf{1{,}883}$

Chapter 23

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

(a) Do not exercise option:

$2M ÷ 1.5180 =	£1,317,523
less: premium	50,000
Net receipt	£1,267,523

(b) Exercise option

$2M ÷ 1.5200 =	£1,315,789
less: premium	50,000
Net receipt	£1,265,789

Chapter 24

Answer to Example 1

Sell futures – amount = $6M \times \frac{6}{3} = \$12M$

On 1 January:

Loan interest: $6M × 10% × $^{6}/_{12}$	300,000
Profit on futures: $12M \times \frac{92-90}{400}$	(60,000)
Net payment	$240,000

Answer to Example 2

If do own borrowing:

X	10%
Y	L + 6.5%
	L + 16.5%

If do swap borrowing:

X	L + 3%
Y	12%
	L + 15%

In total 1.5% may be saved

Paper F9

PRACTICE QUESTIONS

1 Crystal Ltd

Crystal Ltd was established in 1999 to sell a range of computer software to small businesses. Since its incorporation, the business has grown rapidly and demand for its products continues to rise. The most recent financial accounts for the company are set out below:

Statement of Financial Position as at 31 May 2009

	$	$	$
Non-current assets			
Freehold land and buildings at cost	55,000		
Less: Accumulated depreciation	4,000	51,000	
Equipment and fittings at cost	20,000		
Less: Accumulated depreciation	5,000	15,000	
Motor vehicles at cost	24,000		
Less: Accumulated depreciation	6,000	18,000	
			84,000
Current assets			
Inventories	26,000		
Receivables	59,000		
		85,000	
Less Liabilities: amounts falling due within one year			
Payables	88,000		
Proposed dividend	1,000		
Taxation	6,000		
Bank overdraft	10,000	105,000	(20,000)
			64,000
Less: liabilities amounts falling due beyond one year			
14% Bank loan (secured on freehold property)			20,000
			44,000
Capital and reserves			
Ordinary $1 shares			25,000
Retained profit			19,000
			44,000

Income Statement for the year ended 31 May 2009

	$	$
Sales		660,000
Less: Cost of sales		
Opening inventory	22,000	
Purchases	426,000	
	448,000	
Less: Closing inventory	26,000	422,000
Gross profit		238,000
Less:		
Selling and distribution expenses	176,000	
Administration expenses	38,000	
Finance expenses	7,000	221,000
Net profit before taxation		17,000
Corporation tax		6,000
Net profit after taxation		11,000
Proposed dividend		1,000
Retained profit for the year		10,000

The company is family owned and controlled and, since incorporation, has operated without qualified finance staff. However, the managing director recently became concerned with the financial position of the company and therefore decided to appoint a qualified finance director to help manage the financial affairs of the business. Soon after joining the company, the finance director called a meeting of his fellow directors and at this meeting stated that, in his opinion, the company was overtrading.

Requirements

(a) What do you understand by the term 'overtrading' and what are the possible consequences of this type of activity?

(b) What are the main causes of overtrading and how might the management of a business overcome the problem of overtrading?

(c) Calculate six financial ratios for Crystal Ltd which you believe would be useful in detecting whether the company was overtrading. Explain the significance of each ratio you calculate.

2 Diamond Ltd

Diamond Ltd provides office supplies and stationery for a wide range of small businesses. In recent months, the company has experienced liquidity problems and the managing director has decided that action must be taken to improve the situation. The principal shareholders of the company, however, have indicated that they are unable to provide further funding for the business and are unwilling to permit the issue of more loan capital. The accounts for the year ended 31 October 2010 are as follows:

Statement of Financial Position as at 31 October 2010

	$	$	$
Non-current Assets			
Freehold land and buildings at cost		145,000	
Less: Accumulated depreciation		28,000	117,000
Fixtures and fittings at cost		45,000	
Less: Accumulated depreciation		9,000	36,000
Motor vehicles at cost		64,000	
Less: Accumulated depreciation		22,000	42,000
			195,000
Current Assets			
Inventories		52,000	
Receivables		89,000	
		141,000	
Less: liabilities: amounts falling due within one year			
Payables	64,000		
Proposed dividend	14,000		
Taxation	21,000		
Bank overdraft	114,000	213,000	(72,000)
			123,000
Less: liabilities: amounts falling due beyond one year			
12% Debentures (secured)			40,000
			83,000
Capital and reserves			
Ordinary $1 shares			25,000
General reserve			10,000
Retained profit			48,000
			83,000

Income Statement for the year ended 31 October 2010

	$	$
Sales		835,000
Less: Cost of sales		
Opening inventory	36,000	
Purchases	520,000	
	556,000	
Less: Closing inventory	52,000	504,000
GROSS PROFIT		331,000
Less:		
Selling and distribution expenses	164,000	
Administration expenses	83,000	
Interest	15,000	262,000
Net profit before taxation		69,000
Corporation tax		21 ,000
Net profit after taxation		48,000
Proposed dividend		14,000
Retained profit for the year		34,000

All purchases and sales were on credit and the receivables and payables outstanding remained at a constant level throughout the year.

The managing director believes that the operating cash cycle should be as low as possible and wishes to improve the liquidity of the business by reducing the operating cash cycle of the business by at least 10 days. Given the views of the principal shareholders, the opportunities to raise long term funds are limited. Nevertheless, the managing director considers that a sale and lease back agreement concerning the freehold land is possible and that this would help overcome the company's weak liquidity position.

Requirements

Using the information above and any analysis you wish to make of it:

(a) Explain why the managing director should be concerned with the short-term liquidity position of the company.

(b) Calculate the existing cash operating cycle of the business.

(c) State whether or not you agree with the managing director's view that the operating cycle should be as low as possible.

(d) State the advantages and disadvantages of a sale and leaseback agreement to improve the liquidity of the company.

3 Sapphire

Sapphire Limited purchases 25,000 litres of a material each year from a single supplier. At the moment, the company obtains the material in batch sizes of 800 litres. The material costs $16 per litre; the cost of ordering a new batch from the supplier is $32 and the cost of holding one litre of inventory, due to certain technical difficulties, is $4 per unit plus an interest cost equal to 15% of the purchase price of the material.

$$EOQ = \sqrt{\frac{2CD}{H}}$$

Requirements

(a) Calculate the economic order quantity and the annual savings which would be obtained if this order quantity replaced the current order size of litres.

(b) The supplier has agreed to offer a discount on orders above a certain size. He has offered the following price structure:

Orders size (litres)	*Unit cost ($)*
0 – 499	16
500 – 999	15.20
1,000 plus	14.80

How does this affect the optimal order quantity, and what would be the annual savings compared to the inventory costs with the EOQ you calculated in (a)?

4 Ruby plc

Ruby plc sells stationery and office supplies on a wholesale basis and has an annual turnover of $4,000,000. The company employs four people in its sales ledger and credit control department at an annual salary of $12,000 each. All sales are on 40 days' credit with no discount for early payment. Irrecoverable debts represent 3% of turnover and Ruby plc pays annual interest of 9% on its overdraft. The most recent accounts of the company offer the following financial information:

Statement of Financial Position as at 31 December 2010

	$'000	*$'000*	*$'000*
Non current assets			17,500
Current assets			
Inventory of goods for resale		900	
Receivables		550	
Cash		120	
		1,570	
Liabilities: amounts falling due within one year			
Payables	330		
Overdraft	1,200		
		1,530	
			40
			17,540
Liabilities: amounts falling due after more than one year			
12% Debenture due 2010			2,400
			15,140
Ordinary shares			3,500
Reserves			11,640
			15,140

Ruby plc is considering offering a discount of 1% to customers paying within 14 days, which it believes will reduce irrecoverable debts to 2·4% of turnover. The company also expects that offering a discount for early payment will reduce the average credit period taken by its customers to 26 days. The consequent reduction in the time spent chasing customers where payments are overdue will allow one member of the credit control team to take early retirement. Two-thirds of customers are expected to take advantage of the discount.

Required:

(a) Using the information provided, determine whether a discount for early payment of 1 per cent will lead to an increase in profitability for Ruby plc.

(b) Discuss the relative merits of short-term and long-term debt sources for the financing of working capital.

(c) Discuss the different policies that may be adopted by a company towards the financing of working capital needs and indicate which policy has been adopted by Ruby plc.

(d) Outline the advantages to a company of taking steps to improve its working capital management, giving examples of steps that might be taken.

5 Pearl plc

(a) The Treasurer of Pearl plc is contemplating a change in financial policy. At present, Pearl's Statement of Financial Position shows that fixed assets are of equal magnitude to the amount of long-term debt and equity financing. It is proposed to take advantage of a recent fall in interest rates by replacing the long term debt capital with an overdraft. In addition, the Treasurer wants to speed up debtor collection by offering early payment discounts to customers and to slow down the rate of payment to creditors.

As his assistant, you are required to write a brief memorandum to other Board members explaining the rationales of the old and new policies and pin-pointing the factors to be considered in making such a switch of policy.

(b) Emerald plc, which currently has negligible cash holdings, expects to have to make a series of cash payments (P) of $1.5m over the forthcoming year. These will become due at a steady rate. It has two alternative ways of meeting this liability.

Firstly, it can make periodic sales from existing holdings of short-term securities. According to Emerald's financial advisers, the most likely average percentage rate of return (i) on these securities is 12% over the forthcoming year, although this estimate is highly uncertain. Whenever Emerald sells securities, it incurs a transaction fee (T) of $25, and places the proceeds on short-term deposit at 5% per annum interest until needed. The following formula specifies the optimal amount of cash raised (Q) for each sale of securities:

$$Q = \sqrt{\frac{2 \times P \times T}{i}}$$

The second policy involves taking a secured loan for the full $1.5m over one year at an interest rate of I4% based on the initial balance of the loan. The lender also imposes a flat arrangement fee of $5,000, which could be met out of existing balances. The sum borrowed would be placed in a notice deposit at 9% and drawn down at no cost as and when required.

Emerald's Treasurer believes that cash balances will be run down at an even rate throughout the year.

Required:

Advise Emerald as to the most beneficial cash management policy.

Note: ignore tax and the time value of money in your answer.

(c) **Discuss the limitations of the model of cash management used in part (b).**

6 Gold

(a) Gold is considering a project requiring investment of $100,000 in equipment with a life of five years and a residual value of $15,000. Annual cash earnings will be $25,000, $34,000, $25,000, $15,000 and $8,000 for the five years respectively.

Requirements

(i) Calculate the ARR based on average investment,

(ii) Calculate the ARR based on initial investment,

(iii) Calculate the payback period.

(b) Silver has a 25% cost of capital and is considering a project requiring initial investment of $183,000. Annual savings will be $70,000 for the next 4 years.

Requirements

(i) Calculate the IRR of the project.

(ii) Calculate the NPV of the project at 25%.

(c) Bronze has recently expanded into new premises which cost $2.5 million and have a current market value of $2.6 million. Equipment must now be installed, one possibility being to purchase this for $1 million, another being to transfer Bronze's existing equipment into the new premises at a cost of $170,000. This existing machinery was bought five years ago for $700,000 and has a current book value of $150,000. Operations will continue at the original premises and if equipment is transferred to the new premises then the cost of replacement will be $660,000.

All equipment has a life of 15 years from now and could generate annual cash returns of $384,000. At the end of this period the new premises would have an estimated market value of $1.8 million and all equipment would have negligible scrap values.

Bronze's cost of capital is 10%.

Requirements

(i) Advise Bronze on the best way of equipping the new premises.

(ii) Advise Bronze whether or not the new premises are worth equipping.

7 Opera Ltd

Opera Ltd is a division of Fine plc which requires each of its divisions to achieve a rate of return on capital employed of at least 10% pa. For this purpose, capital employed is defined as fixed capital and investment in stocks. This rate of return is also applied as a hurdle rate for new investment projects. Divisions have limited borrowing powers and all capital projects are centrally funded.

The following is an extract from Opera's divisional accounts:

Income Statement for the year ended 31 December 2009

	$m
Turnover	120
Cost of sales	(100)
Operating profit	20

Assets employed as at 31 December 2009

	$m	*$m*
Non-current (net)		75
Current assets (including stocks $25m)	45	
Current liabilities	(32)	
		13
Net capital employed		88

Opera's production engineers wish to invest in a new computer-controlled press. The equipment cost is $14m. The residual value is expected to be $2m after four years operation, when the equipment will be shipped to a customer in South America.

The new machine is capable of improving the quality of the existing product and also of producing a higher volume. The firm's marketing team is confident of selling the increased volume by extending the credit period. The expected additional sales are:

Year 1	2,000,000 units
Year 2	1,800,000 units
Year 3	1,600,000 units
Year 4	1,600,000 units

Sales volume is expected to fall over time due to emerging competitive pressures. Competition will also necessitate a reduction in price by $0.5 each year from the $5 per unit proposed in the first year. Operating costs are expected to be steady at $ 1 per unit, and allocation of overheads (none of which are affected by the new project) by the central finance department is set at $0.75 per unit.

Higher production levels will require additional investment in stocks of $0.5m, which would be held at this level until the final stages of operation of the project. Customers at present settle accounts after 90 days on average.

Required:

(a) Determine whether the proposed capital investment is attractive to Opera, using the average rate of return on capital method, as defined as average profit-to-average capital employed, ignoring debtors and creditors. [Note: Ignore taxes]

(b) (i) Suggest three problems which arise with the use of the average return method for appraising new investment.

(ii) In view of the problems associated with the ARR method, why do companies continue to use it in project appraisal?

(c) Briefly discuss the dangers of offering more generous credit, and suggest ways of assessing customers' creditworthiness.

8 Theatre

Theatre Co needs to increase production capacity to meet increasing demand for an existing product, 'Fiber', which is used in food processing. A new machine, with a useful life of four years and a maximum output of 600,000 kg of Fiber per year, could be bought for $800,000, payable immediately. The scrap value of the machine after four years would be $30,000. Forecast demand and production of Fiber over the next four years is as follows:

Year	**1**	**2**	**3**	**4**
Demand (kg)	1·4 million	1·5 million	1·6 million	1·7 million

Existing production capacity for Fiber is limited to one million kilograms per year and the new machine would only be used for demand additional to this.

The current selling price of Fiber is $8·00 per kilogram and the variable cost of materials is $5·00 per kilogram. Other variable costs of production are $1·90 per kilogram. Fixed costs of production associated with the new machine would be $240,000 in the first year of production, increasing by $20,000 per year in each subsequent year of operation.

Theatre Co pays tax one year in arrears at an annual rate of 30% and can claim capital allowances (tax-allowable depreciation) on a 25% reducing balance basis. A balancing allowance is claimed in the final year of operation.

Theatre Co uses its after-tax weighted average cost of capital when appraising investment projects. It has a cost of equity of 11% and a before-tax cost of debt of 8·6%. The long-term finance of the company, on a market-value basis,consists of 80% equity and 20% debt.

Required:

(a) Calculate the net present value of buying the new machine and advise on the acceptability of the proposed purchase (work to the nearest $1,000).

(b) Calculate the internal rate of return of buying the new machine and advise on the acceptability of the proposed purchase (work to the nearest $1,000).

(c) Explain the difference between risk and uncertainty in the context of investment appraisal, and describe how sensitivity analysis and probability analysis can be used to incorporate risk into the investment appraisal process.

9 Ballet plc

Ballet plc, a manufacturer of speciality chemicals, has been reported to the anti-pollution authorities on several occasions in recent years, and fined substantial amounts for making excessive toxic discharges into local rivers. Both the environmental lobby and Ballet's shareholders demand that it clean up its operations.

It is estimated that the total fines it may incur over the next four years can be summarised by the following probability distribution (all figures are expressed in present values):

Level of fine	*Probability*
$0.5m	0.3
$1.4m	0.5
$2.0m	0.2

ABC Ltd, a firm of environmental consultants; has advised that new equipment costing $1m can be installed to virtually eliminate illegal discharges. Unlike fines, expenditure on pollution control equipment is tax-allowable via a 25% writing-down allowance (reducing balance). The rate of corporate tax is 33%, paid with a one-year delay. The equipment will have no resale value after its expected four-year working life, but can be in full working order immediately prior to Ballet's next financial year.

A European Union Common Pollution Policy grant of 25% of gross expenditure is available, but with payment delayed by a year. Immediately on receipt of the grant from the EU, Ballet will pay 20% of the grant to ABC as commission. These transactions have no tax implications for Ballet.

A disadvantage of the new equipment is that it will raise production costs by $30 per tonne over its operating life. Current production is 10,000 tonnes per annum, but expected to grow by 5% per annum compound. It can be assumed that other production costs and product price are constant over the next four years. No change in working capital is envisaged.

Ballet applies a discount rate of 12% after all taxes to investment projects of this nature. All cash inflows and outflows occur at year ends.

Required:

(a) Calculate the expected net present value of the investment assuming a four-year operating period. Briefly comment on your results.

(b) Write a memorandum to Ballet's management as to the desirability of the project, taking into account both financial and non-financial criteria.

10 Glitter Railways

Glitter Railways plc, which has a financial year-end of 31 December, operates a rail passenger service between two major cities in England. It is currently negotiating with the regulatory authorities about a five year extension and enhancement of its existing contract. Glitter Railways has forecast passenger use over the next five year period to 31 December 2010 and, based on its proposed carriage capacity, has calculated the following figures:

Five year projections:	
Number of carriages used on the line:	8
Maximum passengers per carriage:	55
Average occupancy rate:	60%
Average number of return journeys per day:	10
Average price per return trip:	$12
Number of days operating per year:	340

Contribution per unit (sales price less variable costs) is expected to remain at a constant 35% of price over the period. Additional fixed costs of $1m per annum will be incurred on the new project. The management accountant has suggested that, in addition, the existing fixed overhead apportionment be increased by $200,000 per annum to reflect the increased activities relating to this part of the business. If the contract is renewed, other services offered by Glitter Railways will be reduced to enable capacity expansion on the new contract. This will involve the loss of a long-standing contract, which was expected to continue indefinitely, worth $250,000 in pre-tax net cash inflows per annum.

One of the conditions of a successful new bid is that a minimum investment of $5m, in support equipment to enhance the existing service, is required at the start of the new contract on 31 December 2005. This equipment will no longer be needed to support the contract after four years and will be disposed of for $0·5m on 31 December 2009. Capital allowances are available for these transactions. A balancing charge or allowance would arise on disposal of the asset. The investment in this asset should be treated separately from any other asset investment for tax purposes (ignore any pooling requirements). Assume all tax payments and allowances arise at the end of the year in which the taxable transactions arise (in other words, not delayed). Assume that all operating cash inflows arise at the relevant year-end.

Other relevant information:	
After tax discount rate per annum:	10%
Corporation tax rate:	30%
Writing down allowance:	25% per annum, reducing balance

Required:

(a) **Calculate separately the present value of the net operating cash flows (after payment of corporation tax and using annuities and perpetuities where appropriate), and the capital flows (investment, disposal and related tax flows). Assess if it is beneficial for Glitter Railways to begin the new contract on 31 December 2005.**

Express all calculations in this and other parts of the question to the nearest $1000. State any assumptions you make.

(b) The Chairman of Glitter Railways is concerned about the risk of the project, particularly with respect to the average price charged.

Calculate the sensitivity of the project in relation to the average price charged.

Assume, in your answer that all other factors are as per your analysis in part (a).

(c) On reviewing the initial proposal from your answer to part (a), the regulatory authorities are now insisting that further investment of $7m be made to ensure carriage availability to meet targets for the level of proposed service provision. This would not involve the purchase of additional carriages. Assume that by incorporating the additional $7m investment on top of the existing $5m, a total NPV at 31 December 2005 of $9·220m (negative) for the capital cash flows only will arise.

Required:

(i) calculate the occupancy rate required to break even (that is, to produce a zero NPV)

(ii) calculate the length of the contract required to break even (that is, to produce a zero NPV). Assume, in your answers to each case that all other factors are as per your analysis in part (a).

(d) Write a report to the Chairman of Glitter Railways, in your capacity as an external consultant, explaining: (i) what is meant by business risk; (ii) the methods of estimating business risk in the context of NPV; and (iii) the methods of reducing business risk.

11 Orange

Orange.com has just issued convertible debentures with an 8% per annum coupon to the value of $5m. The nominal value of the debentures is $100 and the issue price was $105. The conversion details are that 45 shares will be issued for every $100 convertible debentures held with a date for conversion in five years exactly. Redemption, should the debenture not be converted, will also take place in exactly five years. Debentures will be redeemed at $110 per $100 nominal convertibles held. It is widely expected that the share price of the company will be $4 in five years' time.

Assume an investor required return of 15%.

Ignore taxation in your answer.

Required:

(a) Briefly explain why convertibles might be an attractive source of finance for companies.

(b) (i) Estimate the current market value of the debentures, assuming conversion takes place, using net present value methods and assess if it is likely that conversion will take place.

(ii) Identify and briefly comment on a single major reservation you have with your evaluation in part b(i).

(c) Explain why an issuing company seeks to maximise its conversion premium and why companies can issue convertibles with a high conversion premium.

(d) Explain what is meant by the concept of intermediation (the role of a banking sector) and how such a process benefits both investors and companies.

12 Blue

Requirements

(a) Blue plc is equity financed by 500,000 50c ordinary shares. Current market value is 30c and the annual dividend of $12,000 is about to be paid.

Calculate Blue's cost of capital.

(b) Red plc is financed by equity shares having a market value of $3. A dividend of 25c has just been paid and this compares favourably with the dividend of 15c paid four years ago.

Calculate Red's cost of capital.

(c) White plc is financed by 400,000 $1 ordinary shares and $600,000 12% debentures. The market values are $1.40 ex div and $90% respectively. A dividend of 14c has just been paid and dividends have been growing at 6% p.a. Interest is shortly to be paid on the debentures which are redeemable at a 5% premium in 6 years time.

Ignoring taxation calculate White's cost of capital.

(d) Yellow plc is financed by 1 million 50c ordinary shares, market value $1.30 and $500,000 5% debentures valued at $95%. A dividend of 15c is about to be paid and dividends have always been constant. Interest on the debentures is soon to be paid and redemption is at par in 5 years time.

If corporation tax is at 35% calculate Yellow's cost of capital.

13 XYZ

Requirements

(a) X plc is financed by 100,000 50p ordinary shares with an ex div market value of $1.30 and $80,000 of 9% irredeemable loan inventory with an ex interest market value of 95 per cent. The dividend which has just been paid is the constant annual dividend of 15p per share.

Corporation tax is at 35%. Find Ke, Kd, E and D, and hence the WACC.

(b) Y limited is partly financed by 9% redeemable debentures currently valued at $75, interest having just been paid. The debentures are redeemable in 5 years time at a premium of 10%.

Calculate the cost of these debentures to the company if tax is at 35%.

(c) Z plc has $1m 8% redeemable debentures in issue. Interest is paid half yearly on June 30 and December 31 and the current ex–interest market price on July 1 2005 is $97. Redemption is at par on December 31 2009.

Calculate the annual cost of the debentures. Tax is at 35%.

14 Little plc

(a) Discuss briefly four techniques a company might use to hedge against the foreign exchange risk involved in foreign trade.

(b) Little plc is a medium sized UK company with export and import trade with the USA. The following transactions are due within the next six months. Transactions are in the currency specified.

Purchases of components, cash payment due in three months: $116,000.

Sale of finished goods, cash receipt due in three months: $197,000.

Purchase of finished goods for resale, cash payment due in six months: $447,000.

Sale of finished goods, cash receipt due in six months: $154,000.

Exchange rates (London market)

	$/£
Spot	1.7106–1.7140
Three months forward	0.82–0.77 cents premium
Six months forward	1.39–1.34 cents premium

Three months or six months	*Interest rates Borrowing*	*Lending*
Sterling	12.5%	9.5%
Dollars	9%	6%

Calculate the net sterling receipts and payments that Little might expect for both its three and six month transactions if the company hedges foreign exchange risk on

(a) the forward foreign exchange market;
(b) the money market.

15 Banks

Your managing director has received forecasts of US$ exchange rates in two years time from three leading banks.

$/£ forecasts 31 December 2009

Onebank	1.25
Twobank	1.55
Threebank	1.68

The current spot mid-rate (December 2007) is $1.5240/£

A non-executive director of your company has suggested that in order to forecast future exchange rates, the interest rate differential between countries should be used. She states that 'as short term interest rates are currently 6% in the UK, and 8.5% in the USA, the exchange rate in two years time will be $1.597/£.

You have been asked by your managing director to prepare a brief report discussing

(a) The likely validity of the non-executive director's estimate
(b) Possible reasons for the wide spread of forecasts by the banks.

Paper F9

PRACTICE ANSWERS

1 Crystal Ltd

(a) Overtrading occurs in a business where the capital base is inappropriate to the level of operational activity. Where a business expands rapidly, as in the case of Crystal Ltd, there is a need to increase the level of working capital and non-current assets in line with the increase in sales. This means, in turn, that the business must be adequately funded by appropriate long-term and short-term sources of finance. Failure to do this can result in difficulties in supplying customers (as inventory levels will be insufficient to meet demand) and liquidity problems.

Liquidity problems may take various forms such as exceeding overdraft limits, failing to pay interest on borrowings or to make capital repayments on due dates, slow payment of trade payables etc. Management of the business during a period of overtrading is often reduced to simply reacting to particular crises as they occur e.g. dealing with an irate creditor demanding payment, finding money to pay wages and salaries etc. This can be extremely time consuming and can detract managers from more profitable use of their time. At the extreme, overtrading can result in the business having to cease trading because it does not have the cash available to meet obligations as they arise.

(b) Overtrading is a symptom of weak financial management of the business. It can arise in a relatively young business, such as Crystal Ltd, from a failure to foresee the growth potential of the business and, as a result, failing to invest sufficient start-up capital in order to deal with the level of demand for the products. Under capitalisation may also occur because the owners simply do not have sufficient resources to invest in the business and are unable to convince others to invest in the business. Errors and miscalculations may also result in overtrading such as the failure to forecast levels of profits and cash flows to materialise thereby placing a strain on working capital and fixed asset requirements, failure to control costs leading to a drain on liquidity and investment in non-current assets without sufficient finance being in place.

In order to deal with the problem of overtrading it is necessary for a business to ensure that the permanent capital base matches the level of activity. This may mean an increase in the equity and/or the borrowings of the business. However, where the business is unable to find new finance it will be necessary to reduce the level of activity in line with the available capital of the business. This is likely to mean turning away profitable opportunities in order to ensure there is a long-term future for the business. It is also important to ensure that the capital available is used as effectively and efficiently as possible. This means monitoring fixed asset utilisation and tight control over working capital requirements.

(c) A number of ratios may be used to detect symptoms of overtrading. Six such ratios are as follows:

$$\text{Average inventory holding period} = \frac{\text{Average inventory}}{\text{Cost of sale}} \times 12$$

$$= \frac{(22{,}000 + 26{,}000)/2}{422{,}000} \times 12$$

$$= \textbf{0.7 months}$$

The average inventory holding period is less than one month. This seems rather low and may suggest that the company is unable to invest sufficiently in inventories so as to meet the requirements of its customers. Too low a inventory holding period can, therefore, lead to lost customer goodwill and lost sales.

$$\text{Average payables period} = \frac{\text{Trade payables}}{\text{Credit purchases}} \times 12$$

$$= \frac{88{,}000}{426{,}000} \times 12$$

$$= \textbf{2.5 months}$$

This ratio reveals that the company is taking 2½ months, on average, to pay trade payables. His seems rather a long period and may indicate liquidity problems.

$$\text{Average receivables period} = \frac{\text{Trade receivables}}{\text{Credit sales}} \times 12$$

$$= \frac{59{,}000}{660{,}000} \times 12$$

$$= \textbf{1.1 months}$$

This ratio reveals that receivables are taking an average of 1.1 months to pay amounts owing. Where a company is overtrading, it may decide to reduce the receivables payment period to a minimum in order to improve its cash flows.

$$\text{Sales/non-current assets} = \frac{\text{Sales}}{\text{non-current assets}}$$

$$= \frac{660{,}000}{84{,}000}$$

$$= \textbf{7.9 times}$$

This ratio reveals that for every $ invested in non-current assets there is $7.90 generated in sales during the year. A very high ratio may suggest that the company has under-invested in non-current assets for the given level of sales.

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

$$= \frac{59{,}000}{105{,}000}$$

$$= \textbf{0.6 : 1}$$

This ratio compares the liquid assets of the business with the maturing obligations. In this particular case, it shows that the company has insufficient liquid assets to meet short-term obligations. The company is, therefore, in a weak liquidity position.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$= \frac{85{,}000}{105{,}000}$$

$$= \textbf{0.8 : 1}$$

This ratio compares the current assets with the maturing obligations. It is a further measure of liquidity. The ratio reveals that the current assets do not cover the maturing obligations of the company. Although this is a less stringent test of liquidity than the acid-test ratio, the ratio helps confirm the liquidity problems of the company.

2 Diamond Ltd

(a) The following liquidity ratios may be calculated

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = \frac{141{,}000}{213{,}000} = 0.66 : 1$$

$$\text{Acid test} = \frac{\text{Current assets less inventory}}{\text{Current liabilities}} = \frac{89{,}000}{213{,}000} = 0.42{:}1$$

The ratios seem very low for a business of this nature. The current ratio indicates that the business does not have significant liquid assets to cover its short-term liabilities by a significant margin. The acid-test ratio, which is a more stringent test of liquidity reveals an even bleaker picture. The business has a large bank overdraft and clearly relies on the continuing support of the bank. Given the weak liquidity position of the business, the decision to distribute dividends for the year is puzzling.

Note: Other ratios such as the average settlement period for payables and times interest earned ratio could have been used to add to the picture.

(b) The operating cycle of the business may be calculated as follows:

	Days
Average inventory holding period	
$\frac{\text{Average inventories}}{\text{Cost of sales}} = \frac{(36{,}000 + 52{,}000)/2}{504{,}000} \times 365$	32
Average settlement days for receivables	
$\frac{\text{Average receivables}}{\text{Credit sales}} = \frac{89{,}000}{835{,}000} \times 365$	39
Less	
Average settlement period for payables	
$\frac{\text{Average payables}}{\text{Credit purchases}} = \frac{64{,}000}{520{,}000} \times 365$	(45)
	26

(c) Although a low operating cash cycle will help improve the liquidity of the business, there may well be costs associated with reducing the cash cycle further. In order to achieve the required reduction there must be:

(i) a reduction in the inventory holding period, or
(ii) a reduction in the average settlement period for receivables, or
(iii) an increase in the settlement period for payables, or
(iv) some combination of the above.

A reduction in the inventory holding period (which at 32 days does not appear to be excessive), may result in stockouts and a subsequent loss of sales and customer goodwill. A reduction in the receivables period may also lead to a loss of sales and customer goodwill. (The industry norm for credit periods allowed to receivables should be considered before action is taken in reducing the average settlement period). An increase in the average settlement period taken for payables may result in lost discounts, and a loss of supplier goodwill which may lead, in turn to future problems when ordering goods.

As the operating cash cycle does not appear to be unduly long, some of the difficulties described may well arise if there is an attempt to reduce the cycle by a significant amount.

(e) A sale and leaseback agreement would involve selling the freehold premises to a financial institution and, at the same time, agreeing to lease the property back from the new owners for a specified rental. This arrangement would have the advantage of providing an immediate injection of cash into the business from the sale, yet would still allow the business to occupy the property. Rental payments made under the lease agreement would also attract tax relief.

However, there are potential disadvantages with such an arrangement. Although rental payments may be quite low in the early years of an agreement, there are usually regular rent reviews and so payments may rise steeply over time. At the end of the lease period the business will be obliged to vacate the property unless a further lease agreement can be successfully negotiated or there is a re-purchase option on the property. The sale of the property

may result in the loss of future capital gains and any capital gains on the property made to date will be taxable. The Statement of Financial Position reveals that the business has debentures outstanding which are secured. If they are secured on the freehold property, permission to sell must be sought from the debenture holders. Although a sale and leaseback agreement would clear the overdraft, it will not alleviate future liquidity problems which will be exacerbated by the rental payments.

3 Sapphire

(a) $EOQ = \sqrt{\frac{2CD}{H}} = \sqrt{\frac{2 \times 32 \times 25{,}000}{4 + (0.15 \times 16)}} = \sqrt{250{,}000}$ litres

	800 litres per order		*500 litres per order*	
Annual costs:		*$*		*$*
Holding costs	$(\frac{800}{2} \times £6.4)$	2,560	$(\frac{500}{2} \times £6.4)$	1,600
Ordering costs	$(\frac{25{,}000}{800} \times £32)$	1,000	$(\frac{25{,}000}{500} \times £32)$	1,600
		$3,560		$3,200

The annual saving would be $(3,560 - 3,200) = $360.

(b) The new EOQ above 500 is caused by the reduction in h to $4 + (15% of $15.20) = 6.28.

$EOQ = \sqrt{\frac{2CD}{H}} = \sqrt{\frac{2 \times 32 \times 25{,}000}{6.28}} = 504.75$ litres, say 505 litres.

	Order 505 units *$*	*Order 1,000 units* *$*
Cost of purchases:		
(i) at $1 5.20 (× 25,000)	380,000	
(ii) at $1 4.80 (× 25,000)		370,000
Holding costs:		
(i) at $6.28	1,586	
(ii) at $4 + (15% of $14.80)		3,110
Ordering costs at $32		
(i) 50 orders per annum		
(ii) $\frac{25{,}000}{505}$ orders per annum	1,584	
(iii) 25 orders per annum		800
	$383,170	$373,910

The optimal order quantity is now 1,000 units, to take advantage of the bulk purchase discounts. This is $(383,170 - 373,910) = $9,260 per annum cheaper than ordering 500 litres with each order.

4 Ruby plc

(a) The benefits of the proposed policy change are as follows.

Trade terms are 40 days, but receivables are taking 365 × 0·550/4 = 50 days

Current level of receivables = $550,000

Cost of 1% discount = 0·01 × 4m × 2/3 = $26,667

Proposed level of receivables = (4,000,000 – 26,667) × (26/365) = $283,000

Reduction in receivables = 550,000 – 283,000 = $267,000

Debtors appear to be financed by the overdraft at an annual rate of 9%

Reduction in financing cost = 267,000 × 0·09 = $24,030

Reduction of 0·6% in irrecoverable debts = $4m × 0·006 = $24,000

Salary saving from early retirement = $12,000

Total benefits = 24,030 + 24,000 + 12,000 = $60,030

Net benefit of discount = 60,030 – 26,667 = $33,363

A discount for early payment of 1 per cent will therefore lead to an increase in profitability for Ruby plc.

(b) Short-term sources of debt finance include overdrafts and short-term loans. An overdraft offers flexibility but since it is technically repayable on demand, it is a relatively risky source of finance and a company could experience liquidity problems if an overdraft were called in, until an alternative source of finance were found. The danger with a short-term loan as a source of finance is that it may be renewed on less favourable terms if economic circumstances have deteriorated at its maturity, leaving the company vulnerable to short-term interest rate changes.

Short-term finance will be cheaper than long-term finance, although this is based on the assumption of a normal shape to the yield curve. Economic circumstances could invert the yield curve, for example if short-term interest rates have been increased in order to curb economic growth or to dampen inflationary pressures.

Long-term sources of debt finance include loan inventory, debentures and long-term loans. These are relatively secure forms of finance: for example, if a company meets its contractual obligations on debentures in terms of interest payments and loan covenants it will not have to repay the finance until maturity. The risk for the company is therefore lower if it finances working capital from a long-term source.

However, long-term finance is more expensive than short-term finance. The shape of the normal yield curve, for example, indicates that providers of debt finance will expect compensation for deferred consumption and default risk, as well as protection against expected inflation. The choice between short-term and long-term debt for the financing of working capital is hence a choice between cheaper but riskier short-term finance and more expensive but less risky long-term debt.

(c) Working capital policies on the method of financing working capital can be characterised as conservative, moderate and aggressive. A conservative financing policy would involve financing working capital needs predominantly from long-term sources of finance. If current assets are analysed into permanent and fluctuating current assets, a conservative policy would use long-term finance for permanent current assets and some of the fluctuating current assets. Such a policy would increase the amount of lower-risk finance used by the company, at the expense of increased interest payments and lower profitability.

Ruby plc is clearly not pursuing a conservative financing policy, since long-term debt only accounts for 2·75% (40/1,450) of non-cash current assets. Rather, it seems to be following an aggressive financing policy, characterised by short-term finance being used for all of fluctuating current assets and most of the permanent current assets as well. Such a policy will decrease interest costs and increase profitability, but at the expense of an increase in the amount of higher-risk finance used by the company.

Between these two extremes in policy terms lies a moderate or matching approach, where short-term finance is used for fluctuating current assets and long-term finance is used for permanent current assets. This is an expression of the matching principle, which holds that the maturity of the finance should match the maturity of the assets.

(d) The objectives of working capital management are often stated to be profitability and liquidity. These objectives are often in conflict, since liquid assets earn the lowest return and so liquidity is achieved at the expense of profitability. However, liquidity is needed in the sense that a company must meet its liabilities as they fall due if it is to remain in business. For this reason cash is often called the lifeblood of the company, since without cash a company would quickly fail. Good working capital management is therefore necessary if the company is to survive and remain profitable.

The fundamental objective of the company is to maximise the wealth of its shareholders and good working capital

management helps to achieve this by minimising the cost of investing in current assets. Good credit management, for example, aims to minimise the risk of irrecoverable debts and expedite the prompt payment of money due from receivables in accordance with agreed terms of trade. Taking steps to optimise the level and age of receivables will minimise the cost of financing them, leading to an increase in the returns available to shareholders.

A similar case can be made for the management of inventory. It is likely that Ruby plc will need to have a good range of stationery and office supplies on its premises if customers' needs are to be quickly met and their custom retained. Good inventory management, for example using techniques such as the economic order quantity model, ABC analysis, inventory rotation and buffer inventory management can minimise the costs of holding and ordering inventory. The application of just-in-time methods of inventory procurement and manufacture can reduce the cost of investing in inventory. Taking steps to improve inventory management can therefore reduce costs and increase shareholder wealth.

Cash budgets can help to determine the transactions need for cash in each budget control period, although the optimum cash position will also depend on the precautionary and speculative need for cash. Cash management models such as the Baumol model and the Miller-Orr model can help to maintain cash balances close to optimum levels.

The different elements of good working capital management therefore combine to help the company to achieve its primary financial objective.

5 Pearl plc

(a) Memorandum

Memo to: Pearl plc Main Board

From: An Accountant

Subject: Alternative Financial Strategies

The present policy is termed a 'matching' financial policy. This attempts to match the maturity of financial liabilities to the lifetime of the assets acquired with this finance. It involves financing long-term assets with long-term finance such as equity or loan inventory and financing short-term assets with short-term finance such as trade credit or bank overdrafts. This avoids the potential wastefulness of over-capitalisation whereby short-term assets are purchased with long-term finance ie the company having to service finance not continuously invested in income-earning assets. It also avoids the dangers of under-capitalisation which entails exposure to finance being withdrawn when the company is not easily able to liquidate its assets. In practice, some short-term assets may be regarded as permanent and it may be thought sensible to finance these by long-term finance and the fluctuating remainder by short-term finance.

The proposed policy is an 'aggressive policy' which involves far heavier reliance on short-term finance, thus attempting to minimise long-term financing costs. This requires very careful manipulation of the relationship between payables and receivables (maximising trade payables and minimising receivables), and highly efficient inventory control and cash management. While it may offer financial savings, it exposes the company to the risk of illiquidity and hence possible failure to meet financial obligations. In addition, it involves greater exposure to interest rate risk. The company should be mindful of the inverse relationship between interest rate changes and the value of its assets and liabilities.

Before embarking on such an aggressive policy, the Board should consider the following factors:

- How good are we at forecasting cash inflows and outflows? How volatile is our net cash flow? Is there any seasonal pattern evident?
- How efficiently do we manage our cash balances? Do we ever have excessive cash holdings which can be reduced by careful and active management?
- Do we have suitable information systems to provide early warnings of illiquidity?
- Do we have any holdings of marketable securities that can be realised if we run into unexpected liquidity problems?
- How liquid are our non-current assets? Can any of these be converted into cash without unduly disrupting productive operations?
- Do we have any unused long- or short-term credit lines? These may have to be utilised if we meet liquidity problems.
- How will the inventory market perceive our switch towards a more aggressive and less liquid financial policy?

(b) Cash management policy

To determine the net benefits of each policy, both cash costs and opportunity costs have to be considered.

First, consider the cash management costs expected from each policy over the course of the forthcoming year.

Policy 1 Selling securities

The cash transaction costs are partly offset by small interest earnings on the average cash balance held. Transactions costs:

Optimal proceeds per sale:	$Q = \sqrt{\frac{2 \times \$1.5m \times \$25}{0.12}} = \$25,000$		
No of sales	$= \frac{\$1.5m}{\$25,000}$	= 60	
Transaction costs	= 60 × $25	=	$1,500
Average cash balances:	$= \frac{\$25,000}{2}$	= $12,500	
Interest on short-term deposits:			
Av cash balance × 5%	= $12,500 × 5%	=	($625)
Total management costs			$875
(TN I)			

Policy 2 Secured loan facility

Assuming an even run-down in cash balances:

Interest charges	= $1.5m × 14%	=	$210,000
Offsetting interest receipts:			
(= average balance × 9%)	$= \frac{\$1.5m}{2} \times 9\%$	=	($67,500)
Arrangement fee:		=	$5,000
Total management costs			$147,500

Hence, the policy of periodic security sales appears greatly superior in cost terms by [$147,500 – $875] = $146,625. However, this simple comparison ignores the income likely to be received from the portfolio of securities under each policy. By taking the secured loan, the company preserves intact its expected returns of [12% × $1.5m = $180,000] from the portfolio. Conversely, making periodic sales from the portfolio during the year lowers the returns to: $[\text{average holding of securities} \times 12\%] = \frac{\$1.5m}{2} \times 12\% = \$90,000$

The net benefits from the two policies can be shown thus:

Security sales			
Income from portfolio	$90,000		
Net management costs	($875)	Net income	$89,125
Loan alternative			
Income from portfolio	$180,000		
Net management costs	($147,500)	Net income	$32,500
		Difference	$56,625

The policy of periodic security sales thus offers greater benefits. However, it is necessary to consider also the company's net worth position at the end of the year ahead. By relying on security sales, the company would avoid the need to repay a loan at the end of the year, but, against this, will have no holdings of securities to fall back on. Moreover, the capital value of this portfolio is uncertain, due to exposure to variation in the return from the portfolio. For example, if money market rates rose over the year, the capital value of the portfolio would probably fall, although the extent of the decrease in value would depend on the nearness to maturity of the securities.

(c) Limitations of cash management policy

- It assumes a steady run-down in cash holdings between successive security sales. In reality, the pattern of cash holdings is likely to be far more erratic, with exceptional demands for cash punctuated by periods of excessive liquidity. However, the period between sales is short enough and the transaction cost low enough to allow flexibility in cash management.
- It allows for no buffer inventory of cash. In reality, security sales are unlikely to be made when cash balances

drop to zero, but when they fall to a level deemed to be the safe minimum.

- It uses a 'highly uncertain' estimate of the return from the portfolio. Emerald should investigate the implications of assuming alternative (higher and lower) rates, and perhaps determine a 'break-even rate' at which the two policies are equally attractive. In this example, the actual rate would have to be well above 12% to achieve this result.
- There may be economies in bulk-selling of securities, although exploiting these would increase the holding cost.

6 Gold

(a) Gold

Initial investment		$100,000
Average investment	$\frac{100,000+15,000}{2}$ =	$57,500
Total return		$107,000
Depreciation		$ 85,000
		$ 22,000
∴ Average return		$4,400

(i) $ARR = \frac{4,400}{57,500} = 7,65\%$

(ii) $ARR = \frac{4,400}{100,000} = 4.4\%$

(iii) Payback period

Time	*Cash flow*	*Cumulative cash flow*
0	(100,000)	-
1	25,000	(75,000)
2	34,000	(41,000)
3	25,000	(16,000)
4	15,000	(1,000)
5	23,000	22,000

Payback period = $4 + \frac{1}{8}$ = **4.125 years**

(b) Silver NPV:

Time	*$*	*25% factor*	*PV*	*15% factor*	*PV*
0	(183,000)	1	(183,000)	1	(183,000)
1-4	70,000	(W1) 2.362	165,340	2.855	199,850
			(17,660)		16,850

$\therefore IRR = 15 + (10 \times \frac{16,850}{34,510}) =$ **19.88%**

$W1: \frac{1-(1+r)^{-n}}{r} = \frac{1-(1.25)^{-4}}{0.25} = 2.362$

(c) Bronze

(i) How to equip new premises:

Cost of new equipment = $1 million

Cost of existing equipment if transferred = $170,000 + $660,000 = $830,000

∴ existing equipment is the cheapest,

(ii) Are new premises worthwhile?

Time		*$'000*	*10% factor*	*PV*
0	Factory MV	(2,600)	1	(2,600)
0	Equipment	(830)	1	(830)
1-15	Returns	384	7.6061	2,920
15	Factory MV	1,800	0.2394	431
				(79)

∴ It is not worthwhile.

7 Opera Ltd

(a) Current return on capital employed

= Operating profit/capital employed = $20m/($75m + $25m) = $20m/$100m = 20%

Analysis of the project.

Project capital requirements are $14m fixed capital plus $0.5m inventories. The annual depreciation charge (straight line) is:

($14m - expected residual value of $2m)/4 = $3m pa

Profit profile ($m)

Year	*1*	*2*	*3*	*4*
Sales	(5.00 × 2m)	(4.50 × 1.8m)	(4.00 × 1.6m)	(3.50 × 1.6m)
	= 10.00	= 8.10	= 6:40	= 5.60
Op: costs	(2.00)	(1.80)	(1.60)	(1.60)
Fixed costs	(1.50)	(1.35)	(1.20)	(1.20)
Depreciation	(3.00)	(3.00)	(3.00)	(3.00)
Profit	3.50	1.95	0.60	(0.20)
Capital employed (start-of-year):	(TN 1)			
Fixed	14.00	11.00	8.00	5.00
Stocks	0.50	0.50	0.50	0.50
Total	14.50	11.50	8.50	5.50

$$\text{Average rate of return} = \frac{\text{Average profit}}{\text{Average capital employed}} = \frac{\$5.85/4}{\$40.0/4} = \frac{\$1.46}{\$10.0} = 14.6\%$$

Note that if receivables were to be included in the definition of capital employed, this would reduce the calculated rate of return, while the inclusion of payables would have an offsetting effect. However, using the ARR criterion as defined, the proposal has an expected return above the minimum stipulated by Fine plc. It is unlikely that the managers of Opera will propose projects which offer a rate of return below the present 20% even where the expected return exceeds the minimum of 10%. To undertake projects with returns in this range will depress the overall divisional return and cast managerial performance in a weaker light.

However, it is unlikely that the senior managers of the Opera subsidiary would want to undertake the project.

(b) ARR

(i) Three problems

The ARR can be expressed in a variety of ways, and is therefore susceptible to manipulation. Although the question specifies average profit to average capital employed, many other variants are possible eg, average profit to initial capital, which would raise the computed rate of return. It is also susceptible to variation in accounting policy by the same firm over time, or as between different firms at a point in time. For example, different methods of depreciation produce different profit figures and hence different rates of return.

Perhaps, most fundamentally, it is based on accounting profits expressed net of deduction for depreciation provisions, rather than cash flows. This effectively results in double-counting for the initial outlay ie, the capital cost is allowed for twice over, both in the numerator of the ARR calculation and also in the denominator. This is likely to depress the measured profitability of a project and result in rejection of some worthwhile investment. Finally, because it simply averages the profits, it makes no allowance for the timing

of the returns from the project.

(ii) Continued use

The continuing use of the ARR method can by explained largely by its utilisation of Statement of Financial Position and Income Statement magnitudes familiar to managers, namely 'profit' and 'capital employed'. 1n addition, the impact of the project on a company's financial statements can also be specified. Return on capital employed is still the commonest way in which business unit performance is measured and evaluated, and is certainly the most visible to shareholders. It is thus not surprising that some managers may be happiest in expressing project attractiveness in the same terms in which their performance will be reported to shareholders, and according to which they will be evaluated and rewarded.

(c) Credit worthiness

Opera intends to achieve a sales increase by extending its debtor collection period. This policy carries several dangers. It implies that credit will be extended to customers for whom credit is an important determinant of supplier selection, hinting at financial instability on their part. Consequently, the risk of later than expected, or even no payment, is likely to increase. Although losses due to default are limited to the incremental costs of making these sales rather than the invoiced value, Opera should recognise that there is an opportunity cost involved in tying up capital for lengthy periods. In addition, companies which are slow payers often attempt to claim discounts to which they are not entitled. Opera may then face the difficult choice between acquiescence in such demands versus rejection, in which case, it may lose repeat sales.

The creditworthiness of customers can be assessed in several ways:

Analyis of accounting statements

In the case of companies which publish their annual accounts, or file them at Companies House, key financial ratios can be examined to assess their financial stability. However, these almost certainly will be provided in arrears and may not give a true indication of the companies' current situation. Some customers may be prepared to supply more up-to-date accounts directly to the seller, although these are unlikely to have been audited.

Analysis of credit reports

It may be possible to obtain detailed assessment of the creditworthiness of customers from other sources, such as their bankers, specialist credit assessment agencies such as Dun & Bradstreet, and from trade sources such as other companies who supply them. These assessments are likely to be more up-to-date than company accounts, but will inevitably be more subjective.

Previous experience

If the firm has supplied the customer in the past, its previous payment record will be available.

Cash-only trial period

If accounting and other data is sparse, and there is no previous trading record with the customer, the seller may offer a trial period over which cash is required, but if the payment record is acceptable (eg, if the customer's cheques always clear quickly), further transactions may be conducted on credit.

Background information

General background information on the industry in which the customer operates will generate insights into the financial health of companies in that sector, and by implication, that of the customer. Many agencies supply such information, although it should only be used as a backup to other assessments.

8 Theatre

(a) Net present value evaluation of investment

After-tax weighted average cost of capital = (11 × 0·8) + (8·6 × (1 – 0·3) × 0·2) = 10%

Year	*1*	*2*	*3*	*4*	*5*
	$000	*$000*	*$000*	*$000*	*$000*
Contribution	440	550	660	660	
Fixed costs	(240)	(260)	(280)	(300)	
Taxable cash flow 200	290	380	360		
Taxation	(60)	(87)	(114)	(108)	
CA tax benefits		60	45	34	92
Scrap value				30	
After-tax cash flows	200	290	338	310	(16)
Discount at 10%	0·9090	8260	7510	6830	621
Present values	182	240	254	212	(10)

	$000
Present value of benefits	878
Initial investment	800
Net present value	78

The net present value is positive and so the investment is financially acceptable. However, demand becomes greater than production capacity in the fourth year of operation and so further investment in new machinery may be needed after three years. The new machine will itself need replacing after four years if production capacity is to be maintained at an increased level. It may be necessary to include these expansion and replacement considerations for a more complete appraisal of the proposed investment.

A more complete appraisal of the investment could address issues such as the assumption of constant selling price and variable cost per kilogram and the absence of any consideration of inflation, the linear increase in fixed costs of production over time and the linear increase in demand over time. If these issues are not addressed, the appraisal of investing in the new machine is likely to possess a significant degree of uncertainty.

Workings

Annual contribution

Year	*1*	*2*	*3*	*4*
	$000	*$000*	*$000*	*$000*
Excess demand (kg/yr)	400,000	500,000	600,000	700,000
New machine output (kg/yr)	400,000	500,000	600,000	600,000
Contribution ($/kg)	1·1	1·1	1·1	1·1
Contribution ($/yr)	440,000	550,000	660,000	660,000

Capital allowance (CA) tax benefits

Year	*Capital allowance ($)*		*Tax× benefit ($)*	
1	200,000	(800,000 × 0·25)	60,000	(0·3 × 200,000)
2	150,000	(600,000 × 0·25)	45,000	(0·3 × 150,000)
3	112,500	(450,000 × 0·25)	33,750	(0·3 × 112,500)
	462,500			
	30,000	(scrap value)		
	492,500			
4	307,500	(by difference)	92,250	(0·3 × 307,500)
	800,000			

(b) Internal rate of return evaluation of investment

Year	*1*	*2*	*3*	*4*	*5*
	$000	*$000*	*$000*	*$000*	*$000*
After-tax cash flows	200	290	338	310	(16)
Discount at 20%	0·833	0·694	0·579	0·482	0·402
Present values	167	201	196	149	(6)

	$000
Present value of benefits	707
Initial investment	800
Net present value	93

Internal rate of return = 10 + [((20 – 10) × 78)/(78 + 93)] = 10 + 4·6 = 14·6%

The investment is financially acceptable since the internal rate of return is greater than the cost of capital used for investment appraisal purposes. However, the appraisal suffers from the limitations discussed in connection with net present value appraisal in part (a).

(c) Risk refers to the situation where probabilities can be assigned to a range of expected outcomes arising from an investment project and the likelihood of each outcome occurring can therefore be quantified. Uncertainty refers to the situation where probabilities cannot be assigned to expected outcomes. Investment project risk therefore increases with increasing variability of returns, while uncertainty increases with increasing project life. The two terms are often used interchangeably in financial management, but the distinction between them is a useful one.

Sensitivity analysis assesses how the net present value of an investment project is affected by changes in project variables. Considering each project variable in turn, the change in the variable required to make the net present value zero is determined,or alternatively the change in net present value arising from a fixed change in the given project variable. In this way the key or critical project variables are determined. However, sensitivity analysis does not assess the probability of changes in project variables and so is often dismissed as a way of incorporating risk into the investment appraisal process.

Probability analysis refers to the assessment of the separate probabilities of a number of specified outcomes of an investment project. For example, a range of expected market conditions could be formulated and the probability of each market condition arising in each of several future years could be assessed. The net present values arising from combinations of future economic conditions could then be assessed and linked to the joint probabilities of those combinations. The expected net present value(ENPV) could be calculated, together with the probability of the worst-case scenario and the probability of a negative net present value. In this way, the downside risk of the investment could be determined and incorporated into the investment decision.

9 Ballet plc

(a) Calculation of NPV

EV = (0.3 × 0.50) + (0.5 × 1.40) + (0.2 × 2.0) = 0.15 + 0.70 + 0.40 = $1.25m

To determine the NPV of the project, Ballet must weigh the present value of the costs incurred ie the outlay and the increased production costs, against the benefits in the form of the two sets of tax reliefs relating to the increased operating costs and to the writing-down allowance and also the present value of the fines avoided. These are set out in the following table.

	Year					
Item ($m)	*0*	*1*	*2*	*3*	*4*	*5*
Outlay	(1.000)					
EU grant		0.250				
ABC's fee		(0.050)				
Increased costs		(0.315)	(0.331)	(0.347)	(0.365)	
Tax saving at 33%			0.104	0.109	0.115	0.120
WDA	0.250	0.188	0.141	0.105	0.316	
Tax saving at 33%		0.083	0.062	0.047	0.035	0.104
Net cash flows	(1.000)	(0.032)	(0.165)	(0.191)	(0.215)	0.224
Discount factor at 12%	1.000	0.893	0.797	0.712	0.636	0.567
PV	(1.000)	(0.029)	(0.132)	(0.136)	(0.137)	0.127

NPV = (1.307), ie ($1.307m)

Since the negative NPV exceeds the expected present value of the fines ($1.25M) over the same period, it appears that the project is not viable in financial terms (i.e.) it is cheaper to risk the fines.

(b) Memorandum

Memo to: Ballet plc Main Board.

Subject: Proposed Pollution Control Project.

From: XYZ.

Date: 31/10/2007

On purely non-financial criteria, it can be suggested that as a regular violator of the environmental regulation, our company has a moral responsibility to install this equipment, so long as it does not jeopardise the long-term survival of the company.

But the figures appended suggest that the project is not wealth-creating for Ballet's shareholders as the EV of the fines is less than the expected NPV of the project. However, this conclusion relies on accepting the validity of the probability distribution, which is debatable. Not only are the magnitudes of the fines merely estimates, but the probabilities shown are subjective. Different decision-makers may well arrive at different assessments which could lead to the opposite decision on financial criteria.

More fundamentally, the use of the expected value principle is only reliable when the probability distribution approximates to the normal. In this case, it is slightly skewed toward the lower outcomes. But more significantly, if the distribution itself is examined more closely, it appears to indicate that there is a 70% chance (0.5+0.2) of fines of at least $ 1 4m, which exceeds the NPV of the costs of the pollution control project. In other words, there is a 70% chance that the project will be worthwhile. It therefore seems perverse to reject it on these figures.

Moreover, given that Ballet is a persistent offender, and that the green lobby is becoming more influential, there must be a strong likelihood that the level of fines will increase in the future, suggesting that the data given are under-estimates. Higher expected fines would further enhance the appeal of the project.

It is also possible that the company may sell more output, perhaps at a higher price, if it is perceived to be more environmentally friendly and if customers are swayed by this. This may be less likely for industrial companies although it would create opportunities for self-publicity on both sides. In addition, there may be more general image effects which may foster enhanced self-esteem among the workforce, as well as increasing the acceptability of the company in the local community. It is even possible that the company's share price may benefit from managers of `ethical' investment funds deciding to include Ballet in their portfolios.

Finally, this may be only a short-term solution. As the operating life of the equipment is only four years, we will face a further investment decision after this period, although technological and legal changes may well have altered the situation by then.

10 Glitter Railways

(a) Data

Discount rate (%)	10
Tax rate (%)	30
Variable cost proportion (%)	65
Occupancy rate (%)	60
No. of carriages	8
Passenger numbers per carriage	55
Number of trips	10
Average price per passenger ($)	12
Annual days travelling	340

CA Calculation

Year to 31 December	*31/12/05 ($000 s)*	*31/12/06 ($000 s)*	*31/12/07 ($000 s)*	*31/12/08 ($000 s)*	*31/12/09 ($000 s)*	*Total allowances* ($000 s)
TWDV	5,000	3,750	2,812	2,109	1,582	
WDA	1,250	938	703	527		
Sale proceeds					500	
Balancing allowance					1,082	
Tax Allowance	375	281	211	158	325	1,350
Capital projections						
Initial investment and proceeds	(5,000)				500	
Capital allowances	375	281	211	158	325	
Net capital flows	(4,625)	281	211	158	825	
Discount factor	1	0·909	0·826	0·751	0·683	
PV capital flows	(4,625)	256	174	119	563	
NPV of capital flows	(3,513)					

Projected revenue = 0·6 × 8 × 55 × 10 × 12 × 340 = $10,771,200

Annuity approach

Year	0	1-5
Projected revenue		10,771
Variable costs		(7,001)
Additional fixed costs		(1,000)
Incremental net revenues		2,770
Tax		(831)
Post tax		1,939
Discount factor		3·791
PV revenue flows		7,351
NPV of revenue flows except perpetuity	7,351	
Perpetuity of lost flows net of tax	(1,750)[1]	
NPV of capital flows	(3,513)	
Total NPV	2,088	

Decision: Contract is worthwhile

Subject to rounding errors the extended approach produces the same answer.

[1] Perpetuity = (250 × (1 0·3))/0·1 = 1,750

Basic approach

Year	*31/12/05*	*31/12/06*	*31/12/07*	*31/12/08*	*31/12/09*	*31/12/10*
Net operating cash flow projections						
Projected revenue		10,771	10,771	10,771	10,771	10,771
Variable costs		(7,001)	(7,001)	(7,001)	(7,001)	(7,001)
Additional fixed costs		(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
Incremental net revenues		2,770	2,770	2,770	2,770	2,770
Tax		(831)	831)	(831)	(831)	(831)
Post tax revenues		1,939	1,939	1,939	1,939	1,939
Discount factor		0·909	0·826	0·751	0·683	0·621
PV revenue flows		1,763	1,602	1,456	1,324	1,204
NPV of net operating flows	7,349					
except perpetuity						
Perpetuity of lost flows net of tax	(1,750)					
Capital projections	(3,513)					
(See calculation above)						
Total NPV	2,086					

Decision: Contract is worthwhile

(b) It is quite possible to answer this and the next question by trial and error using the cash flow structures outlined. A quicker method is to use the structure of the cash flows to identify the relationship of price to the remaining variables. Thus, if:

p = average price

cr = contribution rate = 0·35

oh = incremental overhead = 1000

t = corporation tax rate = 0·3

A_n = annuity factor

r = occupancy rate

Total revenue = p × occupancy rate × number of carriages × number of trips per day × number of days per year × number of passengers per carriage = p × 0·6 × 8 × 10 × 340 × 55 = 897·6p. Thus, profit can be defined as:

NPV = A_n [(897·6p × cr – oh)(1 – t)] + Perpetuity + NPV capital flows = 0, for break even.

NPV = 3·791[897·6p × 0·35 – 1,000]0·7 – 1,750 – 3,513 = 0

897·6p × 0·35 – 1,000 = 5,263/(0·7 × 3·791) = 1,983

p = (1,983 + 1,000)/(0·35 × 897·6) = 9·50

Sensitivity is therefore: (12 9·50)/12 = 20·83%

More succinctly, the same result can be derived via interpolation. A 10% change in contribution gives rise to a change in NPV of:

(10,771 – 7,001) × 0·1 × 0·7 × 3·791 = $1,000,444, or $1,000 to three figures.

To reduce NPV of the project to zero requires a (2,087/1,000) × 10% = 2 × 10% = 20% (approximate) change in price.

(c) (i) As before, total revenue = p × occupancy rate × number of carriages × number of trips per day × number of days per year × number of passengers per carriage = 12 × r × 8 × 10 × 340 × 55 = 17,952r. Thus, profit can be defined as:

NPV = An [(17,952r × cr – oh)(1 – t)] + Perpetuity + NPV capital flows = 0, for break even.

NPV = 3·791[17,952r × 0·35 – 1,000]0·7 – 1,750 – 9,220 = 0

3·791[17,952r × 0·35 – 1,000]0·7 = 10,970

17,952r × 0·35 – 1,000 = 10,970/(0·7 × 3·791)

r = (4,134 + 1,000)/(0·35 × 17,952) = 0·817 or 82%.

(ii) Profit can be defined as before:

NPV = A_n [(10,771 × cr – oh)(1 – t)] + Perpetuity + NPV capital flows = 0, for break even.

This time we can solve for An to find the length of the contract:

A_n[1,939] – 1,750 – 9,220 = 0

A_n[1,939] = 10,970

A_n = 10,970/1,939 = 5·658

Examining the annuity tables under the 10% column for a figure closest to 5·658 we find that project length, expressed in whole years, should be at least 9 years long (at 9 years the annuity figure is 5·759).

(d) Report on Business Risk for Glitter Railways plc

Author: XYZ

Date: December 2005

Introduction

In the light of the possibility of an extension to the contract to service the main railway line this report makes an assessment of the background and specific risk relating to the project.

What is meant by business risk

1. Basic description: risk is related to the lack of certainty of future outcomes and is fundamentally related to decision making, such as the project proposed, in that business decisions are always taken against a background of risk. Because of that, it becomes important to understand the risk exposure that exists. At a basic level risk is positively associated with return in that the higher the return we expect from a project, the higher the degree of risk it is likely to be exposed to.

2. Chance and Probability: risk is associated with chance or probability in ways that allow us to quantify the degree of risk we face. This is particularly relevant to businesses that face variability in projected outcomes, for example, so that a fairly clear idea can be formed of the profit impact of risk. In the contract extension facing Glitter Railways, project outcome has been assessed using NPV techniques that assume cash flows are certain (without risk). However, the cash flows are dependent on projections of future passenger occupancy, prices charged, implicit zero inflation, the relation of variable costs to sales, discount rates, constant tax rates and so on. In fact, every component of the calculation is subject to risk because we cannot be certain of ensuring that the figures we use will actually arise when the time comes or even at the time we project. Under such circumstances, we can only estimate the most likely figures and the most likely times and accept that we may be wrong on either or both counts.

3. Time: risk is also related to the length of time the projections extend. There is an important distinction at this point between constant risk and increased exposure. For example, we may assume that passenger occupancy stays constant at 60% and we may feel that there is a risk associated with being wrong in this projection by a factor of 1% or +1% each year. Whilst risk might remain constant at ±1% each year, it is feasible that after five years projected passenger occupancy could be less than 55% or over 65%. Compounding effects of risk on risk over successive periods means that risk exposure grows without having to alter the risk percentage faced.

4. Negative and Positive Variability: another important point relates to risk being both a good or bad thing. Risk, in the context of NPV projections, relates to variability of returns, both positive and negative. Thus, whilst you may not welcome negative variability in income, you would welcome it in relation to costs. Thus risk is not only related to unwelcome outcomes, although it is often misperceived as such.

5 Uncertainty: risk can also arise but may be unforeseen. This is perhaps the most important aspect in that, whilst we may be able to anticipate variability in incomes, we may not anticipate fully the risk we are exposed to or the form it will take (variability in sales revenues may be more than we anticipate, for example). This is the hardest aspect of risk to judge.

Methods of estimating the degree of business risk$_2$

Because risk affects decisions in such a fundamental way, businesses attempt to estimate risk as a way of putting in place contingency plans and/or evaluating if the project is likely to produce a profitable outcome. This is usually incorporated into NPV decisions in a number of ways:

1. Sensitivity Analysis: this is one method which is widely used by which an assessment may be made of how responsive a project s NPV is to changes in its components. Thus, an idea may be gained of to what extent prices charged for a good or service have to reduce by before a zero NPV is produced. This technique can be applied to any cost, including initial capital costs, and also to the discount rate. Sensitivity is normally expressed as a percentage. Some of the difficulties associated with the technique are as follows:

   » the analysis can only deal with changes in one key factor at a time. It cannot deal with multiple

changes in NPV components which may well arise.

» no idea is given in sensitivity analysis of the likelihood of occurrence of a key variable changing to the extent to produce a zero NPV. In other words, it measures the percentage change required to produce a catastrophic result but does not indicate if this has a low, medium or high chance of occurring.

» as with any risk assessment, sensitivity analysis is only a guide. It cannot tell managers how important such a risk exposure is to the company. In order to assess this, the risk proclivity or otherwise, of the managers needs to be determined. In other words, a high return/high risk company will want to be exposed to more risk than a low return/ low risk company.

2. Probability analysis: this approach attempts to use measures which indicate just how variable cash flows are. It addresses one of the key criticisms of the sensitivity approach in that it provides an idea of how much variability is likely whereas sensitivity analysis indicates the room for manoeuvre without an assessment of the likelihood that any such event will arise. Probability analysis is essentially a weighted average approach where the averages are determined by pre-set probabilities. By doing this, expected cash flows emerge based on the most likely outcomes. The degree of variability of the expected outcomes may be estimated from the standard deviation of the net present value. It is in this calculation that we at least get some idea of the degree of risk a project is exposed to, which can be expressed in terms of a range of NPVs. The important drawback of this approach is that a good idea of what probability weights to use must first be established. This can never be determined with 100% accuracy for project cash flows that arise in the future simply because the future is uncertain and so are the probabilities.

3. Decision trees: this is similar to a probability approach in that it relies on weighting future cash flows by probabilities to arrive at an overall average. The distinctive feature of decision trees is that certain cash flow outcomes can be made contingent on certain previous ones arising. Decision trees are most useful in expressing, in a systematic manner, the different project outcomes that may emerge. Formally, the technique is no different to that of using compound probabilities and hence the criticisms of probabilities apply here also.

4. Simulation models: this method allows management to vary changes in the different cash flows simultaneously. As such it gives an idea of the variability in project cash flows overall by allowing changes in many of the outcomes. It can only give an idea since the number of changes allowed can be quite large and, when compounded together, the number of different combinations becomes unmanageable in terms of trying to interpret what is going on. The key advantage of this technique is that it allows an idea of the most likely range of project outcomes that could possibly emerge. However, the technique requires many computations to be carried out.

Methods of reducing business risk

Risk can only be reduced to the extent that management can control events. Risk associated with uncontrollable events cannot be manipulated. There are a variety of ways that management can respond to risky situations:

- undertake short payback projects. This is related to the fact that risk exposure increases with time because of its compounding effect even though the degree of risk may remain constant (this point is explained above).
- avoid risky projects. If riskless projects are undertaken then only a risk free return could be expected. This may not satisfy shareholders.
- ensure proper evaluations of risk are undertaken so that unnecessary exposure to risk is avoided.
- employ risk avoidance project selection strategies. Management should not undertake high risk projects simultaneously which might produce undesirable risk exposure to the business as a whole.
- combine projects to diversify risk.

11 Orange

(a) Why convertibles might be an attractive source of finance for companies

1. Convertibles can provide immediate finance at lower cost since the conversion option effectively reduces the interest rates payable.
2. They represent attractive investments to investors since they are effectively debt risks for future equity benefits. Hence, finance is relatively easily raised.
3. Should the company's assumption regarding the likelihood of conversion prove true then there is no problem of establishing a large sinking fund for the redemption of the debentures.
4. Convertibles allow for higher gearing levels than would otherwise be the case with straight debt (interest costs are potentially lower with convertibles).

(b) (i) Calculate PV of cash flows

	Interest (8%)	*PV at 15%*	
1	8	6·95	
2	8	6·05	
3	8	5·26	
4	8	4·57	
5	8	3·97	
5 (Conversion): 4 × 45 × 0·497		89·46	
Estimated market value:		$116·26	per $100 of debentures

The value of 45 shares in 5 years' time is expected to be $4 × 45 = $180. The value of debenture redemption will be $110. Hence it is likely that conversion will take place. (ii) Arguably, the most important reservation concerns the future value of the share since it is likely to be the most uncertain aspect of the calculation. Other factors that may be relevant, but which are less uncertain, are issue price, and the cost of capital used.

(c) By maximising the conversion premium the greatest amount of funds are raised for the fewest number of new shares issued.

Companies can issue convertibles with a high conversion premium because, firstly, the calculation in part (a)i produces a positive NPV against issue costs and, secondly, because there is high growth potential in share value.

(d) Financial intermediation refers to the role of a bank or other financial institution that serves to bring together lenders and borrowers. Investors are seeking avenues to place surplus funds whilst companies are seeking sources of finance. Because of the disparate nature of both investors and companies it is difficult to match investors to a company where the requirements of the investor are met and the needs of the company are satisfied. Thus, banks (as an example) act as a conduit through which investors can place funds and companies can borrow funds. In return, investors obtain interest on their deposits and the banks obtain interest on their loans. Clearly, the interest charged by the bank to the company is higher than it pays out to investors.

The role that financial intermediaries perform is to pool together investor funds to facilitate easy access by companies. Without financial intermediaries, companies would almost certainly face capital shortages.

The benefits of financial intermediation are as follows:

1. Investors can pool their funds in a bank deposit account to facilitate access by companies to larger resources than would otherwise be the case. This enables companies to:
   - (a) Exploit investment opportunities that would otherwise be untapped.
   - (b) Become larger than would otherwise be the case and thus take advantage of economies of scale.
   - (c) Find capital readily and easily thus reducing the costs associated with raising funds.
   - (d) Reduce the cost of finance since:
     - (i) banks can, with their greater financial expertise, more accurately assess the risk of corporate investments.
     - (ii) banks can diversify their risk across many companies thus lowering their required rate of return which, in turn, reduces the cost base on which interest charges to companies will be referenced.
     - (iii) banks can reduce interest costs because of their size. They are able to borrow on the wholesale market at rates that are not accessible to small banks or individual investors.

(e) Bridge the maturity gap. Banks can lend longer term than individual investors desire since banks will have access to a level of funds that is largely constant irrespective of a high turnover of constituent investors.

(f) Access finance for high risk projects that banks may find acceptable because of their capacity to diversify.

2. Investors benefit substantially from financial intermediation because:

(a) By investing in a market or bank, investors can get access to diversified portfolios which might otherwise be difficult. Since their funds are pooled, investors benefit from the banks' abilities to aggregate funds and allocate them efficiently.

(b) Investors can access bank expertise in assessing corporate risk, thus obtaining the best return for a particular level of risk.

(c) Investor risk is reduced because of the banks' diversifying activities. Minimised risk, subject to a required rate of return, is passed onto investors in a competitive banking market.

(d) Legislation that provides for investor protection should a bank fail (in terms of either central bank support or investor guarantee schemes by other banks), further reduces the risk investors face.

(e) Investors can choose their exposure to a particular level of risk subject to depositing money in appropriate funds. For example, mutual funds offer a range of risk profiles from which the investor can choose.

12 Blue

(a) Blue plc

$$K_e = \frac{0.024}{0.30 - 0.024} = 8.7\%$$

(b) Red plc

Growth rate, g:

$$(1+g)^4 = \frac{25}{15} = 1.667 \therefore g = 13.62\%$$

$$K_e = \frac{0.25 \times 1.1362}{3} + 0.1362 = \mathbf{23.1\%}$$

(c) White plc

$$K_e = \frac{0.14 \times 1.06}{1.40} + 0.06 = \mathbf{16.6\%}$$

E= 400,000 × 1.40 = $560,000

K_d:

Time	*$*	*10%*	*PV*	*20%*	*PV*
0	(78)	1	(78)	1	(78)
1–6	12	4.355	52.26	3.326	39.91
6	105	0.564	59.22	0.335	35.18
			33.48		(2.91)

$$\therefore K_d = 10 + \ 10 \times \frac{33.48}{33.48 + 2.91} \ = 19.2\%$$

D = 600,000 × .78 = $468,000

$$\therefore \text{WACC} = \frac{(560{,}000 \times 16.6) + (468{,}000 \times 19.2)}{1{,}028{,}000} = 17.8\%$$

(d) Yellow plc

$$K_d = \frac{15}{130-15} = 13.04\%$$

E = 1 million × 1.15 = $1.15 million

K_d:

Time	*$*	*10%*	*PV*	*5%*	*PV*
0	(90)	1	(90)	1	(90)
1–5	3.25	3.791	12.32	4.329	14.07
5	100	0.621	62.10	.784	78.80
			(15.58)		2.47

$$K_d = 5 + \ 5 \times \frac{2.47}{18.05} \ = 5.68\%$$

D = 500,000 × .90 – $450,000

$$WACC = \frac{(1{,}150{,}000 \times 13.04) + (450{,}000 \times 5.08)}{1{,}600{,}000} = 10.97\%$$

13 XYZ

(a) WACC

K_e = 15/130 = 11.5%

K_d (after tax) = 9 × (1–0.35)/95 = 6.2%

E= 100,000 × 1.30 = $130,000

D = 95% × 80,000 = $76,000

$$WACC = 11.5\% \times \frac{130}{(130+76)} + 6.2\% \times \frac{76}{(130+76)} = 9.5\%$$

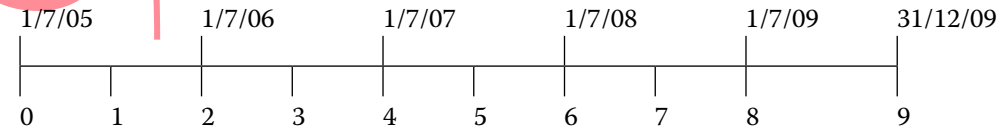
(b) Internal Rate of Return to company per period

Time	*$*	*DF@ 10%*	*PV* *$*	*DF@ 15%*	*PV* *$*
0	(75)	1	(75)	1	(75)
1 – 5	9(1–0.35)	3.791	22.18	3.352	19.61
5	110	0.621	68.31	0.497	54.67
		15.49		(0.72)	

Using linear interpolation

$$IRR + 10\% + \frac{15.49}{15.49+0.72} \times 5\% = \text{approx.}14.78\%$$

(c)



Internal Rate of Return to investors

Time	*$*	*DF@ 5%*	*PV* *$*	*DF@0%*	*PV* *$*
0	(97)	1	(97)	1	(97)
1 – 9	4(1–0.35)	7.108	18.48	9	23.40
9	100	0.645	64.50	1	100
			(14.02)		26.40

Using linear interpolation

$$\text{IRR} = 0\% + \frac{26.40}{14.02 + 26.40} \times 5\% = \text{approx. } 3.3\%$$

This is equivalent to $R=(1+r)^n - 1 = (1 + 0.033)^2 = \text{approx. } 6.7\%$ per annum

14 Little plc

(a) Techniques for protecting against the risk of adverse foreign exchange movements include the following.

(i) A company could trade only in its own currency, thus transferring all risks to suppliers and customers.

(ii) A company could ensure that its assets and liabilities in any one currency are as nearly equal as possible, so that losses on assets (or liabilities) are matched by gains on liabilities (or assets).

(iii) A company could enter into forward contracts, under which an agreed amount of a currency will be bought or sold at an agreed rate at some fixed future date or, under a forward option contract, at some date in a fixed future period.

(iv) A company could buy foreign currency options, under which the buyer acquires the right to buy (call options) or sell (put options) a certain amount of a currency at a fixed rate at some future date. If rates move in such a way that the option rate is unfavourable, the option is simply allowed to lapse.

(v) A company could buy foreign currency futures on a financial futures exchange. Futures are effectively forward contracts, in standard sizes and with fixed maturity dates. Their prices move in response to exchange rate movements, and they are usually sold before maturity, the profit or loss on sale corresponding approximately to the exchange loss or profit on the currency transaction they were intended to hedge.

(vi) A company could enter into a money market hedge. One currency is borrowed and converted into another, which is then invested until the funds are required or funds are received to repay the original loan. The early conversion protects against adverse exchange rate movements, but at a cost equal to the difference between the cost of borrowing in one currency and the return available on investment in the other currency.

(b) (i) 1 Forward exchange market

The rates are:

	$/£
Spot	1.7106 – 1.7140
3 months forward	1.7024 – 1.7063
6 months forward	1.6967 – 1.7006

The net payment three months hence is $116,000 – $197,000/1.7063 = £546.

The net payment six months hence is $(447,000 – 154,000)/1.6967 = £172,688.

Note that the dollar receipts can be used in part settlement of the dollar payments, so only the net payment is hedged.

2 Money market

$197,000 will be received three months hence, so $197,000/(1 + 0.09 × 3/12) may be borrowed now and converted into sterling, the dollar loan to be repaid from the receipts. The net sterling payment three months hence is

$$£116{,}000 - \frac{\$197{,}000}{1 + \left(0{,}009 \times \frac{3}{12}\right)} \times \frac{1}{1.7140} \times \left(1 + (0.095 \times \tfrac{3}{12})\right) = £924$$

The equation for the $197,000 receipt in three months is to calculate the amount of dollars to borrow now (divide by the dollar borrowing rate) and then to find out how much that will give now in sterling (divide by the exchange rate). The final amount of sterling after three months is given by multiplying by the sterling lending rate.

$293,000 (net) must be paid six months hence. We can borrow sterling now and convert it into dollars, such that the fund in six months will equal $293,000. The sterling payment in six months time will be the principal and the interest thereon. A similar logic applies as for the equation above except that the situation is one of making a final payment rather than a receipt.

The sterling payment six months hence is therefore

$$\frac{293{,}000}{1 + 0.06 \times \frac{6}{12}} \times \frac{1}{1.7106} \times \left(1 + 0.125 \times \tfrac{6}{12}\right) = £176{,}690$$

(ii) Available put options (put, because sterling is to be sold) are at $1.70 (cost 3.45 cents per $) and at $1.80 (cost 9.32 cents per $).

Using options at \$1.70 gives the following results.

$$\frac{\$293{,}000}{1.70\$/£} = £172{,}353$$

$$\text{Contracts required} = \frac{£172{,}353}{£12{,}500} = 14 \text{ (to the next whole number)}$$

Cost of options = 14 × 12,500 × 3.45 cents = \$6,038.

14 contracts will provide, for £12,500 × 14 = £175,000, \$(175,000 × 1.70) = \$297,500

$$\text{The overall cost is } £175{,}000 + \frac{\$293{,}000 + \$6{,}038 - \$297{,}500}{1.6967} = £175{,}906$$

As this figure exceeds the cost of hedging through the forward exchange market (\$172,688), use of \$1.70 options would have been disadvantageous.

Note. The rate of 1.6967 is used instead of 1.7006 because buying 14 contracts leaves the company slightly short of dollars (by \$293,000 + \$6,038–\$297,500 = \$1,538).

Using options at \$1.80:

$$\frac{\$293{,}000}{1.80\$/£} = £162{,}778$$

$$\text{Contracts required} = \frac{£162{,}778}{£12{,}500} = 14 \text{(to next whole number)}$$

Cost of options = 14 × 12,500 × 9.32 cents = \$16,310

14 contracts will provide, for £12,500 × 14 = £175,000, 175,000 × 1.80 = \$315,000

$$\text{Theoverall cost is } £175{,}000 + \frac{\$293{,}000 + \$16{,}310 - \$315{,}000}{1.7006} = £171{,}654$$

This figure is less than the cost of hedging through the forward exchange market, so use of \$1.80 options would have been preferable.

15 Banks

(a) According to the International Fisher Effect (IFE) interest rate differentials between any two countries provide an unbiased predictor of future changes in the spot rate of exchange.

If interest rates are 6% in the UK, and 8.5% in the USA the expected annual change in spot exchange rates is:

$$\frac{0.085 - 0.06}{1.06} = 2.358\% \text{ with the dollar WEAKENING against pound}$$

The expected exchange rate in two years time is \$1.5240 $(1.02358)^2$ = \$1.5967/£

The non-executive director has based her estimate on the International Fisher Effect, and has correctly calculated the expected change in exchange rates.

However, this does NOT mean that the exchange rate in two years time will be \$l.5967/\$ Reasons for this rate:

(i) The interest rate differential may change during the next two years

(ii) Even if the interest differential remains constant the IFE is an unbiased, not accurate, predictor of future exchange rates.

(iii) Exchange rates may not be in equilibrium at the current time. The IFE predicts movements from an equilibrium position.

(iv) Factors other than interest rates influence exchange rates, including government intervention in foreign exchange markets.

(b) The most likely reason for the differences in the forecasts of the banks is that they have based their forecasts on different economic assumptions and/or used different types of forecasting model.

Different assumptions about inflation rates, interest rates, unemployment levels, balance of payments, economic growth, which political party will be in power etc. will lead to wide variations in forecasts.

Forecasts may be based on purchasing power parity, IFE or other elements of the four way equivalence model, on macro-economic factors such as flow of funds and the balance of payments, on charting exchange rate trends in order to spot patterns of future exchange rate movements, on econometric modelling, or a combination of such methods. Each of these forecasting methods is likely to produce different results.

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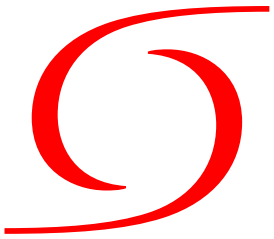

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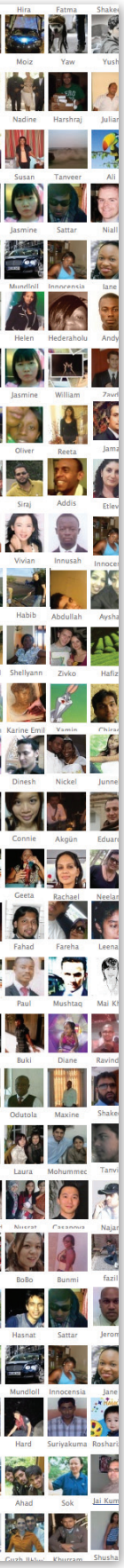

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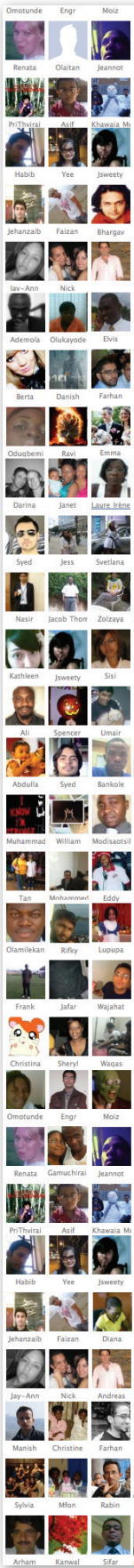

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