ACCA

FM

Financial Management

Integrated Workbook

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FORMULAE AND TABLES

Economic order quantity

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

Miller-Orr Model

$$\text{Return point} = \text{Lower limit} + \left(\frac{1}{3} \times \text{spread}\right)$$

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

The Capital Asset Pricing Model

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

The asset beta formula

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

The Growth Model

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

Gordon's growth approximation

$$g = br_e$$

The weighted average cost of capital

$$\text{WACC} = \left[\frac{V_e}{(V_e + V_d)}\right] K_e + \left[\frac{V_d}{V_e + V_d}\right] K_d\,(1-T)$$

The Fisher formula

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

Purchasing power parity and interest rate parity

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

Present value table

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

Where r = discount rate

n = number of periods until payment

Periods (n)	Discount rate (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239

Periods (n)	Discount rate (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065

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 until payment

Periods (n)	Discount rate (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606

Periods (n)	Discount rate (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.968	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675

Chapter 1

The financial management function

Outcome

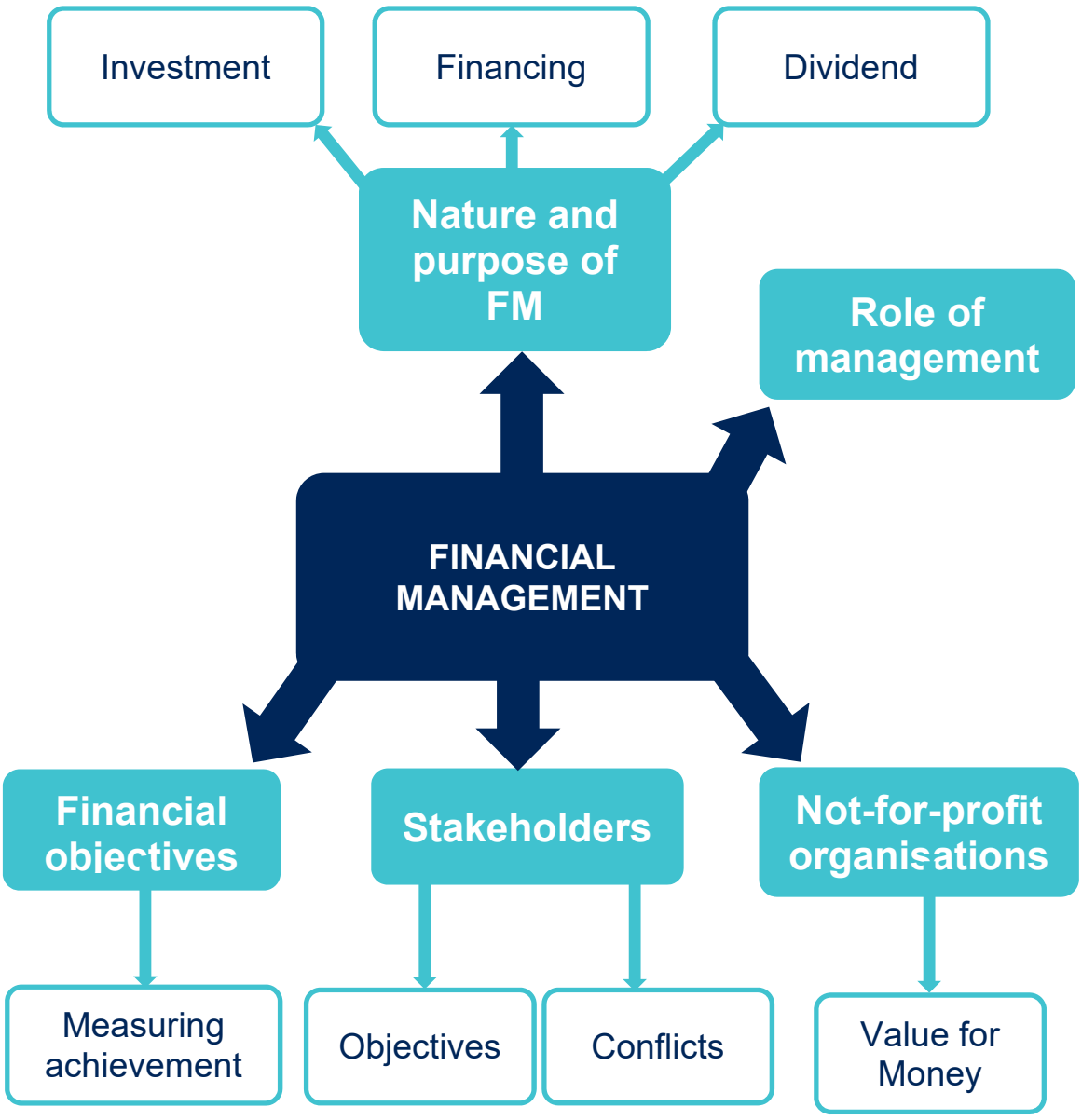
By the end of this session, you should be able to:

- explain the nature and purpose of financial management (FM)
- distinguish between FM and financial and management accounting
- discuss the relationship between financial objectives, corporate objectives and corporate strategy
- identify and describe a variety of financial objectives, including shareholder wealth maximisation, profit maximisation and earnings per share growth
- identify stakeholders, their objectives and possible conflicts and discuss those conflicts
- discuss the role of management in meeting stakeholder objectives, including the use of agency theory
- explain ways to encourage the achievement of stakeholder objectives, including managerial reward schemes and regulatory requirements
- discuss the impact of not-for-profit status on financial and other objectives
- discuss the nature and importance of Value for Money as an objective in not-for-profit organisations
- discuss ways of measuring the achievement of objectives in not-for-profit organisations

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 1 of your Study Text

Overview


Investment
Financing
Dividend
Nature and purpose of FM
Role of management
FINANCIAL MANAGEMENT
Financial objectives
Stakeholders
Not-for-profit organisations
Measuring achievement
Objectives
Conflicts
Value for Money

1 The nature and purpose of financial management

1.1 Financial management decisions

Financial management is concerned with the efficient acquisition and deployment of both short- and long-term financial resources, to ensure the objectives of the enterprise are achieved.

Decisions must be taken in three key areas:

Investment decision

Financing decision

Dividend decision

Notes

1.2 Financial roles

Financial management should be distinguished from other important financial roles:

- **management accounting**

- **financial accounting**

The impact of external economic forces (such as interest rates, inflation, exchange rates) needs to be considered before objectives can be set.

Conflicts will often arise between different stakeholder groups (e.g. shareholders requiring dividends and employees requiring pay rises).

Notes

2 Financial objectives

2.1 Shareholder wealth maximisation

Shareholder wealth maximisation is a fundamental principle of financial management.

Companies may also have other objectives such as:

- profit maximisation
- growth
- market share
- social responsibilities.

2.2 Measuring achievement

Ratio analysis is commonly used to measure the progress of a company towards its objectives.

Ratio analysis compares and quantifies relationships between financial variables. You will see ratios in detail in a later chapter.

Notes

3 Stakeholders

A stakeholder group is one with a vested interest in the company.

Typical stakeholders for an organisation would include:

- internal
- connected
- external

The various stakeholders will have different needs and objectives. Conflict between and within groups of stakeholders and the need for management to balance the various interests is a key issue.

Notes

4 The role of management

4.1 Agency theory

Agency theory is often used to describe the relationships between the various interested parties in a firm and can help to explain the various duties and conflicts that occur.

Agency relationships occur when one party, **the principal**, employs another party, **the agent**, to perform a task on their behalf. In particular, directors (agents) act on behalf of shareholders (principals).

Issues arise when the shareholders who own the company and the directors/managers who run the company have different interests with regard to it.

4.2 Managerial reward schemes

One way to help ensure that managers take decisions that are consistent with the objectives of shareholders is to introduce carefully designed remuneration packages. The schemes should:

- be clearly defined, impossible to manipulate and easy to monitor
- link rewards to changes in shareholder wealth
- match managers' time horizons to those of shareholders
- encourage managers to adopt the same attitudes to risk as shareholders.

Notes

4.3 Corporate governance codes

The director/shareholder conflict has also been addressed by the requirements of a number of corporate governance codes. The following key areas relate to this conflict:

- Non-executive directors (NEDs)

- Executive directors

Notes

5 Not for profit organisations

5.1 Objectives

The primary objective of not for profit organisations (NFPs or NPOs) is not to make money but to benefit prescribed groups of people.

NFPs will use a mix of financial and non-financial objectives.

However, unlike companies, the non-financial objectives are often more important for NFPs:

- key objectives may be difficult to quantify, especially financial ones
- multiple and conflicting objectives are common.

5.2 Value for money (3Es)

Value for money can be defined as 'achieving the desired level and quality of service at the most economical cost'.

It can be measured using the 3 Es:

- economy
- efficiency
- effectiveness

Notes

Questions

Chapter 2

Basic investment appraisal techniques

Outcome

By the end of this session, you should be able to:

- define a relevant cash flow (and distinguish it from an accounting profit)
- identify and calculate relevant cash flows in a scenario
- calculate the payback period and use it to appraise an investment
- discuss the usefulness of payback as an investment appraisal method
- calculate return on capital employed (ROCE) (accounting rate of return) and use it to appraise an investment
- discuss the usefulness of ROCE as an investment appraisal method

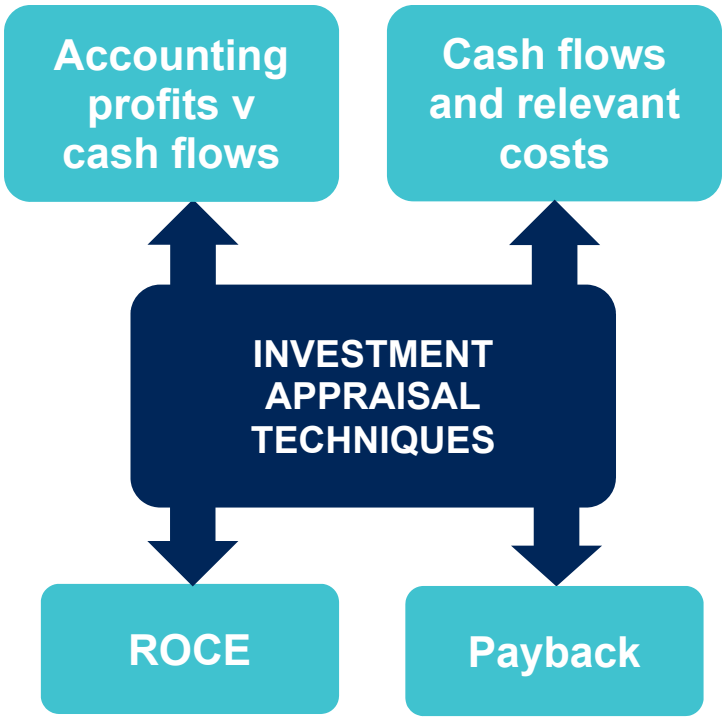
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You evaluate investment opportunities and their consequences and advise on their costs and benefits to the organisation. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 2 of your Study Text

Overview


Accounting profits v cash flows
Cash flows and relevant costs
INVESTMENT APPRAISAL TECHNIQUES
ROCE
Payback

1 Return on capital employed (ROCE)

1.1 Calculation

Also known as the accounting rate of return (ARR). Two methods of calculation:

$$\text{ROCE} = \frac{\text{Average annual profits before interest and tax}}{\text{Initial capital costs}} \times 100$$

or alternatively:

$$\text{ROCE} = \frac{\text{Average annual profits before interest and tax}}{\text{Average capital investment}} \times 100$$

Average capital investment = (initial investment + residual value)/2

1.2 Decision criteria

Decision criteria

- Compare the ROCE to the target return and if it is larger than the target, the project should be accepted.
- Ensure you know how the target return has been calculated (initial or average basis) to make a like-for-like comparison.

Notes

1.3 Advantages and disadvantages of ROCE

Notes

Question 1

ROCE

A project involves the immediate purchase of an item of plant costing $50,000. Annual cash flows of $14,500 will be earned and the plant will be sold at the end of the four-year project life for $10,000.

Calculate the project's ROCE using:

(a) Initial capital costs

(b) Average capital investment.

Notes

Question 2

ROCE

A project requires an initial investment of $1,000,000 and then earns net cash inflows as follows:

Year	1	2	3	4	5	6
Cash inflows ($000)	400	250	200	175	75	50

In addition, at the end of the six-year project the assets initially purchased will be sold for $200,000.

Determine the project's average ROCE

Illustrations and further practice

Notes

2 Accounting profits versus relevant cash flows

2.1 Accounting profits versus cash flows

In capital investment appraisal, it is more appropriate to evaluate future cash flows rather than accounting profits.

- profits cannot be spent
- profits are subjective
- cash is required to pay dividends.

Major differences between profit and cash flows will relate to:

- asset purchase and depreciation
- changes in working capital
- deferred taxation
- capitalisation of research and development expenditure.

2.2 Cash flows and relevant costs

- future, incremental cash flows

Ignore:

- sunk, committed, allocated, apportioned items
- non-cash items, e.g. depreciation.

Notes

Question 3

Relevant costs

Various items in relation to a project are:

Market research costs of $50,000 that have been carried out.

The purchase of an asset that would cost $95,000.

The sale of that asset at the end of the project for $10,000.

Depreciation of the asset over the life of the project of $85,000.

Sales revenue per annum of $65,000.

Variable costs of $34 per unit produced.

Factory fixed costs of $18,000 per year that will rise to $21,000 per year for the life of the project.

Apportioned head office costs of $2 per unit representing the project's share of existing head office costs.

Which of these items are relevant cash flows?

Illustrations and further practice

Notes

3 Payback

3.1 Payback technique

The payback technique considers the time a project will take to pay back the money invested in it. It is based on expected cash flows. To use the payback technique a company must set a **target payback period**.

Decision criteria

- Compare the payback period to the company's target return time and if the payback for the project is quicker, the project should be accepted.
- Faced with mutually exclusive projects choose the project with the quickest payback.

Question 4

Payback

An expenditure of $2 million is expected to generate net cash inflows of $600,000 each year for the next seven years.

What is the payback period?

Notes

Question 5

Payback

A project requires an initial investment of $1,000,000 and then earns net cash inflows as follows:

Year	1	2	3	4	5	6
Cash inflows ($000)	400	250	200	175	75	50

In addition, at the end of the six-year project the assets initially purchased will be sold for $200,000.

Determine the project's payback period.

Illustrations and further practice

Notes

3.2 Advantages and disadvantages of payback

Notes

Questions

Chapter 3

Investment appraisal – Discounted cash flow techniques

Outcome

By the end of this session, you should be able to:

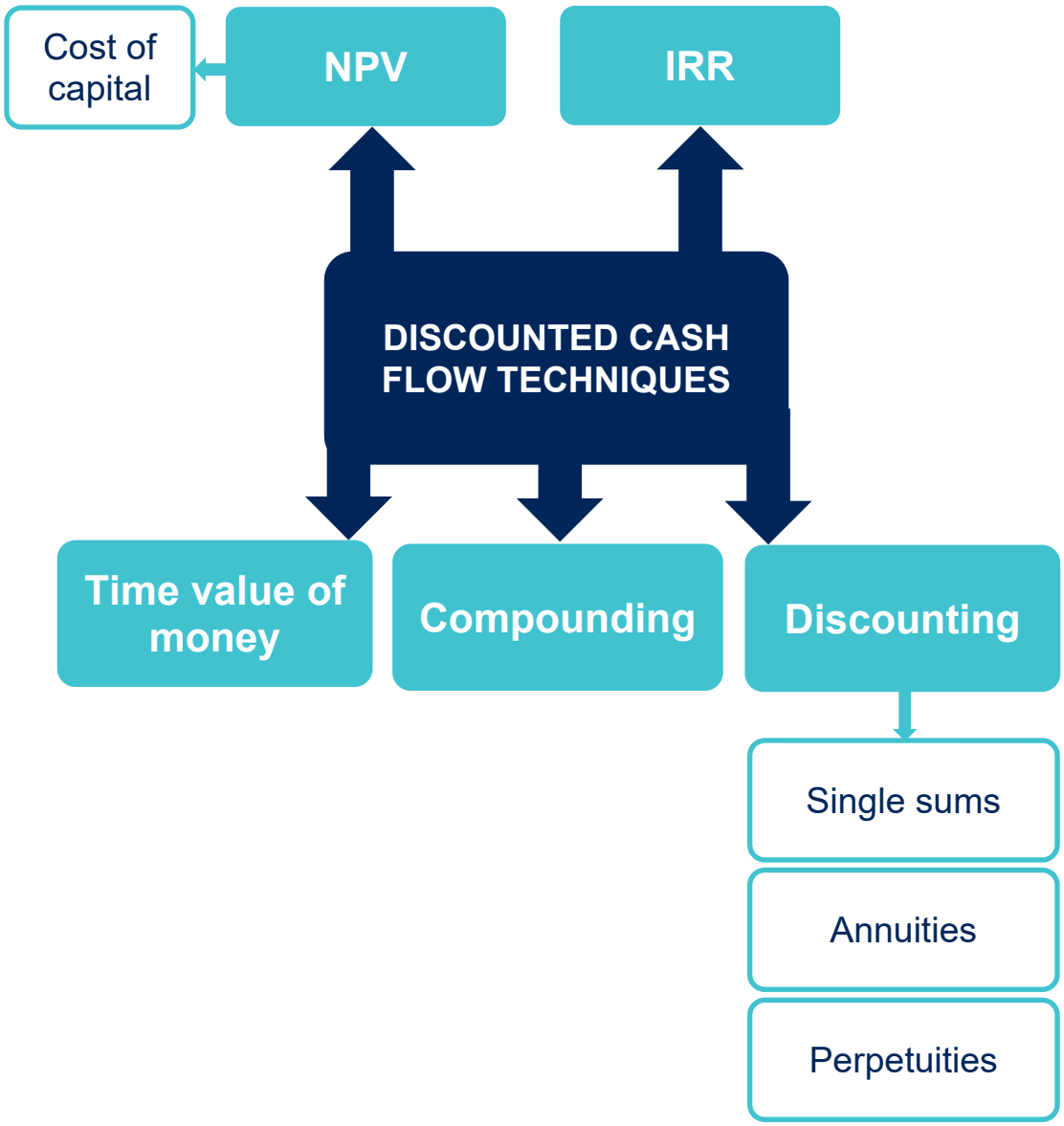
- explain the concept of the time value of money
- calculate the future value of a sum by compounding
- calculate the present value (PV) of a single sum or of an annuity using a formula and discount tables and of a perpetuity using a formula
- calculate the PV of advanced and delayed annuities and perpetuities
- explain the basic principles behind the concept of a cost of capital
- calculate the net present value (NPV) of an investment and use it to appraise the proposal
- discuss the usefulness of NPV as a discounted cash flow (DCF) investment appraisal method and its superiority over non-discounted cash flow methods
- calculate the internal rate of return (IRR) of an investment and use it to appraise the proposal
- discuss the usefulness of IRR as a DCF investment appraisal method and its superiority over non-DCF methods
- discuss the relative merits of NPV and IRR

and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You evaluate investment opportunities and their consequences and advise on their costs and benefits to the organisation. Working through this chapter should help you understand how to demonstrate that objective.

Overview


Cost of capital
NPV
IRR
DISCOUNTED CASH FLOW TECHNIQUES
Time value of money
Compounding
Discounting
Single sums
Annuities
Perpetuities

1 The time value of money

Money received or paid today is worth more than the same sum received or paid in the future, i.e. it has a time value. This occurs for three reasons:

- potential for earning interest/cost of finance
- impact of inflation
- effect of risk.

Discounted cash flow (DCF) techniques take account of the time value of money when appraising investments.

Notes

2 Compounding and discounting

2.1 Compounding

A sum invested today will earn interest. Compounding calculates the future (or terminal) value of a given sum invested today for a particular time period at a particular rate of interest.

It assumes that interest is earned not just on the initial investment amount but also on interest already earned.

Formula for compounding:

$F = P(1 + r)^n$ F = Future value

P = Initial investment (present value)

r = Interest rate

n = number of time periods

Notes

Question 1

Compounding

An investment of $500 is to be made today in an account earning 5% interest per annum. What will be the value of the account after 3 years?

Illustrations and further practice

Notes

2.2 Discounting

Discounting performs the opposite calculation to compounding. It calculates the present value of an amount received or paid in the future.

In a potential investment project, cash flows will arise at many different points in time, with different time values. To make a useful comparison of the different flows, they must all be converted to a common point in time, usually the present day, i.e. the cash flows are discounted.

The present value (PV) is the cash equivalent now of money receivable/payable at some future date.

Formula for discounting:

Present value (P) = Future value (F) × $(1 + r)^{-n}$

This is just a rearrangement of the formula for compounding.

$(1 + r)^{-n}$ is called the discount factor (DF).

Question 2

Discounting

What is the present value of $65,000 receivable in 6 years' time if the applicable interest rate is 7%?

Illustrations and further practice

Notes

3 Net present value

3.1 The cost of capital

When discounting so far we have referred to the rate of interest. Alternative terms to be used for this are:

- cost of capital
- discount rate
- required return.

You will learn more about the terms 'cost of capital' and 'required return' in later chapters.

Whichever term is used, the rate of interest used for discounting reflects the cost of the finance that will be tied up in the investment.

3.2 Net present value (NPV)

-
-

The NPV represents the surplus funds (after funding the investment) earned on the project.

- if the NPV is positive – the project is financially viable (PV inflows > PV outflows)
- if the NPV is zero – the project breaks even (PV inflows = PV outflows)
- if the NPV is negative – the project is not financially viable (PV inflows < PV outflows)

Notes

- if the company has two or more mutually exclusive projects under consideration, it should choose the one with the highest NPV
- **The NPV gives the impact of the project on shareholder wealth**

3.3 Assumptions used in discounting

Unless told otherwise:

- all cash flows occur at the start or end of a year
- initial investments occur at time period 0 (t0)
- other cash flows start one year after that (t1)
- do not include interest cash flows on funding (already taken into account within the cost of capital used).

Notes

Question 3

NPV

Calculate the NPV of the following cash flows at a discount rate (cost of capital) of 8%.

Year	$
t0	(25,000)
t1	10,000
t2	9,000
t3	8,000
t4	5,000

Notes

Question 4

NPV

A project has the following information: Purchase of asset at the start of the project $120,000. Sale of asset at the end of the project $25,000. Depreciation per each year of the five year project $19,000. Contribution per annum $40,000. Incremental fixed costs per annum $10,000.

Calculate the NPV of the project at a discount rate of 10%.

Illustrations and further practice

Notes

3.4 Advantages and disadvantages of NPV

3.5 Use of present value tables

The discount factor $(1 + r)^{-n}$ can be calculated or looked up in present value tables given in the exam.

On the present value table, look along the top row for the interest rate and down the columns for the number of years, where the two intersect you can read off the discount factor.

Notes 

Question 5

Discounting using tables

Calculate the present value of $40,000 discounted at 9% for 4 years.

Illustrations and further practice

Notes

4 Annuities and perpetuities

An annuity is a constant annual cash flow for a number of years.

A perpetuity is an annual cash flow that occurs forever.

4.1 Discounting annuities

The present value of an annuity can be found as:

PV = Annual cash flow × annuity factor (AF)

The annuity factor is the name given to the sum of the individual discount factors covering the period of the annuity and has the formula:

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

Annuity factors can also be found in the exam on annuity tables, which will be provided.

Notes

Question 6

Annuities

A project has the following information: Purchase of asset at the start of the project $120,000. Sale of asset at the end of the project $25,000. Depreciation per each year of the five year project $19,000. Contribution per annum $40,000. Incremental fixed costs per annum $10,000.

Calculate the NPV of the project at a discount rate of 10%.

Notes

Question 7

Annuities

A payment of $5,800 is to be made every year for 15 years, the first payment occurring in one year's time. The interest rate is 12%. Calculate the PV of the annuity:

(a) Using the annuity factor formula

(b) Using the annuity factor tables.

Illustrations and further practice

Notes

4.2 Discounting perpetuities

The present value of a perpetuity can be found as:

PV = Annual cash flow × perpetuity factor

The perpetuity factor can be calculated as:

$$\text{Perpetuity factor} = \frac{1}{r}$$

For perpetuities whose cash value grows at a constant rate, the perpetuity factor that should be used is:

$$\text{Growing perpetuity factor} = \frac{1}{r - g}$$

g = growth rate (expressed as a decimal)

Notes

Question 8

Perpetuities

A payment of $5,800 is to be made every year for the foreseeable future, the first payment occurring in one year's time. The interest rate is 12%. Calculate the PV of the perpetuity if:

(a) The value of the perpetuity remains constant

(b) The value of the perpetuity grows by 3% in the second year and remains growing at that rate for the foreseeable future.

Illustrations and further practice

Notes

4.3 Advanced and delayed annuities and perpetuities

The use of an annuity factor or perpetuity factor comes with the assumption that the series of cash flows starts at t1.

- If instead the cash flow starts at t0 this is known as an advanced annuity or perpetuity.

- If instead the cash flow starts at a time period later than t1 this is known as a delayed annuity or perpetuity.

Notes

Question 9

Advanced and delayed annuities and perpetuities

Calculate the present values of the following at a discount rate of 10%:

(a) A series of 3 annual payments of $5,000 starting today.

(b) A series of 3 annual payments of $5,000 starting in 4 years' time.

(c) A series of annual payments of $5,000 starting today and continuing for the foreseeable future.

(d) A series of annual payments of $5,000 starting in 6 years' time and continuing for the foreseeable future.

(e) A series of annual payments starting with $5,000 in 6 years' time and then growing at 2% per annum into the foreseeable future.

Illustrations and further practice

Notes

5 Internal rate of return (IRR)

5.1 IRR calculation

The IRR represents the discount rate at which the NPV of an investment is zero. As such, it represents a breakeven cost of capital.

- Projects should be accepted if the IRR is greater than the cost of capital.

IRR is calculated using linear interpolation.

- Calculate two NPVs for a project at two different costs of capital.
- Use the following formula to find the IRR:

$$IRR = L + \frac{N_L}{N_L - N_H}(H - L)$$

where: L = lower discount rate

H = higher discount rate

N_L = NPV at the lower discount rate

N_H = NPV at the higher discount rate.

Notes

Question 10

IRR

A potential project's predicted cash flows give a positive NPV of $6,000 at a discount rate of 9% and a negative NPV of $3,000 at a discount rate of 12%. Calculate the project's IRR.

Note that you may have a choice in the exam as to which two discount rates to use for the IRR calculation. Different rates will lead to slightly different IRRs but your choice of which rates to use is not important. It is your ability to use an appropriate technique to calculate an IRR that gains the available marks.

Notes

Question 11

IRR

Calculate the internal rate of return (IRR) of the following cash flows. The NPV at a discount rate of 8% is $2,000. Use 15% as the second discount rate.

Year	$
0	(25,000)
1	10,000
2	9,000
3	8,000
4	5,000

Notes

Question 12

IRR of an annuity

A project will earn net cash flows of $4,000 for 5 years. The initial capital cost of the project is $17,000. Calculate the project's IRR.

Notes

Question 13

IRR of a perpetuity

A project will earn net cash flows of $4,000 for the foreseeable future. The initial capital cost of the project is $17,000. Calculate the project's IRR.

Notes

Question 14

IRR

Find the IRR of an investment of $20,000 if the cash flows are:

(a) $4,500 for 7 years, starting at t1

(b) $4,500 into perpetuity, starting at t1

Notes

Illustrations and further practice

Notes

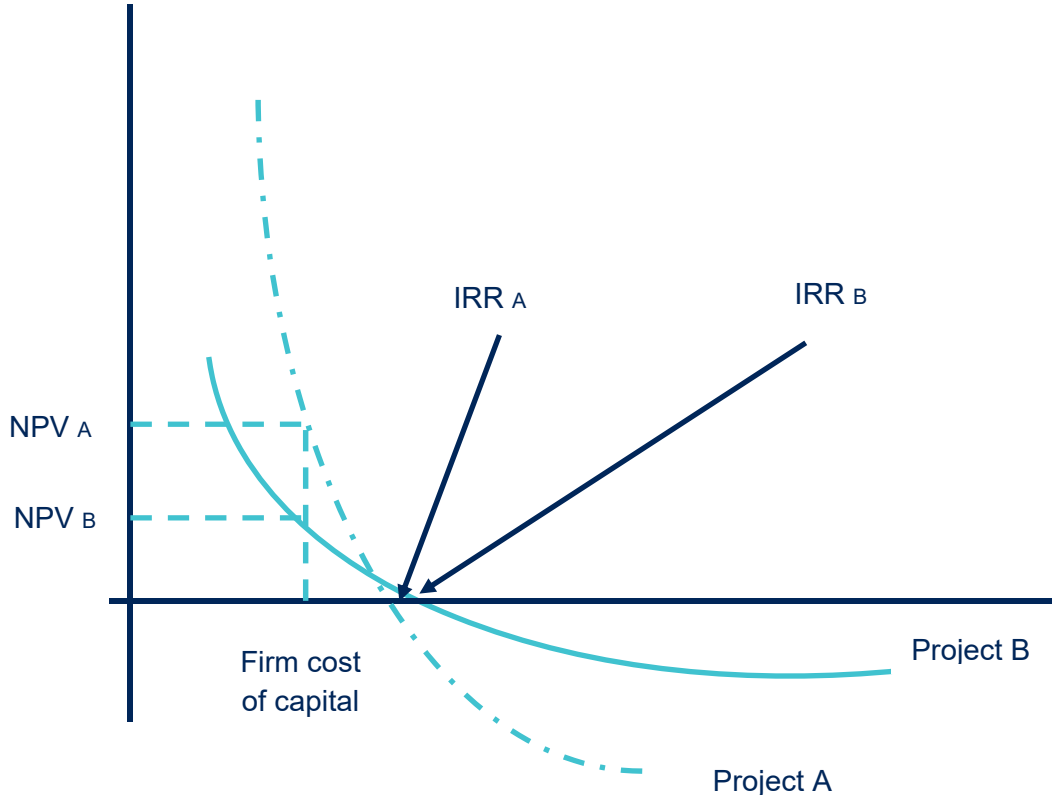
5.2 Advantages and disadvantages of IRR

Notes

5.3 NPV vs IRR

NPV and IRR are both superior DCF techniques for evaluating investment opportunities but they can give a different decision about a project.



- If the two measures conflict, NPV should be used as it gives the absolute increase in shareholder wealth at the business's current funding level, as represented by the cost of capital.

Notes

Questions

Notes

Chapter 4

Investment appraisal – Further aspects of discounted cash flows

Outcome

By the end of this session, you should be able to:

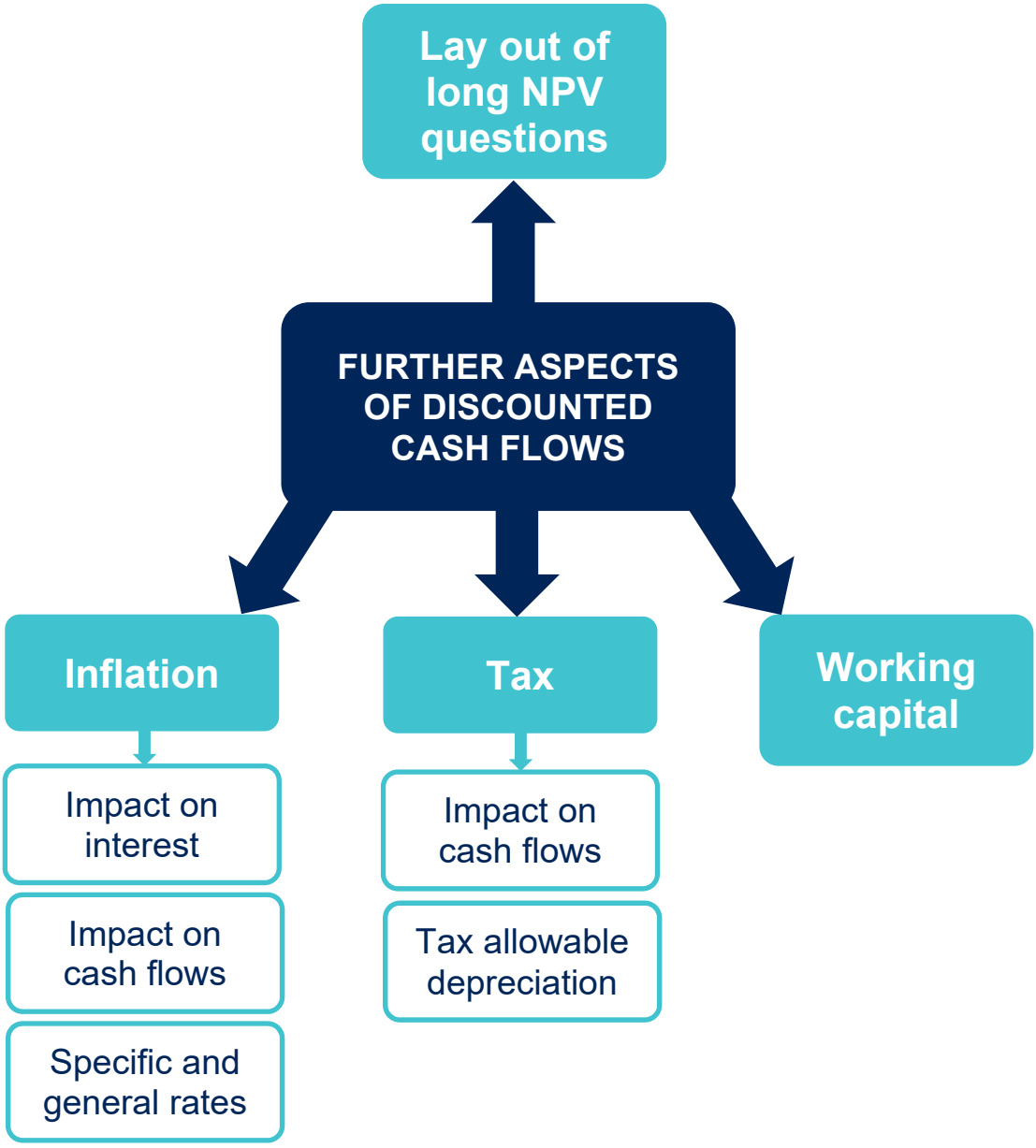
- explain the impact of inflation on interest rates and define and distinguish between real and nominal (money) rates
- explain the difference between the real terms and nominal terms approaches to investment appraisal
- use the nominal (money) terms approach to appraise an investment
- use the real terms approach to appraise an investment
- explain the impact of tax on DCF appraisals
- calculate the tax cash flows associated with tax-allowable depreciation and incorporate them into net present value (NPV) calculations
- calculate the tax cash flows associated with taxable profits and incorporate them into NPV calculations
- explain the impact of working capital on an NPV calculation and incorporate working capital flows into NPV calculations

and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You evaluate investment opportunities and their consequences and advise on their costs and benefits to the organisation. Working through this chapter should help you understand how to demonstrate that objective.

Overview


Lay out of long NPV questions
FURTHER ASPECTS OF DISCOUNTED CASH FLOWS
Inflation
Tax
Working capital
Impact on interest
Impact on cash flows
Specific and general rates
Impact on cash flows
Tax allowable depreciation

1 The impact of inflation

1.1 The impact of inflation on interest rates (discount rates)

Inflation is a general increase in prices leading to a general decline in the real value of money.

In times of inflation, the funding providers will require a return made up of two elements:

- a **real** return for the use of their funds
- an additional return to compensate for inflation
- the overall return required from these two elements is called the **money or nominal** rate of return.

The real and money (nominal) returns are linked by the formula:

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

Where r = real rate of return h = inflation rate

i = money cost of capital (the company's normal cost of capital)

Notes

Question 1

Real and money rates

An investor requires a real return on their investment of 12%, but in addition will need to be compensated for anticipated inflation of 3%.

Calculate the money rate of return required by the investor.

Notes

Question 2

Real and money rates

If an investment pays interest of 5.5% and the general rate of inflation is 3%, what is the real return on the investment?

Illustrations and further practice

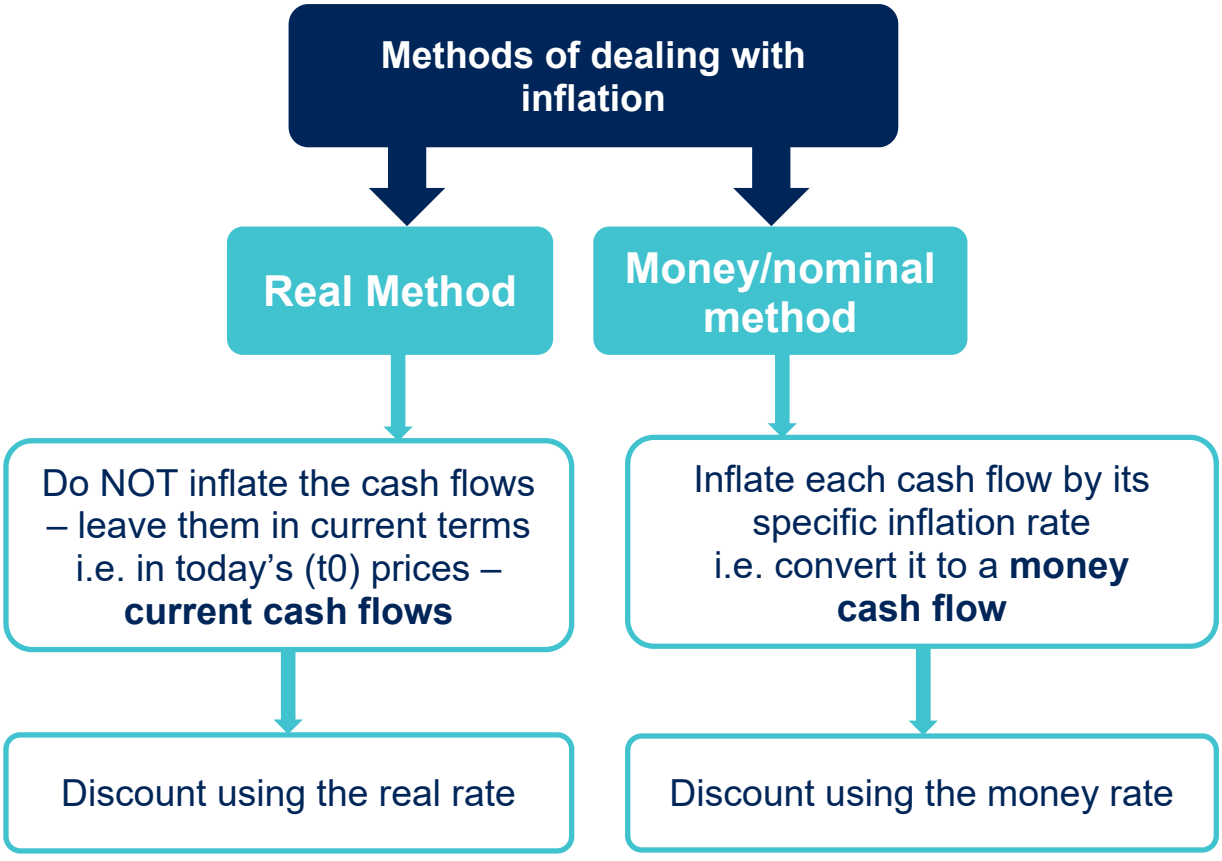
Notes

1.2 The impact of inflation on cash flows

Cash flows that **have not** been increased for expected inflation are described as being in **current prices** or **today's prices**.

Cash flows that **have** been increased to take account of inflation are known as **money cash flows** or **nominal cash flows**. They represent the expected cash outflow or inflow to hit the bank account.

Assume in the exam that cash flows are money cash flows unless stated otherwise.



The key is to be consistent – match the type of rate used with the type of cash flows.

Notes

Question 3

Real and money methods

An investment costs $20,000. Expected net cash flows from the investment are $7,000 per annum in current terms and will last for four years. The cash flows are expected to be subject to inflation of 4%. The money cost of capital for discounting is 14%.

Calculate the NPV by:

(a) Discounting the money cash flows at the money cost of capital

(b) Discounting the current cash flows at the real cost of capital.

Illustrations and further practice

Notes

1.3 Specific and general inflation rates

Specific inflation rates affect specific cash flows

General inflation rates affect the investors' overall required rate of return

The key is to be consistent – match the type of rate used with the type of cash flows.

To convert between different types of cash flows:

Current cash flows —(Inflate using specific rate)→ Money cash flows

Money cash flows —(Deflate using general rate)→ Real cash flows

Notes

Question 4

Specific & general inflation

A company is considering a project that would involve purchasing a machine for $18,000, which will have no value at the end of the project. It will be used to produce a product that will have sales of 500 units per year for 4 years. The sales price per unit will be $50, the variable costs per unit $20 and the incremental fixed costs of the project will be $8,000 per annum. These are all expressed in current terms and will be subject to inflation.

Sales will inflate at 5% per annum, variable costs at 6% per annum and fixed costs at 7% per annum.

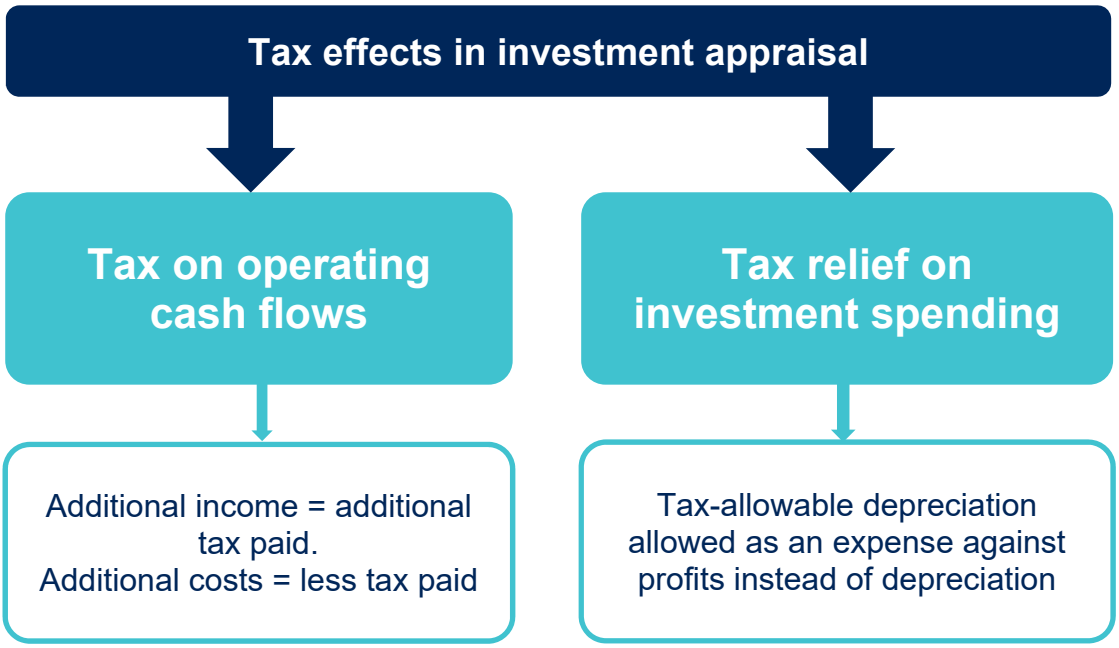
The cost of capital in real terms is 11.3% and the general rate of inflation is 3.3%.

Calculate the NPV of the investment.

Illustrations and further practice

Notes

2 Dealing with tax in NPV calculations



2.1 Impact of taxation on cash flows

Unless stated otherwise:

- Tax inflows and outflows are relevant cash flows for NPV purposes
- Operating cash inflows will be taxed at the prevailing tax rate
- Operating cash outflows will be tax deductible and save tax at the prevailing rate
- Investment spending will attract tax-allowable depreciation
- The business is making net profits overall
- Tax is paid one year after the related operating cash flow is earned.

Notes

2.2 Tax-allowable depreciation

Instead of accounting depreciation, a business may claim tax-allowable depreciation to offset against its profits for tax purposes.

- Tax-allowable depreciation is calculated based on the written down value of the assets (reducing balance or straight line according to the question)
- The total amount of tax-allowable depreciation given over the life of an asset will equate to its fall in value over the period (cost less scrap proceeds)
- Tax-allowable depreciation is claimed as early as possible
- Tax-allowable depreciation is given for every year of ownership of the asset except the year of disposal (the tax-allowable depreciation is allowed against profits and therefore reduces the tax bill – shown as an inflow of tax on the NPV)
- In the year of disposal, a balancing allowance or charge arises instead (tax equivalent of profit or loss on disposal and allowed against profits)
- Timing of asset purchase:

  The asset is purchased for the project at time period 0. Assume that the first tax-allowable depreciation is given at time period 1.

  If tax is paid (and saved) a year in arrears then the first saving will be at time period 2.

Notes

Question 5

Tax-allowable depreciation

An asset is bought for a project at a cost of $25,000 and will be used for four years before being disposed of for $5,000. Tax-allowable depreciation is available at 25% reducing balance and the tax rate is 30%.

Calculate the tax allowable depreciation and hence the tax savings for each year if tax is paid (and saved) a year in arrears.

Notes

Question 6

Tax-allowable depreciation

How would your answer to the previous question change if the sales proceeds for the asset at the end of the project had been $15,000?

Notes

Question 7

Tax-allowable depreciation

Based on the figures where the sales proceeds are $5,000 (the original scenario), with net trading income for the project being $12,000 per annum, calculate the NPV of the project. The cost of capital is 10%.

Illustrations and further practice

Notes

3 Incorporating working capital

Investment in a new project often requires an additional investment in working capital for the project duration, such as increasing inventory levels or offering credit to customers (offset by taking credit from suppliers).

There are therefore relevant cash flows related to working capital that need to be included in the NPV.

The treatment of working capital is as follows:

- Initial investment is a cash outflow at the start of the project
- If the investment is increased, the increase is a relevant cash outflow
- If the investment is decreased, the decrease is a relevant cash inflow
- Working capital is 'released' at the end of the project, leading to a cash inflow.

Question 8

Working capital

A company expects sales for a new project to be $20,000 in the first year, growing at 4% per annum. The project is expected to last for 3 years. Working capital equal to 15% of annual sales is required and needs to be in place at the start of each year.

Calculate the working capital cash flows for incorporation into the NPV calculation.

Notes

Question 9

Working capital

A company expects sales for a new project to be 10,000 units per year. The sales price in current terms is $25, but will grow at 6% per annum. The project is expected to last for three years.

Working capital equal to 10% of sales is required to be in place at the beginning of each year.

Calculate the working capital cash flows for incorporation into the NPV calculation.

Illustrations and further practice

Notes

4 Approach to long NPV questions

4.1 Layout

	T_0	T_1	T_2	T_3
	$	$	$	$
Operating cash inflows		X	X	
Operating cash outflows		(X)	(X)	
		———	———	
Net operating cash flow		X	X	
Tax on net operating cash flow (1 year in arrears)			(X)	(X)
Investment	(X)			
Scrap value			X	
Tax savings from tax-allowable depreciation		X	X	X
Working capital	(X)		X	
Total net cash flows	(X)	X	X	X
Discount factor	1	x	x	x
Present Value	PV	PV	PV	PV
NPV	X			

Remember to add an extra year to the project life if tax is paid a year in arrears.

If a question has both tax and inflation use the money method:

- Inflate the cash flows unless they are given in money terms
- Tax-allowable depreciation calculations and working capital calculations should be done on the inflated figures
- Use a post-tax money (inflated) discount rate.

Notes

Question 10

Full NPV question

Larson Co is considering a potential project with the following forecasts:

	Now	T1	T2	T3
Initial investment ($million)	(2,500)			
Disposal proceeds ($million)			700	
Demand (millions of units)		8	12	4

The selling price per unit is expected to be $225 and the variable cost $85 per unit. Both of these figures are given in today's terms.

Tax is paid at 30%, one year after the accounting period concerned.

Working capital will be required equal to 10% of annual sales. This will need to be in place at the start of each year.

Tax-allowable depreciation is available at 25% reducing balance.

The company has a real required rate of return of 7.7%.

General inflation is predicted to be 4% pa but the selling price is expected to inflate at 3% and variable costs by 6% pa.

Determine the NPV of the project.

Chapter 4

Notes

Questions

Chapter 5

Asset investment decisions and capital rationing

Outcome

By the end of this session, you should be able to:

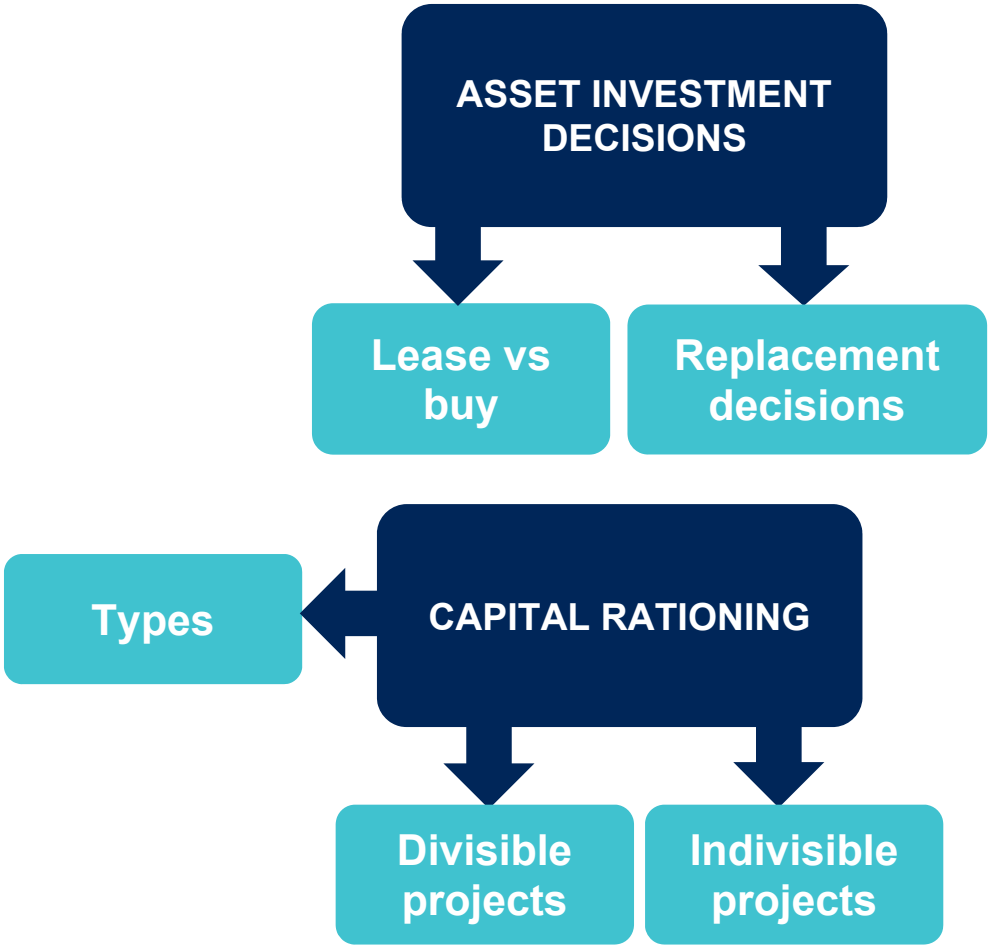
- evaluate the choice between leasing an asset and borrowing to buy using the before-tax and after-tax costs of debt
- define and calculate an equivalent annual cost (EAC)
- evaluate asset replacement decisions using EACs
- explain the reasons why capital rationing might be required
- define and distinguish between divisible and indivisible projects
- calculate profitability indexes for divisible investment projects and use them to evaluate investment decisions
- calculate the net present value (NPV) of combinations of non-divisible investment projects and use the results to evaluate investment decisions

and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You evaluate investment opportunities and their consequences and advise on their costs and benefits to the organisation. Working through this chapter should help you understand how to demonstrate that objective.

Overview


ASSET INVESTMENT DECISIONS
Lease vs buy
Replacement decisions
Types
CAPITAL RATIONING
Divisible projects
Indivisible projects

1 Lease versus buy

A separate decision to the investment decision is on how to finance the asset purchase. The choice is between:

- **leasing –**
- **buying –**

The NPVs of the two financing options are calculated and the lowest cost option selected. The cash flows of this option would then be included as relevant cash flows in the NPV calculation for the project.

Cash flows for leasing:

- The lease payments
- The tax relief on the lease payments

Cash flows for buying:

- The purchase payment and scrap value
- The tax savings from tax-allowable depreciation

Cost of capital

Use the post-tax cost of borrowing for both sets of calculations:

Cost of borrowing × (1 – tax rate)

Notes

Question 1

PV of a lease

A company has already decided to accept a project and is now considering how best to finance it.

The asset needed for the project could be leased over five years at a rental cost of $14,000 per annum with the first payment due immediately (at the start of an accounting period).

Tax is payable at 30%, one year in arrears. The post-tax cost of borrowing is 8%.

Calculate the net present value of the leasing option.

Notes

Question 2

Lease vs buy

A company has already decided to acquire a new machine in order to make cost savings on production. It needs to decide whether to lease or buy the machine.

The machine would cost $500,000 and the company would be able to claim tax-allowable depreciation on a 25% reducing balance basis. The machine would be worthless at the end of the four-year project.

Alternatively, the company could enter into a four-year lease for the asset with annual payments of $160,000 starting immediately.

Tax is payable at 30%, one year in arrears.

Calculate whether the company should lease or buy the asset. The company's post-tax cost of borrowing is 10%.

Illustrations and further practice

Notes

2 Replacement decisions

If a capital asset is to be replaced, there are different potential replacement strategies.

Issues arise where there are competing replacements for a particular asset:

- Equivalent available assets may last for different lengths of time
- Assets may need to be replaced at regular intervals.

Calculation of the present costs of each available asset will make each individual set of cash flows equivalent to each other in terms of time value but will not make the overall decisions comparable to each other.

For instance, an asset that lasts for two years may be cheaper than an asset that lasts for four but the replacement cash flows would have to be spent twice as frequently.

In order to make the different strategies comparable, use equivalent annual costs (EACs).

$$\text{Equivalent Annual Cost} = \frac{\text{PV of costs}}{\text{Annuity factor for year n}}$$

Where n is the length of the replacement period in years

This converts the cost of each decision into an equivalent annuity figure meaning that they can be compared on a like for like basis.

The decision that has the lowest EAC will be the one chosen.

Notes

2.1 Assumptions and limitations

- Trading cash flows from the use of the asset are ignored as they are assumed to be similar whichever asset/replacement cycle is chosen

- Operating efficiencies of machines will be similar with differing machines and with differing ages

- The assets will be replaced into perpetuity or at least into the foreseeable future

- In most questions tax and inflation are ignored

- Non-financial aspects are ignored

In reality changing technology, inflation and changes to production plans are all likely to limit the effective use of replacement analysis using equivalent annual costs.

Notes

Question 3

EAC

A machine costs $15,000. Running costs in the first year are anticipated to be $3,000 and in the second year would be $3,600. If the machine were sold after one year, the anticipated sales proceeds are $7,000. If used for another year and then sold the proceeds would fall to $4,000.

Calculate the optimal replacement cycle for the machine if the cost of capital is 11%.

Notes

Question 4

EAC

A decision must be made on a replacement policy for a fleet of cars. A car costs $20,000 and the following additional information applies:

Sales value at end of year: 1 $12,000 2 $10,000 3 $6,000

Maintenance costs in year: 1 $1,500 2 $2,300 3 $4,000

Calculate the optimal replacement cycle for the machine if the cost of capital is 14%.

Illustrations and further practice

Notes

3 Capital rationing

3.1 Introduction

Shareholder wealth is maximised if a company undertakes all positive NPV projects it has available. Capital rationing is where there are insufficient funds to do this. It comes in two forms.

Hard capital rationing – an absolute limit on financing available is imposed by the funders of the business. The business cannot raise further cash.

Soft capital rationing – an internally imposed limit on investment capital. This is contrary to the rational view of shareholder wealth maximisation.

3.2 Single and multi-period capital rationing

Multi-period rationing is where funds are rationed in more than one period, but is outside of the syllabus.

Single period rationing is where funds are limited in one period only.

Notes

3.3 Divisible projects and the profitability index (PI)

If a project is divisible then any proportion of the project may be undertaken and the returns from the project are expected to be generated in exact proportion to the amount of investment undertaken.

The profitability index (PI) can be used to rank projects against each other in order to determine which ones to undertake to maximise the total NPV earned from the available capital.

PI formula:

$$\text{Profitability Index} = \frac{\text{NPV}}{\text{Initial investment}}$$

Notes

Question 5

Capital rationing – divisible projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can be done in whole to earn the entire NPV or in part to earn a proportional share of the NPV. All investments must be started now.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Notes

3.4 Indivisible projects – trial and error

If a project is indivisible then it must be done in its entirety or not at all

When projects are indivisible, the optimal combination of projects to undertake with the capital available can only be found by trial and error.

3.5 Mutually exclusive projects

When certain projects cannot be done together, perhaps because they are different uses of the same asset, each combination of investments should be tried to determine which gives the highest overall NPV.

Notes

Question 6

Capital rationing – indivisible projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can only be done in whole or not at all. All investments must be started now.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Notes

Question 7

Capital rationing – mutually exclusive projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can be done in whole to earn the entire NPV or in part to earn a proportional share of the NPV. All investments must be started now. Projects 1 and 5 use the same asset and so cannot be done together.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Illustrations and further practice

Notes

Questions

Notes

Chapter 6

Investment appraisal under uncertainty

Outcome

By the end of this session, you should be able to:

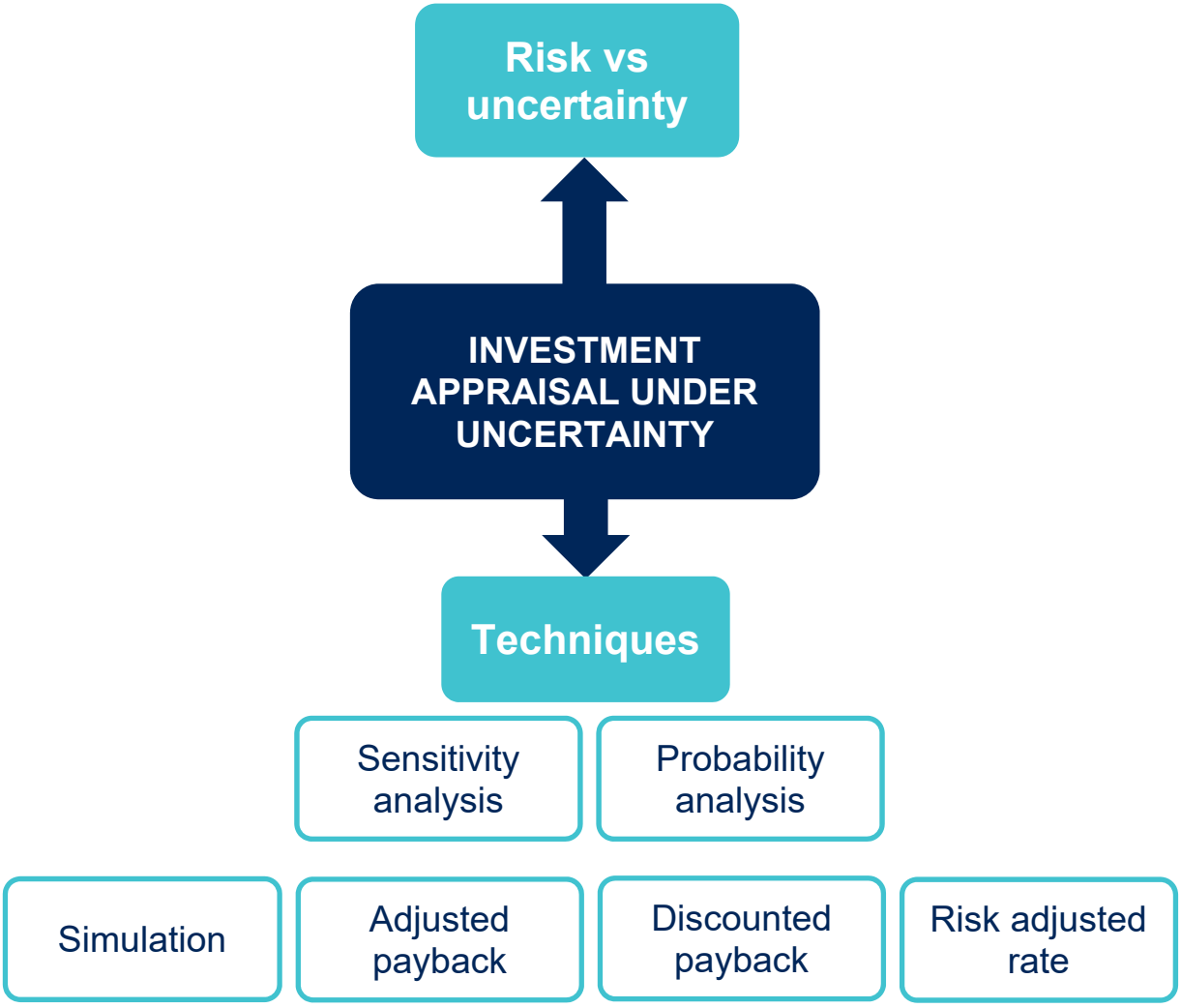
- distinguish between risk and uncertainty in investment appraisal (IA)
- define sensitivity analysis and discuss its usefulness in assisting investment decisions
- apply sensitivity analysis to investment projects and explain the meaning of the findings
- define an expected value (EV) and discuss the usefulness of probability analysis in assisting investment decisions
- apply probability analysis to investment projects and explain the meaning of the findings
- discuss the use of simulation to take account of risk and uncertainty in IA
- discuss the use of adjusted payback in IA
- calculate the discounted payback and discuss its usefulness as an IA method
- explain the principle of adjusting discount rates to take account of risk

and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You evaluate investment opportunities and their consequences and advise on their costs and benefits to the organisation. Working through this chapter should help you understand how to demonstrate that objective.

Overview


Risk vs uncertainty
INVESTMENT APPRAISAL UNDER UNCERTAINTY
Techniques
Sensitivity analysis
Probability analysis
Simulation
Adjusted payback
Discounted payback
Risk adjusted rate

1 Risk and uncertainty

1.1 The difference between risk and uncertainty

Risk and uncertainty affect investment appraisals because the appraisals are an attempt to forecast the future of such things as cash flows, inflation rates, taxation laws, cost of capital, etc., none of which may be known for certain over the life of the investment.

Risk – quantifiable. Possible outcomes have associated probabilities, thus allowing the use of mathematical techniques.

- Expected values
- Simulation
- Adjusted payback
- Risk-adjusted discount rates.

Uncertainty – unquantifiable. Outcomes cannot be mathematically modelled.

- Set shorter payback targets
- Make prudent estimates of cash flows in the appraisal
- Assess best and worst case scenarios
- Use sensitivity analysis.

Notes

1.2 Sensitivity analysis

Calculated as follows:

$$\text{Sensitivity margin} = \frac{\text{NPV}}{\text{PV of cash flows under consideration}} \times 100$$

The lower the sensitivity of an input variable, the more sensitive the project NPV is to changes in that input variable.

Notes

Question 1

Sensitivity analysis

A project requires an investment of $220,000 today and will bring in annual operating cash flows of $75,000. These are made up of sales volumes of 5,000 units each year for the four years of the project, a sales price of $50 per unit, variable costs per unit of $25 and annual incremental fixed costs of $50,000. The asset will have no value at the end of the project.

There is no tax or inflation and the discount rate is 8%.

(a) Calculate the NPV of the project.

(b) Calculate the sensitivity of the project to:

(i) initial investment

(ii) selling price per unit

(iii) variable cost per unit

(iv) sales volume

(v) fixed cost per unit

(vi) discount rate

Notes

Question 2

Sensitivity analysis with tax

A project requires an investment of $35,000 today and will bring in annual revenues for 3 years of $100,000 and operating costs of $70,000. The asset will have no value at the end of the project.

Operating cash flows are taxed at 30% and are paid a year in arrears but there is no tax-allowable depreciation available. The discount rate is 10%.

(a) Calculate the NPV of the project.

(b) Calculate the sensitivity of the project to the sales revenue.

Notes

Illustrations and further practice

Notes

1.3 Advantages and disadvantages of sensitivity analysis

Notes

2 Probability analysis

When there are several possible outcomes for a decision and probabilities can be assigned to each, a probability distribution of expected cash flows can be estimated, recognising that there are several possible outcomes, not just one. This could then be used to:

- Calculate an expected value (EV)
- Measure risk by:
  - calculating the worst possible outcome and its probability
  - calculating the probability that the project will fail (e.g. that a negative NPV will be the outcome)
  - assessing the standard deviation of the outcomes.

2.1 Expected values

An expected value is an average outcome weighted by the probabilities of each individual outcome.

EV = ∑ p x

Where x = future outcome and p = probability of outcome occurring.

It can be used to find an average outcome for a project under different scenarios or to find an average outcome for a particular input to go into an NPV calculation.

Notes

Question 3

Expected values

A company has to choose between three mutually exclusive projects, the outcomes of which depend on the state of the economy. The following estimates have been made:

State of the economy	poor	good	excellent
Probability	0.4	0.5	0.1
Project:	NPV ($000)	NPV ($000)	NPV ($000)
A	150	70	10
B	(10)	40	600
C	75	75	125

Determine which project should be selected on the basis of expected NPVs.

Notes

Question 4

EVs in NPV calculation

A project requires an investment of $50,000 today and will bring in annual sales volumes for 3 years of 5,000 units with annual operating costs of $20,000. The asset will have no value at the end of the project.

The sales price has not yet been finalised due to uncertainty in the market. A probability analysis has been put together as follows:

20% probability of selling at $10 per unit, 30% of $9 per unit and 50% of $8 per unit.

There is no tax or inflation. The discount rate is 10%.

Calculate the expected NPV of the project.

Illustrations and further practice

Notes

2.2 Strengths and weaknesses of EVs

EVs are appropriate to use when:

- there is a reasonable basis for making the forecasts and estimating the probabilities of different outcomes
- the decision is relatively small in relation to the business, so the risk is small in magnitude
- the decision is for a category of decisions that are often made.

Notes

2.3 Joint probabilities

Some questions in the exam may best be answered with the use of joint probabilities.

In the exam context, a joint probability represents the probability of one thing **AND** then another separate thing happening. The joint probability of both things happening can be found by **multiplying** the individual probabilities together.

Also potentially useful is the ability to calculate the probability of one thing **OR** another thing happening. If the events are mutually exclusive, this is found by adding the individual probabilities together. If the two events are not mutually exclusive, you add the individual probabilities together and then deduct the joint probability of them both occurring.

Question 5

Joint probabilities

Cash flows in a bank account have the following probabilities:

Month 1		Month 2	
Cash flow	Probability	Cash flow	Probability
$5,000	25%	$7,000	43%
$8,000	75%	$12,000	57%

Calculate:

(a) The probability of the total cash flows over months 1 and 2 totalling $15,000

(b) The probability of the balance at the end of month 2 being either $12,000 or $20,000.

(c) The probability of either a $5,000 cash flow in month 1 or a $12,000 cash flow in month 2.

Illustrations and further practice

Notes

2.4 Simulation

Simulation addresses one of the weaknesses of sensitivity analysis by calculating the effect of changes in multiple variables at a time.

It produces a distribution of the possible outcomes from the project, the probabilities of which can then be calculated by reference to the frequencies on which they occur.

2.5 Adjusted payback

Shortening the payback period required places more emphasis on earlier (less risky) cash flows.

2.6 Discounted payback

When calculating the payback period, the cumulative position can be calculated using the discounted cash flows instead of the cash flows themselves. This removes the disadvantage of payback calculations failing to take into account the time value of money.

2.7 Risk-adjusted discount rates

Increasing the discount rate used to appraise a project will reduce its NPV. If a project is perceived to be more risky than usual, the appraisal could therefore be done with a higher discount rate than usual, making it harder for the project to gain a positive NPV.

Decision makers could there be more confident that those projects that do earn a positive NPV are worthwhile.

Notes

Question 6

Discounted payback

A project with the following cash flows is under consideration:

t0	(10,000)
t1	4,000
t2	3,500
t3	3,000
t4	2,500

With a cost of capital of 10%, calculate the discounted payback period.

Notes

Question 7

Discounted payback

A company is currently evaluating a project that requires investments of $10,000 now and a further $3,000 at the end of year 1. There will be a net cash inflow of $15,000 at the end of year 2 and $3,000 at the end of year 3.

The cost of capital is 10%.

What is the discounted payback period (DPP) and net present value (NPV) for the project?

Illustrations and further practice

Notes

Questions

Notes

Chapter 7

Working capital management

Outcome

By the end of this session, you should be able to:

- define working capital and identify its elements
- explain the objectives of working capital management in terms of liquidity and profitability, and discuss the conflict between them
- explain the importance of working capital management to good financial management
- describe the principle and components of the cash operating cycle including the impact on it of accounts payable and receivable
- calculate the length of the cash operating cycle from supplied data
- calculate the current ratio and explain its relevance
- calculate the quick ratio and explain its relevance
- calculate the average collection period for receivables and explain its relevance
- calculate the average payable period for payables and explain its relevance
- calculate the length of a company's cash operating cycle by selecting relevant data from the company's accounts and discuss the implications for the company
- calculate the sales revenue/net working capital ratio and explain its relevance
- calculate the level of working capital investment in current assets from supplied data
- discuss the effect of a business' terms of trade on the length of the working capital cycle

- explain the policies a company may adopt on the level of investment in current assets
- discuss the effect of the industry in which the organisation operates on the length of the working capital cycle
- calculate the level of working capital investment in current assets by selecting relevant data from the company's accounts and discuss the implications for the company

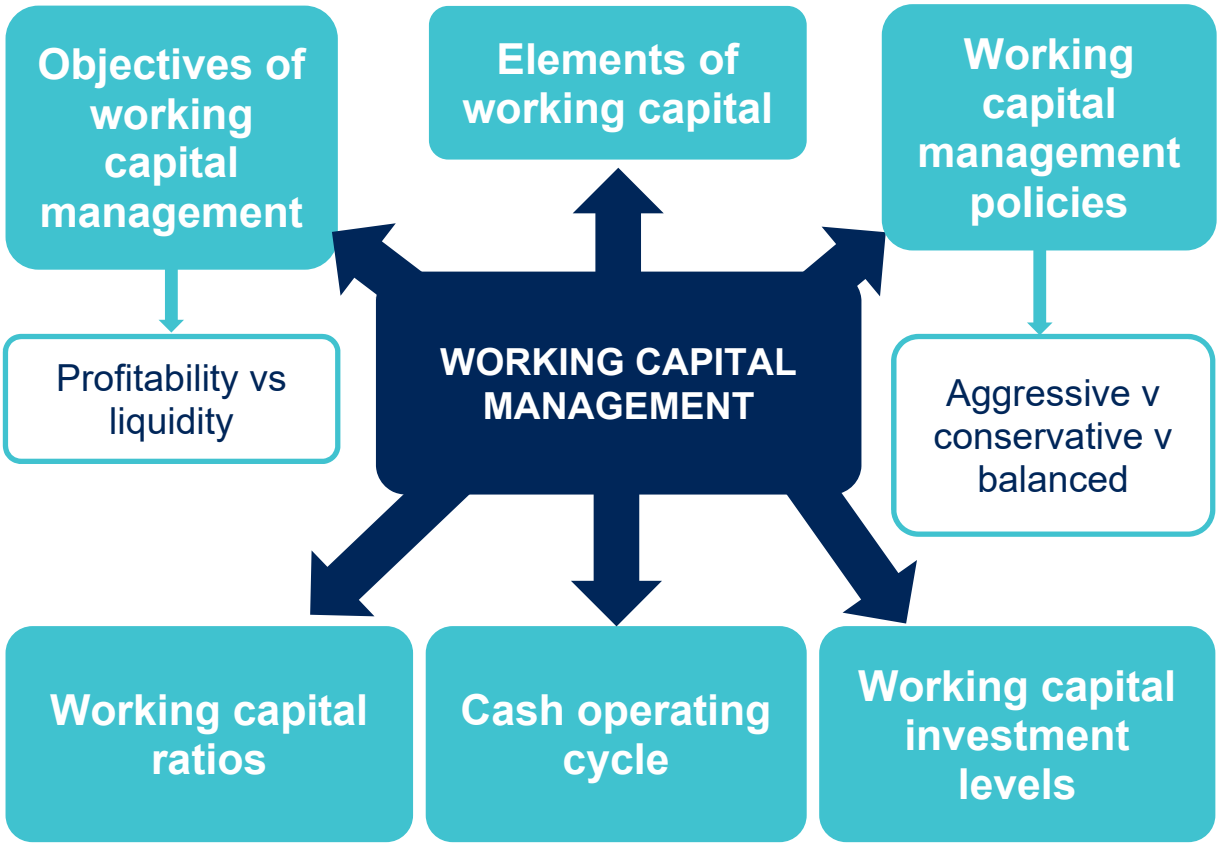
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO10) is to manage and control working capital. You manage cash and working capital effectively, planning for any shortfall or surplus including receivables, payables and inventories. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 7 of your Study Text

Overview


Objectives of working capital management
Elements of working capital
Working capital management policies
Profitability vs liquidity
WORKING CAPITAL MANAGEMENT
Aggressive v conservative v balanced
Working capital ratios
Cash operating cycle
Working capital investment levels

1 The elements of working capital

Working capital is the capital available for conducting the day-to-day operations of an organisation; normally the excess of current assets over current liabilities.

Working capital management is the management of all aspects of both current assets and current liabilities, to minimise the risk of insolvency while maximising the return on assets.

Current assets require funding – consider reducing funding levels

➢

Current liabilities provide funding – consider increasing levels

➢

Investing in working capital has a cost:

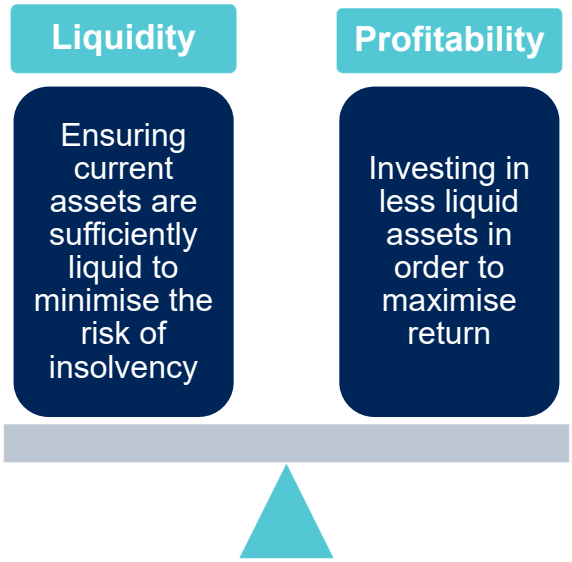
- ➢ the cost of funding it, or
- ➢ the opportunity cost of lost investment opportunities because cash is tied up in working capital and unavailable for other uses.

Notes

2 The objectives of working capital management

The main objective of working capital management is to get the balance of current assets and current liabilities right.

It can be seen as a trade-off between profitability and liquidity.



Notes

3 Policies regarding working capital management

3.1 Aggressive vs conservative

Aggressive approach – low levels of working capital

Conservative approach – high levels of working capital

3.2 Over-capitalisation and working capital

Excessive current assets and low current liabilities mean that the business is over-capitalised.

3.3 Overtrading

Healthy trading growth typically leads to:

If the business does not have access to sufficient capital to fund the increase, it is said to be “over trading”. This can cause serious trouble for the business if it is unable to pay its business payables.

Indicators of overtrading are:

Notes

4 Working capital ratios

4.1 Liquidity ratios

Current ratio

This measures how much of the total current assets are financed by current liabilities.

A measure of 2:1 means that current liabilities can be paid twice over out of existing current assets.

Quick (acid test) ratio

- Measures how well current liabilities are covered by liquid assets.
- Is particularly useful where inventory holding periods are long.

A measure of 1:1 means that the entity is able to meet existing liabilities if they all fall due at once.

Question 1

Current & quick ratios

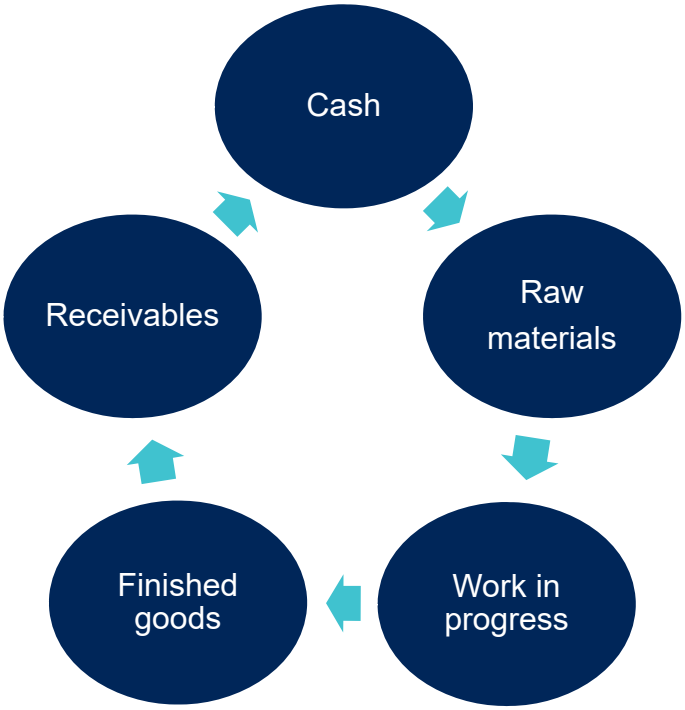
A company has $25m of current assets, of which $5m are inventory. Its current liabilities stand at $15m. Calculate the current and quick ratios.

Notes

4.2 Cash operating cycle

The Working Capital Cycle is the length of time between the company's outlay on raw materials, wages and other expenditures and the inflow of cash from the sale of goods.

The faster a firm can 'push' items around the cycle, the lower the total working capital and the lower its investment in working capital needs to be.



Raw materials holding period	X
Less: payables payment period	(X)
WIP holding period	X
Finished goods holding period	X
Receivables collection period	X
Working Capital Cycle	**X**

Notes

Factors affecting the length of the cycle depend on:

The optimum level of working capital is the amount that results in no idle cash or unused inventory but that does not put a strain on liquid resources.

Question 2

Cash operating cycle

A company has provided the following information:

Raw material inventory holding period	25 days
Payables payment period	40 days
Production period (WIP)	5 days
Finished goods holding period	15 days
Receivables collection period	66 days

Calculate the length of the cash operating cycle.

Illustrations and further practice

Notes

4.3 Cash operating cycle ratios

Inventory holding period

This is the length of time inventory is held between purchase/completion and sale.

Manufacturing industries will instead have:

Raw material inventory holding period

This is the length of time raw materials are held between purchase and being used in production.

NB: where usage cannot be calculated, purchases give a good approximation.

and:

WIP holding period

This is the length of time goods spend in production.

NB: where production cost cannot be calculated, cost of goods sold gives a good approximation.

and:

Finished goods inventory holding period

This is the length of time goods spend in production.

Notes

Trade receivables days

This is the length of time credit is extended to customers.

Trade payables days

This is the average period of credit extended by suppliers.

Working capital turnover

Be flexible – the exact figure you need may not be given – use the closest approximation.

Notes

Question 3

Working capital ratios

A company has the following figures from its most recent accounts:

Receivables	$13.7m
Trade payables	$7.5m
Inventory (raw materials)	$2.1m
Inventory (WIP)	$1.1m
Inventory (finished goods)	$5.9m
Sales (90% on credit)	$105.9m
Materials purchases (100% on credit)	$77.7m
Cost of sales	$80.5m

Calculate the relevant working capital ratios. Assume 365 days in a year and round calculations to the nearest day.

Notes

Question 4

Working capital ratios

A company has the following figures from its most recent accounts:

Receivables	$295,000
Trade payables	$120,000
Inventory (raw materials)	$45,000
Inventory (WIP)	$25,000
Inventory (finished goods)	$66,000
Sales (100% on credit)	$1,631,000
Gross profit margin	$30% on sales value
Raw materials purchases	90% of cost of sales value

Calculate the cash operating cycle. Assume 365 days in a year and round calculations to the nearest day.

Illustrations and further practice

Notes

4.4 Working capital investment levels

The working capital ratios formulae can be rearranged so that instead of calculating the number of days they can be used to predict future (or calculate current) levels of investment (the SFP figure).

For instance, to calculate a trade receivables balance:

Question 5

Working capital investment

A company has the following expectations for the forthcoming period:

Sales	$30m
Materials costs	$20m
Other costs	$4m
Profit	$6m

The following working capital ratios are expected to apply:

Inventory days	45
Receivables days	65
Payables days	35

Calculate the working capital requirement.

Illustrations and further practice

Notes

Questions

Chapter 8

Working capital management – Inventory control

Outcome

By the end of this session, you should be able to:

- explain the objectives of inventory management
- define and explain lead time and buffer inventory
- explain and apply the basic economic order quantity (EOQ) formula to data provided
- calculate the EOQ taking account of quantity discounts and calculate the financial implications of discounts for bulk purchases
- define and calculate the re-order level where demand and lead time are known
- describe and evaluate the main inventory management systems including Just-In-Time (JIT) techniques
- suggest appropriate inventory management techniques for use in a scenario

and answer questions relating to these areas.

PER

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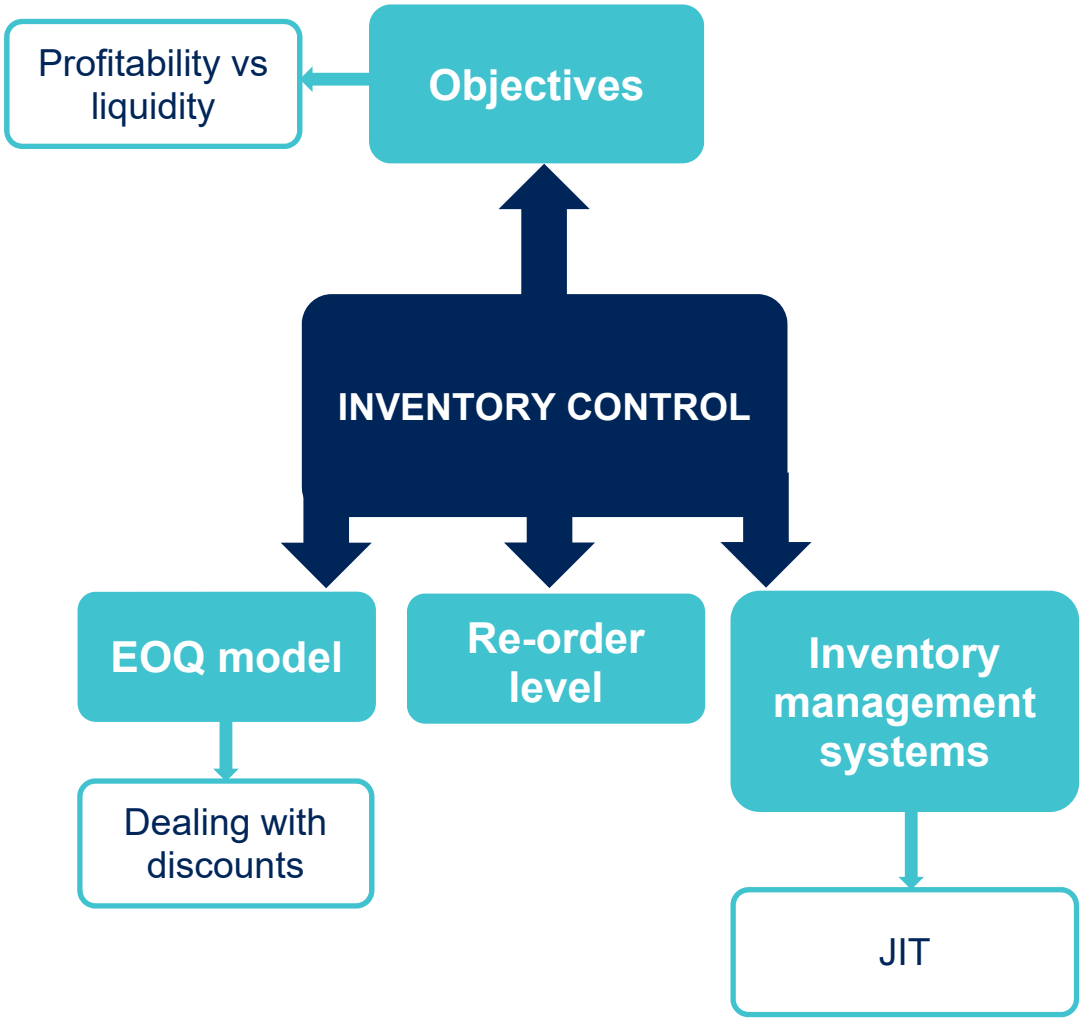
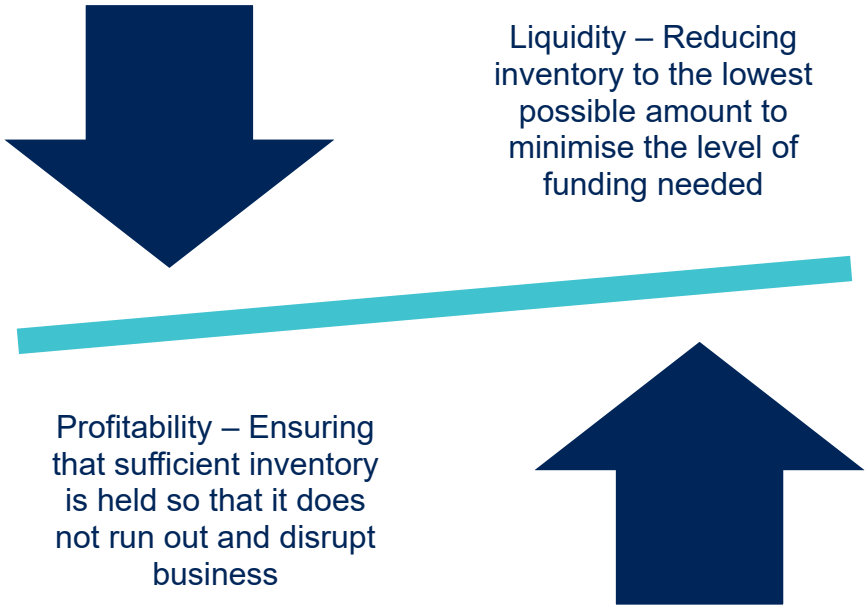
Overview


Profitability vs liquidity
Objectives
INVENTORY CONTROL
EOQ model
Re-order level
Inventory management systems
Dealing with discounts
JIT

1 The objectives of inventory management

1.1 Overview

Inventory is a major investment for many companies. Manufacturing companies can easily carry inventory equivalent to between 50% and 100% of the revenue of the business. It is therefore essential to reduce the levels of inventory held to the necessary minimum.



Notes

1.2 Problems

Keeping inventory levels high is expensive owing to:

- The foregone interest that is lost (or borrowing interest that is paid) from tying up capital in inventory.
- Holding costs:

If inventory levels are kept too low, the business faces alternative problems:

- High re-order/set up costs.
- Stock outs:
- Lost quantity discounts.

Notes

1.3 The challenge

The objective of good inventory management is therefore to determine:

The optimum re-order level **(ROL)** –

The optimum re-order quantity **(EOQ)** –

In practice, this means striking a balance between holding costs on one hand and stock out and re-order costs on the other.

Notes

2 Economic order quantity (EOQ)

2.1 The calculation

For businesses that do not use JIT inventory management systems there is an optimum order quantity for inventory orders, the EOQ. The aim of the EOQ model is to minimise the total cost of holding and ordering inventory.

The EOQ can be found using a formula

$$EOQ = \sqrt{\left(\frac{2CoD}{Ch}\right)}$$

Where:

C_O = cost per order

D = annual demand

C_H = cost of holding one unit for one year.

Notes

Question 1

EOQ

A company requires 2,000 units of material A per month. The cost per order is $250 and the holding costs of inventory are $1.33 per unit per year.

Investigate the total cost of buying the material in quantities of 2,000, 3,000 and 4,000 units at a time. Which is the cheapest option?

Use the EOQ formula to prove your answer is correct.

Notes

Question 2

EOQ

Annual demand for a product is 100,000 units. The purchase price is $10 per unit and the company's cost of finance is 20% per annum. Other holding costs of inventory total $0.50 per unit per month. Ordering costs are $125 each time an order is made.

Calculate the EOQ.

Illustrations and further practice

Notes

2.2 EOQ with quantity discounts

Discounts may be offered for ordering in large quantities. If the EOQ is smaller than the order size needed for a discount, should the order size be increased above the EOQ?

To work out the answer you should carry out the following steps.

Step 1:

Step 2:

Total annual inventory cost = purchase costs + ordering costs + holding costs

Purchase costs = D × P (where P is purchase price, including discounts if available)

Ordering costs = Co × D/Q

Holding costs = C_H × (Q/2 + buffer inventory)

(If the business holds no buffer inventory then just C_H × Q/2)

Step 3:

Step 4:

Step 5:

Notes

Question 3

EOQ and discounts

A company has annual demand for its product of 50,000 units. Each unit costs $1.50. Ordering costs are $55 per order and the annual holding cost per unit is $1.

Calculate the EOQ.

Determine if the optimum ordering quantity would change if the supplier offered a discount of 1% as long as at least 4,000 units were ordered each time.

Notes

Question 4

EOQ and discounts

A company has annual demand for its product of 200,000 units. Each unit costs $5. Ordering costs are $300 per order and the annual holding cost per unit is $0.85.

A 0.25% discount is available on all orders of at least 20,000 units and a 0.5% discount for orders of at least 30,000 units.

Calculate the optimum order level to reduce total inventory costs.

Illustrations and further practice

Notes

2.3 Calculating the reorder level (ROL) with known demand and lead time

Having decided how much inventory to reorder, the next problem is when to reorder. The firm needs to identify a level of inventory that can be reached before an order needs to be placed.

The ROL is the quantity of inventory on hand when an order is placed.

When demand and lead time are known with certainty the ROL may be calculated exactly,

i.e**. ROL = demand in the lead time.**

2.4 ROL with variable demand or variable lead time

When there is uncertainty over demand or lead time then an optimum level of buffer inventory must be found, which will depend on such things as the variability of demand, the cost of holding inventory and the cost of stockouts.

The calculation for this is not needed for the exam.

Question 5

Re-order level

Using the data from the previous question, assume that the company adopts an order level of 20,000 units and that the lead time from the supplier is four weeks.

What is the reorder level?

How frequently (in weeks) will an order be made?

Notes

Question 6

Re-order level

A company has demand per year for a product of 66,000 units and the supplier has a lead time of 2 months.

The company wishes to keep a buffer inventory of 2,000 units.

Calculate the re-order level.

Illustrations and further practice

Notes

3 Inventory management systems

3.1 Periodic review systems

Inventory levels are reviewed at fixed intervals and then topped up to a pre-determined level.

3.2 Just in time (JIT) systems

JIT is a series of manufacturing and supply chain techniques that aim to minimise inventory levels and improve customer service by manufacturing not only at the exact time customers require, but also in the exact quantities they need and at competitive prices.

In JIT systems, the balancing act is dispensed with. Inventory is reduced to an absolute minimum or eliminated altogether.

Notes

Questions

Chapter 9

Working capital management – Accounts receivable and payable

Outcome

By the end of this session, you should be able to:

- explain how to establish and implement a credit policy for accounts receivable
- explain the administration involved in collecting amounts owing from accounts receivable
- explain the pros and cons of offering early settlement discounts to accounts receivable and calculate the financial implications of early settlement
- define and explain the features of factoring and invoice discounting and discuss the pros and cons
- suggest and evaluate suitable techniques for managing accounts receivable within a scenario question
- explain the factors involved in the effective management of trade credit
- calculate the effective cost of an early settlement discount offered on an account payable
- discuss the pros and cons of trade credit as a source of short-term finance
- explain the specific factors to be considered when managing foreign accounts receivable and payable

and answer questions relating to these areas.

Chapter 9

PER

One of the PER performance objectives (PO10) is to manage and control working capital. You manage cash and working capital effectively, planning for any shortfall or surplus including receivables, payables and inventories. Working through this chapter should help you understand how to demonstrate that objective.

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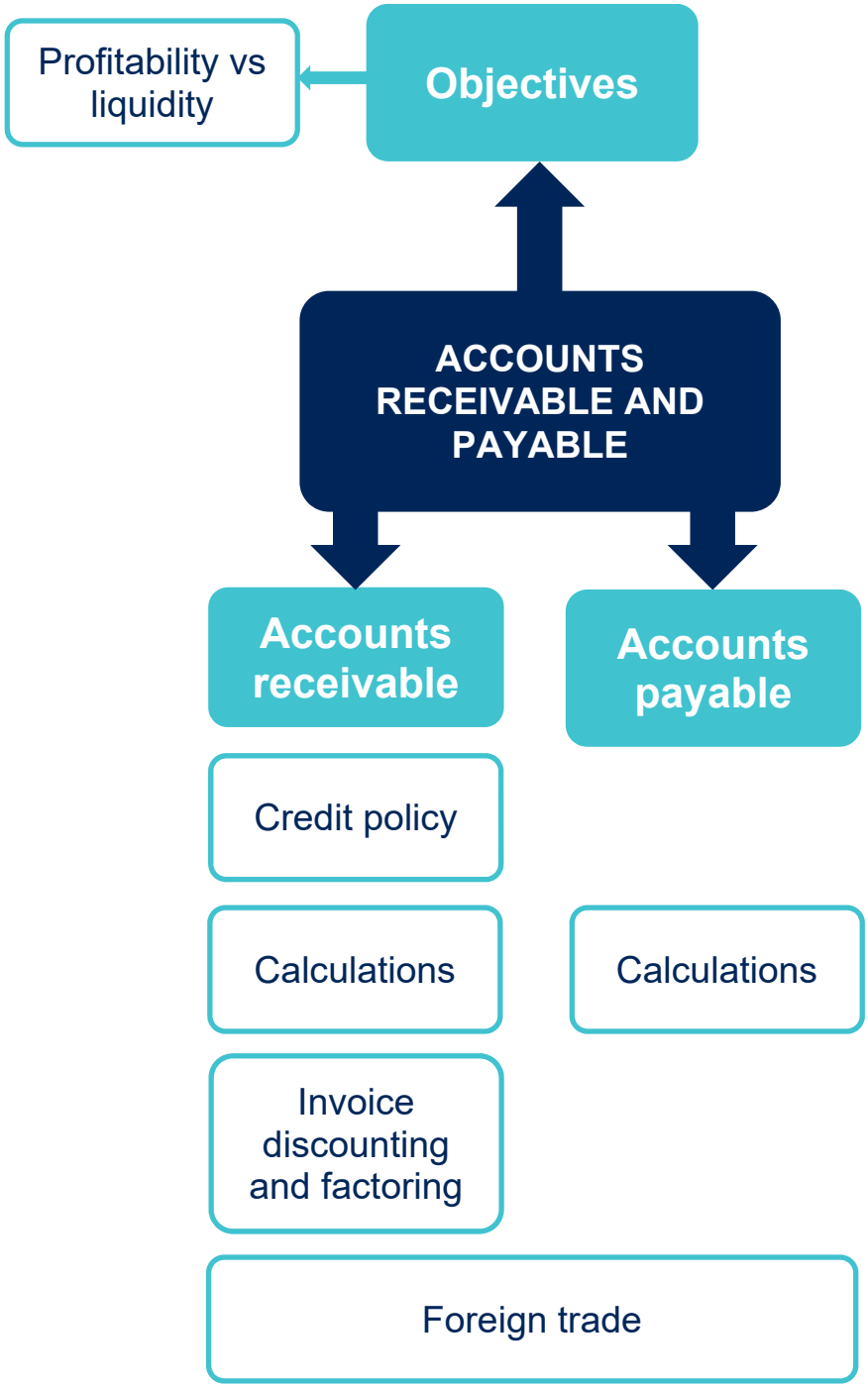
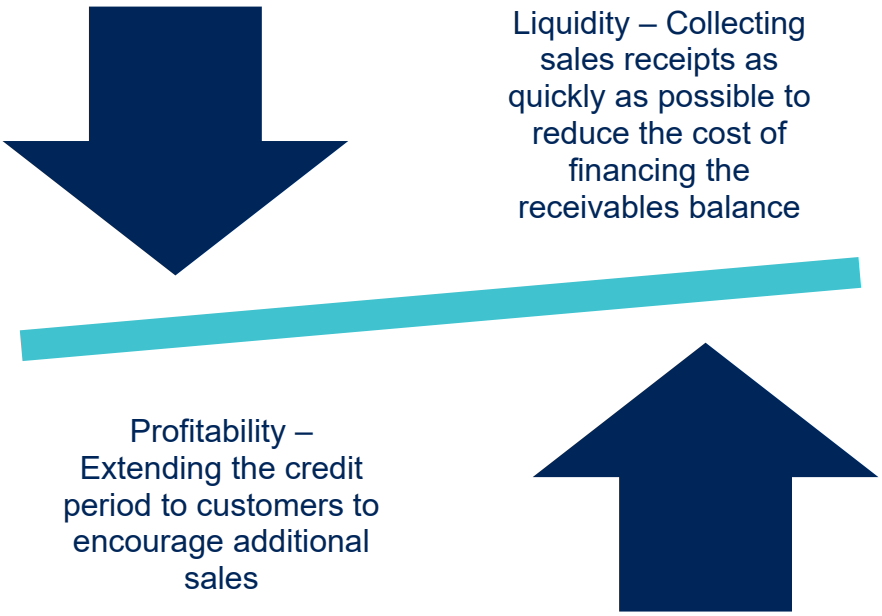
Overview


Profitability vs liquidity
Objectives
ACCOUNTS RECEIVABLE AND PAYABLE
Accounts receivable
Accounts payable
Credit policy
Calculations
Calculations
Invoice discounting and factoring
Foreign trade

1 Accounts receivable

1.1 Objectives

Management must establish a credit policy. The optimum level of trade credit extended represents a balance between two factors. This trade-off is a key factor in determining the entities working capital investment.



Notes

1.2 Establishing a credit policy

A company's credit policy will be influenced by:

-
-
-
-
-

A credit policy has four key aspects:

- assess creditworthiness
- credit limits
- invoice promptly and collect overdue debts
- monitor the credit system

Notes

1.3 Accounts receivable calculations

Cost of financing receivables

Question 1

Receivables financing cost

ABC Co has sales of $50m for the previous year. Receivables days are 57 and receivables are financed using an overdraft costing 6% per annum.

Calculate the receivables balance and the annual financing cost for receivables.

Illustrations and further practice

Notes

1.4 Early settlement discounts

Cash discounts may be offered by the company to encourage early payment by customers.

Cost = cash lost from receiving less money from customers

Benefit = cash received earlier = lower receivables balance = lower working capital funding requirement

Discounts may also reduce the number of irrecoverable debts.

Calculation of annual cost of discount:

If the cost of offering the discount exceeds the benefit of the saved funding cost, then the discount should not be offered.

Question 2

Early settlement discount

A company is offering a 2% discount to receivables if they agree to pay within 30 days. The current receivables days figure is 65. Receivables are financed using an overdraft costing 20%.

Calculate the effective annual cost of offering the discount and state whether it should be offered.

Notes

Question 3

Early settlement discount

ABC Co has sales of $50m for the previous year. Receivables at the yearend were $7,808,219 and receivables are financed using an overdraft costing 6% per annum. Receivables days are 57. The current receivables financing cost is $468,493.

ABC Co is now considering offering a discount of 1% for payment within 7 days. Should it be introduced if 20% of customers take the offer?

Illustrations and further practice

Notes

1.5 Invoice discounting and factoring

Invoice discounting and factoring are both ways of speeding up the receipt of funds from accounts receivable and therefore of reducing the funding need but they both come with costs attached.

Invoice discounting

Invoice discounting is a method of raising finance against the security of receivables without using the receivables ledger administration services of a factor.

Advantages	Disadvantages
Short term cash boost	Expensive long term
Customer is unaware	Extra administration costs

Factoring

Factoring is outsourcing of the credit control department to a third party.

Advantages	Disadvantages
Short term cash boost	Expensive long term
Administration savings	Customer stigma

Notes

Question 4

Factoring

ABC Co has sales of $50m for the previous year. Receivables at the yearend were $7,808,219 and receivables are financed using an overdraft costing 6% per annum. Receivables days are 57. The current receivables financing cost is $468,493.

ABC Co is now considering using a debt factor. It has been in negotiations with two factors who are offering different terms.

The first factor will operate on a service-only basis. ABC would be able to make administrative savings of $50,000 from this service. The factor also undertakes to pay all invoices within 30 days instead of the current 57. For its services, the factor will charge a fee of 0.5% of ABC Co's revenue.

The second factor will advance 85% of the book value of ABC Co's invoices immediately at a cost of 7% in addition to administering the receivables ledger. The remaining 15% of sales will continue to be paid on average over 57 days. The factor promises administrative savings of $100,000 and will charge a fee of 0.25% of all sales.

Determine whether either of the factor offers is acceptable to ABC Co.

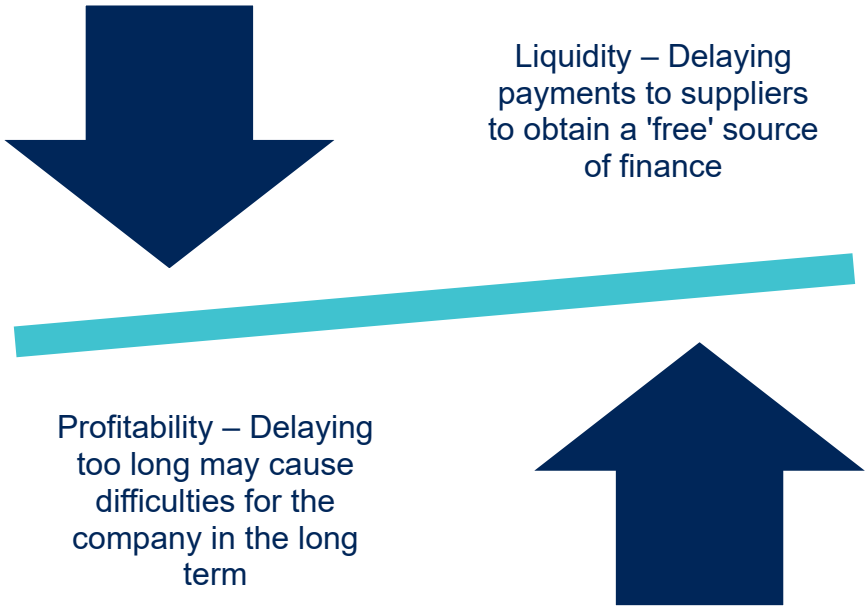
Illustrations and further practice

Notes

2 Accounts payable

2.1 Objectives

Trade credit is the simplest and most important source of short-term finance for many entities. Again, it is a balancing act between profitability and liquidity.



Notes

2.2 Problems

By delaying payment to suppliers, entities face possible problems:

-
-
-
-

2.3 Early payment discount

Cash discounts maybe offered by suppliers to encourage early payment by the company.

Cost = cash paid earlier = lower payables balance = higher working capital funding requirement

Benefit = less cash paid to suppliers

The calculations use the same techniques as those for accounts receivable.

Notes

Question 5

Early payment discount

A supplier has offered a discount to Paxton Co of 1.5% for early payment within 5 days of invoices for which 35 days is the usual payment time.

If Paxton Co funds working capital at a rate of 15% per annum, should the discount be accepted?

Notes

Question 6

Early payment discount

A supplier has offered a one off discount to Hudson Co on a large invoice of $1,500,000. If Hudson Co pays within 10 days instead of the usual 45, the supplier will allow Hudson to take a 1% discount.

If Hudson Co funds working capital at a rate of 12%, should the discount be accepted?

Illustrations and further practice

Notes

3 Accounts receivable and payable – managing foreign trade

Overseas accounts receivable and payable bring additional risks that need to be managed.

Export credit risk is the risk of failure or delay in collecting payments due from foreign customers.

Foreign exchange risk is the risk that the value of the currency will change between the date of the contract and the date of settlement.

Foreign exchange risk will be looked at in more detail in a later chapter.

Notes

Questions

Notes

Chapter 10

Working capital management – Cash and funding strategies

Outcome

By the end of this session, you should be able to:

- explain the main reasons for a business to hold cash
- define and explain the use of cash budgets and cash flow forecasts
- prepare a cash flow forecast to determine future cash flows and cash balances
- explain the points addressed by the Baumol cash management model
- explain the logic of the Miller-Orr cash management model
- calculate the optimum cash management strategy using the Baumol and Miller-Orr cash management models
- explain the ways in which a firm can invest cash short-term and long-term
- calculate the level of working capital investment in current assets from supplied data
- explain the main strategies available for the funding of working capital
- explain the distinction between permanent and fluctuating current assets
- explain the relative costs and risks of short-term and long-term finance
- explain the logic behind matching short-term and long-term assets and funding
- explain the relative costs and benefits of aggressive, conservative and matching funding policies

- explain the impact that factors such as management attitudes to risk, previous funding decisions, and organisation size might have on the strategy chosen to fund working capital
- discuss the advantages and disadvantages of an overdraft and short-term loans as a source of short-term finance

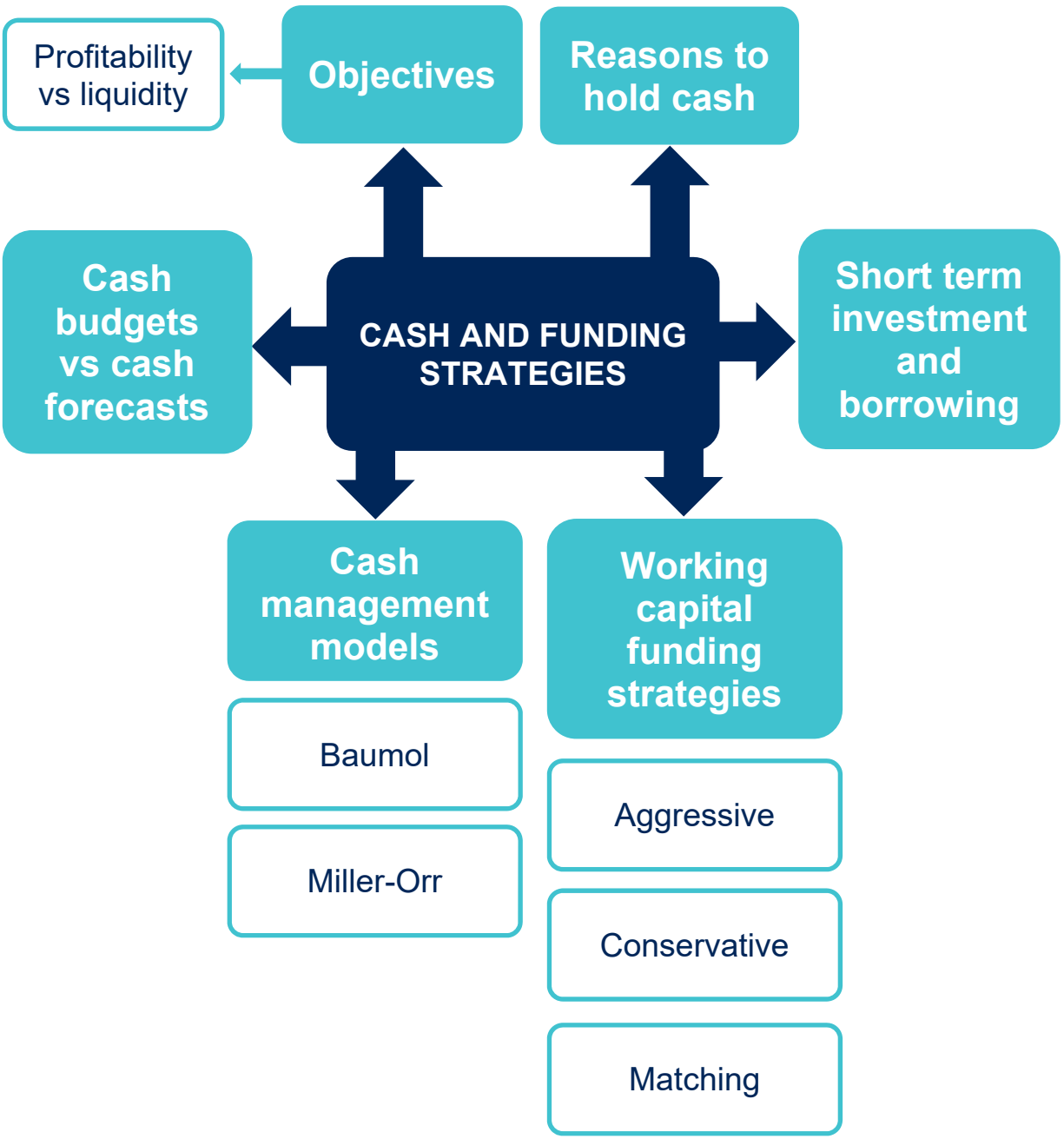
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO10) is to manage and control working capital. You manage cash and working capital effectively, planning for any shortfall or surplus including receivables, payables and inventories. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 10 of your Study Text

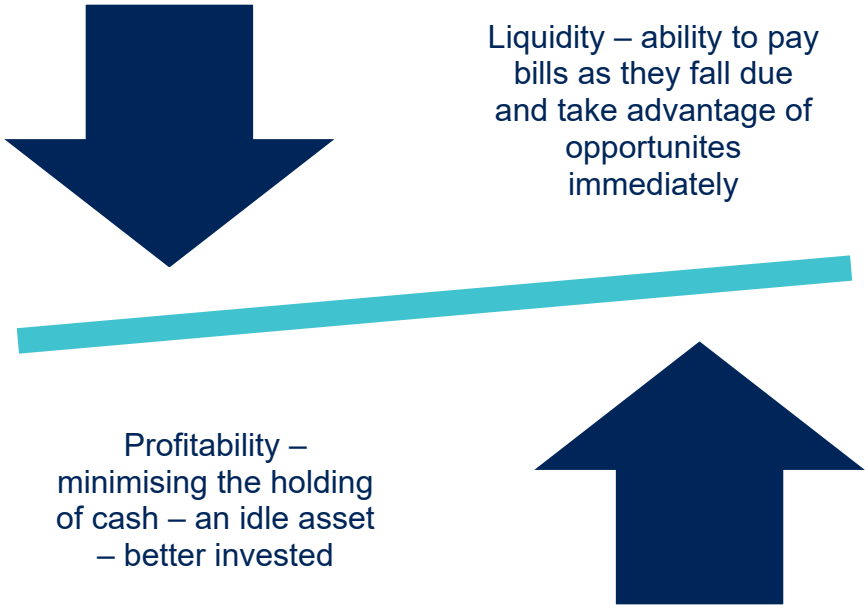
Overview


Profitability vs liquidity
Objectives
Reasons to hold cash
Cash budgets vs cash forecasts
CASH AND FUNDING STRATEGIES
Short term investment and borrowing
Cash management models
Baumol
Miller-Orr
Working capital funding strategies
Aggressive
Conservative
Matching

1 Reasons for holding cash

1.1 Objectives

Once again, the company faces a balancing act:



Notes

1.2 Motives for holding cash

- transactions motive
- precautionary motive
- investment motive

Failure to hold enough cash can lead to:

- loss of settlement discounts
- loss of supplier goodwill
- poor industrial relations
- potential liquidation

Notes

2 Cash budgets and cash flow forecasts

A cash forecast is an estimate of cash receipts and payments for a future period under existing conditions.

A cash budget is a commitment to a plan for cash receipts and payments for a future period after taking any action necessary to bring the forecast into line with the overall business plan.

Cash budgets are used to:

-
-
-

Cash forecasts can be prepared based on:

-
-
-

Notes

Question 1

Cash forecasting

Sales (before discounts) for a company are predicted to be as follows:

Month	1	2	3	4	5	6
($000)	50	55	58	63	70	74

20% of the sales will be for cash, with customers taking a 2% discount. 40% of sales will pay in the following month and 35% in two months. The remaining 5% will be written off as bad debts.

Calculate the cash receipts for months 3 to 6.

Notes

Question 2

Cash forecasting

Material usage quantities for a company are predicted to be as follows:

Month	1	2	3	4	5
(000)	10	12	14	16	18

Production costs are $5 per unit and suppliers are paid in the month after purchase. The company intends to increase stocks of materials by 2,000 units each month by the end of months 1 and 2 and by 1,000 units each month by the end of months 3, 4 and 5.

Calculate the cash payments for material purchases for months 3 to 5.

Illustrations and further practice

Notes

3 Cash management models

3.1 Overview

Cash management models are aimed at minimising the total costs associated with movements between:

- a current account
- short-term investments

3.2 The Baumol cash management model

Baumol noted that cash balances are very similar to inventories, and developed a model based on the economic order quantity (EOQ) inventory model.

This model is most useful when cash balances move steadily in one direction over time.

Notes

Question 3

Baumol model

A profitable company has a cash balance that is growing over time. Each month it generates $25,000 excess cash. It intends to transfer this cash into a short-term deposit account, which would earn 3% per annum. Every time it transfers money into the account, it incurs a transaction fee of $25.

Using the Baumol cash model, calculate the optimum amount of cash to be transferred each time.

Notes

Question 4

Baumol model

A company is undertaking a large investment, which will require cash next year of $500,000 spread evenly throughout the year. At the moment, it holds most of its money in a short-term deposit account. In order to pay for the investment, it intends to move this money from the deposit account into the current account.

If the transaction fee every time money is transferred between the accounts is $29.50 and the deposit account earns interest of 2% per year, calculate how frequently (in weeks) the company should transfer cash from the deposit account and how much cash should be transferred each time.

Illustrations and further practice

Notes

3.3 The Miller-Orr cash management model

The Miller-Orr model controls irregular movements of cash by the setting of upper and lower control limits on cash balances.

It has the advantage of incorporating uncertainty in the cash outflows and inflows.

This model is most useful when cash balances fluctuate up and down over time.

Question 5

Miller Orr model

The cash balance at ABC plc fluctuates over time with some months seeing a large positive cash balance and others showing an overdraft. The company wishes to control its cash more efficiently and take advantage of available short-term investments when it has surplus cash. It wishes to maintain a minimum cash balance of $10,000. The short-term investments earn interest at 0.04% per day.

If the transaction cost of switching cash between the current account and the company's short-term investments is $15 and the variance of the company's cash flows is $6 million per day, use the Miller Orr model to calculate the spread, the return point and the upper limit.

Notes

Question 6

Miller Orr model

A company uses the Miller Orr cash management model, with the following figures:

Minimum cash balance: $25,000

Transaction cost: $20 per transaction

Standard deviation of cash flows: $3,000 per day (i.e. variance of cash flows = (standard deviation)^2 = $3,000^2 = $9,000,000 per day

Interest rate: 10.95% per annum (i.e. 0.03% per day)

Use the Miller Orr model to calculate the spread, the return point and the upper limit.

Illustrations and further practice

Notes

4 Short-term investment and borrowing solutions

4.1 Short-term cash investments

These are used for temporary cash surpluses.

To weigh up an investment a company has to weigh up three potentially conflicting objectives and the factors surrounding them.

- liquidity
- safety
- profitability

4.2 Short-term borrowing

There are two main sources of bank lending:

- bank overdraft
- bank loans

Notes

5 Strategies for funding working capital

In the same way as for long-term investments, a firm must make a decision about what source of finance is best used for the funding of working capital requirements.

Current assets are made up of two elements:

- permanent
- fluctuating

The choice of funding working capital is either from:

- short-term sources
- long-term sources

The strategy adopted depends on management's attitude to risk

- aggressive
- conservative
- matching

Notes

Questions

Chapter 11

The economic environment for business

Outcome

By the end of this session, you should be able to:

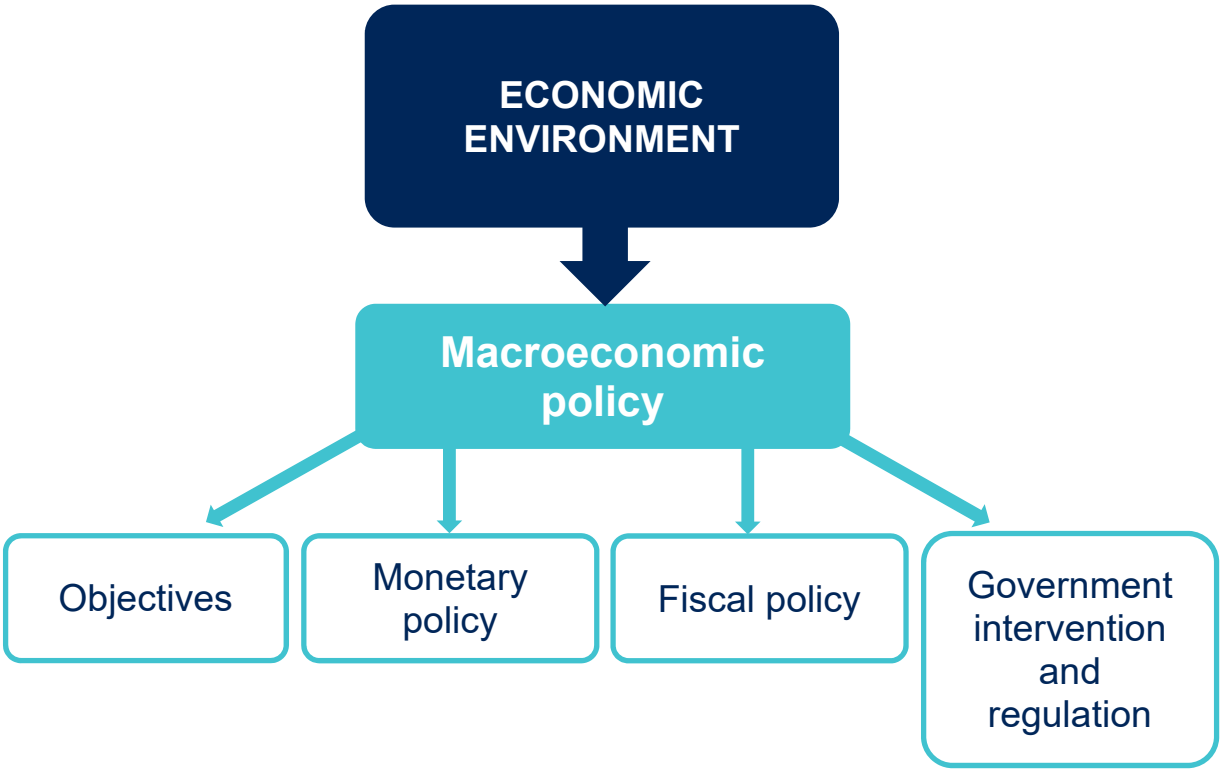
- explain the main objectives of macroeconomic policy
- explain the potential conflict between the main objectives of macroeconomic policy and its impact on policy targets
- explain the impact of general macroeconomic policy on planning and decision making in the business sector
- define monetary policy and explain the main tools used
- discuss the general role of monetary policy in the achievement of macroeconomic policy targets
- discuss use of interest rates in the achievement of macroeconomic policy targets
- define exchange rate policy and discuss its role in the achievement of macroeconomic policy targets
- explain the impact of specific economic policies on planning and decision making in the business sector
- define fiscal policy and explain the main tools used
- discuss the role of fiscal policy in the achievement of macroeconomic policy targets
- explain the need for competition policy and its interaction with business planning and decision making

- explain the need for government assistance for business and its interaction with business planning and decision making
- explain the need for green policies and their interaction with business planning and decision making
- explain the need for corporate governance regulation and its interaction with business planning and decision making

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 11 of your Study Text

Overview


ECONOMIC ENVIRONMENT
Macroeconomic policy
Objectives
Monetary policy
Fiscal policy
Government intervention and regulation

1 Macroeconomic policy

Macroeconomic policy is the management of the economy by government in such a way as to influence the performance and behaviour of the economy as a whole.

1.1 Principal objectives

Organisations set objectives that will satisfy key stakeholders, such as:

- full employment of resources
- price stability
- economic growth
- balance of payments equilibrium
- an appropriate distribution of income and wealth

The pursuit of these objectives may involve conflict and trade-offs, e.g.

Full employment versus price stability

Economic growth versus balance of payments

Notes

2 Monetary policy

Monetary policy is concerned with influencing the overall monetary conditions in the economy.

In particular:

- the volume of money in circulation – the money supply
- the price of money – interest rates.

2.1 Impact of monetary policy on business decision making

Factors affected	Achieved by controlling supply	Achieved by increasing interest rates
Availability of finance	Credit restrictions mean small businesses can struggle to raise funds	
Cost of finance	Reduced supply pushes up the cost of funds and discourages business expansion	Shareholders require higher returns to make investing in shares worthwhile compared to interest earning investments. Without an increase in return, share price falls
Level of consumer demand	Too difficult to raise funds to spend	Saving becomes more attractive, borrowing to spend is less attractive
Exchange rates		High interest rates attract foreign investment and leads to a short-term increase in exchange rates (increased demand for currency) Exports become dearer Imports become cheaper

Notes

All the above factors also influence inflation, which has a significant impact on business cash flows and profits. Inflation may be:

- demand-pull inflation – due to excess demand

- cost-push inflation – due to higher costs

Notes

3 Fiscal policy

Fiscal policy is the manipulation of the government budget in order to influence the level of aggregate demand and therefore the level of activity in the economy.

Aggregate demand is the total demand for goods and services in the economy.

Fiscal policy covers:

- government spending
- taxation
- government borrowing

The role of the government is to balance the budget. Expenditure by the government is financed either by taxation or borrowing.

A balanced budget is where total expenditure is matched by total taxation income.

A budget deficit is where government expenditure exceeds taxation income.

A surplus budget is where government expenditure is less than taxation income.

Notes

4 Government intervention and regulation

As well as the general policy measures to impact business operations, governments can also take more specific measures to regulate businesses.

- competition policy
- provision of government assistance
- green policies
- corporate governance guidelines

Notes

4.1 Corporate governance

Corporate governance is defined as 'the system by which companies are directed and controlled' and covers issues such as ethics, risk management and stakeholder protection.

Corporate governance frameworks contain regulations on:

- separation of the supervisory function and the management function
- transparency in the recruitment and remuneration of the board
- appointment of non-executive directors (NEDs)
- establishment of risk control procedures to monitor strategic, business and operational activities.

Notes

Questions

Notes

Chapter 12

Financial markets and the treasury function

Outcome

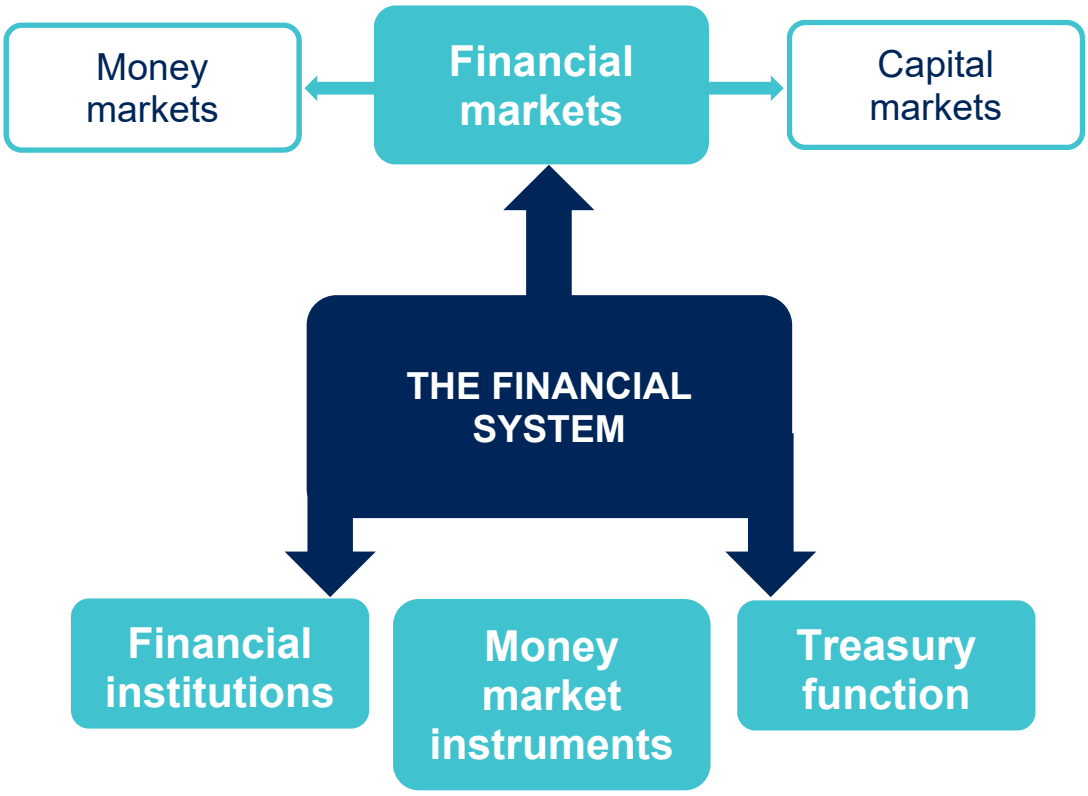
By the end of this session, you should be able to:

- identify the nature and role of capital and money markets, both nationally and internationally
- explain the role of financial intermediaries
- explain the main functions of a stock market and of a corporate bond market
- describe the role of the money markets in providing short-term liquidity to industry and the public sector and in providing short-term trade finance
- describe the role of the money markets in allowing an organisation to manage its exposure to foreign currency and interest rate risk
- explain the role of the banks and other financial institutions in the operation of the money markets
- explain the characteristics of interest-bearing and discount instruments and their use in the money markets
- explain the characteristics of derivatives and their use in the money markets
- discuss the pros and cons of centralised treasury management and control

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 12 of your Study Text

Overview


Money markets
Financial markets
Capital markets
THE FINANCIAL SYSTEM
Financial institutions
Money market instruments
Treasury function

1 Introduction

The financial system is an umbrella term covering the following:

- **financial markets**
- **financial institutions**
- **financial securities**

The financial system does the following:

- channels funds from lenders to borrowers
- provides a mechanism for payments
- creates liquidity and money
- provides financial services such as insurance and pensions
- offers facilities to manage investment portfolios.

Security is a generic term for a medium of investment, for example a share, a corporate bond or a money market instrument. Many securities are traded on a market.

Notes

2 The role of financial markets

Financial markets are mechanisms where those requiring finance (deficit units) can get in touch with those able to supply it (surplus units), i.e. allowing the buyers and sellers of finance to get together.

There are two main types of financial market:

- capital markets
- money markets

Within each of these are:

- primary markets
- secondary markets

Notes

3 Money markets

Money markets deal in short-term funds (<1 year) and transactions.

They play a key role in:

- providing short-term liquidity to companies, banks and the public sector

Notes

4 Capital markets

Capital markets deal in longer-term finance, mainly via a stock exchange, dealing mainly in:

- public sector and foreign stocks
- company securities (shares and corporate bonds)
- Eurobonds (bonds issued in a currency other than that of the national currency of the issuing company).

4.1 International capital markets

An international financial market exists where domestic funds are supplied to a foreign user or foreign funds are supplied to a domestic user. The currencies need not be those of either the lender or the borrower.

Notes

4.2 Stock markets and corporate bond markets

The role of the stock market is to:

- facilitate trade in stocks such as:
  - issued shares of public companies
  - corporate bonds
  - government bonds
  - local authority loans
- allocate capital to industry (share prices of attractive companies rise making it easier for them to raise cheap capital)
- determine a fair price for the assets traded.

Speculative trading on the market can assist by:

- smoothing price fluctuations
- ensuring shares are readily marketable.

Market-makers:

- maintain stocks of securities in a number of quoted companies
- continually quote prices for buying and for selling the securities (bid and offer prices)
- generate income by the profits they make from the difference (or 'spread') between the bid and offer prices.

Notes

5 The role of financial institutions

Faced with a desire to lend or borrow, there are three choices open to the end-users of the financial system:

- Lenders and borrowers contact each other directly
- Lenders and borrowers use an organised financial market
- Lenders and borrowers use financial institutions as intermediaries

Intermediation refers to the process whereby potential borrowers are brought together with potential lenders by a third party, the intermediary.

Financial intermediaries have a number of important roles:

- Risk reduction
- Aggregation
- Maturity transformation
- Financial intermediation

Notes

6 Money market instruments

A money market instrument is any type of security that is traded in the money market.

Coupon bearing securities

Certificates of deposit (CDs)

Sale and repurchase agreements (repos)

Discount instruments

Treasury bills

Commercial bills

Commercial paper

Banker's acceptances

Derivatives

FRAs

Caps and floors

Interest rate futures and options

Interest rate swaps

Swaptions

Notes

7 The role of the treasury function

The treasury function of a firm usually has the following roles:

Short-term management of resources

- short-term cash management – lending/borrowing funds as required
- currency management.

Long-term maximisation of shareholder wealth

- raising long-term finance, including equity strategy, management of debt capacity and debt/equity structure
- investment decisions, including investment appraisal, the review of acquisitions and divestments and defence from takeover
- dividend policy.

Risk management

- assessing risk exposure
- interest rate risk management
- hedging of foreign exchange risk.

Notes

7.1 The international treasury function

Specific functions may include:

- setting transfer prices to reduce the overall tax bill (subject to local laws)
- deciding currency exposure policies and procedures
- transferring cash across international borders
- devising investment strategies for short-term funds from the range of international money markets and international marketable securities
- netting and matching currency obligations.

7.2 Centralising treasury management

- Centralised
  - avoids duplication of skills
  - arrange funding in bulk – cheaper
  - more effective foreign currency management
  - netting off surpluses and deficits in same currency means less need for overdraft and incidence of bank charges.
- Decentralised
  - greater autonomy and motivation in operating companies
  - better feel for local conditions and quicker response to developments.

Notes

Questions

Chapter 13

Foreign exchange risk

Outcome

By the end of this session, you should be able to:

- explain the meaning and causes of translation risk, transaction risk and economic risk
- describe how the balance of payments can cause exchange rate fluctuations
- explain the impact of purchasing power parity on exchange rate fluctuations
- explain the impact of interest rate parity on exchange rate fluctuations
- use purchasing power parity theory (PPPT) to forecast exchange rates
- use interest rate parity theory (IPPT) to forecast exchange rates
- explain the principle of four-way equivalence and the impact on exchange rate fluctuations
- explain the significance of the currency of an invoice on foreign currency risk management
- discuss and apply netting and matching as a form of foreign currency risk management
- discuss and apply leading and lagging as a form of foreign currency risk management
- define a forward exchange contract
- calculate the outcome of a forward exchange contract
- define money market hedging

- calculate the outcome of a money market hedge used by an exporter
- calculate the outcome of a money market hedge used by an importer
- explain the significance of asset and liability management on foreign currency risk management
- compare and evaluate traditional methods of foreign currency risk management
- define the main types of foreign currency derivatives and explain how they can be used to hedge foreign currency risk

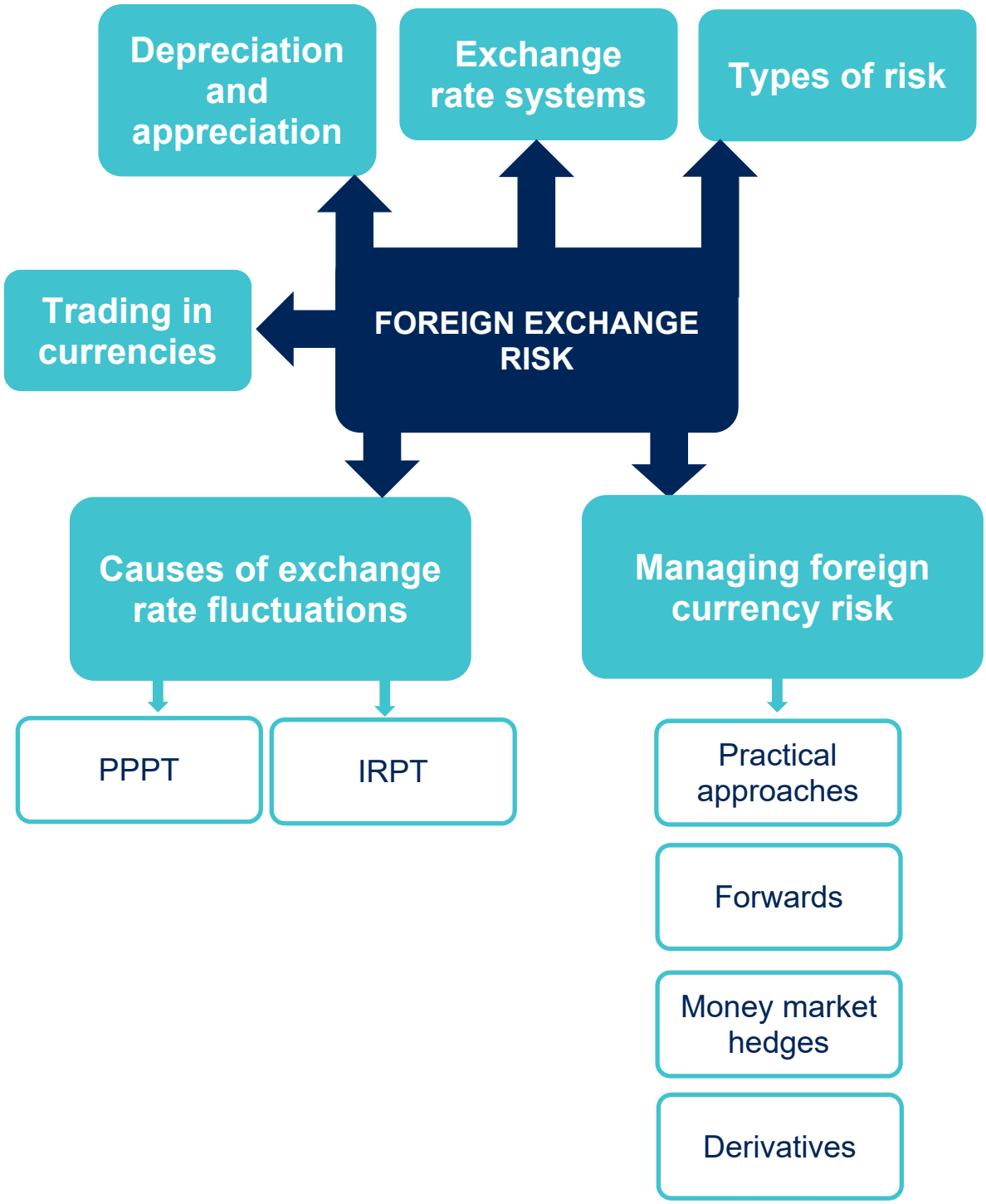
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO11) is to identify and manage financial risk. You identify sources of risk, assess their impact and advise on ways of managing the risks. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 13 of your Study Text

Overview


Depreciation and appreciation
Exchange rate systems
Types of risk
Trading in currencies
FOREIGN EXCHANGE RISK
Causes of exchange rate fluctuations
Managing foreign currency risk
PPPT
IRPT
Practical approaches
Forwards
Money market hedges
Derivatives

1 Foreign currency risk

Foreign currency risk arises for companies that trade internationally.

1.1 Exchange rate systems

In a floating exchange rate system:

- the authorities allow the forces of supply and demand to continuously change the exchange rates without intervention
- the future value of a currency against other currencies is uncertain
- the value of foreign trades will be affected

The world's leading currencies such as the US dollar, Japanese Yen, British pound and the European Euro float against each other.

Other systems include:

- fixed exchange rates
- freely floating exchange rates
- managed floating exchange rates

Notes

1.2 Depreciation and appreciation of a currency

If a currency depreciates, its price (exchange rate) has fallen.

If a currency appreciates, its exchange rate has risen.

If one currency appreciates then another currency depreciates.

$1.50 = £1 ⟶ $1.60 = £1

Notes

2 Types of foreign currency risk

2.1 Transaction risk

Transaction risk is the risk of an exchange rate changing between the transaction date and the subsequent settlement date, i.e. it is the gain or loss arising on currency conversion.

It arises on any future transaction involving conversion of cash between two currencies. The most common area where transaction risk is experienced relates to imports and exports.

A firm may decide to hedge – take action to minimise – the risk, if it is:

- a material amount
- over a material time period
- thought likely exchange rates will change significantly.

Hedging methods are looked at later in this chapter.

Notes

Question 1

Transaction risk

On 1 Sep a US company enters into a contract with a customer for which €100,000 is due to be received in 6 months. The exchange rate on the date the contract is entered into is €0.93 = $1.

Calculate the change in $ received compared to 1 Sep if the exchange rate moves to:

(1) €0.97 = $1

(2) €0.89 = $1

Illustrations and further practice

Notes

2.2 Economic risk

Economic risk is the variation in the value of the business (i.e. the present value of future cash flows) due to unexpected changes in exchange rates. It is the long-term version of transaction risk.

For an export company it could occur because:

- the home currency strengthens against the currency in which it trades

- a competitor's home currency weakens against the currency in which it trades

Companies may choose to diversify their business internationally so that the company is not overexposed to any one economy in particular.

Notes

Question 2

Economic risk

A US exporter sells one product in the UK on a cost plus basis and invoices in £ to remain competitive in the UK market. The selling price in £ is based on costs of $125 plus a mark-up of 5% to give a sales price of $131.25.

The current exchange rate is £0.81 = $1

Does the exporter still make a profit on the goods if the exchange rate moves to £0.87 = $1?

Illustrations and further practice

Notes

2.3 Translation risk

Where the reported performance of an overseas subsidiary in home-based currency terms is distorted in financial statements because of a change in exchange rates.

NB. This is an accounting risk rather than a cash-based one.

Notes

3 Trading in currencies

3.1 The foreign exchange market

The foreign exchange market is an international market in foreign currencies. It is highly competitive and virtually no difference exists between the prices in one market (e.g. New York) and another (e.g. London).

Banks dealing in foreign currency quote two prices for an exchange rate:

- a lower 'offer' price
- a higher 'bid' price

3.2 The spot market

The spot market is where you can buy and sell a currency now (immediate delivery), i.e. the spot rate of exchange is the exchange rate as of today.

3.3 The forward market

The forward market is where you can buy and sell a currency at a fixed future date for a predetermined rate, by entering into a forward exchange contract.

Notes

Question 3

Bid and offer prices

The € rate per £ is quoted as €1.153 – €1.158 = £1.

Company X wants to sell €1,000,000 to buy sterling.

Company Z wants to buy €1,000,000 by selling sterling

What rate will the bank offer each company?

Illustrations and further practice

Notes

4 The causes of exchange rate fluctuations

4.1 Purchasing power parity theory (PPPT)

PPPT claims that the rate of exchange between two currencies depends on the relative inflation rates within the respective countries.

- 'the law of one price'
- the country with the higher inflation rate will be subject to a depreciation of its currency.

Formula to estimate expected **future spot rates**:

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

h_c represents the inflation of the country with the counter currency and h_b represents inflation in the base country.

Limitations:

- the future inflation rates are estimates
- the market is dominated by speculative transactions
- government may intervene to manage exchange rates.

Notes

Question 4

PPPT

An item costs $5,000 in the US. The spot exchange rate is $1.23 = £1. Inflation over the next year is expected to be 4% in the US and 2% in the UK.

Assuming that the law of one price applies:

Calculate the £ value of the item today.

Calculate the exchange rate in one year's time.

Notes

Question 5

PPPT

The current exchange rate between Euros and US$ is €0.93 = $1.

If inflation in the Eurozone is anticipated to be 2.5% over the next year and in the US will be 3%, calculate the expected future spot rate in a year's time.

Illustrations and further practice

Notes

4.2 Interest rate parity theory (IRPT)

IRPT claims that the difference between the spot and the forward exchange rates is equal to the differential between interest rates available in the two countries.

The forward rate is a future exchange rate, agreed now, for buying or selling an amount of currency on an agreed future date.

- the country with the higher interest rate see the forward rate for its currency subject to a depreciation.

Formula to estimate **forward rates**:

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

Limitations:

- government controls on capital markets
- controls on currency trading
- intervention in foreign exchange markets.

Notes

Question 6

IRPT

The current exchange rate between US$ and £ is $1.23 = £1. A UK investor invests £100,000 in a US deposit account for one year earning interest at a rate of 5.6% instead of in a UK deposit account earning 3.6% as he feels he will get a better return.

Assuming interest rate parity holds, show that the investor would end up no better off from investing in the US than in the UK.

Question 7

IRPT

The current exchange rate between Euros and US$ is €0.93 = $1.

If interest in the Eurozone is anticipated to be 5% over the next year and in the US will be 6%, calculate the forward rate for delivery in a year's time.

Notes

Question 8

IRPT non-annual periods

The current exchange rate between US$ and £ is $1.23 = £1.

If interest in the UK is anticipated to be 4% over the next year and in the US will be 7%, calculate the forward rate for delivery in:

(a) 2 years' time

(b) 6 months' time.

Illustrations and further practice

Notes

5 Managing foreign currency risk

Taking measures to eliminate or reduce a risk is called hedging the risk or hedging the exposure.

5.1 Practical approaches

- Deal in home currency
- Do nothing
- Leading
- Lagging
- Matching receipts and payments
- Netting
- Foreign currency bank accounts
- Matching assets and liabilities

Notes

5.2 Forward exchange contracts

Used to hedge against transaction risk. Exchange made at pre-agreed forward rate.

Advantages

- flexibility on amount and date
- straightforward.

Disadvantages

- contractual commitment
- no opportunity to benefit from favourable rate movements.

Question 9

Forward exchange contract

On 1 Sep a US company enters into a contract with a customer for which €100,000 is due to be received in 6 months. The exchange rate on the date the contract is entered into is €0.93 = $1.

The company takes on a forward exchange contract with a rate of €0.94 = $1

Calculate the $ received if the exchange rate moves to:

(1) €0.97 = $1

(2) €0.89 = $1

Notes

Question 10

Forward exchange contract

A UK importer expects to pay $150,000 in 3 months and enters into a forward exchange contract with a spread of $1.22 – $1.24 = £1.

Calculate in £ how much will be paid to settle the contract.

Illustrations and further practice

Notes

5.3 Money market hedges

Hedging a payment – 3 steps

- divide the foreign currency payment amount by (1 plus the **foreign** currency **deposit** rate for the time period in question)
- take the figure calculated and translate it to the home currency at the **spot rate**
- take the figure calculated and multiply it by (1 plus the **home** currency **borrowing** rate for the time period in the question).

NB. May have to adjust given annual interest rates to the time period of the question scenario.

Hedging a receipt – 3 steps

- divide the foreign currency receipt amount by (1 plus the **foreign** currency **borrowing** rate for the time period in question)
- take the figure calculated and translate it to the home currency at the **spot rate**
- take the figure calculated and multiply it by (1 plus the **home** currency **deposit** rate for the time period in the question).

Notes

Question 11

Money market hedge – payment

Hicks plc, a UK company, needs to make a payment in € of 900,000 in 6 months' time and chooses to enter into a money market hedge to eliminate the transaction risk on the payment.

Appropriate information is as follows:

Current spot rate: €1.153 – €1.158 = £1

Money market rates per annum:

Eurozone Borrowing 3%, Lending 2%

UK Borrowing 5%, Lending 3.5%

Calculate the £ that would be needed for the payment to be made using the money market hedge.

Notes

Question 12

Money market hedge – receipt

Hicks plc, a UK company, is now due to receive €1,400,000 in 3 months' time and chooses to enter into a money market hedge to eliminate the transaction risk on the receipt.

Appropriate information is as follows:

Current spot rate: €1.153 – €1.158 = £1

Money market rates per annum:

Eurozone Borrowing 3%, Lending 2%

UK Borrowing 5%, Lending 3.5%

Calculate the £ that would be received using the money market hedge.

Illustrations and further practice

Notes

5.4 Foreign currency derivatives

Currency futures

- like a forward in that they fix the foreign currency rate and are binding
- are tradable on futures exchanges
- are settled on three monthly cycles
- are for standardised amounts
- are priced at the exchange rate specified in the contract.

Because of their standardised nature, by date and by amount, they rarely cover the exact currency transaction exposure.

The operation of the futures contract is that if an unfavourable currency movement affects the underlying transaction, the futures contract will generate a profit to offset this and if the underlying transaction sees a favourable movement, the futures contract will generate an offsetting loss.

e.g. if due to sell a foreign currency in the future, sell today a futures contract in that currency ready to buy it back in the future. The buy back of the futures contract and the selling of the currency will offset each other and cancel out exchange rate movements between now and that date.

Note that calculations for futures contracts will not be required in the exam.

Notes

Question 13 (optional)

Futures contracts

It is currently February and a US exporter expects to receive £500,000 in June.

Current spot rate $1.65 = £1 (would lead to a $ receipt of £500,000 × 1.65 = $825,000)

Quote for June sterling futures $1.65

Standard size of futures contract £62,500

Spot rate in June $1.70 = £1, futures price in June $1.70.

Illustrations and further practice

Notes

Currency options

Options give the right but not the obligation to buy or sell currency at some point in the future at a predetermined rate.

A company will therefore:

- exercise the option if it is in its interests to do so
  or
- let the option lapse

Options provide extra flexibility – the opportunity to take advantage of favourable rate movements, but they come with a cost – a premium paid up front and spent whether the option is exercised or not.

Options may be:

- **put** – the right to sell currency at a particular rate
- **call** – the right to buy currency at a particular rate.

Notes

Question 14 (optional)

Options

A UK importer is due to pay €100m in 6 months' time and the financial manager is concerned about exchange rate fluctuations between now and the payment date affecting the value of £ that will be needed to complete the transaction.

The company's bank has offered a 6 month call option on €100m at an exercise price of €1.155 with a premium of £20,000.

Show the total payment if the exchange rate moves to either €1.150 = £1 or to €1.160 = £1.

Illustrations and further practice

Notes

Questions

Chapter 14

Interest rate risk

Outcome

By the end of this session, you should be able to:

- describe and discuss gap exposure as a form of interest rate risk
- describe and discuss basis risk as a form of interest rate risk
- define the term structure of interest rates
- explain the features of a yield curve
- explain expectations theory, liquidity preference theory and market segmentation theory and their impact on the yield curve
- discuss and apply matching and smoothing as a method of interest rate risk management
- discuss and apply asset and liability management as a method of interest rate risk management
- define a forward rate agreement
- use a forward rate agreement as a method of interest rate risk management
- define the main types of interest rate derivatives and explain how they can be used to hedge interest rate risk

and answer questions relating to these areas.

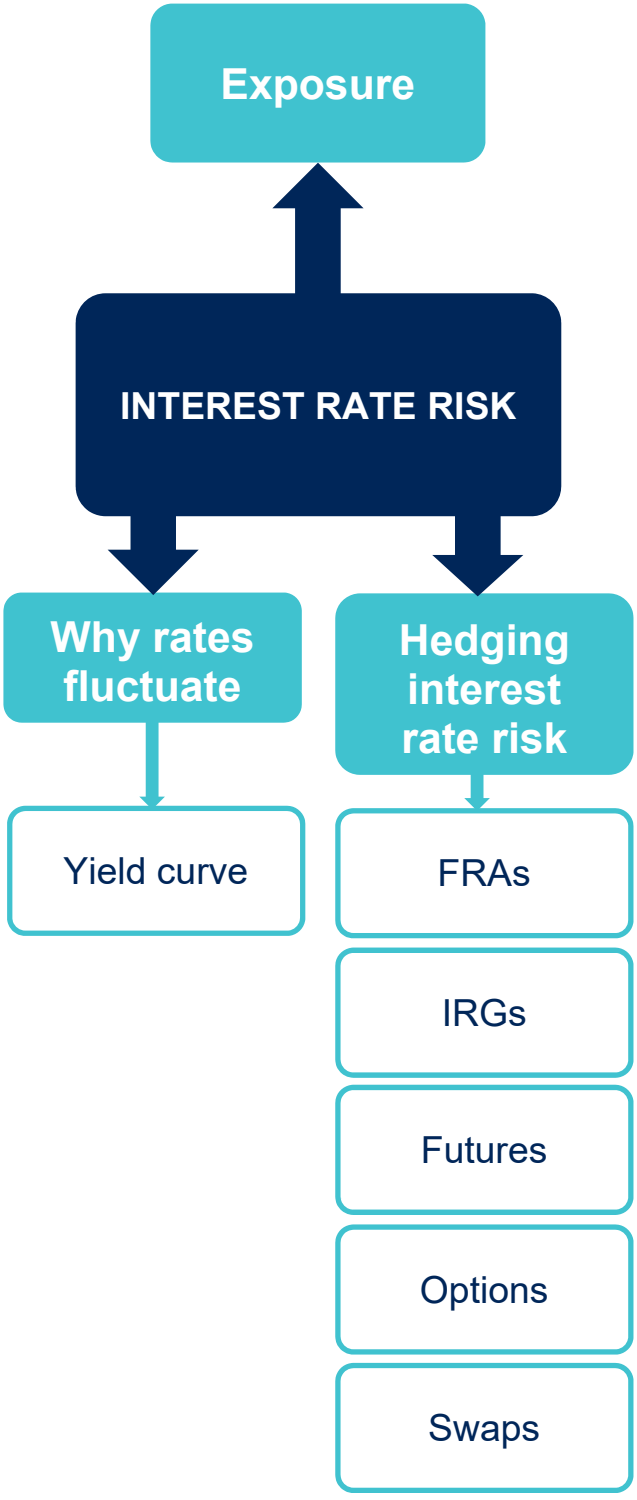
Chapter 14

PER

One of the PER performance objectives (PO11) is to identify and manage financial risk. You identify sources of risk, assess their impact and advise on ways of managing the risks. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 14 of your Study Text

Overview


Exposure
INTEREST RATE RISK
Why rates fluctuate
Hedging interest rate risk
Yield curve
FRAs
IRGs
Futures
Options
Swaps

1 Interest rate exposure

On existing loans and deposits:

Loans

- variable rate – risk that interest rates will rise
- fixed rate – risk that interest rates will fall (and so the company can't take advantage of the fall).

Deposits

- variable rate – risk that interest rates will fall
- fixed rate – risk that interest rates will rise (and so the company can't take advantage of the rise).

Even if a company has matched its variable rate loans against its variable rate deposits there may still be basis risk if the rates on each aren't calculated in the same way.

Basis risk is the risk that investments that, in theory, should offset each other in terms of changing values, do not do so.

On future loans and deposits:

The risk that interest rates will change before the loan / deposit contract is entered into.

Gap exposure

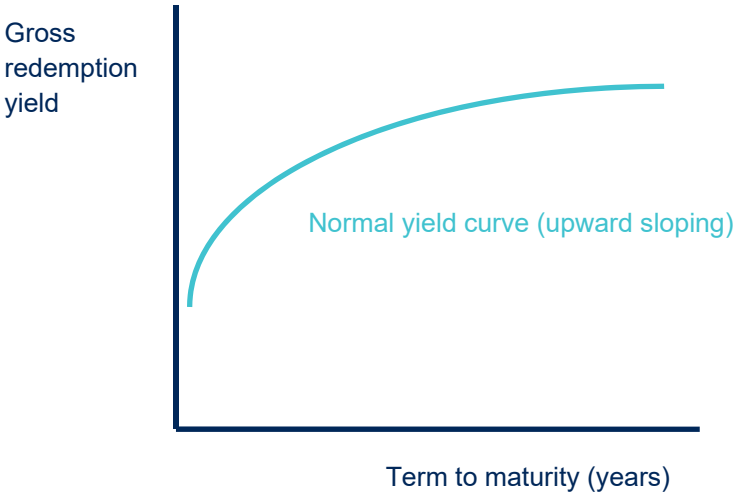
- Negative gap – interest-sensitive liabilities maturing at a certain time are greater than interest-sensitive assets maturing at the same time. Exposure to rising interest rates.
- Positive gap – interest-sensitive liabilities maturing at a certain time are less than interest-sensitive assets maturing at the same time. Exposure to falling interest rates.

Notes

2 Why interest rates fluctuate

2.1 The yield curve

The term structure of interest rates refers to the way in which the yield (return) of a debt security or bond varies according to the term of the security, i.e. the length of time before the borrowing will be repaid.



- Normal yield curve – longer maturity bonds have a higher yield due to the risks associated with time.
- Inverted yield curve – shorter-term yields are higher than longer-term ones, which can be a sign of an upcoming recession.
- Flat (or humped) yield curve – the shorter- and longer-term yields are very close to each other, which is also a predictor of an economic transition.

Notes

2.2 The shape of the yield curve

Three theories:

- Liquidity preference theory

- Expectations theory

- Market segmentation theory

2.3 Use of the yield curve

Financial managers should inspect the shape of the curve when deciding on the term of borrowings or deposits.

e.g. a normal upward sloping yield curve suggests that interest rates may rise in the future:

- avoid borrowing on long-term variable rates
- choose to borrow on short-term variable or long term fixed rates instead.

Notes

3 Hedging interest rate risk

3.1 Forward rate agreements (FRAs)

Aim of an FRA:

- lock the company into a target interest rate
- hedge both adverse and favourable interest rate movements.

Steps:

- company enters into a normal loan and separately into an FRA
- company pays interest on the loan in the normal way
- if the interest rate paid is greater than the agreed forward rate, the FRA provider pays the difference to the company
- if the interest rate paid is less than the agreed forward rate, the company pays the difference to the FRA provider

and vice versa for a deposit.

Note that the buyer of an FRA hedges against interest rate rises, while the seller hedges against interest rate falls. A business should therefore buy an FRA if it wishes to hedge in relation to a future loan and sell the FRA if it wishes to hedge against a future deposit. The other party, often a bank, fulfils the opposite side of the transaction.

Notes

Question 1

Forward rate agreements

Ripley Co's cash forecasts show an expected surplus of cash in four months' time of $6 million, which is expected to last for 3 months. Ripley Co would like to use a short term deposit to earn interest on this surplus but is worried that interest rates will drop before the deposit is made.

The FRAs available are:

A 1–3 FRA at 4% – 3.8% per annum

A 4–7 FRA at 3.9% – 3.7% per annum

A 4–9 FRA at 3.8% – 3.6% per annum

Assuming Ripley uses the appropriate FRA, calculate the interest receivable on the deposit if the market interest rate per annum moves to:

(i) 5%

(ii) 3.5%

Notes

Question 2

Forward rate agreements

Newt Co will need to borrow €55 million in 3 months' time for 6 months.

A 3–9 FRA is available at 6.6% – 6.3% per annum

Calculate the interest payable (and show the details of the individual elements) if the interest rate moves to (i) 7%, (ii) 6% per annum by the date of the borrowing.

Illustrations and further practice

Notes

3.2 Interest rate guarantees (IRGs)

An IRG is an option on an FRA. It allows the company a period of time during which it has the option to buy an FRA at a set price.

- Adverse movements – exercise the option
- Favourable movements – let the option lapse

IRGs are more expensive than FRAs due to their flexibility.

Notes

3.3 Interest rate futures (IRFs)

Aim of an interest rate future:

- like an FRA in that they fix the interest rate and are binding
- like currency futures in that they are standardised by date and value.

Operation for a loan:

- if you know you will need a loan in the future, sell futures contracts now
- when the borrowing is needed, enter into the loan in the normal way
- also at this point, close out the futures contract by buying it back
- the loan and the buying back of the futures contracts effectively cancel each other out
- perform the opposite futures transactions for a deposit (buy up front and sell on close out).

Basis risk

Because futures are standardised by date, the exact interest rate exposure may not be covered exactly – the gain or loss on the futures contract may not exactly offset the movement in interest rates for the underlying loan or deposit. This gives an imperfect hedge.

It arises because the futures price only matches the spot interest rate on the exact date of close out. The difference on any other date is the basis.

Imperfect hedges also occur because the contracts are standardised in value and therefore may not cover the exact deposit or loan value.

Notes

3.4 Options

Borrowers may additionally buy options on futures contracts. As with any option, it gives the chance to protect against downside risk by exercising the option and to take advantage of favourable movements by letting the option lapse.

3.5 Caps, floors and collars

Borrowers/investors can use interest rate options to set:

- maximum rates (interest rate cap)
- minimum rates (interest rate floor)
- a confined range of rates (interest rate collar).

3.6 Swaps

An interest rate swap is whereby the parties agree to swap a floating (variable) stream of interest payments for a fixed stream of interest payments and vice versa.

There is no exchange of principal.

- A company may swap from fixed to floating because it believes interest rates will move favourably in future
- A company may swap from floating to fixed because it wants certainty about its cash payments or because it believes that interest rates will move adversely in future.

Currency swaps are also available whereby debt in different currencies is swapped.

Notes

Questions

Chapter 15

Sources of finance

Outcome

By the end of this session, you should be able to:

- discuss the criteria which may be used by companies to choose between sources of finance
- explain the relationship between risk and return
- explain the nature and features of different securities in relation to the risk/return trade-off
- discuss increasing the efficiency of working capital management as a source of finance
- discuss the advantages and disadvantages of lease finance as a source of short-term finance
- suggest appropriate sources of short-term finance in a scenario question
- define and distinguish between equity finance and other types of share capital
- discuss the advantages and disadvantages of using retained earnings as a source of finance
- explain the benefits of a placing for an unlisted company
- describe the features and methods of a stock exchange listing including a placing and a public offer
- describe a rights issue and calculate the theoretical ex-rights price (TERP) of a share
- demonstrate the impact of a rights issue on the wealth of a shareholder
- discuss the advantages and disadvantages of equity finance as a source of long-term finance

- identify and suggest appropriate methods of raising equity finance for a business in a scenario question
- explain the main sources of long-term debt finance available to a business
- discuss the pros and cons of debt finance as a source of long-term finance
- discuss the pros and cons of lease finance as a source of long-term finance
- discuss the advantages and disadvantages of venture capital as a source of long-term finance
- suggest appropriate sources of long-term finance in a scenario question
- describe the financing needs of small businesses
- describe the nature of the financing problem for small businesses in terms of the funding gap, the maturity gap and inadequate security
- explain measures that may be taken to ease the financing problems of small and medium enterprises (SMEs), including the responses of government departments and financial institutions
- identify appropriate sources of finance for an SME in a scenario question and evaluate the financial impact of the different sources of finance on the business
- explain the major differences between Islamic finance and other forms of business finance
- explain the concept of interest (riba) and how returns are made by Islamic financial securities
- identify and briefly discuss a range of short and long-term Islamic financial instruments available to businesses

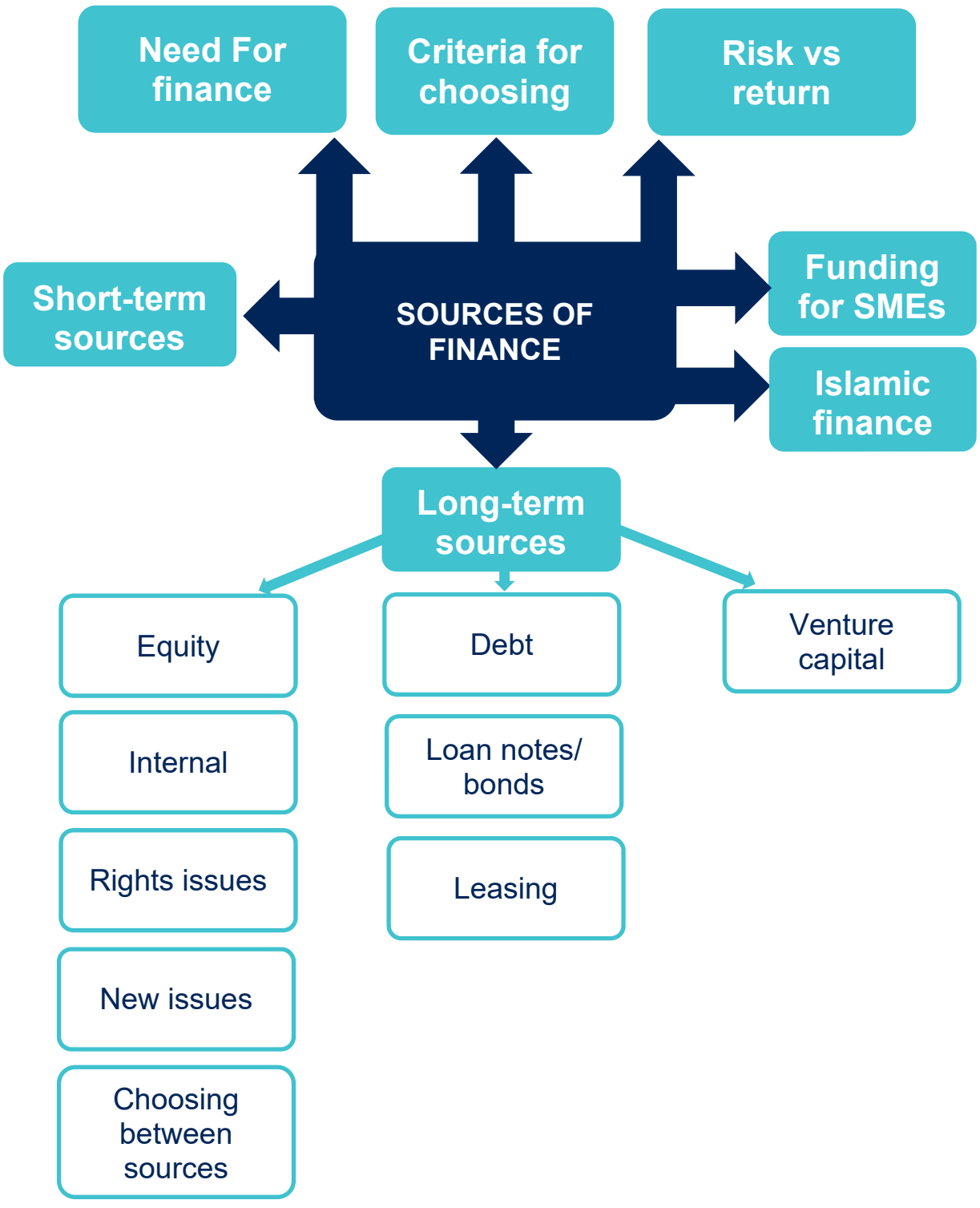
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You identify and advise on appropriate sources of finance and their costs. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 15 of your Study Text

Overview


Need For finance
Criteria for choosing
Risk vs return
Short-term sources
SOURCES OF FINANCE
Funding for SMEs
Islamic finance
Long-term sources
Equity
Internal
Rights issues
New issues
Choosing between sources
Debt
Loan notes/ bonds
Leasing
Venture capital

1 Selection of appropriate sources of finance

Firms need finance to:

- provide working capital
- invest in non-current assets

Criteria for choosing a source of finance:

- **Cost**
- **Duration**
- **Term structure of interest rates**
- **Gearing**
- **Accessibility**

Notes

2 Risk versus return

The relationship between risk and return is a key topic for this syllabus.

Risk is the variability of potential returns.

Investment risk arises because returns are variable and uncertain.

An increase in the risk taken on by an investor generally requires an increase in returns provided by the investment.

Each time an investor demands a higher return on the finance they have provided, this is reflected in a higher cost of that finance to the company.

Notes

3 Short-term sources of finance

- Bank overdrafts
- Bank loans
- Better management of working capital
- Leasing
- Sale and leaseback

Notes

4 Long-term finance – equity

Equity shareholders (ordinary shareholders) are the owners of the business and exercise ultimate control through their voting rights.

Equity finance is the investment in a company by the ordinary shareholder, represented by the issued ordinary share capital plus reserves.

While strictly preference shares are an equity source of finance, their characteristics bear more resemblance to debt finance and so for the purposes of such calculations as gearing they are considered to be part of debt rather than equity.

4.1 Raising equity

- Internally generated funds
- Rights issues
- New external share issues

Notes

4.2 Rights issues

More expensive than internally generated funds but cheaper than a new issue.

Shareholders can sell their rights instead of taking them up.

Issuing new shares at a discount will cause the share price to fall.

Theoretical ex-rights price (TERP)

Question 1

TERP

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50.

Calculate the TERP.

Notes

Question 2

TERP

Jones Co, which has an issued share capital of 3 million shares each priced at $6.70, makes a 2 for 3 rights issue at an issue price of $6.10.

Calculate the TERP.

Illustrations and further practice

Notes

4.3 Value of a right

As a rights issue gives the opportunity to buy shares at a discount, the right itself has value and can be sold on.

Question 3

Value of a right

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50 and the TERP is $10.30.

Calculate the value of a right and the value of a right per existing share.

Notes

Question 4

Value of a right

Jones Co, which has an issued share capital of 3 million shares each priced at $6.70, makes a 2 for 3 rights issue at an issue price of $6.10. The TERP is $6.46 per share.

Calculate the value of a right and the value of a right per existing share.

Illustrations and further practice

Notes

4.4 Shareholder's options

- take up the rights by buying the specified proportion of shares at the price offered
- renounce the rights and sell them in the market.
- Renounce part of the rights and take up the remainder
- Do nothing

Notes

Question 5

Shareholder's options

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50, the TERP is $10.30 and the value of a right is $0.80.

Calculate the effect on the wealth of a shareholder who initially held 15,000 shares in Hicks Co if they:

(i) Take up their rights

(ii) Sell the rights

(iii) Do nothing.

Notes

Illustrations and further practice

4.5 New external share issues

- expensive
- may fail
- may require business to become quoted – stringent criteria to adhere to
- via placing, enterprise investment scheme, public offer, fixed price offer, offer for sale by tender
- dilution of control for existing shareholders.

Notes

5 Long-term finance – debt

Long-term debt (bonds), usually in the form of debentures or loan notes, is frequently used as a source of long-term finance as an alternative to equity.

A bond is a written acknowledgement of a debt by a company, normally containing provisions as to payment of interest and the terms of repayment of the principal.

Features:

- traded on stock markets
- usually denominated in blocks of $100 nominal value
- may be secured or unsecured
- may be redeemable or irredeemable

Illustrations and further practice

Notes

5.1 Characteristics of long-term debt

	Investor viewpoint	Company viewpoint
	Low risk, therefore low return acceptable	Cheap, predictable, does not dilute control
	No voting rights (no control)	Inflexible, increases risk at high levels of gearing, must be repaid

5.2 Other types of bonds

- Deep discount – issued at a discount to nominal value and redeemable at nominal value and above
- Zero coupon – like deep discount but no interest is paid whilst in issue
- Hybrids – convertibles

  Give the bond holder the right to convert (if they choose at the time) the debt into other securities, normally ordinary shares, at a future date.

  - converted at either a pre-determined price or ratio
  - conversion premium occurs if the market value of the convertible stock is greater than the market value of the shares the stock can be converted into
  - floor value is the minimum market price of the note, calculated as the PV of the future interest plus the PV of the cash redemption value.

Notes 

- Hybrids – loan notes with warrants

  Give the bond holder the right to subscribe at a fixed future date for a certain number of ordinary shares at a predetermined price.

  - the loan notes are not converted. They remain in place after the subscription date
  - can be used to make the debt more attractive and able to set a low coupon rate
  - holder gets right to buy shares at attractive price
  - holder can sell on the warrants, effectively reducing the cost of purchasing the debt.

Notes

5.3 Leasing

Long-term lease arrangements would be used as debt finance for assets that have a useful life over the medium to long-term period.

- Lease generally covers the whole useful life of the asset
- Lessor does not usually deal directly in this type of asset
- Risks and rewards of ownership generally passed to the lessee
- Lease agreement cannot be cancelled.

5.4 Venture capital

Venture capital is the provision of risk-bearing capital, usually in the form of a participation in equity, to companies with high growth potential.

Venture capitalists provide start-up and late stage growth finance, usually for smaller firms and will often look for an exit route in the form of flotation of the company enabling them to sell their investment.

Notes

6 Sources of finance for small and medium enterprises (SMEs)

SMEs tend to be unquoted and can have difficulty raising finance because:

- Small number of owners with limited capital available between them
- Lack of business history or proven track record
- lower level of public scrutiny over accounts and records.

6.1 The funding gap

Unquoted SMEs may find they have an inability to raise funding without becoming quoted. This may be bridged by using:

- business angels or venture capitalists
- government assistance
- supply chain financing, crowdfunding, peer-to-peer funding.

6.2 The maturity gap

SMEs may find it easier to obtain long-term finance secured against their assets than short or medium-term finance.

But for short to medium-term assets it would prefer to raise short to medium-term finance to match the term of its assets against its liabilities and keep funding costs down.

The inability to do this is known as the maturity gap.

Notes

7 Islamic finance

Islamic finance operates in accordance with the principles of Sharia law:

- Sharing of profits and losses
- no interest (riba) allowed
- Restricted to Islamically accepted transactions, i.e. no investment in alcohol, gambling, etc.

Main sources of Islamic finance are:

- Murabaha (trade credit)
- Ijara (lease finance)
- Sukuk (debt finance)
- Mudaraba (equity finance)
- Musharaka (venture capital).

Notes

Questions

Notes

Chapter 16

Dividend policy

Outcome

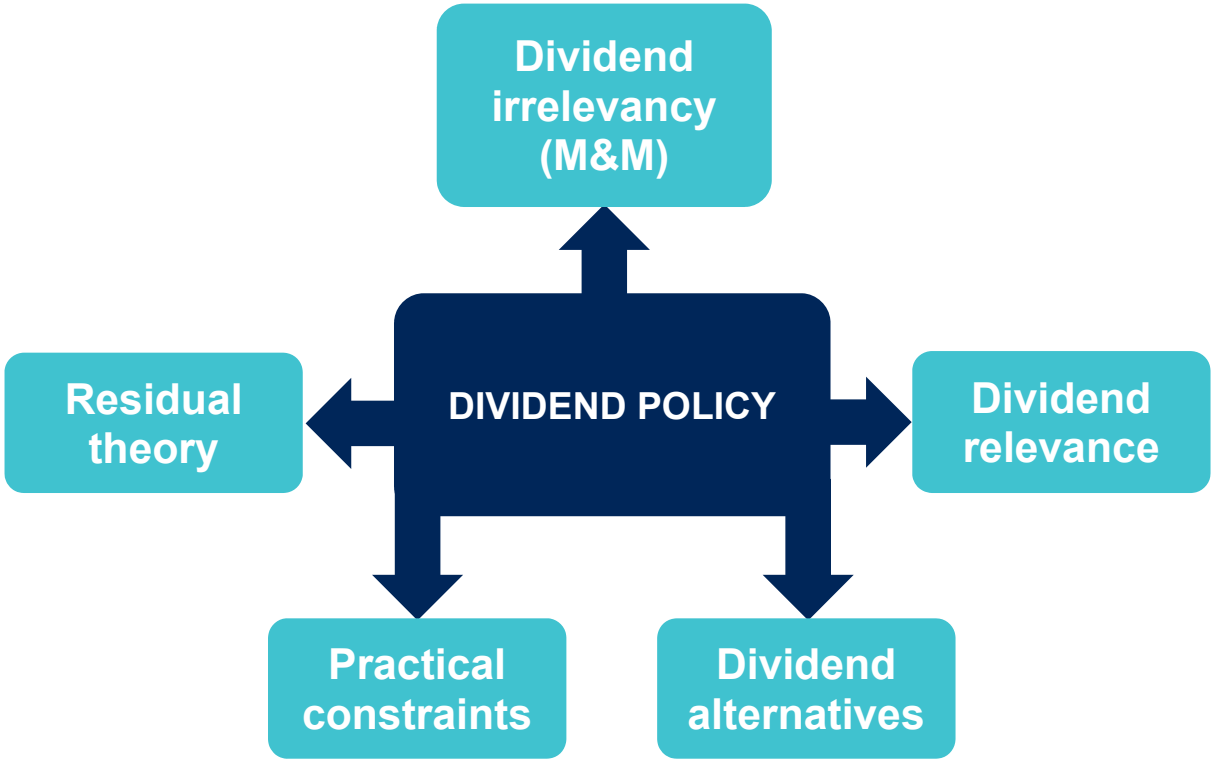
By the end of this session, you should be able to:

- explain the impact that the issue of dividends may have on a company's share price
- explain the theory of dividend irrelevance
- discuss the influence of shareholder expectations on the dividend decision
- discuss the influence of legal constraints on the dividend decision
- discuss the influence of liquidity constraints on the dividend decision
- define and distinguish between bonus issues and scrip dividends

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 16 of your Study Text

Overview


Dividend irrelevancy (M&M)
Residual theory
DIVIDEND POLICY
Dividend relevance
Practical constraints
Dividend alternatives

1 Theories of dividend policy

Should an organisation pay out a regular dividend or use the cash to fund further investment?

1.1 Dividend irrelevancy theory (Modigliani & Miller)

Assumptions

- There exists a perfect capital market
- There are no transaction costs
- There are no taxes or dividends and capital gains are taxed in the same way.

Theory

The pattern of dividend payouts should be irrelevant. As long as companies continue to invest in positive NPV projects, the wealth of the shareholders should increase whether or not the company makes a dividend payment in the year.

Modigliani and miller (M&M) suggested that entities should focus on investment policy rather than dividend policy and that if investors required income, they could sell shares to 'manufacture' dividends.

Notes

1.2 Residual theory

This theory is closely related to M&Ms but recognises the costs involved for the company in raising new finance.

It argues that dividends themselves are important but the pattern of them is not.

Only after a firm has invested in all positive NPV projects should a dividend be paid if there are any funds remaining.

Notes

1.3 Dividend relevance

Practical influences on dividend policy:

- Dividend signalling
- Investor liquidity requirements
- Clientele effect

As a result, companies tend to adopt a stable dividend policy and keep shareholders informed of any changes.

Notes

1.4 Other practical constraints

- Legal restrictions on dividend payments, such as:
  - rules as to distributable profits that prevent excess cash distributions
  - bond and loan agreements may contain covenants that restrict the amount of dividends a firm can pay.
- Liquidity.

Notes

2 Alternatives to cash dividends

- Share repurchase
- Scrip dividends

Notes

Questions

Chapter 17

The cost of capital

Outcome

By the end of this session, you should be able to:

- explain the relationship between risk and return in financial investments
- explain the nature and features of different securities in relation to the risk/return trade-off
- explain the relative risk/return relationship of debt and equity and the effect on their relative costs
- describe the creditor hierarchy and its connection with the relative costs of sources of finance
- calculate cost of equity using the DVM and be able to discuss its weaknesses
- calculate dividend growth using the dividend growth model (DGM)
- define and distinguish between systematic and unsystematic risk
- explain the relationship between systematic risk and return and describe the assumptions and components of the capital asset pricing model (CAPM)
- use the CAPM to find a company's cost of equity
- explain and discuss the advantages and disadvantages of the CAPM
- calculate the cost of finance for irredeemable debt, redeemable debt, convertible debt, preference shares, and bank debt
- define and distinguish between a company's average and marginal cost of capital

- calculate an appropriate weighted average cost of capital (WACC) for a company in a scenario, identifying the relevant data

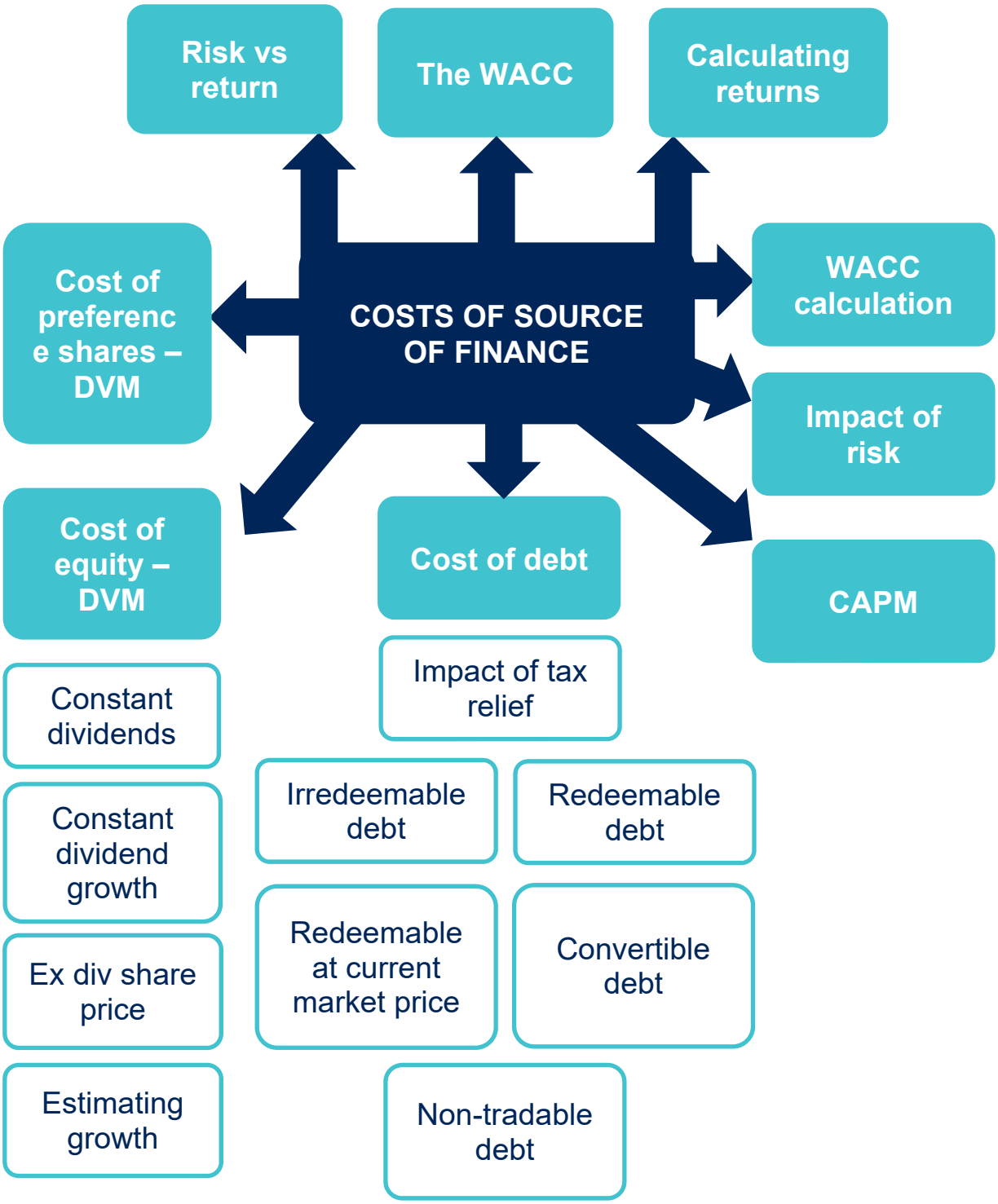
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You identify and advise on appropriate sources of finance and their costs. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 17 of your Study Text

Overview


Risk vs return
The WACC
Calculating returns
Cost of preferenc e shares – DVM
COSTS OF SOURCE OF FINANCE
WACC calculation
Impact of risk
Cost of equity – DVM
Cost of debt
CAPM
Impact of tax relief
Constant dividends
Irredeemable debt
Redeemable debt
Constant dividend growth
Redeemable at current market price
Convertible debt
Ex div share price
Estimating growth
Non-tradable debt

1 Overall approach

The discount rate used in investment appraisal, known as the cost of capital, represents the company's costs of long-term finance.

The costs of each source of finance will differ depending on the risk levels taken on by the investor in that finance.

If an investor takes on higher risk in their investment, they will seek a higher return.

To calculate a cost of capital:

- **identify the sources of finance used –**
- **for each type calculate the cost –**
- **calculate a weighted average of all the costs –**

Notes

1.1 Calculating returns

The cost of each source of finance can be equated with the return that the providers of finance (investors) are demanding on their investment.

In a perfect market:

Market value of investment = PV of expected future returns discounted at the investors required rate of return

In other words:

PV of future returns discounted at investors' required return – MV of investment = 0

And therefore:

Investors' required rate of return = IRR of investing at current market price and receiving the future expected returns.

Notes

2 Estimating the cost of equity – the dividend valuation model (DVM)

The cost of equity finance to the company is the return that the investors expect to achieve on their shares.

2.1 DVM with no growth in dividends

$$r_e = \frac{D}{P_0}$$

r_e = shareholders' required return, expressed as a decimal

D = constant dividend from year 1 to infinity

P_o = ex div market price of a share (ex div = AFTER dividend paid)

In exam questions, prices could be quoted ex div or cum div. Read the question properly!

Ex-div share price = Cum-div share price – dividend due

The value of r_e calculated is equivalent to k_e (the cost of equity finance to the company)

Question 1

DVM no growth

KLF Co has paid a dividend of $0.25 per share for many years and expects to continue paying out at this level for the foreseeable future. The company's current share price is $2.45.

Calculate the cost of equity using the dividend valuation model.

Notes

Question 2

Cum div vs ex div

The current share price of a company is $3.65 and a dividend of 15 cents is just about to be paid.

Calculate the ex div share price, P_0.

Notes

2.2 DVM with dividend growth at a fixed rate

$$r_e = \frac{D_0 (1 + g)}{P_0} + g \qquad = \frac{D_1}{P_0} + g$$

D_o = current dividend

D_1 = dividend in 1 year's time

g = constant rate of growth in dividends

Question 3

DVM with growth

Bishop Co has just paid out a dividend of $0.45 per share and expects dividends to grow at a rate of 3% per annum for the foreseeable future. Bishop Co's current share price is $3.50 per share.

Calculate the cost of equity using the dividend valuation model.

Notes

Question 4

DVM with growth

Gorman Co expects to pay out a dividend next year of 50 cents. Its current share price is $5.20 and it expects annual dividends to grow after next year's payment at a constant rate of 2%.

Calculate the cost of equity using the dividend valuation model.

Notes

Question 5

DVM with growth

Boop Co is about to pay a dividend of 18 cents per share and its current share price is $2.40. Shareholders expect dividends to grow at a constant rate of 5% per annum.

Calculate the cost of equity of Boop Co.

Illustrations and further practice

Notes

2.3 Estimating growth

Past dividends:

$$g = \left[\frac{D_0}{D_n}\right]^{1/n} - 1$$

D_n = dividend n years ago

n = number of years of growth

Earnings retention model (Gordon's growth model):

$g = br_e$

b = earnings retention rate

r_e = accounting rate of return

Question 6

Estimating growth using past dividends

A company's dividend just paid was $0.63 per share. 6 years ago, the dividend was $0.50 per share.

Estimate the annual growth rate in dividends.

Notes

Question 7

Estimating growth using past dividends

A company has paid the following dividends per share over the past few years:

20X1	25.0 cents
20X2	25.8 cents
20X3	26.5 cents
20X4	27.4 cents
20X5	28.1 cents

Estimate the annual growth rate in dividends.

Notes

Question 8

Earnings retention model

An all equity financed company has made profits after taxation of $15,000 for the year. It then pays out a dividend of $8,250. Opening capital was $50,000.

Assuming the company's return on capital and its dividend payout ratio remains the same, calculate the growth in dividends for next year.

Notes

Question 9

Earnings retention model

A company is just about to pay an ordinary dividend of 9 cents per share and the current share price is $2.45.

The accounting rate of return on equity is 10% and the dividend payout ratio is 25% and both of these figures are expected to remain at this level for the foreseeable future.

Calculate the cost of equity for the company.

Illustrations and further practice

Notes

3 Estimating the cost of preference shares

$$k_p = \frac{D}{P_0}$$

k_p = cost of the preference share

D = constant annual preference dividend

P_o = ex div market price of a share

N.B. The fixed preference share dividend is always based on the nominal value of the share, which may vary.

Question 10

Cost of preference shares

Bishop Co has 100,000 18% preference shares in issue with a nominal value of $0.50 each. The current ex div market value is $1.75.

Calculate the cost of the preference shares.

Illustrations and further practice

Notes

4 Estimating the cost of debt

4.1 Debt terminology and key points

- The terms loan notes, bonds, loan stock and marketable debt are used interchangeably. Gilts are debts issued by the government.
- Debt is always quoted in $100 nominal blocks.
- interest paid on the debt is stated as a percentage of nominal value, called the coupon rate.
- Ex-interest (after interest payment) and cum-interest (before interest payment).

4.2 The impact of tax relief

- Company receives tax relief on interest payments.
- Investor return (yield) k_d > '$k_d(1 - T)$' cost of debt.

Notes

4.3 Irredeemable debt

$$k_d = \frac{I}{MV} \qquad \text{'}k_d(1 - T)\text{'} = \frac{I(1 - t)}{MV}$$

k_d = debt holders' required rate of return

I = annual interest starting in 1 year's time

MV = ex-int market price of the loan note

'$k_d(1 - T)$' = cost of debt to the company

T = rate of corporation tax

Question 11

Cost of irredeemable debt

Bishop Co has in issue 6% irredeemable debt quoted at $105 (ex-interest). The corporation tax rate is 30%.

Calculate the return required by the debt providers and the cost of debt to Bishop Co.

Notes

Question 12

Cost of irredeemable debt

A company has irredeemable loan notes in issue trading at $95 cum interest. The coupon rate is 5% and the rate of corporation tax is 30%.

Calculate the pre-tax and post-tax cost of debt.

Illustrations and further practice

Notes

4.4 Redeemable debt

Investor return (k_d) can be found by calculating the IRR of the investment cash flows:

T_0	MV	(x)
T_{1-n}	Interest payments	x
T_n	Capital repayment	x

Cost of debt ($k_d(1 – T)$) to the company can be found using:

T_0	MV	(x)
T_{1-n}	Interest payments **× (1 – T)**	x
T_n	Capital repayment	x

Notes

Question 13

Cost of redeemable debt

Bishop Co has in issue 6% redeemable debt with 6 years to redemption. Redemption will be at nominal value. The current market value of the debt is $92.96. The rate of corporation tax is 30%.

Calculate the return required by debt holders (pre-tax cost of debt).

Then calculate the cost of debt to the company (post-tax cost of debt).

Illustrations and further practice

Notes

4.5 Convertible debt

- Calculate the value of the conversion option using available data.
- Compare the conversion option with the cash option. Assume all investors will choose the option with the higher value and use this as the redemption value in the calculations.
- Calculate the IRR of the flows as for redeemable debt.

Note: there is no tax effect whichever option is chosen at the conversion date.

4.6 Non-tradeable debt

- Cost to company = Interest rate × (1 – T).

Notes

Question 14

Cost of convertible debt

A company has in issue 4% convertible loan notes, which are due to be redeemed in 4 years at a premium of 10%. Alternatively, the investor can choose to convert the loan notes into 5 ordinary shares in 4 years' time. The current market value of the loan notes is $90 ex interest.

The company's ordinary shares are currently worth $20.50 each with the share price being expected to grow at a constant rate of 3% per annum. The rate of corporation tax is 30%.

Calculate the cost of debt to the company (post-tax cost of debt).

Notes

Question 15

Non-tradeable debt

Bishop Co has a fixed rate bank loan of $2 million. The interest rate charged on the loan is 7% per annum. The corporation tax rate is 30%.

Calculate the post-tax cost of the loan.

Illustrations and further practice

Notes

5 The weighted average cost of capital (WACC)

5.1 Assumption

Funds from each source of long-term finance are pooled together and used to finance the various investment projects.

Therefore, a weighted average cost of these sources of finance is appropriate to evaluate the investment projects.

5.2 WACC calculation

- Calculate weights for each source of capital.
- Estimate the cost of each source of capital.
- Multiply proportion of total of each source by its cost and sum the results, using the formula:

$$WACC = \left[\frac{V_e}{V_e + V_d}\right] k_e + \left[\frac{V_d}{V_e + V_d}\right] `k_d(1 - T)'$$

V_e and V_d are the market values of equity and of debt

Notes

Question 16

WACC

A company has the following long-term sources of finance:

2m ordinary shares, nominal value $0.75, market price $1.60, cost of equity 15%

0.5m 5% preference shares, nominal value $1, market value $1.25, cost of preference shares 4%

4% irredeemable debt, nominal value $1m, market value $80, post-tax cost of debt 5%.

Calculate the current WACC by book (nominal) values and by market values.

Notes

Question 17

WACC

Bishop Co has previously calculated figures as follows:

Ke = 16.2%, market value of 1 ordinary share = $3.50

Kp = 5.1%, market value of one preference share = $1.75

'Kd(1–t)' (irredeemable debt) = 4%, market value per $100 nominal value = $105

'Kd(1–t)' (redeemable debt) = 5.7%, market value per $100 nominal value = $92.96

'Kd(1–t)' (non tradable debt) = 4.9%, book value $2m.

In addition, the following information is relevant:

Ordinary shares in issue 5 million

Preference shares in issue 1 million

Nominal value in issue of irredeemable loan notes = $2 million

Nominal value of redeemable loan notes in issue = $0.5 million.

Calculate the current WACC by market values.

Notes

Question 18

WACC

A company has 6 million ordinary shares of $1 each nominal value and a cum div market price of $1.65. It is just about to pay out a dividend of $0.10. Five years ago, the dividend was $0.08.

The company also has 8% redeemable loan notes of $0.75m nominal value with a current market value cum interest of $105.20. The loan notes will be redeemed in 5 years at a 5% premium.

If the corporation tax rate is 25%, calculate the company's current WACC by market values.

Illustrations and further practice

Notes

5.3 When to use the WACC

- If historic proportions of debt and equity are not to be changed
- If the operating risk of the business will not be changed
- If the finance is not project-specific, i.e. projects are financed from a pool of funds

or

- the project is small in relation to the company so any of these changes are insignificant.

Notes

6 The impact of risk

The total return demanded by an investor is dependent on two specific factors:

- the prevailing risk-free rate (R_f) of return
- the reward investors demand for the risk they take in advancing funds to the firm.

The risk-free rate (R_f) is the minimum rate required by all investors for an investment whose returns are certain.

It is given in questions as the return on treasury bills or government gilts.

6.1 Return on risky investments – loan notes

Loan notes are riskier than government gilts.

They are less risky than equity investment because:

- interest is a legal commitment
- interest will be paid before any dividends
- loans are often secured.

6.2 Return on risky investments – equities

The return required by equity investors can be shown as:

Required return = Risk-free return + risk premium

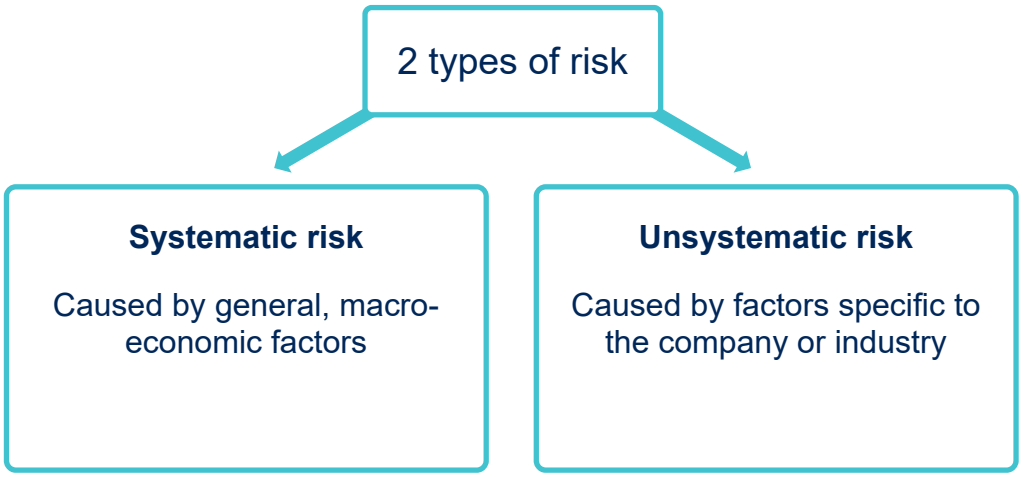
Notes

7 Estimating the cost of equity – the capital asset pricing model (CAPM)

The CAPM enables us to calculate the required return from an investment given the level of risk associated with the investment (measured by its beta factor).

Before showing how the CAPM formula can be used to derive a suitable risk adjusted cost of capital for discounting, we first need to introduce the model and explain the **terminology** surrounding it.

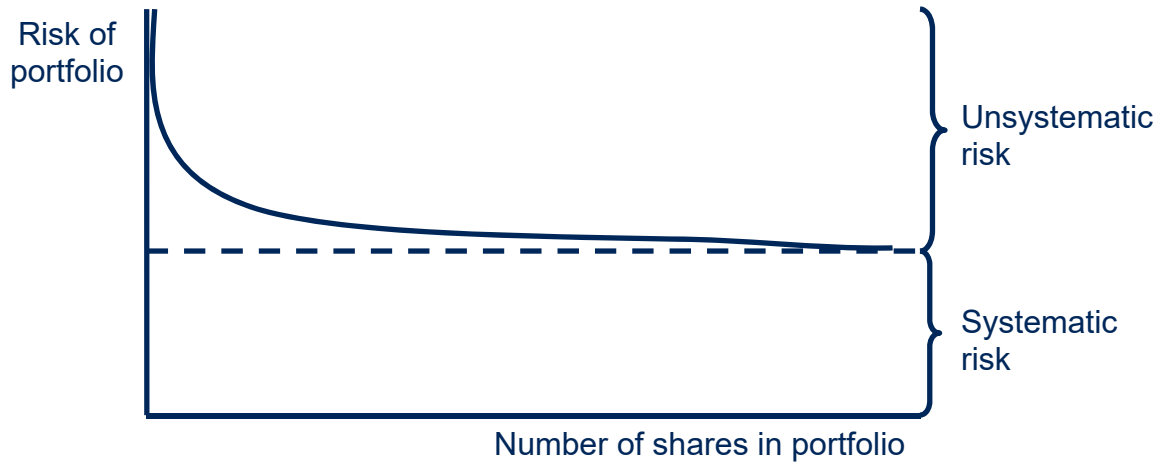
In order to explain how the CAPM works, it is first necessary to introduce the concepts of systematic and unsystematic risk.



Notes

Diversification of unsystematic risk

As an investor increases the size of his portfolio, overall risk reduces.



If the investor has approximately 15–20 well-chosen shares in their portfolio, the unsystematic risk will be eliminated.

Systematic risk cannot be eliminated by diversification.

Illustrations and further practice

Notes

The CAPM formula and the beta factor

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

Where:

$ß_i$ = the entity's 'beta factor' – a measure of the **systematic** risk of investment i relative to the market

Theory: The CAPM gives a required return for a given level of systematic risk.

Therefore, if we can estimate the level of risk associated with an entity (the beta of the entity), we can use CAPM to give a required return to shareholders.

This required return to shareholders is essentially the cost of equity which can then be used to derive an appropriate WACC for the entity.

Notes

Question 19

The CAPM

The current average market return being paid on risky investments is 15%, compared with 7% on government gilts. X Co has a beta figure of 0.9.

Calculate the required return of an equity investor in X Co.

Question 20

The CAPM

Z Co is currently paying a return of 13% to its equity shareholders. The return on treasury bills is 5% and the average market premium for risky investments is 7%.

Calculate the beta of Z Co and what does this tell us about the volatility of Z Co's returns compared to the market average.

Illustrations and further practice

Notes

Assumptions of the CAPM

- Well diversified investors
- Perfect capital market
- Unrestricted borrowing/lending at the risk-free rate
- Single period transaction horizon
- CAPM assumes an efficient market where it is possible to diversify away unsystematic risk, and no transaction costs.

Notes

Questions

Chapter 18

Capital structure

Outcome

By the end of this session, you should be able to:

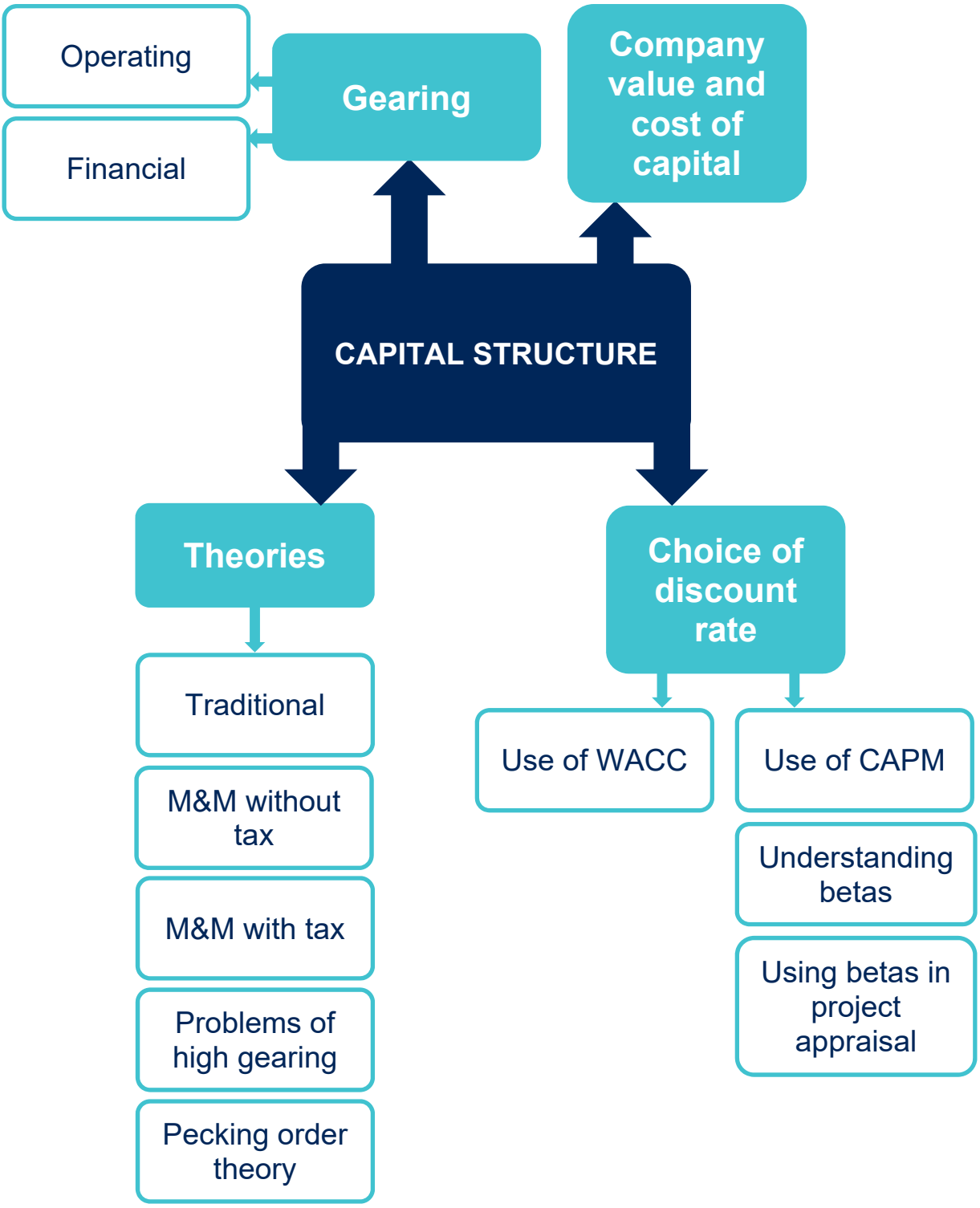
- define, calculate and explain the significance to a company's financial position and financial risk of its level of the following ratios:
  - operating gearing
  - financial gearing
  - interest gearing
- define company value
- explain the relationship between company value and cost of capital
- explain the traditional view of capital structure theory
- explain the underlying assumptions of the traditional view of capital structure theory
- interpret a graph demonstrating the traditional view of capital structure theory
- explain the assumptions of a perfect capital market
- describe the views and assumptions of Miller and Modigliani (M&M) on capital structure without corporate taxes
- interpret a graph demonstrating the views of M&M on capital structure without corporate taxes
- describe the views and assumptions of Miller and Modigliani (M&M) on capital structure with corporate taxes

- interpret a graph demonstrating the views of M&M on capital structure with corporate taxes
- identify a range of capital market imperfections and describe their impact on the views of M&M on capital structure
- explain the relevance of pecking order theory to the selection of sources of finance
- discuss the circumstances under which weighted average cost of capital (WACC) can be used in investment appraisal
- identify in a scenario question whether WACC is appropriate for use by a company
- discuss the advantages of the capital asset pricing model (CAPM) over WACC in determining a project-specific cost of capital
- identify in a scenario where CAPM may be suitable to determine a project-specific cost of equity capital
- apply CAPM in calculating a project-specific discount rate

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 18 of your Study Text

Overview


Operating
Financial
Gearing
Company value and cost of capital
CAPITAL STRUCTURE
Theories
Traditional
M&M without tax
M&M with tax
Problems of high gearing
Pecking order theory
Choice of discount rate
Use of WACC
Use of CAPM
Understanding betas
Using betas in project appraisal

1 Operating gearing

Operating gearing is a measure of the extent to which a firm's operating costs are fixed rather than variable as this affects the level of business risk in the firm.

Operating gearing can be measured as:

$$\frac{\text{Fixed costs}}{\text{Variable costs}} \quad \text{or} \quad \frac{\text{Fixed costs}}{\text{Total costs}} \quad \text{or} \quad \frac{\text{\% change in EBIT}}{\text{\% change in revenue}}$$

Note: an alternative calculation as used in the specimen exam is contribution/PBIT, which gives the same answer as % change in EBIT/% change in revenue.

Notes

Question 1

Operating gearing

Two firms have the following cost structures:

	Bat Co	Man Co
	$m	$m
Sales	10.0	10.0
Variable costs	(2.0)	(4.0)
Fixed costs	(4.0)	(2.0)
EBIT	4.0	4.0

Calculate the operating gearing for each company (as fixed costs/total costs) and determine the impact on each of a 10% increase and of a 10% decrease in sales.

Illustrations and further practice

Notes

2 Financial gearing

Financial gearing is a measure of the extent to which debt is used in the capital structure.

Note that preference shares are usually treated as debt.

Financial gearing can be measured as equity gearing, capital gearing or interest gearing:

$$\frac{\text{Debt}}{\text{Equity}} \quad \text{or} \quad \frac{\text{Debt}}{\text{Total capital}} \quad \text{or} \quad \frac{\text{Debt interest}}{\text{Operating profit before debt interest and tax}}$$

And can be calculated using book values or market values.

Where two companies have the same level of variability in earnings, the company with the higher level of financial gearing will have increased variability of returns to shareholders.

Notes

Question 2

Financial gearing

A company has the following long-term sources of finance:

Ordinary shares: 3 million, nominal value $1 each, market value $1.50 each.

Reserves: $0.34 million.

Preference shares: 0.6 million, nominal value $0.50 each, market value $0.85 each

8% irredeemable debt: $1.5 million nominal value, market value $110

Current liabilities: $0.5m

Calculate the capital and equity gearing using both book and market values.

Notes

Question 3

Financial gearing

Two firms have the same cost structures but different financial gearing levels:

	Double Co	Dare Co
	$m	$m
Sales	10.0	10.0
Variable costs	(4.0)	(4.0)
Fixed costs	(2.0)	(2.0)
EBIT	4.0	4.0
Interest	(2.0)	0.0
PBT	2.0	4.0

Calculate the impact on each of a 10% increase and of a 10% decrease in sales.

Illustrations and further practice

Notes

3 An optimal capital structure? – Company value and cost of capital

The objective of management is to maximise shareholder wealth. If altering the gearing ratio could increase wealth, then finance managers would have a duty to do so.

MV of a company = PV of its future cash flows discounted at the WACC.

3.1 Gearing and the effect on WACC

As an entity increases its gearing i.e. the amount of debt in its capital structure, two things happen to the cost of capital (WACC)

1 debt is a cheaper source of finance than equity (lower risk and tax relief on interest) so the **WACC falls** by introducing more debt

2 the equity holders perceive more risk caused by the increase in debt, so the cost of equity rises and hence **WACC rises**

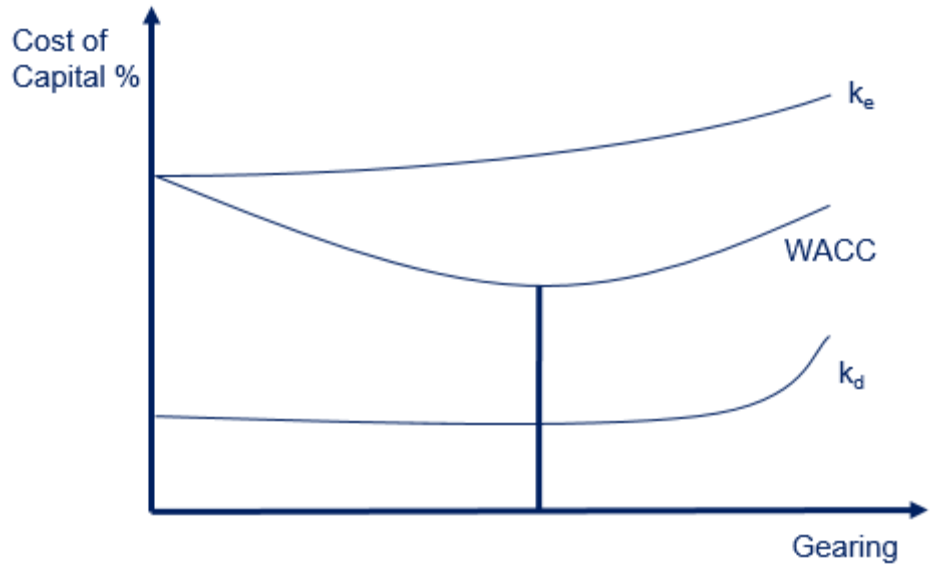
The different gearing theories interpret the net effect of these two factors in different ways.

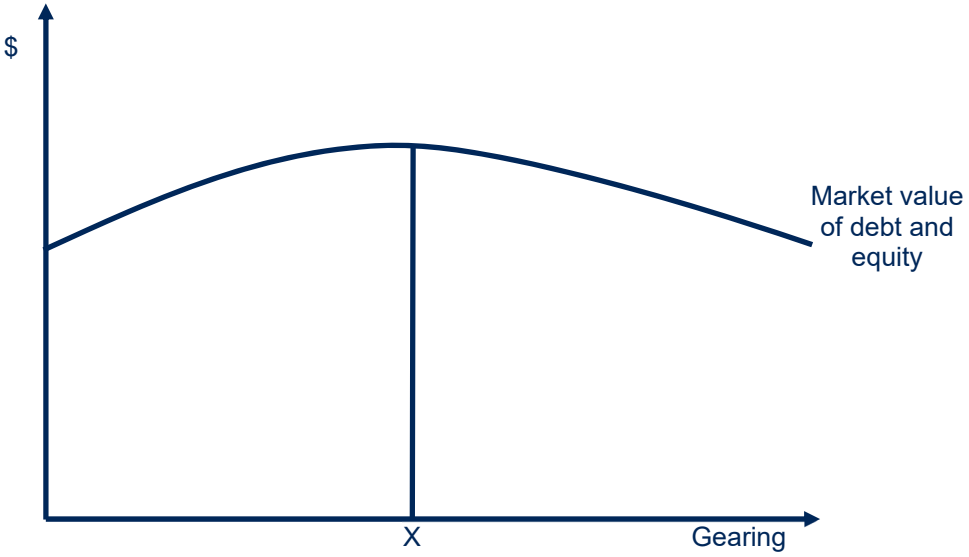
Notes

4 The traditional view of capital structure

4.1 Graphical representation of the traditional view

The traditional view is based on real world observation.





Notes

4.2 Traditional view conclusions

Shareholder wealth is affected by changing the level of gearing.

There is an optimal gearing ratio at which WACC is minimised and the total value of the company is maximised.

Financial managers have a duty to achieve and maintain this ratio.

While we accept that the WACC is probably U shaped for entities generally, we cannot precisely calculate a best gearing level.

The optimum level will differ from one entity to another and can only be found by trial and error.

Notes

5 Modigliani and Miller (M&M) – 1958 theory with no taxation

5.1 M & M's key assumptions

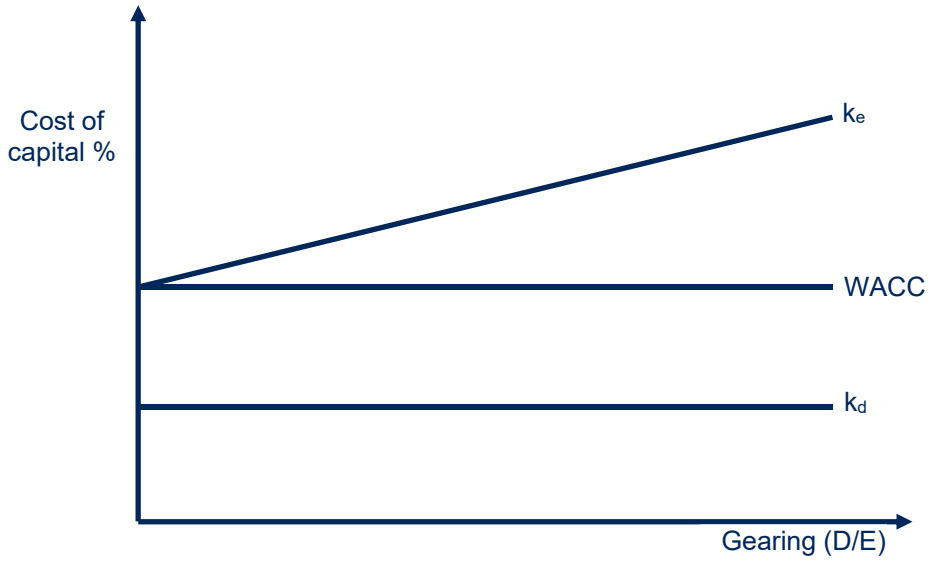
There exists a perfect capital market in which there are no information costs or transaction costs.

Debt is risk free and kd remains constant at all levels of gearing.

No taxation.

5.2 M & M's no tax theory

Under M & M's theoretical assumptions, and in the absence of tax, the two opposing factors cancel out exactly, so the WACC (and business value) is constant at all levels of gearing.

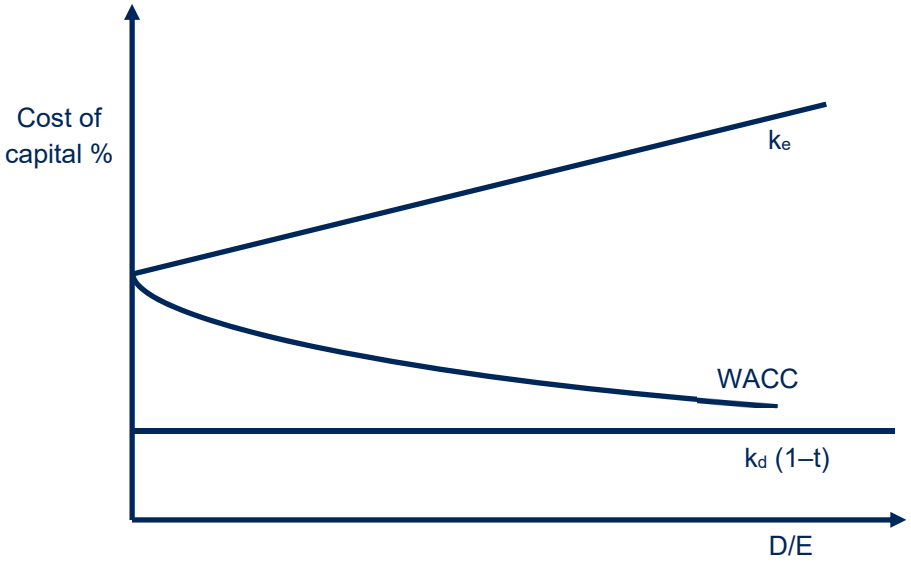


Notes

6 Modigliani and Miller (M&M) – 1963 theory with taxation

When the effect of tax is taken into account, the tax relief on debt interest causes the WACC to fall (and the business value to rise) as gearing increases.

Implication: The optimum gearing level is 99.9% debt.



Notes

7 The problems of high gearing

In practice, firms are rarely found with very high levels of gearing. This is because of:

- bankruptcy risk
- agency costs
- tax exhaustion
- the impact on borrowing/debt capacity
- difference between risk tolerance levels between directors and shareholders
- restrictions in the articles of association
- increase in the cost of borrowing as gearing increases

Notes

8 Pecking-order theory

In this theory, there is no search for an optimal capital structure through a theorised process. Instead, it is argued that firms will raise new funds as follows:

- internally generated funds
- debt
- new issue of equity

Illustrations and further practice

Notes

9 Capital structure and the choice of discount rate

If an investment significantly changes the proportions of debt and equity or the risk levels of the firm, or the finance is project-specific then the existing WACC will no longer be an appropriate rate at which to discount the investment cash flows.

When it is the risk that has changed (either by altering the gearing levels or by moving into a different business area) the CAPM may be used to find an up to date cost of equity to be used in a new calculation of the WACC.

Question 4

The CAPM

Brixit Co is an all equity company with a beta of 1.4. It is appraising a one year project which requires an outlay now of $5,000 and will return cash in one year with a value of $6,000. The project has a beta of 1.2. Rf is 6% and Rm is 14%.

Calculate the firm's current cost of equity capital, the minimum required return of the project and determine whether the project is worthwhile.

Illustrations and further practice

Notes

9.1 CAPM and gearing risk

The CAPM uses a beta factor to represent the systematic risk levels of the investment.

There are two types of beta factor:

Asset beta (β_a)

Equity beta (β_e)

To use the CAPM to find a cost of equity for use in investment appraisal, a beta with both the correct business risk (for the investment type) and the correct financial risk (for the company undertaking the investment) must be determined.

Notes

9.2 Steps to calculate a discount rate for use in investment appraisal

- Find an appropriate asset beta that reflects the correct business risk for the project – this may involve de-gearing a proxy equity beta using the formula:

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

  NB: βd will be assumed to be zero.

  V_e and V_d are the market values of equity and debt of the proxy company

  If more than one proxy asset beta is provided, use an average figure.

- Re-gear the asset beta to reflect the gearing levels of the company making the investment

- Use the re-geared beta to find the risk-adjusted cost of equity using the CAPM.

- If a WACC is needed, use the new cost of equity in the WACC calculation (calculation outside the scope of the syllabus).

Notes

Question 5

CAPM and gearing risk

Eleven Co is a manufacturer of wooden shelving whose equity:debt ratio (by market value) is 3:2. The corporate debt, which is assumed to be risk free, has a gross redemption yield of 8%. The beta value of the company's equity is 0.9. The average return on the stock market is 15% and the rate of corporation tax is 30%.

The company is considering a project in which it will make and sell wooden sculptures.

Dustin Co is a company that is in the wooden sculpture market. It has an equity beta of 1.4 and an equity:debt ratio of 4:1.

If Eleven Co takes on the new project, it expects to maintain its existing capital structure.

Calculate a suitable risk-adjusted cost of equity for use in evaluating the sculpture project.

Notes

Question 6

CAPM and gearing risk

Burke Co is an all equity clothing retailer who is about to diversify into food sales. Its current equity beta is 1.3. The corporation tax rate is 30%.

Gearing in the food sales industry averages 80% equity, 20% debt.

Some representative asset betas for firms in the food sales industry are:

Frost Co 1.6, Vasquez Co 1.7, Ferro Co 1.75.

Calculate appropriate betas for Burke Co to use in evaluation of the food sales business if its restructures its capital in the following ways:

(i) Burke Co remains an all equity company

(ii) Burke Co gears up to 10% debt and 90% equity.

Illustrations and further practice

Notes

Questions

Notes

Chapter 19

Financial ratios

Outcome

By the end of this session, you should be able to:

- calculate return on capital employed (ROCE) with data provided
- explain the meaning and usefulness of a calculated ROCE figure
- calculate earnings per share (EPS) and price/earnings (PE) ratio with data provided
- explain the meaning and usefulness of an EPS figure and a PE ratio
- calculate return on equity (ROE) with data provided
- explain the meaning and usefulness of a calculated ROE figure
- calculate dividend per share (DPS) with data provided
- explain the meaning and usefulness of a DPS figure
- calculate dividend yield with data provided
- explain the meaning and usefulness of a dividend yield figure
- calculate total shareholder return (TSR) (dividend yield plus capital growth) with data provided
- explain the meaning and usefulness of a TSR figure
- select appropriate ratios to measure changes in shareholder wealth within a scenario and discuss the relevance of the findings

- define, calculate and explain the significance to a company's financial position and financial risk of its level of the following ratios:
  - operating gearing
  - financial gearing
  - interest cover
  - interest yield
  - dividend cover
  - dividend per share
  - dividend yield
  - earning per share (EPS)
  - price/earnings (PE) ratio
- assess a company's financial position and financial risk in a scenario by calculating and assessing appropriate ratios

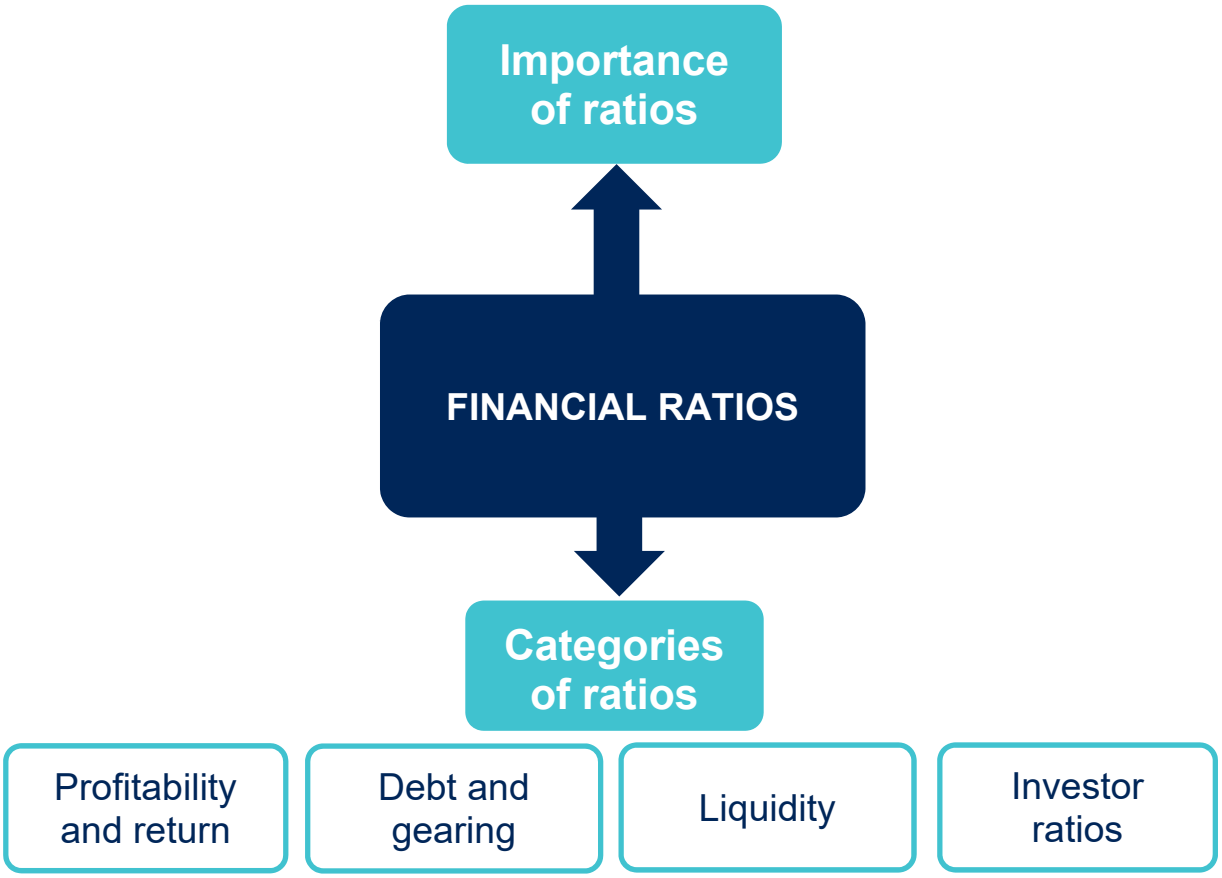
and answer questions relating to these areas.

PER

One of the PER performance objectives (PO9) is to evaluate investment and financing decisions. You advise on alternative sources of finance and you evaluate and review the financial viability of investment decisions. Working through this chapter should help you understand how to demonstrate that objective.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 19 of your Study Text

Overview


Importance of ratios
FINANCIAL RATIOS
Categories of ratios
Profitability and return
Debt and gearing
Liquidity
Investor ratios

1 The importance of financial ratios

Ratio analysis is the process of comparing and quantifying relationships between financial variables, such as those variables found in the statement of financial position and statement of profit or loss of a company.

Ratios can assist with:

- Measuring the achievement of corporate objectives
- Investment appraisal
- Working capital management
- Capital structure
- Business valuations.

Notes

2 Profitability and return ratios

2.1 Return on capital employed (ROCE)

ROCE gives a measure of how efficiently a business is using the funds available. It measures how much is earned per $1 invested.

$$\text{ROCE} = \frac{\text{Profit before interest and tax}}{\text{Capital employed}} \times 100$$

Capital employed = Total assets – current liabilities

Or

= Equity plus long-term debt

ROCE uses profit, which is not directly linked to the objective of maximising shareholder wealth.

Notes

2.2 Return on equity (ROE)

ROE gives a measure of how profit a company generates for its ordinary shareholders with the money they have invested in the company.

$$\text{ROE} = \frac{\text{Profit after tax and preference dividends}}{\text{Ordinary share capital and reserves}} \times 100$$

ROE uses profit, which is not directly linked to the objective of maximising shareholder wealth.

It is sensitive to gearing levels – increasing as gearing increases.

Notes

2.3 Profit margins

Profit margins measure how well revenue is converted into profit by the company.

$$\text{Profit margin} = \frac{\text{Profit}}{\text{Revenue}} \times 100$$

and can be calculated using any profit figure, e.g. gross profit or operating profit.

Notes

3 Debt and gearing ratios

In addition to the gearing ratios seen in the capital structure chapter, the following ratios are also useful.

3.1 Interest cover

Interest cover is a measure of the adequacy of a company's profits relative to its interest payments on its debt.

$$\text{Interest cover} = \frac{\text{Operating profit before interest and tax}}{\text{Debt interest}}$$

The lower the cover, the greater the risk that profit will become insufficient to cover interest payments.

Notes

4 Investor ratios

4.1 Earnings per share (EPS)

This is the basic measure of a company's performance from an ordinary shareholder's point of view. It is the amount of profit attributable to each ordinary share.

$$\text{EPS} = \frac{\text{Profit after interest, tax and preference share dividends}}{\text{Number of ordinary shares in issue}}$$

EPS does not represent actual income of the shareholder and it uses earnings, which are not directly linked to the objective of maximising shareholder wealth.

Notes

4.2 Price/Earnings (PE) ratio

A PE ratio gives a basic measure of company performance. It expresses the amount the shareholders are prepared to pay for the share as a multiple of current earnings.

$$\text{PE ratio} = \frac{\text{Share price}}{\text{EPS}}$$

A high PE ratio indicates that investors perceive the form's earnings to be of high quality – usually a mixture of high growth and/or lower risk expectations.

Notes

4.3 Dividend per share (DPS)

The DPS helps individual ordinary shareholders see how much of the overall dividend payout they are entitled to.

$$\text{DPS} = \frac{\text{Total dividend}}{\text{Total number of shares issued}}$$

Notes

4.4 Dividend cover

This is a measure of how many times the company's earnings could pay the dividend.

$$\text{Dividend cover} = \frac{\text{Profit available for ordinary shareholders}}{\text{Dividend for the year}}$$

The higher the cover, the better the ability to maintain dividends if profits drop.

4.5 Dividend yield

This is a direct measure of the wealth received by the ordinary shareholder.

$$\text{Dividend yield} = \frac{\text{DPS}}{\text{Market price per share}} \times 100$$

No capital growth is taken into account.

Notes

4.6 Total shareholder return (TSR)

This measures the income to the investor by taking account of capital growth and dividend income.

$$\text{TSR} = \frac{\text{DPS + change in share price}}{\text{Share price at start of period}} \times 100$$

Notes

4.7 Interest yield

This measures the interest on debt expressed as a percentage of the market price.

$$\text{Interest yield} = \frac{\text{Interest}}{\text{Market value of debt}} \times 100$$

Notes

Question 1

Financial ratios

Connor Co has the following SFP and SPL information:

Statement of financial position as at 31 Dec

	20X6	20X5
	$000	$000
Non-current assets	4,900	4,600
Current assets:		
Inventory	85	70
Receivables	750	600
Cash	0	50
Total assets	5,735	5,320
Equity and liabilities:		
Ordinary share capital ($1 shares)	3,150	3,000
Share premium	50	0
Retained earnings	550	400
	3,750	3,400
Non-current liabilities:		
8% loan notes	1,300	1,250
5% preference shares	300	300
Current liabilities:		
Trade payables	255	370
Bank overdraft	130	
	5,735	5,320

Statement of profit and loss for the year ended 31 Dec

	20X6 $000	20X5 $000
Revenue	3,200	2,990
Cost of sale	(1,940)	(1,905)
Gross profit	1,260	1,085
Distribution costs	(208)	(195)
Admin expenses	(373)	(350)
Operating profit	679	540
Interest	(104)	(100)
Profit before taxation	575	440
Taxation	(80)	(69)
Profit after taxation	495	371
preference dividends	(15)	(15)
ordinary dividends	(330)	(225)
Retained profit for the year	150	131
Share price ordinary shares (start of year) ($)	1.55	1.30
Market value of loan notes ($)	106	104
Industry averages:		
PE ratio	9	9
Average growth in EPS	20%	18%
ROE	12%	11%

Calculate the following figures:

- Return on capital employed (ROCE)
- Return on equity (ROE)
- Gross profit margin
- Operating profit margin
- Interest cover
- Earnings per share (EPS)
- EPS growth from 20X5 to 20X6
- PE ratio
- Dividend per share
- Dividend cover
- Dividend yield
- Total shareholder return for 20X6
- Interest yield

Notes

Questions

Notes

Chapter 20

Business valuations and market efficiency

Outcome

By the end of this session, you should be able to:

- identify and discuss reasons for valuing businesses and financial assets
- identify information requirements for the purposes of carrying out a valuation in a scenario
- discuss the limitations of the different typed of information available for valuing companies
- value a share using the dividend valuation model (DVM), including the dividend growth model
- define market capitalisation
- calculate the market capitalisation of a company using the DVM, including the dividend growth model
- explain the difference between asset- and income-based valuation models
- value a company using the statement of financial position, net realisable value (NRV), and replacement cost asset-based valuation models
- discuss the advantages and disadvantages of the different asset-based valuation models
- value a company using the price/earnings (PE) ratio income-based valuation model
- value a company using the earnings yield income-based valuation model

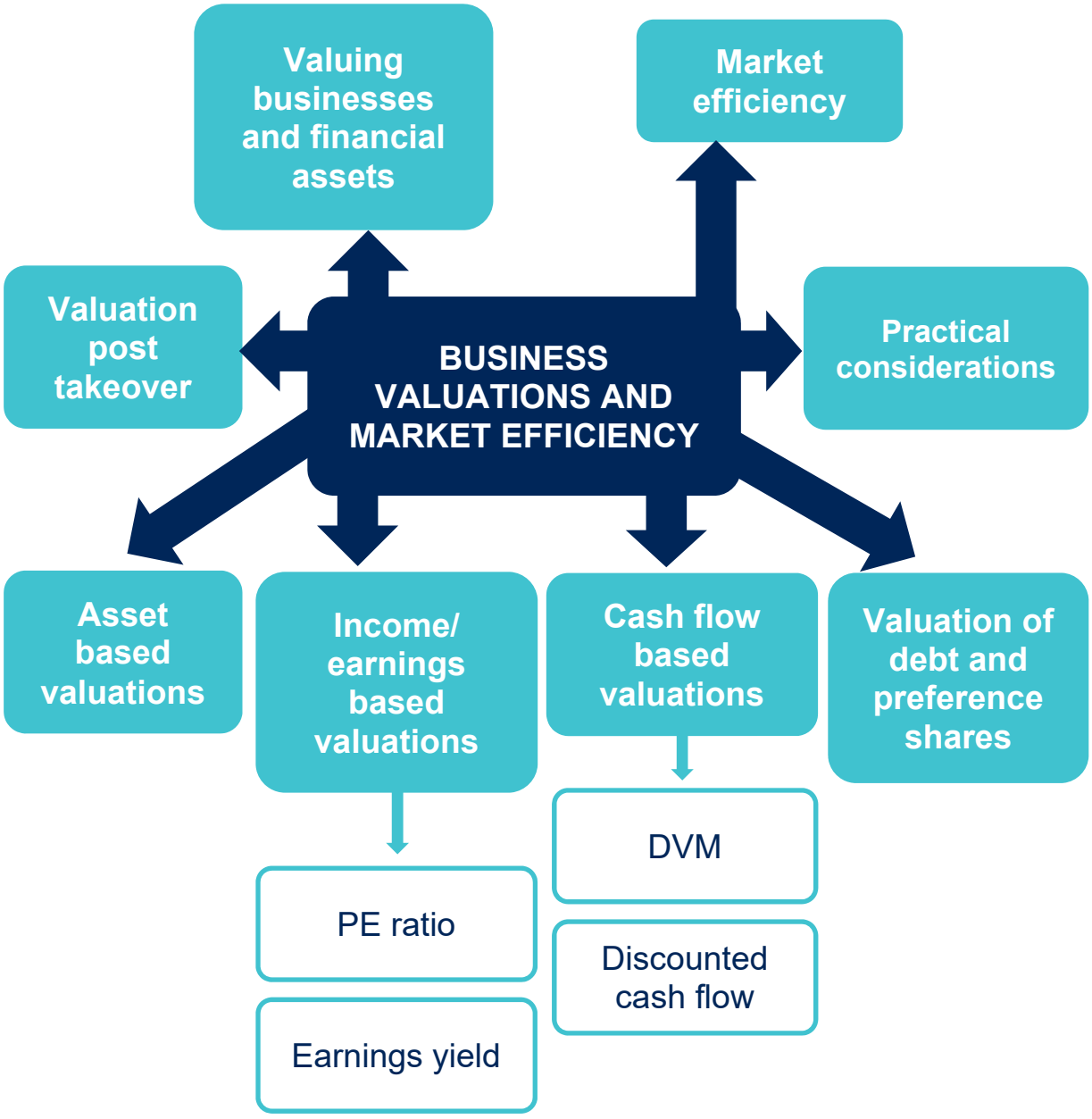
Chapter 20

- value a company using the discounted cash flow (DCF) income-based valuation model
- discuss the advantages and disadvantages of the different income-based valuation models
- value a company in a scenario question, selecting appropriate valuation methods
- calculate the value of irredeemable debt, redeemable debt, convertible debt, and preference shares
- explain the concept of market efficiency
- distinguish between and discuss markets that are not efficient at all, weak form efficient, semi-strong form efficient and strong form efficient
- evaluate the efficiency of a market in a scenario
- describe the significance of investor speculation and the explanations of investor decisions offered by behavioural finance
- discuss the impact of the marketability and liquidity of shares in reaching a valuation
- discuss the impact of availability and sources of information in reaching a valuation
- discuss the impact of market imperfections and pricing anomalies in reaching a valuation

and answer questions relating to these areas.

The underpinning detail for this Chapter in your Integrated Workbook can be found in Chapter 20 of your Study Text

Overview


Valuing businesses and financial assets
Market efficiency
Valuation post takeover
BUSINESS VALUATIONS AND MARKET EFFICIENCY
Practical considerations
Asset based valuations
Income/ earnings based valuations
Cash flow based valuations
Valuation of debt and preference shares
PE ratio
Earnings yield
DVM
Discounted cash flow

1 Valuing business and financial assets

Valuations of share in both public and private companies are needed for several purposes by investors including:

- to establish terms of takeovers and mergers
- to be able to make 'buy and hold' decisions
- to value companies entering the stock market
- to establish values of shares held by retiring directors, which the articles of the company specify must be sold
- for fiscal purposes (capital gains tax, inheritance tax)
- divorce settlements, etc.

1.1 Market capitalisation

Market capitalisation of public companies =

- share prices are constantly moving
- a premium may be paid if purchasing a controlling interest.

1.2 Real worth of a company

Ultimately, the real worth of a company will only be known once a purchase has been made after negotiation between the two parties.

The valuation methods in this chapter give figures to be used as starting points for the negotiations.

Notes

2 Asset based valuations

Asset based valuations involve adding up the value of the company's assets and deducting the value of any purchased liabilities.

2.1 Alternative asset valuation bases

- **Book value**

  Value is largely a function of depreciation policy.

- **Replacement value**

  Useful for the buyer.

- **Breakup value/Net realisable value**

  Useful for the seller.

Notes

2.2 Problems with asset-based valuations

Asset based valuations do not value what is being purchased, i.e. the right to future earnings/cash flows of the company.

Asset based valuations ignore intangible assets, such as goodwill

Question 1

Asset based valuation

The following are extracts from the statement of financial position of MNM Co, an unquoted company, as at 31 December 20X6.

	$
Non-current assets (written down value)	2,292,000
Net current assets	395,000
$0.50 ordinary shares	1,500,000
Reserves	687,000
8% loan notes	500,000

Further information is provided as follows:

A recent valuation of the non-current assets put them at 45% above their current written down value.

The loan notes are redeemable at a 10% premium.

There is a long outstanding debt of $20,000 in receivables that is not expected to be received.

Calculate the value of a share in MNM Co.

Illustrations and further practice

Notes

3 Income/earnings based valuation methods

These methods are particularly useful when valuing a majority shareholding. They reflect that the investor has additional benefits of control, which means they have access to the earnings of the business, not just the dividends (as they can influence dividend policy).

3.1 PE ratio method

Value per share = EPS × P/E ratio

Total value of equity = Total earnings × P/E ratio

Which earnings figure?

Starting point: The current post-tax earnings, or EPS

BUT this is historic, not expected, future earnings.

Adjust for factors such as:

- one-off items which will not recur in the coming year
- directors' salaries, which
- synergies

Notes

Which P/E ratio?

An unquoted company will not have a market-driven P/E ratio, so an industry average P/E, or one for a similar company, will be used as a proxy.

If a quoted company proxy is used, it may need to be adjusted to reflect the position of the business being valued:

Private company shares are less liquid

The company may be more risky than the proxy

The company may have a higher projected growth level

Proxy P/E ratios are also sometimes used when valuing a quoted company too

Notes

Question 2

PE ratio valuation

BC Co is looking to take over ZJ Co, an unquoted company and has gathered the following information:

Profit after taxation for the most recent accounting period was $250,000. This was after deducting $15,000 for the write off of a bad debt and salaries of $120,000 for managers who will no longer be employed if BC purchases the company. Preference dividends of $25,000 and ordinary dividends of $45,000 were paid out of these profits. ZJ Co has no debt.

Quoted businesses similar to ZJ Co have an average PE ratio of 9. As ZJ Co is unquoted, BC Co decides to reduce the calculated value by 20% when determining ZJ Co's value.

Calculate the value of equity in ZJ Co for BC Co's purposes.

Illustrations and further practice

Notes

3.2 Earnings yield method

The earnings yield is the inverse of the PE ratio, hence:

Value per share = EPS × 1/earnings yield

Total value of equity = Total earnings × 1/earnings yield

Incorporating constant growth in earnings:

$$\text{Total value of equity} = \frac{\text{earnings} \times (1 + g)}{\text{earnings yield} - g}$$

Question 3

Earnings yield valuation

Company J has earnings of $1.2 million. A similar listed company has an earnings yield of 11%. J's earnings have been growing at a rate of 2% per annum but it is unknown as to whether this will continue.

Estimate the value of J Co in the situation of no growth in earnings and of growth maintained at 2% per annum.

Illustrations and further practice

Notes

4 Cash flow based valuation methods

4.1 The dividend valuation model (DVM)

This method can be used for valuing a minority shareholding in a company. Minority investors have little influence on how earnings are spent/distributed and rely on dividends as the source of income from their investment.

$$P_0 = \frac{D}{r_e}$$

$$P_0 = \frac{D_0(1 + g)}{r_e - g} \text{ (on formula sheet)}$$

r_e will be given in the question or may be calculated using the CAPM.

4.2 Strengths and weaknesses of the DVM

- problems estimating a future growth rate
- growth assumed to be zero or at a constant rate
- high sensitivity to changes in the assumptions used
- few advantages over earnings based methods for controlling interests.

Notes

Question 4

DVM valuation

A company has the following information available:

Share capital in issue: 2 million ordinary shares at a nominal value of $0.75.

Dividend just paid: $0.10 per share.

Dividend 5 years ago: $0.07 per share.

Current equity beta: 0.9

Average market return on shares: 16%

Risk free rate: 7%

Calculate the market capitalisation of the company.

Notes

Question 5

DVM valuation

A company has the following information available:

Share capital in issue: 1 million ordinary shares at a par value of $1.

Dividend just paid: $0.20 per share.

Current earnings per share (EPS): $0.25.

Current return earned on assets: 15%

Current equity beta: 1.2

Average market return on shares: 14%

Risk free rate: 4%

Calculate the market capitalisation of the company.

Illustrations and further practice

Notes

4.3 Discounted cash flow basis

The value of equity is derived by estimating the future annual free cash flows of the entity, and discounting these cash flows at an appropriate cost of capital (that reflects the systematic risk of the flows).

Steps for valuation:

- Identify the free cash flows
- Select a suitable time horizon
- Calculate the PV over this time period

- If valuing equity only, deduct the value of the debt (which is now a liability for the new owner) to give the equity value.

Notes

Question 6

DCF valuation

The following information has been taken from the statement of profit or loss and the statement of financial position for X Co:

Revenue:	$500m
Production expenses:	$200m
Administrative expenses:	$100m
Tax-allowable depreciation:	$50m
Capital investment in year:	$25m
Corporate debt:	$250m

Corporation tax is 30%, the WACC is 15.5% and inflation is 4%.

These cash flows are expected to continue for the foreseeable future.

Calculate the value of equity.

Notes

Question 7

DCF valuation

The following information has been taken from the statement of profit or loss and the statement of financial position for X Co:

Revenue:	$900k
Production expenses:	$375k
Administrative expenses:	$290k
Tax-allowable depreciation:	$35k
Capital investment in year:	$80k
Corporate debt:	$100k

Corporation tax is 30%, the WACC is 16.5% and inflation is 4%.

These cash flows are expected to continue for the foreseeable future.

Calculate the value of equity.

Illustrations and further practice

Notes

4.4 Strengths and weaknesses of the discounted cash flow basis

Strengths

- Theoretically the best method
- Can be used to value all or part of a company.

Weaknesses

- Relies on estimates of cash flows and discount rates.
- Difficulty in choosing a time horizon.
- Difficulty in valuing a company's worth beyond this time horizon.
- Assumes that discount rates, tax and inflation rates are constant over the period.

Notes

5 Valuation post-takeover

Extra considerations:

- Synergy
- Method of financing

Question 8

Valuation in a takeover

Douglas Co is an all equity financed company and has 5 million shares in issue, with a share price of $2.60 each. It is considering a takeover of Peel Co, a company in the same industry. Peel Co is also all equity financed and has 2 million shares in issue, each worth $1.75.

The takeover is likely to result in synergy gains estimated to be worth a present value of $2.5 million.

The financial advisers to Douglas Co have indicated that if an offer is made at a 10% premium to Peel Co's current share price that it is likely to be accepted by Peel Co's shareholders.

Calculate the value of a share in Douglas Co post takeover if the takeover is financed entirely by cash.

Calculate how many Douglas Co shares would need to be issued to Peel Co shareholders in a share-for-share exchange.

Illustrations and further practice

Notes

6 Valuation of debt and preference shares

Uses the same principles seen in the cost of capital chapter, with the calculations rearranged.

Preference shares P_0	= D/K_p
Irredeemable debt MV	= I/r
Redeemable debt MV	= PV of future interest and redemption receipts (or value of converted shares if convertible debt) discounted at investors' required return rate.

Question 9

Preference share valuation

A firm has in issue 10% preference shares with a nominal value of $0.50 each. The required return of preference shareholders is currently 13%.

Calculate the value of a preference share.

Notes

Question 10

Irredeemable debt valuation

A company has issued irredeemable loan notes with a coupon rate of 6%. If the required return of investors is 5%, what is the current market value of the debt?

Question 11

Redeemable debt valuation

A company has issued 8% redeemable loan notes with 7 years to redemption, which will be at par. Investors require a return of 12%.

Calculate the market value of the loan notes.

Notes

Question 12

Convertible debt valuation

A company has issued 9% redeemable loan notes with 6 years to redemption, which would be at a premium of 5%. Alternatively, investors have the option of converting their debt in 6 years to 20 ordinary shares. Investors require a return of 14%. The current share price is $4.25 and the value is expected to grow at a rate of 7% per annum.

Calculate the market value of the loan notes.

Calculate also the floor value and the conversion premium.

Illustrations and further practice

Notes

7 Market efficiency and the efficient market hypothesis

7.1 The concept of market efficiency

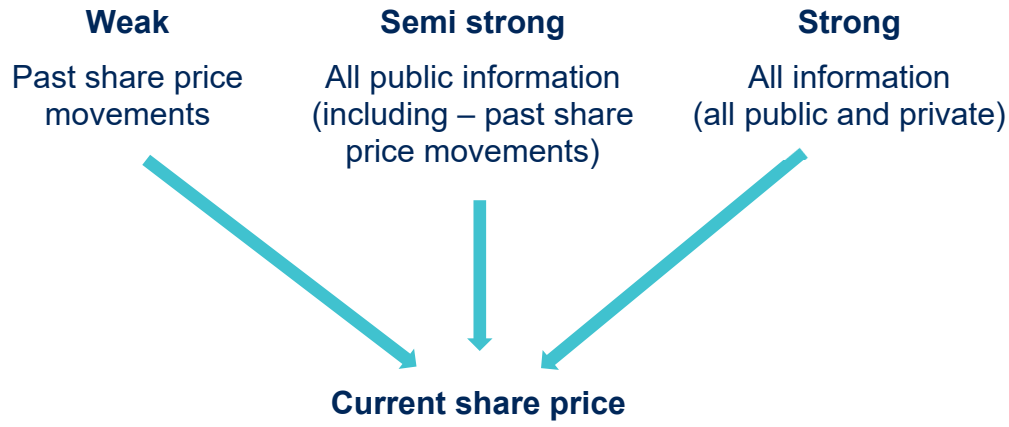
An efficient market is one in which security prices fully reflect all available information (i.e. they are fairly priced).

In an efficient market, new information is rapidly and rationally incorporated into share prices in an unbiased way.

Fairly priced shares ensure investor confidence and reflect director performance.

7.2 The efficient market hypothesis

There are three forms of efficiency based on different theories about where this new information comes from:



Notes

7.3 Weak form efficiency

In a weak form efficient market, share prices reflect information about all past price movements. Past movements do not help investors in identifying positive NPV trading strategies.

Evidence

Share prices follow a random walk:

- There are no patterns or trends.
- Prices rise or fall depending on whether the next piece of news is good or bad.
- Very little of a share price movement on one day can be predicted from knowledge of the change on the previous day.

Conclusion for the stock market

- It is weak form efficient.
- Future price movements cannot be predicted from past price movements.
- Chartism/technical analysis cannot help make consistent gains on the market.

Notes

7.4 Semi-strong form efficiency

In a semi-strong form efficient market, share prices incorporate all past information and all publicly-available information. Semi-strong market efficiency incorporates weak form market efficiency.

Evidence

Share prices react within 5 – 10 minutes of any new information being released:

- rising in response to good news
- falling in response to bad news.

Conclusion for the stock market

- It is also semi-strong form efficient.
- Fundamental analysis – examining publicly-available information will not provide opportunities to consistently beat the market.
- Only those trading in the first few minutes after the news breaks can beat the market.

Notes

7.5 Strong form efficiency

In a strongly efficient market, share prices incorporate all information, whether public or private, including information which is as yet unpublished.

Evidence

Insiders (directors for example) have access to unpublished information. If the market was strong form:

- share prices would not move with breaking news, as they would have already reacted before the news became public
- there would be no need to ban 'insider dealing' as insiders would not be able to beat the market.

Conclusion for the stock market

- It is not strong form efficient; therefore, its maximum level of efficiency is semi-strong.
- insider dealing is banned.
- the stock exchange encourages the release of new information quickly to prevent insider dealing opportunities.
- insiders are forbidden from dealing in their shares at crucial times.

Notes

7.6 Conclusions

In the semi-strong stock market:

- shares will be fairly priced (within 5 – 10 minutes of news breaking)
- managers can improve shareholder wealth by investing in positive NPV projects and communicating this to the market
- most investors (including professional fund managers) cannot consistently beat the market without inside information.

7.7 Behavioural finance

Why do investors make seemingly irrational decisions when buying and selling?

- Market paradox (investors must believe the market is inefficient in order for it to be efficient)
- Herding (investors follow trends rather than make their own, rational decisions)
- Stock market bubble (an unsustainable rise in the price of an investment due to, for example, herding)
- Noise traders (those who follow trends rather than make professional decisions)
- Loss aversion (those whose focus is to avoid a loss rather than make a gain)
- Momentum effect (a trend of rising prices leads to optimism and further price rises and vice versa)

Illustrations and further practice

Notes

8 Practical considerations in the valuation of shares and businesses

- marketability and liquidity of shares
- available information
- equilibrium prices

Notes

Questions

Notes

Chapter 21

Answers

Chapter 2

Question 1

ROCE

A project involves the immediate purchase of an item of plant costing $50,000. Annual cash flows of $14,500 will be earned and the plant will be sold at the end of the four-year project life for $10,000.

Calculate the project's ROCE using:

(a) Initial capital costs

(b) Average capital investment.

Average annual profit is used in both calculations:

(Total annual cash flows – total depreciation)/project life

($14,500 × 4 – ($50,000 – $10,000)/4 = $4,500 per annum

(a) Initial capital ROCE = $4,500/$50,000 × 100 = 9%

For average ROCE, need average capital investment:

($50,000 + $10,000)/2 = $30,000

(b) Average ROCE = $4,500/$30,000 × 100 = 15%

NB. What if the target return were 12%? Would the project be accepted?

You would need to know whether the target related to the initial or average method.

Question 2

ROCE

A project requires an initial investment of $1,000,000 and then earns net cash inflows as follows:

Year	1	2	3	4	5	6
Cash inflows ($000)	400	250	200	175	75	50

In addition, at the end of the six-year project the assets initially purchased will be sold for $200,000.

Determine the project's average ROCE

Average annual profit:

(Total annual cash flows – total depreciation)/project life

(400 + 250 + 200 + 150 + 100 + 50 – (1,000 – 200))/6 = $58,333 per annum

Average capital investment:

(1,000 + 200)/2 = 600

Average ROCE = $58,333/$600,000 × 100 = 9.7%

Question 3

Relevant costs

Various items in relation to a project are:

Market research costs of $50,000 that have been carried out.

The purchase of an asset that would cost $95,000.

The sale of that asset at the end of the project for $10,000.

Depreciation of the asset over the life of the project of $85,000.

Sales revenue per annum of $65,000.

Variable costs of $34 per unit produced.

Factory fixed costs of $18,000 per year that will rise to $21,000 per year for the life of the project.

Apportioned head office costs of $2 per unit representing the project's share of existing head office costs.

Which of these items are relevant cash flows?

- Market research is sunk, i.e. it is not a future cash flow so is not relevant.
- The asset purchase is a future cash flow incremental to the project so is relevant.
- The sale of the asset is also a future cash flow incremental to the project so is relevant.
- Depreciation isn't a cash flow and so is not relevant.
- Sales revenue is a future, incremental cash flow and is relevant.
- Variable costs are future incremental cash flows and so are relevant.
- Of the factory fixed costs, only the extra $3,000 per year is incremental to the project and so only that part is relevant.
- The head office costs are not changing in total, so there is no incremental element and so they are not relevant.

Question 4

Payback

An expenditure of $2 million is expected to generate net cash inflows of $600,000 each year for the next seven years.

What is the payback period?

$2,000,000/600,000 = 3.33 years.

Or 3 years + 0.33*12 months

3 years and 4 months.

Question 5

Payback

A project requires an initial investment of $1,000,000 and then earns net cash inflows as follows:

Year	1	2	3	4	5	6
Cash inflows ($000)	400	250	200	175	75	50

In addition, at the end of the six-year project the assets initially purchased will be sold for $200,000.

Determine the project's payback period.

Calculate cumulative cash flows:

Year	cash flow $000	Cumulative cash flow
0	(1,000)	(1,000)
1	400	(600)
2	250	(350)
3	200	(150)
4	175	25
5	75	
6	250	

Payback period = 3 years + 150/175 × 12 months

= 3 years and 11 months (always round up the months)

Chapter 3

Question 1

Compounding

An investment of $500 is to be made today in an account earning 5% interest per annum. What will be the value of the account after 3 years?

Either:

Take each year separately:

Year 1 $500 × 5% = $25 interest. Value at end of yr = $525.00

Year 2 $525 × 5% = $26.25 interest. Value at end of year = $551.25

Year 3 $551.25 × 5% = $27.56 interest. Value at end of year = $578.81

Or:

Use compounding formula $F = P(1 + r)^n$

P = $500, r = 0.05, n = 3

$F = \$500 \times 1.05^3 = \$578.81$

Question 2

Discounting

What is the present value of $65,000 receivable in 6 years' time if the applicable interest rate is 7%?

$P = F \times (1 + r)^{-n}$

$P = \$65{,}000 \times 1.07^{-6} = \$43{,}312$

Question 3

NPV

Calculate the NPV of the following cash flows at a discount rate (cost of capital) of 8%.

Year	$
t0	(25,000)
t1	10,000
t2	9,000
t3	8,000
t4	5,000

Year	$	Discount factors 8%	PV
0	(25,000)	1	(25,000)
1	10,000	0.926	9,260
2	9,000	0.857	7,713
3	8,000	0.794	6,352
4	5,000	0.735	3,675
		NPV	**2,000**

Question 4

NPV

A project has the following information: Purchase of asset at the start of the project $120,000. Sale of asset at the end of the project $25,000. Depreciation per each year of the five year project $19,000. Contribution per annum $40,000. Incremental fixed costs per annum $10,000.

Calculate the NPV of the project at a discount rate of 10%.

Year	$	Discount factors 10%	PV
t0	(120,000)	1	(120,000)
t1	30,000	0.909	27,270
t2	30,000	0.826	24,780
t3	30,000	0.751	22,530
t4	30,000	0.683	20,490
t5	55,000	0.621	34,155
		NPV	**9,225**

NB: remember to use relevant cash flows.

Question 5

Discounting using tables

Calculate the present value of $40,000 discounted at 9% for 4 years.

PV = future value × discount factor

Using the formula

PV = $40,000 × 1.09^{-4} = $28,337

From tables, discount factor for 9% and 4 years is 0.708

PV = $40,000 × 0.708 = $28,320

NB: the only difference is roundings. Either method is acceptable for the exam.

Question 6

Annuities

A project has the following information: Purchase of asset at the start of the project $120,000. Sale of asset at the end of the project $25,000. Depreciation per each year of the five year project $19,000. Contribution per annum $40,000. Incremental fixed costs per annum $10,000.

Calculate the NPV of the project at a discount rate of 10%.

Method as used before:

Year	$	Discount factors 10%	PV
0	(120,000)	1	(120,000)
1	30,000	0.909	27,270
2	30,000	0.826	24,780
3	30,000	0.751	22,530
4	30,000	0.683	20,490
5	55,000	0.621	34,155
		NPV	**9,225**

Answer can be done more quickly using the annuity formula for the series of cash flows of $30,000 in years 1 to 4:

Year	$	Discount factors 10%	PV
0	(120,000)	1	(120,000)
1 – 4	**30,000**	**3.170**	95,100
5	55,000	0.621	34,155
		NPV	**9,255**

NB: the only difference between the two answers is due to roundings.

Question 7

Annuities

A payment of $5,800 is to be made every year for 15 years, the first payment occurring in one year's time. The interest rate is 12%. Calculate the PV of the annuity:

(a) Using the annuity factor formula

(b) Using the annuity factor tables.

(a)

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

Annuity factor = $(1 - 1.12^{-15})/0.12 = 6.810864489$

PV = $5,800 × 6.810864489 = $39,503

(b) from tables, annuity factor for 12% and 15 years is 6.811

PV = $5,800 × 6.811 = $39,504

Question 8

Perpetuities

A payment of $5,800 is to be made every year for the foreseeable future, the first payment occurring in one year's time. The interest rate is 12%. Calculate the PV of the perpetuity if:

(a) The value of the perpetuity remains constant

(b) The value of the perpetuity grows by 3% in the second year and remains growing at that rate for the foreseeable future.

(a) $PV = FV \times 1/r$

$PV = \$5{,}800 \times 1/0.12 = \$48{,}333$

(b) $PV = FV \times 1/(r - g)$

$PV = \$5{,}800 \times 1/(0.12 - 0.03) = \$64{,}444$

Question 9

Advanced and delayed annuities and perpetuities

Calculate the present values of the following at a discount rate of 10%:

(a) A series of 3 annual payments of $5,000 starting today.

(b) A series of 3 annual payments of $5,000 starting in 4 years' time.

(c) A series of annual payments of $5,000 starting today and continuing for the foreseeable future.

(d) A series of annual payments of $5,000 starting in 6 years' time and continuing for the foreseeable future.

(e) A series of annual payments starting with $5,000 in 6 years' time and then growing at 2% per annum into the foreseeable future.

(a) use annuity factor for 2 years and add 1 to its value

$5,000 × (1 + 1.736) = $13,680

(b) use 3-year annuity factor to discount to a single sum as at t3, then use 3-year discount factor to discount the single sum back to t0.

$5,000 × 2.487 × 0.751 = $$9,339

(c) use perpetuity factor and add 1 to its value

$5,000 × (1 + 1/0.1) = $55.000

(d) Use perpetuity factor to discount to a single sum as at t5, then use the 5-year discount factor to discount the single sum back to t0

$5,000 × 1/0.1 × 0.621 = $31,050

(e) Use growing perpetuity factor to discount to a single sum as at t5, then use the 5-year discount factor to discount the single sum back to t0.

$5,000 × 1/(0.1 – 0.02) × 0.621 = $38,813

Question 10

IRR

A potential project's predicted cash flows give a positive NPV of $6,000 at a discount rate of 9% and a negative NPV of $3,000 at a discount rate of 12%. Calculate the project's IRR.

$$IRR = L + \frac{N_L}{N_L - N_H}(H - L)$$

$IRR = 9 + [\$6,000/(\$6,000 + \$3,000)] \times (12 - 9)$

$IRR = 9 + 0.667 \times 3 = 11\%$

Question 11

IRR

Calculate the internal rate of return (IRR) of the following cash flows. The NPV at a discount rate of 8% is $2,000. Use 15% as the second discount rate.

Year	$
0	(25,000)
1	10,000
2	9,000
3	8,000
4	5,000

Year	$	Discount factors 15%	PV
0	(25,000)	1	(25,000)
1	10,000	0.870	8,700
2	9,000	0.756	6,804
3	8,000	0.658	5,264
4	5,000	0.572	2,860
		NPV	**(1,372)**

IRR = 8 + [$2,000/($2,000 + $1,372)] × (15 – 8)

IRR = 8 + 0.593 × 7 = 12.2%

Question 12

IRR of an annuity

A project will earn net cash flows of $4,000 for 5 years. The initial capital cost of the project is $17,000. Calculate the project's IRR.

An initial NPV calculation is set up as follows:

Time	Cash flow	discount factor	Present value
t0	(17,000)	1	(17,000)
t1–5	4,000	?	

At the IRR, the NPV will be $0 so we can fill in more figures as follows:

Time	Cash flow	discount factor	Present value
t0	(17,000)	1	(17,000)
t1–5	4,000	?	**17,000**
			_____
		NPV	**0**

Now we can work out what the 5 year annuity factor must be:

$17,000/$4,000 = 4.25

Then look on the annuity tables to see what percentage has an annuity factor closest to this for 5 years.

5% = 4.329, 6% = 4.212, 7% = 4.1

So the IRR is closest to 6%

Question 13

IRR of a perpetuity

A project will earn net cash flows of $4,000 for the foreseeable future. The initial capital cost of the project is $17,000. Calculate the project's IRR.

The give an NPV of zero, the PV of the cash inflows must be equal to the initial capital outlay of $17,000.

PV of a perpetuity = cash flow × 1/r

$4,000 × 1/r = $17,000 at the IRR.

r = $4,000/$17,000 = 0.235 or 23.5%

Question 14

IRR

Find the IRR of an investment of $20,000 if the cash flows are:

(a) $4,500 for 7 years, starting at t1

(b) $4,500 into perpetuity, starting at t1

(a)

Time	Cash flow	discount factor	Present value
t0	(20,000)	1	(20,000)
t1–7	4,500	?	**20,000**
		NPV	**0**

Now we can work out what the 7 year annuity factor must be:

$20,000/$4,500 = 4.44

Then look on the annuity tables to see what percentage has an annuity factor closest to this for 7 years.

12% = 4.564, 13% = 4.423, 14% = 4.288

So the IRR is closest to 13%

(b)

IRR = $4,500/$20,000 = 0.225 or 22.5%

Chapter 4

Question 1

Real and money rates

An investor requires a real return on their investment of 12%, but in addition will need to be compensated for anticipated inflation of 3%.

Calculate the money rate of return required by the investor.

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

$r = 0.12, h = 0.03$

$1 + i = 1.12 \times 1.03 = 1.1536$

$i = 0.1536$ or 15.36%

Question 2

Real and money rates

If an investment pays interest of 5.5% and the general rate of inflation is 3%, what is the real return on the investment?

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

$i = 0.055, h = 0.03$

$1.055 = (1 + r) \times 1.03$

$1 + r = 1.055/1.03 = 1.024$

$r = 0.024$ or 2.4%

Question 3

Real and money methods

An investment costs $20,000. Expected net cash flows from the investment are $7,000 per annum in current terms and will last for four years. The cash flows are expected to be subject to inflation of 4%. The money cost of capital for discounting is 14%.

Calculate the NPV by:

(a) Discounting the money cash flows at the money cost of capital

(b) Discounting the current cash flows at the real cost of capital.

(a)

Time	Cash flow ($)	Discount factor 14%	PV
t0	(20,000)	1	(20,000)
t1	7,280	0.877	6,385
t2	7,571	0.769	5,822
t3	7,874	0.675	5,315
t4	8,189	0.592	4,848
		NPV	$2,370

(b)

Real cost of capital = (1.14/1.04) – 1 = 0.096 or 9.6%

Uninflated cash flows act as an annuity for 4 years.

4 year annuity factor for 9.6%:

$(1 - 1.096^{-4})/0.096 = 3.198$

NPV = (20,000) + 7,000 × 3.198 = $2,386

Question 4

Specific & general inflation

A company is considering a project that would involve purchasing a machine for $18,000, which will have no value at the end of the project. It will be used to produce a product that will have sales of 500 units per year for 4 years. The sales price per unit will be $50, the variable costs per unit $20 and the incremental fixed costs of the project will be $8,000 per annum. These are all expressed in current terms and will be subject to inflation.

Sales will inflate at 5% per annum, variable costs at 6% per annum and fixed costs at 7% per annum.

The cost of capital in real terms is 11.3% and the general rate of inflation is 3.3%.

Calculate the NPV of the investment.

Time	0	1	2	3	4
Machine purchase	(18,000)				
Sales		26,250	27,563	28,941	30,388
Variable costs		(10,600)	(11,236)	(11,910)	(12,625)
Fixed costs		(8,560)	(9,159)	(9,800)	(10,486)
Net cash flow	(18,000)	7,090	7,168	7,231	7,277
d.f 15% (W1)	1	0.870	0.756	0.658	0.572
Present values	(18,000)	6,168	5,419	4,758	4,162
NPV	**2,507**				

Example workings:

Sales year 1 = 500 × $50 × 1.05 = $26,250

Sales year 2 = $26,250 × 1.05 = $27,563, etc.

Money cost of capital = (1.113 × 1.033) – 1 = 0.15 or 15%

Question 5

Tax-allowable depreciation

An asset is bought for a project at a cost of $25,000 and will be used for four years before being disposed of for $5,000. Tax-allowable depreciation is available at 25% reducing balance and the tax rate is 30%.

Calculate the tax allowable depreciation and hence the tax savings for each year if tax is paid (and saved) a year in arrears.

			tax rate 30%	1 year in arrears
t0	asset purchase 1st day of accounting period	25,000		
t1	1st tax-allowable depreciation 25%	6,250	1,875	t2
	tax written down value	18,750		
t2	2nd tax-allowable depreciation 25%	4,688	1,406	t3
	tax WDV	14,062		
t3	3rd tax-allowable depreciation 25%	3,516	1,055	t4
	tax WDV	10,546		
t4	sales proceeds	5,000		
	balancing allowance	5,546	1,664	t5

Question 6

Tax-allowable depreciation

How would your answer to the previous question change if the sales proceeds for the asset at the end of the project had been $15,000?

			tax rate 30%	1 year in arrears
	First three years as before			
		_____		
	tax WDV	10,546		
t4	sales proceeds	**15,000**		
	balancing **charge**	(4,454)	(1,336)	t5

Question 7

Tax-allowable depreciation

Based on the figures where the sales proceeds are $5,000 (the original scenario), with net trading income for the project being $12,000 per annum, calculate the NPV of the project. The cost of capital is 10%.

	t0	t1	t2	t3	t4	t5
net trading income		12,000	12,000	12,000	12,000	
tax on net trading income			(3,600)	(3,600)	(3,600)	(3,600)
asset purchase and sale	(25,000)				5,000	
tax savings on tax allowable depreciation			1,875	1,406	1,055	1,664
net cash flow	(25,000)	12,000	10,275	9,806	14,455	(1,936)
discount factors	1.00	0.909	0.826	0.751	0.683	0.621
Present values	(25,000)	10,908	8,487	7,364	9,873	(1,202)
NPV	10,430					

Question 8

Working capital

A company expects sales for a new project to be $20,000 in the first year, growing at 4% per annum. The project is expected to last for 3 years. Working capital equal to 15% of annual sales is required and needs to be in place at the start of each year.

Calculate the working capital cash flows for incorporation into the NPV calculation.

Time	t0	t1	t2	t3
Sales		$20,000	$20,800	$21,632
Working capital needed	$3,000	$3,120	$3,245	$0
Cash flows	$(3,000)	$(120)	$(125)	$3,245

Question 9

Working capital

A company expects sales for a new project to be 10,000 units per year. The sales price in current terms is $25, but will grow at 6% per annum. The project is expected to last for three years.

Working capital equal to 10% of sales is required to be in place at the beginning of each year.

Calculate the working capital cash flows for incorporation into the NPV calculation.

	t0	t1	t2	t3
		10000 × $25 × 1.06	$265,000 × 1.06	$280,900 × 1.06
sales ($)		265,000	280,900	297,754
working capital 10%	26,500	28,090	29,775	
cash flow	(26,500)	(1,590)	(1,685)	29,775

Question 10

Full NPV question

Larson Co is considering a potential project with the following forecasts:

	Now	T1	T2	T3
Initial investment ($million)	(2,500)			
Disposal proceeds ($million)			700	
Demand (millions of units)		8	12	4

The selling price per unit is expected to be $225 and the variable cost $85 per unit. Both of these figures are given in today's terms.

Tax is paid at 30%, one year after the accounting period concerned.

Working capital will be required equal to 10% of annual sales. This will need to be in place at the start of each year.

Tax-allowable depreciation is available at 25% reducing balance.

The company has a real required rate of return of 7.7%.

General inflation is predicted to be 4% pa but the selling price is expected to inflate at 3% and variable costs by 6% pa.

Determine the NPV of the project.

$ millions	T_0	T_1	T_2	T_3	T_4
Sales (W1)		1,854	2,864	983	
Variable costs (W1)		(721)	(1,146)	(405)	
Net trading inflows		1,133	1,718	578	
Tax payable (30%)			(340)	(516)	(174)
Initial investment	(2,500)				
Scrap proceeds				700	
Tax relief on tax-allowable depreciation (W2)			188	141	212
Working capital (W3)	(185)	(101)	188	98	
Net cash flows	(2,685)	1,032	1,754	1,001	38
DF @ 12% (W4)	1	0.893	0.797	0.712	0.636
PV	(2,685)	922	1,398	713	24
NPV	**372**				

(W1) Revenue and costs

Revenue and costs need to be inflated to be expressed in money terms.

E.g. revenue at T2 = 12m × \$225 × 1.03^2 = \$2,864.43m

variable cost at T3 = 4m × \$85 × 1.06^3 = \$404.945m

(W2) Tax-allowable depreciation

Time		$m	Tax saving	Timing of tax relief
			$m	
T0	Initial investment	2,500		
T1	Tax-allowable depreciation @ 25%	(625)	187.5	T2
	Written down value	1,875		
T2	Tax-allowable depreciation @ 25%	(468.75)	140.625	T3
	Written down value	1,406.25		
	Sale proceeds	(700)		
T3	Balancing Allowance	706.25	211.875	T4

(W3) Working capital requirements

$ millions	T0	T1	T2	T3
Sales		1,854	2,864	983
Working capital required	185	286	98	
Working		185–286	286–98	98–0
Cash flow	(185)	(101)	188	98

(W4) Discount rate

$(1 + i) = (1 + r) \times (1 + h) = 1.077 \times 1.04 = 1.12$, giving a money rate (i) = 12%.

Chapter 5

Question 1

PV of a lease

A company has already decided to accept a project and is now considering how best to finance it.

The asset needed for the project could be leased over five years at a rental cost of $14,000 per annum with the first payment due immediately (at the start of an accounting period).

Tax is payable at 30%, one year in arrears. The post-tax cost of borrowing is 8%.

Calculate the net present value of the leasing option.

Time	Cash flow ($)	annuity factor	PV ($)
t0 – t4	(14,000)	(1 + 3.312)	(60,368)
t2 – t6	4,200	3.993 × 0.926	15,530
		NPV	(44,838)

The lease payments are an advanced annuity starting at t0.

The tax payments are a delayed annuity. The first tax computation will be done in 1 year at the end of the accounting period and the first tax saving on the lease payments will be one year in arrears at t2.

Question 2

Lease vs buy

A company has already decided to acquire a new machine in order to make cost savings on production. It needs to decide whether to lease or buy the machine.

The machine would cost $500,000 and the company would be able to claim tax-allowable depreciation on a 25% reducing balance basis. The machine would be worthless at the end of the four-year project.

Alternatively, the company could enter into a four-year lease for the asset with annual payments of $160,000 starting immediately.

Tax is payable at 30%, one year in arrears.

Calculate whether the company should lease or buy the asset. The company's post-tax cost of borrowing is 10%.

Purchase costs:

	0	1	2	3	4	5
asset purchase	(500,000)					
tax savings on tax-allowable depreciation			37,500	28,125	21,094	63,281
discount factor 10%	1	0.909	0.826	0.751	0.683	0.621
PV	(500,000)	0	30,975	21,122	14,407	39,298
PV of costs	(394,198)					

Lease costs:

	0	1	2	3	4	5
lease payments	(160,000)	(160,000)	(160,000)	(160,000)		
tax savings on lease payments			48,000	48,000	48,000	48,000
net cash flow	(160,000)	(160,000)	(112,000)	(112,000)	48,000	48,000
discount factor 10%	1	0.909	0.826	0.751	0.683	0.621
PV	(160,000)	(145,440)	(92,512)	(84,112)	32,784	29,808
PV of costs	(419,472)					

The purchase option is cheaper by $25,274

Question 3

EAC

A machine costs $15,000. Running costs in the first year are anticipated to be $3,000 and in the second year would be $3,600. If the machine were sold after one year, the anticipated sales proceeds are $7,000. If used for another year and then sold the proceeds would fall to $4,000.

Calculate the optimal replacement cycle for the machine if the cost of capital is 11%.

1 year cycle

t0 (15,000) × 1 = (15,000)

t1 [(3,000) + 7,000] × 0.901 = 3,604

Total PV of cycle = $(11,396)

EAC = (11,396)/0.901 = $(12,648)

2 year cycle

t0 (15,000) × 1 = (15,000)

t1 (3,000) × 0.901 = (2,703)

t2 [(3,600) + 4,000] × 0.812 = 325

Total PV of cycle = $(17,378)

EAC = (17,378)/1.713 = $(10,145)

The 2 year cycle is the cheaper option.

Question 4

EAC

A decision must be made on a replacement policy for a fleet of cars. A car costs $20,000 and the following additional information applies:

Sales value at end of year: 1 $12,000 2 $10,000 3 $6,000

Maintenance costs in year: 1 $1,500 2 $2,300 3 $4,000

Calculate the optimal replacement cycle for the machine if the cost of capital is 14%.

1 year cycle

t0 (20,000) × 1 = (20,000)

t1 [(1,500) + 12,000] × 0.877 = 9,209

Total PV of cycle = $(10,791)

EAC = (10,791)/0.877 = $(12,304)

2 year cycle

t0 (20,000) × 1 = (20,000)

t1 (1,500) × 0.877 = (1,316)

t2 [(2,300) + 10,000] × 0.769 = 5,921

Total PV of cycle = $(15,395)

EAC = (15,395)/1.647 = $(9,347)

3 year cycle

t0 (20,000) × 1 = (20,000)

t1 (1,500) × 0.877 = (1,316)

t2 (2,300) × 0.769 = (1,769)

t2 [(4,000) + 6,000] × 0.675 = 1,350

Total PV of cycle = $(21,735)

EAC = (21,735)/2.322 = $(9,360)

The 2 year cycle is the cheapest option.

Question 5

Capital rationing – divisible projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can be done in whole to earn the entire NPV or in part to earn a proportional share of the NPV. All investments must be started now.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Project	Initial investment	NPV	PI	Rank	Invest	NPV
1	$250,000	$50,000	0.2	4	$160k	$32k
2	$300,000	$30,000	0.1	5		
3	$650,000	$195,000	0.3	2	$650k	$195k
4	$40,000	$20,000	0.5	1	$40k	$20k
5	$150,000	$42,000	0.28	3	$150k	$42k
					$1,000k	**$289k**

Only ($160k/$250k) 64% of project 1 can be done, earning 64% of its total NPV.

Question 6

Capital rationing – indivisible projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can only be done in whole or not at all. All investments must be started now.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Look at the various combinations of projects that could be done:

1, 2, 4 and 5 uses $740k and earns $142k

1, 3 and 4 uses $940k and earns $265k

2, 3 and 4 uses $990k and earns $245k

3, 4 and 5 uses $840k and earns $257k

So the optimum combination is to do projects 1, 3 and 4.

Question 7

Capital rationing – mutually exclusive projects

A company has $1,000,000 available for investment and has identified the following investment opportunities, all of which can be done in whole to earn the entire NPV or in part to earn a proportional share of the NPV. All investments must be started now. Projects 1 and 5 use the same asset and so cannot be done together.

Determine which projects should be undertaken to maximise the overall NPV earned.

Project	Initial investment	NPV
1	$250,000	$50,000
2	$300,000	$30,000
3	$650,000	$195,000
4	$40,000	$20,000
5	$150,000	$42,000

Choosing project 1 over project 5

Project	Initial investment	NPV	PI	Rank	Invest	NPV
1	$250,000	$50,000	0.2	4	$250k	$50k
2	$300,000	$30,000	0.1	5	$60k	$6k
3	$650,000	$195,000	0.3	2	$650k	$195k
4	$40,000	$20,000	0.5	1	$40k	$20k
5	$150,000	$42,000	0.28	3		
					$1,000k	**$271k**

Only ($60k/$300k) 20% of project 2 can be done, earning 20% of its total NPV.

Choosing project 5 over project 1

Project	Initial investment	NPV	PI	Rank	Invest	NPV
1	$250,000	$50,000	0.2	4		
2	$300,000	$30,000	0.1	5	$160k	$16k
3	$650,000	$195,000	0.3	2	$650k	$195k
4	$40,000	$20,000	0.5	1	$40k	$20k
5	$150,000	$42,000	0.28	3	$150k	$42k
					$1,000k	**$273k**

Only ($160k/$300k) 53.3% of project 2 can be done, earning 53.3% of its total NPV.

Choosing project 5 over project 1 for the use of the asset gives a higher overall NPV of $273k.

Chapter 6

Question 1

Sensitivity analysis

A project requires an investment of $220,000 today and will bring in annual operating cash flows of $75,000. These are made up of sales volumes of 5,000 units each year for the four years of the project, a sales price of $50 per unit, variable costs per unit of $25 and annual incremental fixed costs of $50,000. The asset will have no value at the end of the project.

There is no tax or inflation and the discount rate is 8%.

(a) Calculate the NPV of the project.

(b) Calculate the sensitivity of the project to:

- (i) initial investment
- (ii) selling price per unit
- (iii) variable cost per unit
- (iv) sales volume
- (v) fixed cost per unit
- (vi) discount rate

(a)

			df/af 8%	PV
t0	purchase	(220,000)	1	(220,000)
t1-4	revenue	250,000	3.312	828,000
t1-4	variable cost	(125,000)	3.312	(414,000)
t1-4	fixed cost	(50,000)	3.312	(165,600)
	NPV			28,400

(b)

(i) Sensitivity to initial investment = $28,400/$(220,000) × 100 = 12.9%

(ii) to sales price = $28,400/$828,000 × 100 = 3.4%

(iii) to variable costs = $28,400/$(414,000) × 100 = 6.9%

(iv) to sales volumes = $28,400/($828,000 – $414,000) × 100 = 6.9%

(v) to fixed costs = $28,400/$(165,600) × 100 = 17.1%

(vi) to discount rate – calculate the IRR:

			df/af 15%	
t0	purchase	(220,000)	1	(220,000)
t1-4	revenue	250,000	2.855	713,750
t1-4	variable cost	(125,000)	2.855	(356,875)
t1-4	fixed cost	(50,000)	2.855	(142,750)
	NPV			(5,875)

IRR = 8 + [$28,400/($28,400 – $(5,875))] × (15 – 8)

IRR = 8 + 0.829 × 7

IRR = 13.8%

To bring the NPV to zero the discount rate needs to move from 8% to 13.8%.

This is an increase of (13.8 – 8)/8 × 100 = 72.5%

Question 2

Sensitivity analysis with tax

A project requires an investment of $35,000 today and will bring in annual revenues for 3 years of $100,000 and operating costs of $70,000. The asset will have no value at the end of the project.

Operating cash flows are taxed at 30% and are paid a year in arrears but there is no tax-allowable depreciation available. The discount rate is 10%.

(a) Calculate the NPV of the project.

(b) Calculate the sensitivity of the project to the sales revenue.

(a)

			df/af 10%	PV
t0	purchase	(35,000)	1	(35,000)
t1-3	revenue	100,000	2.487	248,700
t1-3	operating costs	(70,000)	2.487	(174,090)
t2-4	taxation	(9,000)	2.487 × 0.909	(20,346)
	NPV			19,264

(b) If revenue changes, so will tax – by 30% of the revenue value and with a 1 year time delay.

PV of revenue = $248,700

PV of taxation = $248,700 × 30% × 0.909 = $67,820

Net PV affected = $248,700 – $67,820 = $180,880

Sensitivity = $19,264/$180,880 × 100 = 10.7%

Question 3

Expected values

A company has to choose between three mutually exclusive projects, the outcomes of which depend on the state of the economy. The following estimates have been made:

State of the economy	poor	good	excellent
Probability	0.4	0.5	0.1
Project:	NPV ($000)	NPV ($000)	NPV ($000)
A	150	70	10
B	(10)	40	600
C	75	75	125

Determine which project should be selected on the basis of expected NPVs.

EV project A = 150 × 0.4 + 70 × 0.5 + 10 × 0.1 = 96

EV project B = (10) × 0.4 + 40 × 0.5 + 600 × 0.1 = 76

EV project C = 75 × 0.4 + 75 × 0.5 + 125 × 0.1 = 80

Choose project A

Question 4

EVs in NPV calculation

A project requires an investment of $50,000 today and will bring in annual sales volumes for 3 years of 5,000 units with annual operating costs of $20,000. The asset will have no value at the end of the project.

The sales price has not yet been finalised due to uncertainty in the market. A probability analysis has been put together as follows:

20% probability of selling at $10 per unit, 30% of $9 per unit and 50% of $8 per unit.

There is no tax or inflation. The discount rate is 10%.

Calculate the expected NPV of the project.

Expected sales price = 0.2 × $10 + 0.3 × $9 + 0.5 × $8 = $8.70

Expected revenue = $8.70 × 5,000 = $43,500

			df/af 10%	PV
t0	purchase	(50,000)	1	(50,000)
t1-3	revenue	43,500	2.487	108,185
t1-3	operating costs	(20,000)	2.487	(49,740)
	NPV			8,445

Question 5

Joint probabilities

Cash flows in a bank account have the following probabilities:

Month 1		Month 2	
Cash flow	Probability	Cash flow	Probability
$5,000	25%	$7,000	43%
$8,000	75%	$12,000	57%

Calculate:

(a) The probability of the total cash flows over months 1 and 2 totalling $15,000

(b) The probability of the balance at the end of month 2 being either $12,000 or $20,000.

(c) The probability of either a $5,000 cash flow in month 1 or a $12,000 cash flow in month 2.

(a) To have total cash flows of $15,000 over the two months there must be an $8,000 cash flow in month 1 AND a $7,000 cash flow in month 2.

Probability = 75% × 43% = 32.25% (or 0.75 × 0.43 = 0.3225)

(b) To get a balance of $12,000 at the end of month 2, there needs to be a $5,000 cash flow in month 1 and a $7,000 cash flow in month 2. The joint probability of these is (25% × 43%) 10.75%.

To get a balance of $20,000 at the end of month 2, there needs to be an $8,000 cash flow in month 1 and a $12,000 cash flow in month 2. The joint probability of these is (75% × 57%) 42.75%

The probability of one or the other of these mutually exclusive balances occurring can then be found by adding the joint probabilities together: 10.75% + 42.75% = 53.5%

(c) Achieving a $5,000 cash flow in month 1 and a $12,000 cash flow in month 2 are not mutually exclusive events, so the calculation is as follows:

Probability of a $5,000 cash flow = 25%

Probability of a $12,000 cash flow = 57%

Probability of a $5,000 cash flow AND a $12,000 cash flow = (25% × 57%) = 14.25%

Probability of a $5,000 cash flow in month 1 OR a $12,000 cash flow in month 2 = 25% + 57% – 14.25% = 67.75%

Question 6

Discounted payback

A project with the following cash flows is under consideration:

t0	(10,000)
t1	4,000
t2	3,500
t3	3,000
t4	2,500

With a cost of capital of 10%, calculate the discounted payback period.

		d.f 10%	PV	Cumulative
t0	(10,000)	1	(10,000)	(10,000)
t1	4,000	0.909	3,636	(6,364)
t2	3,500	0.826	2,891	(3,473)
t3	3,000	0.751	2,253	(1,220)
t4	2,500	0.683	1,708	488

The payback period is 3 years + (1,220/1,708) years = 3.7 years or 3 years and 9 months.

Question 7

Discounted payback

A company is currently evaluating a project that requires investments of $10,000 now and a further $3,000 at the end of year 1. There will be a net cash inflow of $15,000 at the end of year 2 and $3,000 at the end of year 3.

The cost of capital is 10%.

What is the discounted payback period (DPP) and net present value (NPV) for the project?

		d.f 10%	PV	Cumulative
t0	(10,000)	1	(10,000)	(10,000)
t1	(3,000)	0.909	(2,727)	(12,727)
t2	15,000	0.826	12,390	(337)
t3	3,000	0.751	2,253	1,916
		NPV	**1,916**	

The payback period is 2 years + (337/2,253) years **= 2.15 years (or 2 years and 2 months)**.

Chapter 7

Question 1

Current & quick ratios

A company has $25m of current assets, of which $5m are inventory. Its current liabilities stand at $15m. Calculate the current and quick ratios.

Current ratio = $25m/$15m = 1.67

Quick ratio = ($25m – $5m) – $15m = 1.33

Question 2

Cash operating cycle

A company has provided the following information:

Raw material inventory holding period	25 days
Payables payment period	40 days
Production period (WIP)	5 days
Finished goods holding period	15 days
Receivables collection period	66 days

Calculate the length of the cash operating cycle.

Cash cycle = 25 – 40 + 5 + 15 + 66 = 71 days

Question 3

Working capital ratios

A company has the following figures from its most recent accounts:

Receivables	$13.7m
Trade payables	$7.5m
Inventory (raw materials)	$2.1m
Inventory (WIP)	$1.1m
Inventory (finished goods)	$5.9m
Sales (90% on credit)	$105.9m
Materials purchases (100% on credit)	$77.7m
Cost of sales	$80.5m

Calculate the relevant working capital ratios. Assume 365 days in a year and round calculations to the nearest day.

Raw material inventory holding period: $2.1m/$77.7m × 365 = 10 days

WIP inventory holding period: $1.1m/$80.5m × 365 = 5 days

Finished goods inventory holding period: $5.9m/$80.5m × 365 = 27 days

Finished goods inventory turnover: $80.5m/$5.9m = 13.6 times

Receivables days: $13.7m/($105.9m × 90%) × 365 = 52 days

Payables days: $7.5m/$77.7m × 365 = 35 days

Question 4

Working capital ratios

A company has the following figures from its most recent accounts:

Receivables	$295,000
Trade payables	$120,000
Inventory (raw materials)	$45,000
Inventory (WIP)	$25,000
Inventory (finished goods)	$66,000
Sales (100% on credit)	$1,631,000
Gross profit margin	$30% on sales value
Raw materials purchases	90% of cost of sales value

Calculate the cash operating cycle. Assume 365 days in a year and round calculations to the nearest day.

Cost of sale = 70% of sales = $1,631,000 × 70% = $1,141,700

Raw materials purchases = $1,141,700 × 90% = $1,027,530

Raw material inventory holding period: $45,000/$1,027,530 × 365 = 16 days

WIP inventory holding period: $25,000/$1,141,700 × 365 = 8 days

Finished goods inventory holding period: $66,000/$1,141,700 × 365 = 21 days

Receivables days: $295,000/$1,631,000 × 365 = 66 days

Payables days: $120,000/$1,027,530 × 365 = 43 days

Cash operating cycle = 16 + 8 + 21 + 66 – 43 = 68 days

Question 5

Working capital investment

A company has the following expectations for the forthcoming period:

Sales	$30m
Materials costs	$20m
Other costs	$4m
Profit	$6m

The following working capital ratios are expected to apply:

Inventory days	45
Receivables days	65
Payables days	35

Calculate the working capital requirement.

Days = SFP figure/SPL figure × 365

SFP figure = Days × SPL figure/365

Inventory = 45 × $20m/365 = $2.47m

Receivables = 65 × $30m/365 = $5.34m

Payables = 35 × $20m/365 = $1.92m

Working capital required = $2.47m + $5.34m – $1.92m = $5.89m

Chapter 8

Question 1

EOQ

A company requires 2,000 units of material A per month. The cost per order is $250 and the holding costs of inventory are $1.33 per unit per year.

Investigate the total cost of buying the material in quantities of 2,000, 3,000 and 4,000 units at a time. Which is the cheapest option?

Use the EOQ formula to prove your answer is correct.

Ordering cost = D/Q × Co

Holding cost = Q/2 × Ch

For 2,000 units:

D = 2,000 × 12 = 24,000

Ordering cost = 24,000/2,000 × $250 = $3,000

Holding cost = 2,000/2 × $1.33 = $1,330

Total cost = $4,330

For 3,000 units:

Ordering cost = 24,000/3,000 × $250 = $2,000

Holding cost = 3,000/2 × $1.33 = $1,995

Total cost = $3,995

For 4,000 units:

Ordering cost = 24,000/4,000 × $250 = $1,500

Holding cost = 4,000/2 × $1.33 = $2,660

Total cost = $4,160

EOQ = √(2 × $250 × 24,000/$1.33) = 3,004 units

Question 2

EOQ

Annual demand for a product is 100,000 units. The purchase price is $10 per unit and the company's cost of finance is 20% per annum. Other holding costs of inventory total $0.50 per unit per month. Ordering costs are $125 each time an order is made.

Calculate the EOQ.

D = 100,000 per annum

Co = $125

Ch = $0.50 × 12 + $10 × 20% = $8 per unit per annum.

EOQ = √(2 × $125 × 100,000/$8) = 1,768 units per order.

Question 3

EOQ and discounts

A company has annual demand for its product of 50,000 units. Each unit costs $1.50. Ordering costs are $55 per order and the annual holding cost per unit is $1.

Calculate the EOQ.

Determine if the optimum ordering quantity would change if the supplier offered a discount of 1% as long as at least 4,000 units were ordered each time.

EOQ = √(2 × $55 × 50,000/$1) = 2,345 units per order.

Total costs at 2,345 units (purchasing + ordering + holding costs):

50,000 × $1.50 + 50,000/2,345 × $55 + 2,345/2 × $1

$75,000 + $1,172.71 + $1,172.50 = $77,345

Total costs at 4,000 units:

50,000 × $1.50 × 99% + 50,000/4,000 × $55 + 4,000/2 × $1

$74,250 + $687.50 + $2,000 = $76,938

With the discount, the optimum ordering quantity rises to 4,000 to save $407 per year.

Question 4

EOQ and discounts

A company has annual demand for its product of 200,000 units. Each unit costs $5. Ordering costs are $300 per order and the annual holding cost per unit is $0.85.

A 0.25% discount is available on all orders of at least 20,000 units and a 0.5% discount for orders of at least 30,000 units.

Calculate the optimum order level to reduce total inventory costs.

EOQ = √(2 × $300 × 200,000/$0.85) = 11,882 units per order.

Total costs at 11,882 units (purchasing + ordering + holding costs):

200,000 × $5 + 200,000/11,882 × $300 + 11,882/2 × $0.85

$1,000,000 + $5,049.65 + $5,049.85 = $1,010,100

Total costs at 20,000 units:

200,000 × $5 × 99.75% + 200,000/20,000 × $300 + 20,000/2 × $0.85

$997,500 + $3,000.00 + $8,500 = $1,009,000

Total costs at 30,000 units:

200,000 × $5 × 99.5% + 200,000/30,000 × $300 + 30,000/2 × $0.85

$995,000 + $2,000.00 + $12,750 = $1,009,750

The optimum order level is 20,000 units

Question 5

Re-order level

Using the data from the previous question, assume that the company adopts an order level of 20,000 units and that the lead time from the supplier is four weeks.

What is the reorder level?

How frequently (in weeks) will an order be made?

Demand in one week = 200,000/52 = 3,846 units.

Demand in the lead time = 3,846 × 4 = 15,384 units = re-order level.

Orders per year = 200,000/20,000 = 10

52/10 = 5.2

Orders will be made every 5.2 weeks.

Question 6

Re-order level

A company has demand per year for a product of 66,000 units and the supplier has a lead time of 2 months.

The company wishes to keep a buffer inventory of 2,000 units.

Calculate the re-order level.

When there is a buffer inventory:

Re-order level = demand in lead time + buffer.

66,000/12 × 2 + 2,000 = 13,000 units.

Chapter 9

Question 1

Receivables financing cost

ABC Co has sales of $50m for the previous year. Receivables days are 57 and receivables are financed using an overdraft costing 6% per annum.

Calculate the receivables balance and the annual financing cost for receivables.

Receivables balance = 57 × $50m/365 = $7,808,219

Financing cost = $7,808,219 × 6% = $468,493

Question 2

Early settlement discount

A company is offering a 2% discount to receivables if they agree to pay within 30 days. The current receivables days figure is 65. Receivables are financed using an overdraft costing 20%.

Calculate the effective annual cost of offering the discount and state whether it should be offered.

Effective annual cost = $[1 + 2/98]^{(365/35)} - 1 = 0.23452$ or 23.5%

If the company offers the discount, it will save interest at a rate of 20% on its overdraft but the discount will cost it 23.5% so the discount should not be offered.

Question 3

Early settlement discount

ABC Co has sales of $50m for the previous year. Receivables at the yearend were $7,808,219 and receivables are financed using an overdraft costing 6% per annum. Receivables days are 57. The current receivables financing cost is $468,493.

ABC Co is now considering offering a discount of 1% for payment within 7 days. Should it be introduced if 20% of customers take the offer?

Sales on which discount is applied = $50m × 20% = $10,000,000.

Old receivables balance on these sales: $10m × 57/365 = $1,561,644

Financing cost on these receivables: $1,561,644 × 6% = $93,699

New receivables balance for these sales: $10m × 7/365 = $191,781

Financing cost on these receivables: $191,781 × 6% = $11,507

Financing cost saving for these receivables = $93,699 – $11,507 = $82,192

Cost of discount = $10m × 1% = $100,000

The cost of the discount is greater than the benefit from the saving in the finance cost and so the discount should not be offered.

Alternative calculation for finance cost saving:

New receivables total balance = $191,781 + $50m × 80% × 57/365 = $6,438,356

New total financing cost = $6,438,356 × 6% = $386,301

Finance cost saving = $468,493 – $386,301 = $82,192

Question 4

Factoring

ABC Co has sales of $50m for the previous year. Receivables at the yearend were $7,808,219 and receivables are financed using an overdraft costing 6% per annum. Receivables days are 57. The current receivables financing cost is $468,493.

ABC Co is now considering using a debt factor. It has been in negotiations with two factors who are offering different terms.

The first factor will operate on a service-only basis. ABC would be able to make administrative savings of $50,000 from this service. The factor also undertakes to pay all invoices within 30 days instead of the current 57. For its services, the factor will charge a fee of 0.5% of ABC Co's revenue.

The second factor will advance 85% of the book value of ABC Co's invoices immediately at a cost of 7% in addition to administering the receivables ledger. The remaining 15% of sales will continue to be paid on average over 57 days. The factor promises administrative savings of $100,000 and will charge a fee of 0.25% of all sales.

Determine whether either of the factor offers is acceptable to ABC Co.

First factor:

Savings = admin saving plus reduced receivables financing cost.

New receivables balance at 30 days = $50m × 30/365 = $4,109,589

Financing cost for these receivables at 6% = $246,575.

Saving compared to old financing cost = $468,493 – $246,575 = $221,918

Plus admin saving of $50,000 = total saving of $271,918.

Factor fee = $50m × 0.5% = $250,000.

This is acceptable to ABC Co, leading to a net saving of $21,918.

Second factor:

On 85% of sales, the factor will make immediate payment, removing the 6% overdraft cost for the receivables in relation to those sales. Instead, however, the factor will charge a 7% cost. So that will represent an increase of 1% in terms of the financing cost for these receivables.

$7,808,219 × 85% = $6,636,986.

Extra cost at 1% = $66,370.

Factor fee = $50m × 0.25% = $125,000

Total cost = $191,370

Admin saving: $100,000

This is not acceptable to ABC Co as they will be $91,370 worse off.

Question 5

Early payment discount

A supplier has offered a discount to Paxton Co of 1.5% for early payment within 5 days of invoices for which 35 days is the usual payment time.

If Paxton Co funds working capital at a rate of 15% per annum, should the discount be accepted?

Effective annual benefit = $[1 + 1.5/98.5]^{(365/30)} – 1 = 0.2019$ or 20.2%

If the company accepts the discount, it will save money from lower payments at a rate of 20% per annum but it will need to increase its working capital investment at a cost of 15%. As the saving is larger than the extra funding cost from investing more in working capital, the discount should be accepted.

Question 6

Early payment discount

A supplier has offered a one off discount to Hudson Co on a large invoice of $1,500,000. If Hudson Co pays within 10 days instead of the usual 45, the supplier will allow Hudson to take a 1% discount.

If Hudson Co funds working capital at a rate of 12%, should the discount be accepted?

If Hudson takes the discount, cash will be paid out earlier meaning that extra working capital will be needed for 35 days on the $1,500,000 value at a cost of 12% per annum:

$1,500,000 × 35/365 × 12% = $17,260 extra finance needed.

The benefit of the discount is that less cash is paid.

Saving = $1,500,000 × 1% = $15,000.

As the cost of funding the $1.5m for an extra 35 days is greater than the saving made from paying a lower amount, the discount should not be accepted.

Chapter 10

Question 1

Cash forecasting

Sales (before discounts) for a company are predicted to be as follows:

Month	1	2	3	4	5	6
($000)	50	55	58	63	70	74

20% of the sales will be for cash, with customers taking a 2% discount. 40% of sales will pay in the following month and 35% in two months. The remaining 5% will be written off as bad debts.

Calculate the cash receipts for months 3 to 6.

Month	3	4	5	6
Cash (20% × 98%)	11.4	12.3	13.7	14.5
1 month (40%)	22	23.2	25.2	28
2 months (35%)	17.5	19.3	20.3	22.1
Total ($000)	50.9	54.8	59.2	64.6

Question 2

Cash forecasting

Material usage quantities for a company are predicted to be as follows:

Month	1	2	3	4	5
(000)	10	12	14	16	18

Production costs are $5 per unit and suppliers are paid in the month after purchase. The company intends to increase stocks of materials by 2,000 units each month by the end of months 1 and 2 and by 1,000 units each month by the end of months 3, 4 and 5.

Calculate the cash payments for material purchases for months 3 to 5.

Cash payments for the month relate to previous month's purchases. Purchases will be greater than usages each month due to the intent to increase stock levels.

Month	3	4	5
Month of purchase	2	3	4
Purchase quantities	12 + 2	14 + 1	16 + 1
At $5 each ($000)	70	75	85

Question 3

Baumol model

A profitable company has a cash balance that is growing over time. Each month it generates $25,000 excess cash. It intends to transfer this cash into a short-term deposit account, which would earn 3% per annum. Every time it transfers money into the account, it incurs a transaction fee of $25.

Using the Baumol cash model, calculate the optimum amount of cash to be transferred each time.

Co = $25

D = $25,000 × 12 = $300,000

Ch = $0.03

Q = √(2 × $25 × $300,000/$0.03) = $22,361

NB: in a similar way to the EOQ model for inventory, the optimum transaction value balances the transaction costs against the opportunity costs of holding cash:

Transaction costs = D/Q × Co = $300,000/$22,361 × $25 = $335

Opportunity costs of holding cash = Q/2 × Ch = $22,361/2 × $0.03 = $335

Question 4

Baumol model

A company is undertaking a large investment, which will require cash next year of $500,000 spread evenly throughout the year. At the moment, it holds most of its money in a short-term deposit account. In order to pay for the investment, it intends to move this money from the deposit account into the current account.

If the transaction fee every time money is transferred between the accounts is $29.50 and the deposit account earns interest of 2% per year, calculate how frequently (in weeks) the company should transfer cash from the deposit account and how much cash should be transferred each time.

Co = $29.50

D = $500,000

Ch = $0.02

Q = √(2 × $29.50 × $500,000/$0.02) = $38,406 should be transferred each time.

To transfer a total of $500,000 during the year this will require ($500,000/ $38,406) 13 transactions, which equates to (52/13) every 4 weeks.

Question 5

Miller Orr model

The cash balance at ABC plc fluctuates over time with some months seeing a large positive cash balance and others showing an overdraft. The company wishes to control its cash more efficiently and take advantage of available short-term investments when it has surplus cash. It wishes to maintain a minimum cash balance of $10,000. The short-term investments earn interest at 0.04% per day.

If the transaction cost of switching cash between the current account and the company's short-term investments is $15 and the variance of the company's cash flows is $6 million per day, use the Miller Orr model to calculate the spread, the return point and the upper limit.

Spread = $3 \times [0.75 \times \$15 \times \$6{,}000{,}000/0.0004]^{1/3} = \$16{,}578$

Return point = $\$10{,}000 + (1/3 \times \$16{,}578) = \$15{,}526$

Upper limit = $\$10{,}000 + \$16{,}578 = \$26{,}578$

NB: remember that 0.04% expressed as a decimal is 0.0004

Question 6

Miller Orr model

A company uses the Miller Orr cash management model, with the following figures:

Minimum cash balance: $25,000

Transaction cost: $20 per transaction

Standard deviation of cash flows: $3,000 per day (i.e. variance of cash flows = (standard deviation)^2 = $3,000^2 = $9,000,000 per day

Interest rate: 10.95% per annum (i.e. 0.03% per day)

Use the Miller Orr model to calculate the spread, the return point and the upper limit.

Spread = 3 × [0.75 × $20 × $9,000,000/0.0003]$^{1/3}$ = $22,989

Return point = $25,000 + (1/3 × $22,989) = $32,663

Upper limit = $25,000 + $22,989 = $47,989

Chapter 13

Question 1

Transaction risk

On 1 Sep a US company enters into a contract with a customer for which €100,000 is due to be received in 6 months. The exchange rate on the date the contract is entered into is €0.93 = $1.

Calculate the change in $ received compared to 1 Sep if the exchange rate moves to:

(1) €0.97 = $1

(2) €0.89 = $1

$ received at rate on 1 Sep = €100,000/0.93 = $107,527

(1) If rate moves to €0.97 = $1, $ received = €100,000/0.97 = $103,093, a loss of $4,434 compared to 1 Sep.

(2) If rate moves to €0.89 = $1, $ received = €100,000/0.89 = $112,360, a gain of $4,833 compared to 1 Sep.

Question 2

Economic risk

A US exporter sells one product in the UK on a cost plus basis and invoices in £ to remain competitive in the UK market. The selling price in £ is based on costs of $125 plus a mark-up of 5% to give a sales price of $131.25.

The current exchange rate is £0.81 = $1

Does the exporter still make a profit on the goods if the exchange rate moves to £0.87 = $1?

Current invoice price: $131.25 × £0.81 = £106.31.

If exchange rate moves, £106.31 will be received and then converted into US$ at the new rate.

At the new rate, this would give £106.31/0.87 = $122.20.

With costs of $125, the exporter is no longer able to make a profit at the same sales price.

Question 3

Bid and offer prices

The € rate per £ is quoted as €1.153 – €1.158 = £1.

Company X wants to sell €1,000,000 to buy sterling.

Company Z wants to buy €1,000,000 by selling sterling

What rate will the bank offer each company?

€ per £ – look to what the bank does with €

Company X. Company sells € so bank buys € – bank buys high so use 1.158

€1,000,000/1.158 = £863,558

Company Z. Company buys € so bank buys € – bank sells low so use 1.153

€1,000,000/1.153 = £867,303

NB: the bank always uses the rate that is favourable to itself.

Question 4

PPPT

An item costs $5,000 in the US. The spot exchange rate is $1.23 = £1. Inflation over the next year is expected to be 4% in the US and 2% in the UK.

Assuming that the law of one price applies:

Calculate the £ value of the item today.

Calculate the exchange rate in one year's time.

£ value of item today = $5,000/1.23 = £4,065.

Apply 1 year of US inflation to US price = $5,000 × 1.04 = $5,200.

Apply 1 year of UK inflation to UK price = £4,065 × 1.02 = £4,146.

Under the law of one price, these two figures must be equivalent to each other.

For $5,200 to be equal to £4,146 in a year's time, the exchange rate at that point must be 5,200/4,146 = $1.254 = £1.

Question 5

PPPT

The current exchange rate between Euros and US$ is €0.93 = $1.

If inflation in the Eurozone is anticipated to be 2.5% over the next year and in the US will be 3%, calculate the expected future spot rate in a year's time.

$S_1 = 0.93 \times 1.025/1.03 = €0.925 = \$1$

Question 6

IRPT

The current exchange rate between US$ and £ is $1.23 = £1. A UK investor invests £100,000 in a US deposit account for one year earning interest at a rate of 5.6% instead of in a UK deposit account earning 3.6% as he feels he will get a better return.

Assuming interest rate parity holds, show that the investor would end up no better off from investing in the US than in the UK.

Value after a year if invest in UK: £100,000 + 3.6% = £103,600

Value after a year if invest in US:

Convert £ to $ to invest: £100,000 × 1.23 = $123,000

Interest earned at 5.6% = $123,000 + 5.6% = $129,888

IRPT prediction of rates: 1.23 × 1.056/1.036 = $1.254 = £1

$ investment converted back into £ = $129,888/1.254 = £103,579

Question 7

IRPT

The current exchange rate between Euros and US$ is €0.93 = $1.

If interest in the Eurozone is anticipated to be 5% over the next year and in the US will be 6%, calculate the forward rate for delivery in a year's time.

F_0 = 0.93 × 1.05/1.06 = €0.921 = $1

Question 8

IRPT non-annual periods

The current exchange rate between US$ and £ is $1.23 = £1.

If interest in the UK is anticipated to be 4% over the next year and in the US will be 7%, calculate the forward rate for delivery in:

(a) 2 years' time

(b) 6 months' time.

(a) $F_0 = 1.23 \times 1.07^2/1.04^2 = \$1.302 = £1$

(b) 6 month simple interest: UK = 2%, US = 3.5%

$F_0 = 1.23 \times 1.035/1.02 = \$1.248 = £1$

Question 9

Forward exchange contract

On 1 Sep a US company enters into a contract with a customer for which €100,000 is due to be received in 6 months. The exchange rate on the date the contract is entered into is €0.93 = $1.

The company takes on a forward exchange contract with a rate of €0.94 = $1

Calculate the $ received if the exchange rate moves to:

(1) €0.97 = $1

(2) €0.89 = $1

It doesn't matter which way the exchange rate moves as using the forward exchange contract locks the rate at €0.94 = $1

$ received = €100,000/0.94 = $106,383

Question 10

Forward exchange contract

A UK importer expects to pay $150,000 in 3 months and enters into a forward exchange contract with a spread of $1.22 – $1.24 = £1.

Calculate in £ how much will be paid to settle the contract.

$ to the £ – look to what the bank does with $

UK company will need to buy $ from the bank, meaning the bank is selling them. The bank sells low so the appropriate rate is $1.22 = £1

$150,000/1.22 = £122,951

Question 11

Money market hedge – payment

Hicks plc, a UK company, needs to make a payment in € of 900,000 in 6 months' time and chooses to enter into a money market hedge to eliminate the transaction risk on the payment.

Appropriate information is as follows:

Current spot rate: €1.153 – €1.158 = £1

Money market rates per annum:

Eurozone Borrowing 3%, Lending 2%

UK Borrowing 5%, Lending 3.5%

Calculate the £ that would be needed for the payment to be made using the money market hedge.

Need a € deposit to mature with a value of €900,000 just in time to make the payment – deposit in € and borrow in £

Present value of € to deposit:

€ 6 month lending rate = 2% × 6/12 = 1%

PV = €900,000/1.01 = €891,089

Buy this amount of € immediately with £:

Buying € with £, bank sells € at low rate = €1.153 = £1

£ spent = 891,089/1.153 = £772,844

Value of £ borrowing at payment date:

£ 6 month borrowing rate = 5% × 6/12 = 2.5%

Final value of £ to be paid off in 6 months = £772,844 × 1.025 = £792,165

Question 12

Money market hedge – receipt

Hicks plc, a UK company, is now due to receive €1,400,000 in 3 months' time and chooses to enter into a money market hedge to eliminate the transaction risk on the receipt.

Appropriate information is as follows:

Current spot rate: €1.153 – €1.158 = £1

Money market rates per annum:

Eurozone Borrowing 3%, Lending 2%

UK Borrowing 5%, Lending 3.5%

Calculate the £ that would be received using the money market hedge.

€ receipt will be used to pay off a € borrowing – borrow in € and deposit in £

Present value of € to borrow:

€ 3 month borrowing rate = 3% × 3/12 = 0.75%

PV = €1,400,000/1.0075 = €1,389,578

Use the borrowed € to buy £ immediately:

Selling € to buy £, bank buys € at high rate = €1.158 = £1

£ purchased and deposited = 1,389,578/1.158 = £1,199,981

Value of £ deposit at payment date:

£ 3 month lending rate = 3.5% × 3/12 = 0.875%

Final value of £ = £1,199,981 × 1.00875 = £1,210,481

Question 13 (optional)

Futures contracts

It is currently February and a US exporter expects to receive £500,000 in June.

Current spot rate $1.65 = £1 (would lead to a $ receipt of £500,000 × 1.65 = $825,000)

Quote for June sterling futures $1.65

Standard size of futures contract £62,500

Spot rate in June $1.70 = £1, futures price in June $1.70.

How the futures contracts work:

Take on enough futures contracts to cover the transaction: £500,000/£62,500 = 8 contracts.

The **£** received in June will be **sold** for $. **Buying £ futures** contracts at the same time will **offset** this transaction and negate the effect of any movement in exchange rates between now and then.

In order to buy £ futures in June, they should be sold now at the current price of $1.65.

Now: sell 8 June futures contracts at $1.65.

In June: receive the £500,000 from the customer and exchange it for $ at the spot rate:

£500,000 × $1.70 = $850,000

Buy back the June futures contracts at the June price of $1.70.

Overall position:

The $ received have risen in value between February and June from $825,000 to $850,000 – a rise of $25,000

The 8 futures contracts were sold at $1.65 and bought back at $1.70, a loss of $0.05 cents per £ on each contract

Total futures loss = $0.05 × £62,500 × 8 = $25,000

The gain on the underlying transaction and the loss on the futures contract offset each other – the exchange rate has effectively been fixed at $1.65 = £1.

Question 14 (optional)

Options

A UK importer is due to pay €100m in 6 months' time and the financial manager is concerned about exchange rate fluctuations between now and the payment date affecting the value of £ that will be needed to complete the transaction.

The company's bank has offered a 6 month call option on €100m at an exercise price of €1.155 with a premium of £20,000.

Show the total payment if the exchange rate moves to either €1.150 = £1 or to €1.160 = £1.

£ paid at €1.155 = £1 = €100m/1.155 = £86,580,087 if option exercised

£ paid at €1.150 = £1 = €100m/1.150 = £86,956,522

This is more than if the option is exercised, so the company would choose to exercise the option and would pay a total (including the premium of £20,000 which is paid regardless of whether the option is exercised or not) of £86,600,087

£ paid at €1.160 = £1 = €100m/1.160 = £86,206,897

This is a lower amount than from exercising the option so the option would be allowed to lapse and the total paid (again, including the premium) would be £86,226,897

Chapter 14

Question 1

Forward rate agreements

Ripley Co's cash forecasts show an expected surplus of cash in four months' time of $6 million, which is expected to last for 3 months. Ripley Co would like to use a short term deposit to earn interest on this surplus but is worried that interest rates will drop before the deposit is made.

The FRAs available are:

A 1–3 FRA at 4% – 3.8% per annum

A 4–7 FRA at 3.9% – 3.7% per annum

A 4–9 FRA at 3.8% – 3.6% per annum

Assuming Ripley uses the appropriate FRA, calculate the interest receivable on the deposit if the market interest rate per annum moves to:

(i) 5%

(ii) 3.5%

Deposit necessity starts in 4 months and ends in 7: 4–7 FRA needed. Deposit rate is the lower of the spread so the rate will be effectively fixed at 3.7%

(i) Interest received on underlying deposit: $6m × 5% × 3/12 = $75,000

As the interest rate is higher than the FRA rate, Ripley Co must pay the difference over to the FRA bank: $6m × (5% – 3.7%) × 3/12 = $19,500

Net interest received = $75,000 – $19,500 = $55,500

(ii) Interest received on underlying deposit: $6m × 3.5% × 3/12 = $52,500

As the interest rate is lower than the FRA rate, the FRA bank will pay the difference to Ripley Co: $6m × (3.7% – 3.5%) × 3/12 = $3,000

Total interest received = $52,500 + $3,000 = $55,500

Either way the net position is a receipt at 3.7% ($6m × 3.7% × 3/12 = $55,500)

Question 2

Forward rate agreements

Newt Co will need to borrow €55 million in 3 months' time for 6 months.

A 3–9 FRA is available at 6.6% – 6.3% per annum

Calculate the interest payable (and show the details of the individual elements) if the interest rate moves to (i) 7%, (ii) 6% per annum by the date of the borrowing.

Borrowing rate is the higher of the spread so the rate will be effectively fixed at 6.6%

(i) Interest paid on underlying borrowing: €55m × 7% × 6/12 = €1,925,000

As the interest rate is higher than the FRA rate, the FRA bank must pay the difference over to Newt Co: €55m × (7% – 6.6%) × 6/12 = €110,000

Net interest paid = €1,925,000 – €110,000 = €1,815,000

(ii) Interest paid on underlying borrowing: €55m × 6% × 6/12 = €1,650,000

As the interest rate is lower than the FRA rate, Newt Co must pay over the difference to the FRA bank: €55m × (6.6% – 6%) × 6/12 = €165,000

Total interest paid = €1,650,000 + €165,000 = €1,815,000

Either way the net position is a payment at 6.6% (€55m × 6.6% × 6/12 = €1,815,000)

Chapter 15

Question 1

TERP

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50.

Calculate the TERP.

MV of shares currently in issue = 5m × $10.50 = $52.5m

Number of new shares issued = 5m/4 × 1 = 1.25m new shares.

Proceeds from share issue = 1.25m × $9.50 = $11.875m

TERP = ($52.5m + $11.875m)/(5m + 1.25m) = $10.30 per share

Question 2

TERP

Jones Co, which has an issued share capital of 3 million shares each priced at $6.70, makes a 2 for 3 rights issue at an issue price of $6.10.

Calculate the TERP.

MV of shares currently in issue = 3m × $6.70 = $20.1m

Number of new shares issued = 3m/3 × 2 = 2m new shares

Proceeds from share issue = 2m × $6.10 = $12.2m

TERP = ($20.1m + $12.2m)/(3m + 2m) = $6.46 per share

Question 3

Value of a right

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50 and the TERP is $10.30.

Calculate the value of a right and the value of a right per existing share.

Value of a right = $10.30 – $9.50 = $0.80

Value of a right per existing share = $0.80/(4/1) = $0.20

Question 4

Value of a right

Jones Co, which has an issued share capital of 3 million shares each priced at $6.70, makes a 2 for 3 rights issue at an issue price of $6.10. The TERP is $6.46 per share.

Calculate the value of a right and the value of a right per existing share.

Value of a right = $6.46 – $6.10 = $0.36

Value of a right per existing share = $0.36/(3/2) = $0.24

Question 5

Shareholder's options

Hicks Co, which has an issued share capital of 5 million shares each priced at $10.50, makes a rights issue of one new share for every 4 currently in issue. The issue price is $9.50, the TERP is $10.30 and the value of a right is $0.80.

Calculate the effect on the wealth of a shareholder who initially held 15,000 shares in Hicks Co if they:

(i) Take up their rights

(ii) Sell the rights

(iii) Do nothing.

Shareholder wealth pre rights issue: 15,000 × $10.50 = $157,500

(i) Take up rights

Pays for (15,000/4 × 1) 3,750 new shares at $9.50 each = $(35,625)

Now has 18,750 shares each worth $10.30 each = $193,125

Net wealth = $193,125 – $35,625 = $157,500

(ii) Sell the rights

Sells rights to 3,750 shares at $0.80 each = $3,000

Now has 15,000 shares worth $10.30 each = $154,500

Net wealth = $154,500 + $3,000 = $157,500

(iii) Do nothing

Has 15,000 shares worth $10.30 each = $154,500

Chapter 17

Question 1

DVM no growth

KLF Co has paid a dividend of $0.25 per share for many years and expects to continue paying out at this level for the foreseeable future. The company's current share price is $2.45.

Calculate the cost of equity using the dividend valuation model.

$Ke = D/P_0$

Ke = $0.25/$2.45 = 0.102 or 10.2%

Question 2

Cum div vs ex div

The current share price of a company is $3.65 and a dividend of 15 cents is just about to be paid.

Calculate the ex div share price, P_0.

Ex div = cum div – dividend

Ex div = $3.65 – $0.15 = $3.50 per share

Question 3

DVM with growth

Bishop Co has just paid out a dividend of $0.45 per share and expects dividends to grow at a rate of 3% per annum for the foreseeable future. Bishop Co's current share price is $3.50 per share.

Calculate the cost of equity using the dividend valuation model.

$Ke = [D_0 (1 + g)/P_0] + g$

Ke = [$0.45 × 1.03/$3.50] + 0.03 = 0.162 or 16.2%

Question 4

DVM with growth

Gorman Co expects to pay out a dividend next year of 50 cents. Its current share price is $5.20 and it expects annual dividends to grow after next year's payment at a constant rate of 2%.

Calculate the cost of equity using the dividend valuation model.

$Ke = [D_1/P_0] + g$

Ke = [$0.50/$5.20] + 0.02 = 0.116 or 11.6%

Question 5

DVM with growth

Boop Co is about to pay a dividend of 18 cents per share and its current share price is $2.40. Shareholders expect dividends to grow at a constant rate of 5% per annum.

Calculate the cost of equity of Boop Co.

Ex div share price for use in DVM = $2.40 – $0.18 = $2.22

Ke = $[D_0 (1 + g)/P_0] + g$

Ke = [$0.18 × 1.05/$2.22] + 0.05 = 0.135 or 13.5%

Question 6

Estimating growth using past dividends

A company's dividend just paid was $0.63 per share. 6 years ago, the dividend was $0.50 per share.

Estimate the annual growth rate in dividends.

$g = (D_0/D_n)^{1/n} – 1$

$g = (\$0.63/\$0.50)^{1/6} – 1$

g = 0.039 or 3.9%

Question 7

Estimating growth using past dividends

A company has paid the following dividends per share over the past few years:

20X1	25.0 cents
20X2	25.8 cents
20X3	26.5 cents
20X4	27.4 cents
20X5	28.1 cents

Estimate the annual growth rate in dividends.

$g = (D_0/D_n)^{1/n} - 1$

$g = (28.1/25.0)^{1/4} - 1$

$g = 0.030$ or 3.0%

Question 8

Earnings retention model

An all equity financed company has made profits after taxation of $15,000 for the year. It then pays out a dividend of $8,250. Opening capital was $50,000.

Assuming the company's return on capital and its dividend payout ratio remains the same, calculate the growth in dividends for next year.

$g = b \times r_e$

b = earnings retention rate = ($15,000 – $8,250)/$15,000 = 0.45 (or 45%)

r_e = accounting rate of return = $15,000/$50,000 = 0.3 (or 30%)

$g = 0.45 \times 0.3 = 0.135$ or 13.5%

Question 9

Earnings retention model

A company is just about to pay an ordinary dividend of 9 cents per share and the current share price is $2.45.

The accounting rate of return on equity is 10% and the dividend payout ratio is 25% and both of these figures are expected to remain at this level for the foreseeable future.

Calculate the cost of equity for the company.

$g = b \times r_e$

$g = 0.75 \times 0.1 = 0.075$ or 7.5%

Ex div share price = $2.45 – $0.09 = $2.36

$Ke = [D_0 (1 + g)/P_0] + g$

$Ke = [\$0.09 \times 1.075/\$2.36] + 0.075 = 0.116$ or 11.6%

Question 10

Cost of preference shares

Bishop Co has 100,000 18% preference shares in issue with a nominal value of $0.50 each. The current ex div market value is $1.75.

Calculate the cost of the preference shares.

$Kp = D/P_0$

$Kp = (\$0.50 \times 18\%)/\$1.75 = 0.051$ or 5.1%

Question 11

Cost of irredeemable debt

Bishop Co has in issue 6% irredeemable debt quoted at $105 (ex-interest). The corporation tax rate is 30%.

Calculate the return required by the debt providers and the cost of debt to Bishop Co.

Kd = I/MV

Kd = ($100 × 6%)/$105 = 0.057 or 5.7%

$Kd_{(1-T)}$ = I (1 – T)/MV

$Kd_{(1-T)}$ = ($6 × 0.7)/$105 = 0.04 or 4%

Question 12

Cost of irredeemable debt

A company has irredeemable loan notes in issue trading at $95 cum interest. The coupon rate is 5% and the rate of corporation tax is 30%.

Calculate the pre-tax and post-tax cost of debt.

Ex interest MV = $95 – ($100 × 5%) = $90

Kd = I/MV

Kd = $5/$90 = 0.056 or 5.6%

$Kd_{(1-T)}$ = I (1 – T)/MV

$Kd_{(1-T)}$ = ($5 × 0.7)/$90 = 0.039 or 3.9%

Question 13

Cost of redeemable debt

Bishop Co has in issue 6% redeemable debt with 6 years to redemption. Redemption will be at nominal value. The current market value of the debt is $92.96. The rate of corporation tax is 30%.

Calculate the return required by debt holders (pre-tax cost of debt).

Then calculate the cost of debt to the company (post-tax cost of debt).

Return required by debt holders (use pre-tax interest value)

Time	cash flow	d.f/a.f 5%	PV	d.f/a.f 10%	PV
t0	$(92.96)	1	$(92.96)	1	$(92.96)
t1-6	$6	5.076	$30.46	4.355	$26.13
t6	$100	0.746	$74.60	0.564	$56.40
		NPV	$12.10	NPV	$(10.43)

IRR = 5 + [$12.10/($12.10 – $(10.43))] × (10 – 5)

IRR = 5 + 0.537 × 5 = 7.7%

Cost of debt to the company (use post-tax interest value)

Time	cash flow	d.f/a.f 5%	PV	d.f/a.f 10%	PV
t0	$(92.96)	1	$(92.96)	1	$(92.96)
t1-6	$4.20	5.076	$21.32	4.355	$18.29
t6	$100	0.746	$74.60	0.564	$56.40
		NPV	$2.96	NPV	$(18.27)

IRR = 5 + [$2.96/($2.96 – $(18.27))] × (10 – 5)

IRR = 5 + 0.139 × 5 = 5.7%

Question 14

Cost of convertible debt

A company has in issue 4% convertible loan notes, which are due to be redeemed in 4 years at a premium of 10%. Alternatively, the investor can choose to convert the loan notes into 5 ordinary shares in 4 years' time. The current market value of the loan notes is $90 ex interest.

The company's ordinary shares are currently worth $20.50 each with the share price being expected to grow at a constant rate of 3% per annum. The rate of corporation tax is 30%.

Calculate the cost of debt to the company (post-tax cost of debt).

Anticipated share value in 4 years: $\$20.50 \times 1.03^4 = \$23.07$ each.

Value of 5 shares at conversion date: $\$23.07 \times 5 = \$115.35$

Value of redemption option = $\$100 \times 1.1 = \$110$

Assume investor would choose to convert.

Cost of debt to the company (use post-tax interest value)

Time	cash flow	d.f/a.f 5%	PV	d.f/a.f 10%	PV
t0	$(90.00)	1	$(90.00)	1	$(90.00)
t1-4	$2.80	3.546	$9.93	3.170	$8.88
t4	$115.35	0.823	$94.93	0.683	$78.78
		NPV	$14.86	NPV	$(2.34)

IRR = 5 + [$14.86/($14.86 – $(2.34))] × (10 – 5)

IRR = 5 + 0.864 × 5 = 9.3%

Question 15

Non-tradeable debt

Bishop Co has a fixed rate bank loan of $2 million. The interest rate charged on the loan is 7% per annum. The corporation tax rate is 30%.

Calculate the post-tax cost of the loan.

$Kd_{(1-T)}$ = interest rate × (1 – T)

$Kd_{(1-T)}$ = 7 × 0.7 = 4.9%

Question 16

WACC

A company has the following long-term sources of finance:

2m ordinary shares, nominal value $0.75, market price $1.60, cost of equity 15%

0.5m 5% preference shares, nominal value $1, market value $1.25, cost of preference shares 4%

4% irredeemable debt, nominal value $1m, market value $80, post-tax cost of debt 5%.

Calculate the current WACC by book (nominal) values and by market values.

WACC by book (nominal) values:

Book value equity = 2m × $0.75 = $1.5m

Book value preference shares = 0.5m × $1 = $0.5m

Book value irredeemable debt = $1m

Total book value = $1.5m + $0.5m + $1.0m = $3.0m

$$\text{WACC} = \frac{V_e}{V_e + V_d} k_e + \frac{V_d}{V_e + V_d} \text{`}k_d(1 - T)\text{'}$$

WACC = $1.5m/$3m × 15 + $0.5m/$3m × 4 + $1m/$3m × 5

WACC = 9.8%

WACC by market values:

Market value equity = 2m × $1.60 = $3.2m

Market value preference shares = 0.5m × $1.25 = $0.625m

Market value irredeemable debt = $1m/$100 × $80 = $0.8m

Total market value = $3.2m + $0.625m + $0.8m = $4.625m

$$\text{WACC} = \frac{V_e}{V_e + V_d} k_e + \frac{V_d}{V_e + V_d} \text{`}k_d(1 - T)\text{'}$$

WACC = $3.2m/$4.625m × 15 + $0.625m/$4.625m × 4 + $0.8m/$4.625m × 5

WACC = 11.8%

Question 17

WACC

Bishop Co has previously calculated figures as follows:

Ke = 16.2%, market value of 1 ordinary share = $3.50

Kp = 5.1%, market value of one preference share = $1.75

'Kd(1–t)' (irredeemable debt) = 4%, market value per $100 nominal value = $105

'Kd(1–t)' (redeemable debt) = 5.7%, market value per $100 nominal value = $92.96

'Kd(1–t)' (non tradable debt) = 4.9%, book value $2m.

In addition, the following information is relevant:

Ordinary shares in issue 5 million

Preference shares in issue 1 million

Nominal value in issue of irredeemable loan notes = $2 million

Nominal value of redeemable loan notes in issue = $0.5 million.

Calculate the current WACC by market values.

WACC by market values:

Market value ordinary shares = 5m × $3.50 = $17.5m

Market value preference shares = 1m × $1.75 = $1.75m

Market value irredeemable debt = $2m/$100 × $105 = $2.1m

Market value redeemable debt = $0.5m/$100 × $92.96 = $0.4648m

Non-tradeable debt use book value = $2m

Total market value = $17.5m + $1.75m + $2.1m + $0.4648m + $2m = $23.8148m

$$\text{WACC} = \frac{V_e}{V_e + V_d} k_e + \frac{V_d}{V_e + V_d} \text{‘}k_d(1 - T)\text{’}$$

WACC = $17.5m/$23.8148m × 16.2 + $1.75m/$23.8148m × 5.1 + $2.1m/$23.8148m × 4 + $0.4648m/$23.8148m × 5.7 + $2m/$23.8148m × 4.9

WACC = 11.90 + 0.37 + 0.35 + 0.11 + 0.41

WACC = 13.1%

Question 18

WACC

A company has 6 million ordinary shares of $1 each nominal value and a cum div market price of $1.65. It is just about to pay out a dividend of $0.10. Five years ago, the dividend was $0.08.

The company also has 8% redeemable loan notes of $0.75m nominal value with a current market value cum interest of $105.20. The loan notes will be redeemed in 5 years at a 5% premium.

If the corporation tax rate is 25%, calculate the company's current WACC by market values.

Ex div share price = $1.65 – $0.10 = $1.55

MV equity = 6 million × $1.55 = $9.3m

Dividend growth rate = $(\$0.10/\$0.08)^{1/5} – 1 = 0.0456$ or 4.6%

Ke = $[D_0 (1 + g)/P_0] + g$

Ke = [$0.10 × 1.046/$1.55] + 0.046 = 0.113 or 11.3%

Ex interest debt market value = $105.20 – $100 × 8% = $97.20

MV debt = $0.75m/$100 × $97.20 = $0.729m

Cost of debt to the company (use post-tax interest value)

Time	cash flow	d.f/a.f 5%	PV	d.f/a.f 10%	PV
t0	$(97.20)	1	$(97.20)	1	$(97.20)
t1-5	$6.00	4.329	$25.97	3.791	$22.75
t5	$105.00	0.784	$82.32	0.621	$65.21
		NPV	$11.09	NPV	$(9.24)

IRR = 5 + [$11.09/($11.09 – $(9.24))] × (10 – 5)

IRR = 5 + 0.545 × 5 = 7.7%

Total market value = $9.3m + $0.729m = $10.029m

$$\text{WACC} = \frac{V_e}{V_e + V_d} k_e + \frac{V_d}{V_e + V_d} \text{‘}k_d(1 - T)\text{’}$$

WACC = $9.3m/$10.029m × 11.3 + $0.729m/$10.029m × 7.7

WACC = 11.0%

Question 19

The CAPM

The current average market return being paid on risky investments is 15%, compared with 7% on government gilts. X Co has a beta figure of 0.9.

Calculate the required return of an equity investor in X Co.

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

$E(r_i) = 7 + 0.9 \times (15 – 7)$

$E(r_i) = 14.2\%$

Question 20

The CAPM

Z Co is currently paying a return of 13% to its equity shareholders. The return on treasury bills is 5% and the average market premium for risky investments is 7%.

Calculate the beta of Z Co and what does this tell us about the volatility of Z Co's returns compared to the market average.

Average market premium of 7% = $(E(r_m) – R_f)$ or in other words $E(r_m) = 7\% + 5\% = 12\%$

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

$13 = 5 + \beta \times 7$

$13 – 5 = 7\beta$

$\beta = 8/7 = 1.14$

As the β is >1 the returns are more volatile (more risky) than average

Chapter 18

Question 1

Operating gearing

Two firms have the following cost structures:

	Bat Co	Man Co
	$m	$m
Sales	10.0	10.0
Variable costs	(2.0)	(4.0)
Fixed costs	(4.0)	(2.0)
EBIT	4.0	4.0

Calculate the operating gearing for each company (as fixed costs/total costs) and determine the impact on each of a 10% increase and of a 10% decrease in sales.

Fixed/total costs	67%	33%

10% increase in sales

	Bat Co $m	Man Co $m
Sales	11.0	11.0
Variable costs	(2.2)	(4.4)
Fixed costs	(4.0)	(2.0)
EBIT	4.8	4.6
EBIT % change	+20%	+15%

10% decrease in sales

	Bat Co $m	Man Co $m
Sales	9.0	9.0
Variable costs	(1.8)	(3.6)
Fixed costs	(4.0)	(2.0)
EBIT	3.2	3.4
EBIT % change	–20%	–15%

The higher the operating gearing, the higher the volatility (risk) of profits

Question 2

Financial gearing

A company has the following long-term sources of finance:

Ordinary shares: 3 million, nominal value $1 each, market value $1.50 each.

Reserves: $0.34 million.

Preference shares: 0.6 million, nominal value $0.50 each, market value $0.85 each

8% irredeemable debt: $1.5 million nominal value, market value $110

Current liabilities: $0.5m

Calculate the capital and equity gearing using both book and market values.

Book values:

Ordinary shares = 3m × $1 = $3m

Reserves = $0.34m

Preference shares = 0.6m × $0.50 = $0.3m

Irredeemable debt = $1.5m

Total equity = $3m + $0.34m = $3.34m

Total long-term debt = $0.3m + $1.5m = $1.8m

Capital gearing = $1.8m/($1.8m + $3.34m) = 0.35 or 35%

Equity gearing = $1.8m/$3.34m = 0.54 or 54%

Market values:

Ordinary shares = 3m × $1.50 = $4.5m

Preference shares = 0.6m × $0.85 = $0.51m

Irredeemable debt = $1.5m/$100 × $110 = $1.65m

Total equity = $4.5m

Total long-term debt = $0.51m + $1.65m = $2.16m

Capital gearing = $2.16m/($2.16m + $4.5m) = 0.32 or 32%

Equity gearing = $2.16m/$4.5m = 0.48 or 48%

Question 3

Financial gearing

Two firms have the same cost structures but different financial gearing levels:

	Double Co	Dare Co
	$m	$m
Sales	10.0	10.0
Variable costs	(4.0)	(4.0)
Fixed costs	(2.0)	(2.0)
EBIT	4.0	4.0
Interest	(2.0)	0.0
PBT	2.0	4.0

Calculate the impact on each of a 10% increase and of a 10% decrease in sales.

	10% increase in sales		10% decrease in sales	
	Double Co	Dare Co	Double Co	Dare Co
	$m	$m	$m	$m
Sales	11.0	11.0	9.0	9.0
Variable costs	(4.4)	(4.4)	(3.6)	(3.6)
Fixed costs	(2.0)	(2.0)	(2.0)	(2.0)
EBIT	4.6	4.6	3.4	3.4
Interest	(2.0)	0.0	(2.0)	0.0
PBT	2.6	4.6	1.4	3.4
PBT % change	+30%	+15%	–30%	–15%

The higher the financial gearing, the higher the volatility (risk) of profits

Question 4

The CAPM

Brixit Co is an all equity company with a beta of 1.4. It is appraising a one year project which requires an outlay now of $5,000 and will return cash in one year with a value of $6,000. The project has a beta of 1.2. Rf is 6% and Rm is 14%.

Calculate the firm's current cost of equity capital, the minimum required return of the project and determine whether the project is worthwhile.

Current cost of equity capital = 6 + 1.4 × (14 – 6) = 17.2%

Minimum return from the project = 6 + 1.2 × (14 – 6) = 15.6%

PV of year 1 cash flow = cash flow × $(1 + r)^{-1}$

NPV of project at 15.6% = $(5,000) + $6,000 × 1.156^{-1}

NPV = $190

With a positive NPV at the minimum required rate of return, the project is worthwhile.

Question 5

CAPM and gearing risk

Eleven Co is a manufacturer of wooden shelving whose equity:debt ratio (by market value) is 3:2. The corporate debt, which is assumed to be risk free, has a gross redemption yield of 8%. The beta value of the company's equity is 0.9. The average return on the stock market is 15% and the rate of corporation tax is 30%.

The company is considering a project in which it will make and sell wooden sculptures.

Dustin Co is a company that is in the wooden sculpture market. It has an equity beta of 1.4 and an equity:debt ratio of 4:1.

If Eleven Co takes on the new project, it expects to maintain its existing capital structure.

Calculate a suitable risk-adjusted cost of equity for use in evaluating the sculpture project.

Use proxy beta from Dustin Co – de-gear it find an asset beta (assume the debt beta is zero):

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

$\beta_a = 4/(4 + (1 \times 0.7)) \times 1.4$

$\beta_a = 4/4.7 \times 1.4 = 1.191$

Re-gear the asset beta to Eleven Co's gearing levels:

$1.191 = 3/(3 + (2 \times 0.7)) \times \beta_e$

$1.191 = 3/4.4 \times \beta_e$

$\beta_e = 1.191/0.6818 = 1.747$

Use the risk-adjusted equity beta figure in the CAPM to find an appropriate equity cost:

$Ke = 8 + 1.747 \times (15 - 8) = 20.2\%$

Question 6

CAPM and gearing risk

Burke Co is an all equity clothing retailer who is about to diversify into food sales. Its current equity beta is 1.3. The corporation tax rate is 30%.

Gearing in the food sales industry averages 80% equity, 20% debt.

Some representative asset betas for firms in the food sales industry are:

Frost Co 1.6, Vasquez Co 1.7, Ferro Co 1.75.

Calculate appropriate betas for Burke Co to use in evaluation of the food sales business if its restructures its capital in the following ways:

(i) Burke Co remains an all equity company

(ii) Burke Co gears up to 10% debt and 90% equity.

As the proxy betas given are all asset betas, they will not need to be de-geared. As there are 3 a simple average of them is calculated to use as the proxy:

(1.6 + 1.7 + 1.75)/3 = 1.683

(i) If Burke remains an all equity company then the asset beta and the equity beta will be the same and so it can directly use the proxy of 1.683

(ii) If Burke gears up it will need to gear up the proxy asset beta too.

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

$1.683 = 90/(90 + (10 \times 0.7)) \times \beta_e$

$1.683 = 90/97 \times \beta_e$

$\beta_e = 1.683/0.9278 = 1.814$

Chapter 19

Question 1

Financial ratios

Connor Co has the following SFP and SPL information:

Statement of financial position as at 31 Dec

	20X6	20X5
	$000	$000
Non-current assets	4,900	4,600
Current assets:		
Inventory	85	70
Receivables	750	600
Cash	0	50
Total assets	5,735	5,320
Equity and liabilities:		
Ordinary share capital ($1 shares)	3,150	3,000
Share premium	50	0
Retained earnings	550	400
	3,750	3,400
Non-current liabilities:		
8% loan notes	1,300	1,250
5% preference shares	300	300
Current liabilities:		
Trade payables	255	370
Bank overdraft	130	
	5,735	5,320

Statement of profit and loss for the year ended 31 Dec

	20X6 $000	20X5 $000
Revenue	3,200	2,990
Cost of sale	(1,940)	(1,905)
Gross profit	1,260	1,085
Distribution costs	(208)	(195)
Admin expenses	(373)	(350)
Operating profit	679	540
Interest	(104)	(100)
Profit before taxation	575	440
Taxation	(80)	(69)
Profit after taxation	495	371
preference dividends	(15)	(15)
ordinary dividends	(330)	(225)
Retained profit for the year	150	131
Share price ordinary shares (start of year) ($)	1.55	1.30
Market value of loan notes ($)	106	104
Industry averages:		
PE ratio	9	9
Average growth in EPS	20%	18%
ROE	12%	11%

Calculate the following figures:

- Return on capital employed (ROCE)
- Return on equity (ROE)
- Gross profit margin
- Operating profit margin
- Interest cover
- Earnings per share (EPS)
- EPS growth from 20X5 to 20X6
- PE ratio
- Dividend per share
- Dividend cover
- Dividend yield
- Total shareholder return for 20X6
- Interest yield

ROCE	= 679/(3,750 + 1,300 + 300) 12.7%	= 540/(3,400 + 1,250 + 300) 10.9%
ROE	= (495 – 15)/3,750 12.8%	= (371 – 15)/3,400 10.5%
Gross profit margin	= 1,260/3,200 39.4%	= 1,085/2,990 36.3%
Operating profit margin	= 679/3,200 21.2%	=540/2,990 18.1%

Interest cover	= 679/104 6.5	= 540/100 5.4
EPS ($)	= (495 – 15)/3,150 0.152	= (371 – 15)/3,000 0.119
EPS growth	=($0.152 – $0.119)/$0.119 28%	
PE ratio	= $1.55/$0.152 10	= $1.30/$0.119 11
Dividend per share	= 330/3,150 0.105	= 225/3,000 0.075
Dividend cover	= (495 – 15)/330 1.5	= (371 – 15)/225 1.6
Dividend yield	= $0.105/$1.55 6.8%	= $0.075/$1.30 5.8%
Total shareholder return	=[$0.105 + ($1.55 – $1.30)]/$1.30 27%	
Interest yield	= $8.00/$106 7.5%	= $8.00/$104 7.7%

Chapter 20

Question 1

Asset based valuation

The following are extracts from the statement of financial position of MNM Co, an unquoted company, as at 31 December 20X6.

	$
Non-current assets (written down value)	2,292,000
Net current assets	395,000
$0.50 ordinary shares	1,500,000
Reserves	687,000
8% loan notes	500,000

Further information is provided as follows:

A recent valuation of the non-current assets put them at 45% above their current written down value.

The loan notes are redeemable at a 10% premium.

There is a long outstanding debt of $20,000 in receivables that is not expected to be received.

Calculate the value of a share in MNM Co.

Total value of assets: $2,292,000 × 1.45 + $395,000 – $20,000 = $3,698,400

Less: redemption value of debt: $500,000 × 1.10 = $550,000

Value of all shares = $3,148,400

Number of shares in issue: $1,500,000/$0.50 = 3,000,000

Value per share: $3,148,400/3,000,000 = $1.05 per share

Question 2

PE ratio valuation

BC Co is looking to take over ZJ Co, an unquoted company and has gathered the following information:

Profit after taxation for the most recent accounting period was $250,000. This was after deducting $15,000 for the write off of a bad debt and salaries of $120,000 for managers who will no longer be employed if BC purchases the company. Preference dividends of $25,000 and ordinary dividends of $45,000 were paid out of these profits. ZJ Co has no debt.

Quoted businesses similar to ZJ Co have an average PE ratio of 9. As ZJ Co is unquoted, BC Co decides to reduce the calculated value by 20% when determining ZJ Co's value.

Calculate the value of equity in ZJ Co for BC Co's purposes.

Maintainable profit figure: $250,000 + $15,000 + $120,000 – $25,000 = $360,000

Apply average PE ratio: $360,000 × 9 = $3,240,000

Reduce by 20%: $3,240,000 × 0.8 = $2,592,000

Question 3

Earnings yield valuation

Company J has earnings of $1.2 million. A similar listed company has an earnings yield of 11%. J's earnings have been growing at a rate of 2% per annum but it is unknown as to whether this will continue.

Estimate the value of J Co in the situation of no growth in earnings and of growth maintained at 2% per annum.

Without growth, value = earnings × 1/earnings yield

Value = $1.2m × 1/0.11 = $10.9 million

With 2% growth, value = (earnings × (1 + growth))/(earnings yield – growth)

Value = ($1.2m × 1.02)/(0.11 – 0.02) = $13.6 million

Question 4

DVM valuation

A company has the following information available:

Share capital in issue: 2 million ordinary shares at a nominal value of $0.75.

Dividend just paid: $0.10 per share.

Dividend 5 years ago: $0.07 per share.

Current equity beta: 0.9

Average market return on shares: 16%

Risk free rate: 7%

Calculate the market capitalisation of the company.

Market capitalisation = number of shares in issue × market price per share.

$P_0 = D_0(1 + g)/(ke – g)$

$Ke = Rf + \beta(Rm – Rf)$

$Ke = 7 + 0.9 \times (16 – 7) = 15.1\%$

$g = (D_0/D_n)^{1/n} – 1$

$g = (0.1/0.07)^{1/5} – 1 = 0.0739$ or 7.4%

$P_0 = (\$0.10 \times 1.074)/(0.151 – 0.074) = \$1.39$ per share

Market capitalisation = $1.39 × 2m = $2.78m

Question 5

DVM valuation

A company has the following information available:

Share capital in issue: 1 million ordinary shares at a par value of $1.

Dividend just paid: $0.20 per share.

Current earnings per share (EPS): $0.25.

Current return earned on assets: 15%

Current equity beta: 1.2

Average market return on shares: 14%

Risk free rate: 4%

Calculate the market capitalisation of the company.

Market capitalisation = number of shares in issue × market price per share.

$P_0 = D_0(1 + g)/(ke – g)$

$Ke = Rf + \beta(Rm – Rf)$

$Ke = 4 + 1.2 \times (14 – 4) = 16\%$

$g = b \times r_e$

$b = (\$0.25 – \$0.20)/\$0.25 = 0.2$

$g = 0.2 \times 0.15 = 0.03$ or 3%

$P_0 = (\$0.20 \times 1.03)/(0.16 – 0.03) = \$1.58$ per share

Market capitalisation = $1.58 × 1m = $1.58m

Question 6

DCF valuation

The following information has been taken from the statement of profit or loss and the statement of financial position for X Co:

Revenue:	$500m
Production expenses:	$200m
Administrative expenses:	$100m
Tax-allowable depreciation:	$50m
Capital investment in year:	$25m
Corporate debt:	$250m

Corporation tax is 30%, the WACC is 15.5% and inflation is 4%.

These cash flows are expected to continue for the foreseeable future.

Calculate the value of equity.

Operating profits = $500m – $200m – $100m = $200m

Tax on operating profits = $200m × 0.3 = $60m

Tax relief on tax-allowable depreciation: $50m × 0.3 = $15m

Free cash flow = $200m – $60m + $15m – $25m = $130m

Using the real method for discounting (don't inflate the cash flows and use the real discount rate):

The cash flows will be a perpetuity of $130m

The real discount rate will be (1.155/1.04) – 1 = 0.11 or 11%

PV of perpetuity = $130m × 1/0.11 = $1,182m

This values the entire cash flows of the business. To obtain the value of equity alone, we must deduct the debt value

Value of equity = $1,182m – $250m = $932m

Question 7

DCF valuation

The following information has been taken from the statement of profit or loss and the statement of financial position for X Co:

Revenue:	$900k
Production expenses:	$375k
Administrative expenses:	$290k
Tax-allowable depreciation:	$35k
Capital investment in year:	$80k
Corporate debt:	$100k

Corporation tax is 30%, the WACC is 16.5% and inflation is 4%.

These cash flows are expected to continue for the foreseeable future.

Calculate the value of equity.

Operating profits = $900k – $375k – $290k = $235k

Tax on operating profits = $235k × 0.3 = $70.5k

Tax relief on tax-allowable depreciation: $35k × 0.3 = $10.5k

Free cash flow = $235k – $70.5k + $10.5k – $80k = $95k

Using the real method for discounting (don't inflate the cash flows and use the real discount rate):

The cash flows will be a perpetuity of $95k

The real discount rate will be (1.165/1.04) – 1 = 0.12 or 12%

PV of perpetuity = $95k × 1/0.12 = $792k

This values the entire cash flows of the business. To obtain the value of equity alone, we must deduct the debt value

Value of equity = $792k – $100k = $692k

Question 8

Valuation in a takeover

Douglas Co is an all equity financed company and has 5 million shares in issue, with a share price of $2.60 each. It is considering a takeover of Peel Co, a company in the same industry. Peel Co is also all equity financed and has 2 million shares in issue, each worth $1.75.

The takeover is likely to result in synergy gains estimated to be worth a present value of $2.5 million.

The financial advisers to Douglas Co have indicated that if an offer is made at a 10% premium to Peel Co's current share price that it is likely to be accepted by Peel Co's shareholders.

Calculate the value of a share in Douglas Co post takeover if the takeover is financed entirely by cash.

Calculate how many Douglas Co shares would need to be issued to Peel Co shareholders in a share-for-share exchange.

Financed by cash:

Douglas Co current value: 5m × $2.60 = $13m

Purchased value of Peel Co added to Douglas Co's value: 2m × $1.75 = $3.5m

Synergy gained and added to Douglas Co value: $2.5m

Cash paid out, reducing the value of Douglas: $3.5m × 1.1 = $3.85m

Total post takeover value of Douglas Co: $15.15m

Value per share: $15.15m/5m = $3.03 per share

Financed by share-for-share exchange:

The total value of the combined entity post takeover (including synergies) will be $13m + $3.5m + $2.5m = $19m.

Peel Co shareholders must own $3.85m of this value, otherwise they would not have agreed to the takeover.

Value remaining for original Douglas Co shareholders = $19m – $3.85m = $15.15m.

All the new shares issued were to Peel Co shareholders, so the original shareholders' value of $15.15m relates to the 5m shares they have.

This calculates as $3.03 per share.

All shares have the same value, so the shares now owned by the old Peel Co shareholders are also worth $3.03 each.

Therefore the number of shares issued to them must have been $3.85m/$3.03 = 1,270,627 shares.

Question 9

Preference share valuation

A firm has in issue 10% preference shares with a nominal value of $0.50 each. The required return of preference shareholders is currently 13%.

Calculate the value of a preference share.

$P_0 = D/kp$

$P_0 = \$0.05/0.13 = \$0.38$ per share

Question 10

Irredeemable debt valuation

A company has issued irredeemable loan notes with a coupon rate of 6%. If the required return of investors is 5%, what is the current market value of the debt?

MV = I/kd

MV = $6/0.05 = $120 per loan note

Question 11

Redeemable debt valuation

A company has issued 8% redeemable loan notes with 7 years to redemption, which will be at par. Investors require a return of 12%.

Calculate the market value of the loan notes.

At current MV, PV of future cash flows from ownership of the debt will equal the market price:

			df/af 12%	PV
		$		
t0	(P0 value)	(?)	1	(81.71)
t1-7	Interest	8	4.564	36.51
t7	Redemption value	100	0.452	45.20
	NPV			0.00

Current market value is $81.71

Question 12

Convertible debt valuation

A company has issued 9% redeemable loan notes with 6 years to redemption, which would be at a premium of 5%. Alternatively, investors have the option of converting their debt in 6 years to 20 ordinary shares. Investors require a return of 14%. The current share price is $4.25 and the value is expected to grow at a rate of 7% per annum.

Calculate the market value of the loan notes.

Calculate also the floor value and the conversion premium.

Expected share value on conversion date:

$\$4.25 \times 1.07^6 = \$6.38$ each.

Value of 20 shares = $6.38 × 20 = $127.60

Share value is higher than redemption value of $105, so assume loan notes will be converted.

At current MV, PV of future cash flows from ownership of the debt will equal the market price:

			df/af 14%	PV
		$		
t0	(P0 value)	(?)	1	(93.19)
t1-6	Interest	9	3.889	35.00
t6	Redemption value	127.60	0.456	58.19
	NPV			0.00

Current market value is $93.19

Floor value = market value without the conversion option.

Floor value = $9 × 3.889 + $105 × 0.456 = $82.88

Conversion premium = market value of loan note – current conversion value of shares

Conversion premium = $93.19 – 20 × $4.25 = $8.19 or $0.41 per share

Chapter 21