



Advanced Financial Management

(AFM)

Super Final Revision Note

(Sample)

Table of contents:

| | |
|--|-------------------------------------|
| Introduction to AFM Exam | 3 |
| Chapter 1 Net Present Value (NPV) | 13 |
| Chapter 2 Payback Period, Discounted Payback Period, Project Duration..... | 17 |
| Chapter 3 Internal rate of return (IRR) and Modified Internal Rate of Return (MIRR) | 20 |
| Chapter 4 Adjusting Risks and Uncertainties in Investment Appraisal | 23 |
| Chapter 5 Value at Risk (VaR)..... | 26 |
| Chapter 6 Capital Rationing | 29 |
| Chapter 7 Free Cash Flow | 32 |
| Chapter 8 Real options (Black-Scholes Option Pricing Model) | 36 |
| Chapter 9 Adjusted Present Value (APV) | 45 |
| Chapter 10 International Investment Appraisal | 48 |
| Chapter 11 Risk Management | Error! Bookmark not defined. |
| Chapter 12 Economic environment..... | Error! Bookmark not defined. |
| Chapter 13 Business Finance..... | Error! Bookmark not defined. |
| Chapter 14 The Cost of Capital..... | Error! Bookmark not defined. |
| Chapter 15 Capital Structure Theories | Error! Bookmark not defined. |
| Chapter 16 Acquisitions and Mergers versus Other Growth Strategies | Error! Bookmark not defined. |
| Chapter 17 Equity Valuation | Error! Bookmark not defined. |
| Chapter 18 Valuation when There are Changes in Risks Profile | Error! Bookmark not defined. |
| Chapter 19 The Valuation of Debt and Other Financial Assets..... | Error! Bookmark not defined. |
| Chapter 20 Interest rates terms considerations for debt valuation..... | Error! Bookmark not defined. |
| Chapter 21 Managing fixed rate debts risks with Macaulay Duration and Modified Duration..... | Error! Bookmark not defined. |
| defined. | |
| Chapter 22 Payment Methods | Error! Bookmark not defined. |
| Chapter 23 Defenses to Hostile Bids | Error! Bookmark not defined. |
| Chapter 24 Regulation of takeovers | Error! Bookmark not defined. |
| Chapter 25 Behavioural Finance | Error! Bookmark not defined. |
| Chapter 26 Organisational Performance | Error! Bookmark not defined. |
| Chapter 27 Corporate Reconstruction and Re-organisation | Error! Bookmark not defined. |
| Chapter 28 Dividend Policy..... | Error! Bookmark not defined. |
| Chapter 29 Ethical and Governance Issues..... | Error! Bookmark not defined. |
| Chapter 30 Foreign Exchange Rate Risk Management..... | Error! Bookmark not defined. |
| Chapter 31 FOREX Internal Hedging Techniques..... | Error! Bookmark not defined. |
| Chapter 32 FOREX External Hedging Techniques (Part One) | Error! Bookmark not defined. |
| Chapter 33 FOREX External Hedging Techniques (Part Two) - Currency Futures..... | Error! Bookmark not defined. |
| Chapter 34 FOREX External Hedging Techniques (Part Three) - Currency Options..... | Error! Bookmark not defined. |
| Chapter 35 FOREX External Hedging Technique (Part Four) - Swap | Error! Bookmark not defined. |
| Chapter 36 Interest Rate Risk Management | Error! Bookmark not defined. |
| Chapter 37 Hedging Interest Rate Risks (Part One) – Internal Hedging Techniques | Error! Bookmark not defined. |
| Chapter 38 Hedging Interest Rate Risk (Part Two) - External Hedging Techniques (FRA) | Error! Bookmark not defined. |
| Chapter 39 Hedging Interest Rate Risk (Part Three) - External Hedging Techniques (Interest Rate Futures) | Error! |
| Bookmark not defined. | |
| Chapter 40 Hedging Interest Rate Risk (Part Four) - External Hedging Techniques (Interest Rate Options) | Error! |
| Bookmark not defined. | |

Chapter 41 Hedging Interest Rate Risk (Part Five) - External Hedging Techniques (Interest Rate Collar Hedge) . **Error!**

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Chapter 42 Hedging Interest Rate Risk (Part Six) - External Hedging Techniques (Interest Rate Swap) **Error!**

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Introduction to AFM Exam

Exam overview

- Exam duration – 3 hours and 15 minutes (195 minutes)
- Total marks – 100 marks
- Passing marks – 50 marks
- Professional marks – 20 marks within the 100 marks
 - Q1 – 50 marks (with 10 professional marks)
 - Q2 – 25 marks (with 5 professional marks)
 - Q3 – 25 marks (with 5 professional marks)
- Time allocation – 195 minutes / 80 marks = 2.4 minutes/mark
- All questions are compulsory

Professional marks

Communication:

- In Q1
- Focus on report headings, sub-headings, introduction, body of report and conclusion.
- Report language should be professional and clear.
- Calculation should be in the appendix, using spreadsheet functionality.

Analysis and evaluation:

- In Q1, Q2 and Q3
- Focus on calculation using appropriate models, reaching a sensible conclusion.

Scepticism:

- In Q1, Q2 and Q3
- Focus on explaining assumptions, problems, and other issues in your calculation.

Commercial acumen:

- In Q1, Q2 and Q3
- Focus on applying answer to the given case, and possible consequences of past and future actions.

Frist step: Read the case overview and exhibits:

Click start and time starts to count down:

Advanced Financial Management (AFM)

Exam Summary

Time allowed: 3 hours 15 minutes.

This exam is divided into two sections:

Section A

- One question worth 50 marks.
- 50 marks in total.

Section B

- Two questions, each worth 25 marks.
- 50 marks in total.

All questions are compulsory.

Select **Next** to start your exam.

Section A

This section of the exam contains **one question**.

This question is worth **50 marks** and is compulsory.

This exam section is worth **50 marks** in total.

Important:





You must:

- Indicate which requirement each of your responses relate to so that this is clear for markers.
- Show all notes/workings that you want the marker to see within your responses. Remember, any notes/workings made on the Scratch Pad or on your workings paper will not be marked.






Select **Next** to continue.

Read the case overview and exhibits:


Advanced Financial Management (AFM)

Symbol  Highlight  Strikethrough  Calculator  Scratch Pad



Exhibits

-  1. Introduction - Westparley Co
-  2. Matravers Co
-  3. Post-acquisition cost of capital
-  4. Plans for Matravers Co
-  5. Post-acquisition details

Requirements

-  Requirements (50 marks)

Response Options

-  Word Processor
-  Spreadsheet

The following **exhibits**, available on the left-hand side of the screen, provide information relevant to the question:

1. Introduction - Westparley Co.
2. Matravers Co - an acquisition target.
3. Post-acquisition cost of capital - for the combined company.
4. Plans for Matravers Co - in the event of acquisition by Westparley Co.
5. Post-acquisition details - financial information post-acquisition by Westparley Co.

This information should be used to answer the question **requirements** within your chosen **response option(s)**.

Step 2: Plan the answer:

Advanced Financial Management (AFM) Specimen - from September 2022 onwards

Symbol Highlight Strikethrough Calculator Scratch Pad Close All Flag for Review

Exhibits

- 1. Kingtim Co
- 2. Takeover defences
- 3. Financial details
- 4. Employee remuneration

Requirements

- Requirements (50 marks)

Response Options

- Word Processor
- Spreadsheet

The following exhibits, available on the left-hand side of the screen, provide information relevant to the question:

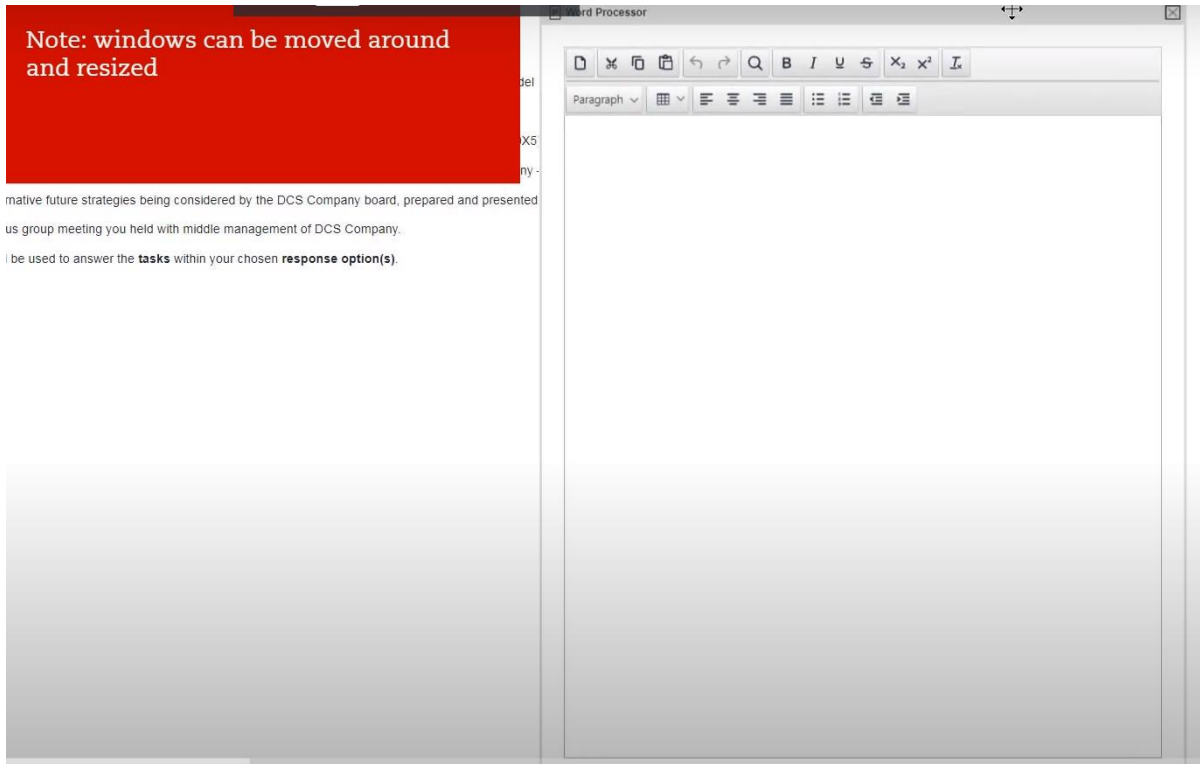
1. Kingtim Co
2. Takeover defences - to be used by Kingtim Co
3. Financial details - relating to cost of capital and bond information
4. Employee remuneration

This information should be used to answer the question requirements within your chosen response option(s).

Help/Formulae Sheet Previous Navigator Next

- (a) Discuss the feasibility and effectiveness of the defence strategies of selling off individual garden centres and enhancing directors' remuneration.** (7 marks)
- (b) Prepare a report for the board of directors of Kingtim Co which:**
- (i) estimates the company's cost of capital before the new bonds are issued;** (4 marks)
 - (ii) estimates the market value and post-tax cost of debt of the new bonds;** (7 marks)
 - (iii) estimates the revised cost of equity and revised cost of capital if the new bonds are issued;** (7 marks)
 - (iv) discusses the impact on Kingtim Co's cost of capital and the reaction of equity and bond holders to the chief executive's proposal. The discussion should include an explanation of any assumptions made in the estimates in (b) (i) – (iii) above.** (9 marks)
- (c) Discuss the approach taken to employee remuneration by Kingtim Co's Northern region and the issues associated with it.** (6 marks)
- Professional marks will be awarded for the demonstration of skill in communication, commercial acumen, analysis, scepticism and evaluation in your answer. (10 marks)

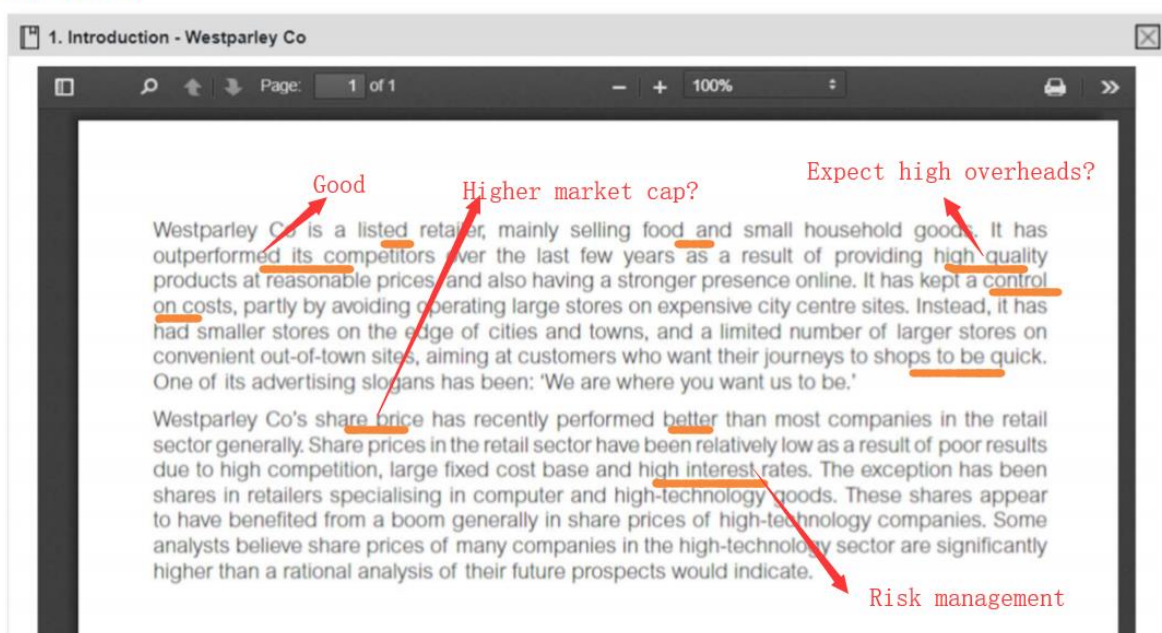
- Copy tasks in the word processor (when this is closed later, the work is automatically saved or simply be minimised by the system)



- Please note, all requirements are answered in a single word processor. Copy all the requirements first in the word processor.
- Plan a deadline for each requirement – rule: Times by 2.25. For example, if the requirement is 6 marks, then total minutes = 2.25 x 6 marks = 13 min. Deadline = 180-13 = 167 min. We would advise students to further break the requirements down and put a deadline to each sub requirement.

Read exhibits with your comments – we always encourage students to make comments when they are reading the exhibits. This helps students keep track of what is going on in the case and what is required.

Exhibit 1



- Next, making key words in each requirement bold, or simply use them as headings in your answer. Key words include verbs, format, professional marks and required knowledge.
- Then, you should use different colours to highlight exhibits to plan your answer. For example, requirement one (yellow), therefore, when reading exhibits, information relating to requirement one should be highlighted in yellow (irrespective of which exhibit).
- **We would recommend students to read exhibits at least twice:**
 - **First** – understand which exhibit relates to which requirement (highlighting in separate colours)
 - **Second** – copy texts from exhibits to each requirement

Step 3: Complete the answer:

For all calculations – use Excel spreadsheet. If any exhibit provides excel data, it is recommended to directly copy them in the Excel response option:

| Financial performance: (all figures in \$m) | | | | |
|--|------|------|------|------|
| | 20X5 | 20X4 | 20X3 | 20X2 |
| Financial performance: (all figures in \$m) | | | | |
| Financial periods: | | | | |
| Sales revenue (domestic and international) | 6.95 | 7.4 | 6.8 | 4.75 |
| Cost of sales | 4.97 | 4.85 | 4.25 | 2.62 |
| Gross profit | 1.98 | 2.55 | 2.55 | 2.13 |
| Overhead expenses | 1.12 | 1.51 | 1.41 | 1.3 |
| Profit before tax and finance costs | 0.86 | 1.04 | 1.14 | 0.83 |
| Finance costs | 0.69 | 0.38 | 0.37 | 0.14 |
| Tax expense | 0.02 | 0.06 | 0.06 | 0.54 |
| Profit for the year | 0.15 | 0.6 | 0.69 | 0.54 |
| Other data: | | | | |
| Number of employees | 127 | 135 | 143 | 150 |
| Staff turnover (%) | 10% | 7% | 5% | 4% |
| % of orders delivered late | 10% | 8% | 7% | 5% |
| Forward contract order book (number of orders) | 2500 | 3750 | 4150 | 3505 |

Make sure you make it clear to the marker of which requirement you are answering, for example, labelling part a, part b in your answer with clear workings.

There is no auto correct or spell check in the exam – but do not spend time in doing grammar check – no marks for this.

Step 1 - as you copy and paste the requirement in the word processor, notice the word 'AND', then break the questions down. Bold and underly the title would be perfect.

For example,

(a) Explain the rationale for the policy of hedging Boullain Co's foreign exchange risk and the potential benefits to shareholder value if that policy is effectively communicated to the company's key stakeholders.

(7 marks)

In your answer:

Word processor:

Explain the rationale for the policy of hedging Boullain Co's foreign exchange risk

Potential benefits to shareholder value if that policy is effectively communicated to the company's key stakeholders

Step 2 – notice how many marks are there and split total marks evenly across different sections.

In the above example, 7 marks should be equally split into explanation and potential benefits. Therefore, we may allocate 4 marks and 3 marks (points) to each sub requirement.

Generally in the AFM exam, 1 mark is awarded per relevant point made.

Step 3 – dig into your answer. We will compare our own answer with the examiner's one. Please make sure that in this exam, each point should contain:

- Theory
- Application to the case (information from the case)

Examiner's answer:

Explain the rationale for the policy of hedging Boullain Co's foreign exchange risk

Within the framework of Modigliani and Miller, Boullain Co's CEO is correct in stating that a company's hedging policy is irrelevant. In a world without transaction or agency costs, and

where markets are efficient and information symmetrical, hedging creates no value if shareholders are well diversified. Shareholder value may even be destroyed if the costs associated with hedging exceed the benefits.

Our answer:

CEO is correct in stating that a company's hedging policy is irrelevant (**our conclusion + copied case information**) per M&M as if there are no transaction and agency costs and where markets are efficient, shareholders are well diversified and therefore, hedging creates no value. (**theory application**)

Please note,

- You can underly your answers' subheadings but subheadings in some cases, may not be necessary
- Leave a line (press 'Enter') for each point you made – make the marker easier when they are marking your script.
- 1 mark per sentence – keep it nice and simple.

Writing approach

Overall approach - Avoid essay style, keep simple sentences (with a line and a half for each point), ie using simple words to make markers understand what you say.

The answer in the AFM paper should contain theory and application. Let's see the below answer.

From the above example:

(a) Explain the rationale for the policy of hedging Boullain Co's foreign exchange risk and the potential benefits to shareholder value if that policy is effectively communicated to the company's key stakeholders.

(7 marks)

Good answer:

CEO is correct in stating that a company's hedging policy is irrelevant (**our conclusion + copied case information**) per M&M as if there are no transaction and agency costs and where markets are efficient, shareholders are well diversified and therefore, hedging creates no value. (**theory application**)

Poor answer:

According to M&M, it assumes market is perfect and investors are rational, ie well diversified.

(theory). Therefore, there is no need to hedge. (not applied to the case, ie what CEO has said).

Tutorial note:

- The answer does not even mention there will be costs involved, ie per M&M, such transaction and agency costs are not there, and therefore, no impact on shareholder value even if there is hedging taking place.
- Therefore, the answer could be awarded with 0.5 mark instead of 1 mark.

Notice the following key verbs in the AFM exam -need narrative comments (usually split evenly between numbers and comments)

- Discuss
- Assess
- Explain
- Recommend/suggest
- Evaluate

Only calculations are required:

- Compare different values (such as different P/E ratios)
- Calculate
- Estimate the total value

How the paper is marked?

Marking guide:

- Usually 1 mark per point made.
- Sometimes, up to 2 marks for each point made.

Best practice:

- **Type one question** – theory + application (information from the case)
- **Type two question** – common sense question (for example, assess the strategic value of this acquiring another company):
 - What (case information) + Why (reasons or impact) + How (suggest what can be done in detail; risks involved) for each point to be made.

Let's look at an example below for the type two question:

Requirement:

Assess the strategic and financial value to Westparley Co of the acquisition, including a discussion of the estimations and assumptions made. (12 marks)

Answer:

Tutorial note:

The company is called Westparley and it operates in the retail industry and now it is considering to buy Matravers Co – potential benefit – merge the online business and out of town stores.

Answer:

Strategic value

The acquisition improves out of town presence for Westparley Co (**What**) and this could generate higher returns (**Your point**) through cross sales revenue between good and home businesses made and shared fixed costs (**Why**).

Chapter 1 Net Present Value (NPV)

Contents:

- Introduction to investment appraisal
- Compounding and discounting
- Relevant cash flows
- NPV calculation
- Allowing for inflation and taxation in DCF Relationship between interest rates and inflation
- Working capital adjustments

Referenced syllabus: B.1 (a)

Introduction to investment appraisal

Before any investment goes ahead, the capital budget needs to be prepared with the following possible appraisal outcome:

- Payback period of the project is 3 years.
- Discounted payback period of the project is 3.5 years.
- Project duration is 2 years.
- Net present value of the project is \$50m.
- Accounting rate of return of the project is 30%.
- Internal rate of return of the project is 25%.
- Modified internal rate of return of the project is 20%.
- Option value of the project is \$25m.
- Value at risk (VAR) - there is 5% chance that business will lose \$3m from this project.
- Sensitivity analysis - if the sales revenue from the project falls by 5%, the project NPV will be zero.

NPV calculation

NPV is the difference between the present value of cash inflows and the present value of cash outflows over a period of time.

- **Step 1:** Add up all the present values
- **Step 2:** Deduct initial investment

Decision rule:

- $NPV > 0$ - Accept the proposed project
- $NPV < 0$ - Reject the proposed project
- $NPV = 0$ - The proposed project is breakeven

Tutorial note: In every NPV exam question, decision rule must be stated at the end of the question.

| Advantages | Disadvantages |
|--|---|
| <ul style="list-style-type: none">• Positive NPV project will maximise shareholder wealth.• It considers the time value of money concept.• Based on cash flows – not subject to accounting manipulation. | <ul style="list-style-type: none">• Difficult to identify an appropriate discount rate.• Future cash flows determination is subjective.• Time period of the project may be subjective to determine. |

Tax issues in NPV calculation:

- Tax paid on cash profits - outflows
 - Tax savings on tax depreciation* on non-current assets - inflows
 - Tax savings on tax depreciation (balancing allowance) when non-current assets are sold – inflows
 - Tax paid on tax depreciation (balancing charge) when non-current assets are sold – outflows
- * **Tax depreciation** is commonly known as **capital allowance** in tax terms.
- * **Balancing charge or allowance** – to compare sale proceeds of the non-current assets with their carrying value (known as tax written down value)
- **Tax exhaustion** – where capital allowances > Profit before tax, therefore, no tax is charged in the current year, and any unused capital allowances can be carried forward to the next period.

Allowing for inflation and taxation in DCF Relationship between interest rates and inflation

Calculation: (The formula is given in the exam)

International Fisher effect:

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

- i = nominal or money rate of interest (interest rates quoted by banks already include inflation)
- r = real rate of interest
- h = inflation rate

Inflation rate of incremental future cash flows is different from the general rate:

- inflate cash flows with specific inflation rate and
- inflate discount rate with general inflation rate

Working capital adjustments

- Working capital may be required in the investment project, ie inventories + receivables - payables.
- The NPV analysis only includes changes in working capital requirements as incremental cash flows. Consider the following example where the project needs \$100 million and \$150 million working capital at the end of the first and second year.

Chapter 2 Payback Period, Discounted Payback Period, Project Duration

Contents:

- Payback period
- Discounted payback period
- Project Duration (Macaulay Duration)

Referenced syllabus: B.1 (a)

Payback period

This method computes the length of time it takes for cash inflows from trading to pay back the initial investment.

Decision criteria:

- Project payback > Target payback: reject the project.
- Project payback < Target payback: accept the project.

| Advantages | Disadvantages |
|---|---|
| <ul style="list-style-type: none">• Easy to calculate.• Cash flows measure – not subject to accounting manipulation. | <ul style="list-style-type: none">• Do not consider cash flows beyond the payback point.• No consideration of the time value of money concept. |

Discounted payback period

This method computes the length of time it takes for cash inflows from trading to pay back the initial investment by considering the time value of money effect.

Decision criteria:

- Discounted Project payback > Target payback: reject the project.
- Discounted Project payback < Target payback: accept the project.

| Advantages | Disadvantages |
|--|---|
| <ul style="list-style-type: none">• Consider time value of money concept.• Identify quick cash generating projects.• Payback can be adjusted for risk by discounting future cash flows with a risk-adjusted discount rate. | <ul style="list-style-type: none">• Require cost of capital to be estimated first.• Ignore cash flows beyond discounted payback period.• No decision criteria to indicate whether the investment increases company's value, unlike NPV and IRR. |

Project Duration (Macaulay Duration)

Definition:

This is the weighted average years to recover project cash flows:

- Recover project initial investment – if discounted at IRR
- Recover project present values – if discounted at cost of capital

Reason for Macaulay Duration:

Both payback and discounted payback period methods do not consider cash flows of the project beyond the payback point, ie does not consider cash flows volatility (risks), however, Macaulay duration method does.

Chapter 3 Internal rate of return (IRR) and Modified Internal Rate of Return (MIRR)

Contents:

- Internal Rate of Return (IRR)
- Modified internal rate of return (MIRR)

Referenced syllabus: B.1 (c)

Internal Rate of Return (IRR)

IRR is the discount rate at which the project NPV is zero.

This is the maximum cost of capital of a business for the project.

Calculation:

Excel Formula: insert the formula: =irr()

Decision rule:

- **Project IRR > Existing cost of capital** - Accept the project since the project NPV is positive.
- **Project IRR < Existing cost of capital** - Reject the project since the project NPV is negative.

| Advantages | Disadvantages |
|---|--|
| <ul style="list-style-type: none">• Consider the time value of money concept• Indicates how sensitive calculations are to changes in interest rates. | <ul style="list-style-type: none">• Problems occur if there are mutually exclusive projects where their NPV and IRR results are different – NPV should only be considered.• There might be multiple IRRs if cash flows are unconventional*. |

Modified internal rate of return (MIRR)

As IRR is based on the assumption that cash flows are reinvested at the IRR which seems a bit optimistic, the MIRR adjusts this assumption, but instead, it is assumed cash flows are reinvested at cost of capital during the remaining years of the project.

Calculation:

Way1: Formulae (given in the exam):

This is particularly useful when you are asked to calculate NPV and then use NPV to slot into this formula.

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

Way2: Growth method:

$$g = \left(\frac{Do}{Dn} \right)^{1/n} - 1$$

Dn
Do=terminal value
Dn=initial investment

Comment about MIRR:

- It gives the same result when using NPV and MIRR.
- Base on the assumption that cash flows are reinvested at cost of capital.
- Eliminate the possibility of multiple IRRs.
- Relative measure, easier for non-financial managers to use.

Chapter 4 Adjusting Risks and Uncertainties in Investment Appraisal

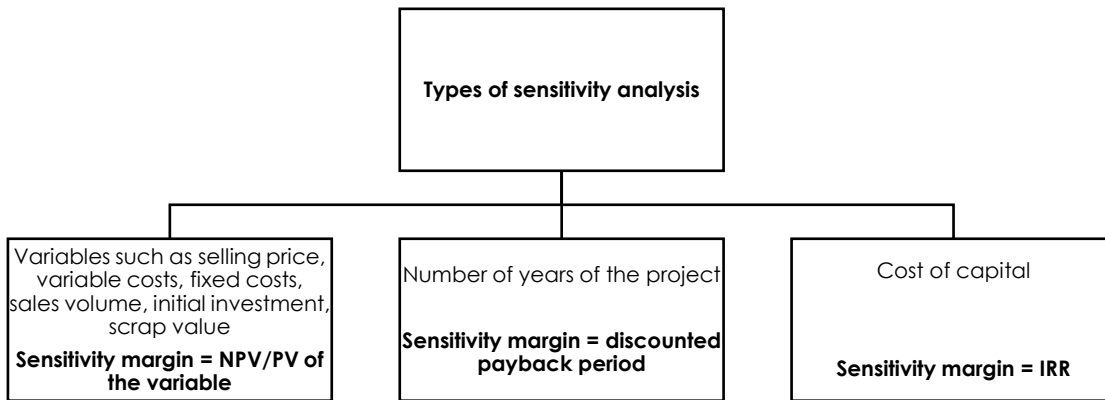
Contents:

- Sensitivity analysis
- Probability analysis
- Risk-adjusted discount rate

Referenced syllabus: B.1 (a)

Sensitivity analysis

This measures a change in the variable which can be accepted before the project NPV becomes zero.



Probability analysis

The expected value method is used in determining relevant cash flows in the NPV calculation.

Risk-adjusted discount rate

The greater the risk, the greater the premium will be required, and therefore, the discount rate should be higher.

The level of adjustment is based on the past experience of the financial manager.

Risks could also be incorporated in calculating cost of capital of a project by using the Capital Asset Pricing Model (CAPM) which adjusts the beta value in calculating the cost of equity.

Chapter 5 Value at Risk (VaR)

Contents:

- Introduction to Value at Risk (VaR)
- Normal Distribution
- VaR Calculation
- Monte Carlo Simulation

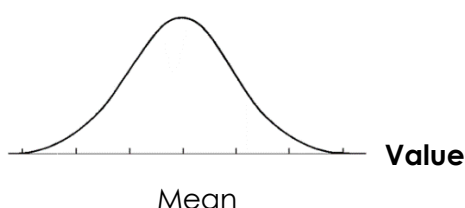
Referenced syllabus: B.1 (b)

Introduction to Value at Risk (VaR)

- This measures how the asset or portfolio of assets value decreases over the holding period (usually 1 – 10 days) under usual (confidence level) market conditions.
- In other words, this is the asset value that business is likely to lose.
- For example, based on past experience, 99% chance that business can earn \$100 from the investment with 1 % chance to lose \$10. In this case, the VaR is \$10.
- In the exam, the 99% chance (confidence level) will be given by the examiner.

Normal Distribution

Probability



VaR Calculation

$$Z = \frac{X - \mu}{\sigma}$$

Z can be found in normal distribution table:

- If it's 99% confidence then $Z=2.33$
- If it's 95% confidence then $Z=1.65$

In one period:

$$\text{VAR (1 period)} = \sigma XZ$$

More than one periods:

$$\text{VAR (multi period)} = \text{VAR (1 period)} \times \sqrt{T}$$

σ is a measure of how data would be different from the average figure (mean).

T would stand for how many times that 1 period would become multi period.

- if one period=1 year and multi period = 5 years, $T=5$.
- If one period is 3 months and multi period =1 year, $T=4$.

The value that business can get (at least):

Mean-VAR

Monte Carlo Simulation

- Simulation is a computer-based method of evaluating an investment project.
- The probability distributions linked with project variables and relationships between them are considered.
- To reflect the probability distribution, random numbers are used to assign different values to those variables.
- An expected NPV is calculated each time when simulation run randomly selects project variables values using random numbers.
- The probability distribution picture is then built up, usually in a histogram chart after a number of repeated simulation runs complete.
- Standard deviation of the expected returns and the most likely outcome show risk of this project.

Case study - Simulation in Excel (Not required in the exam):

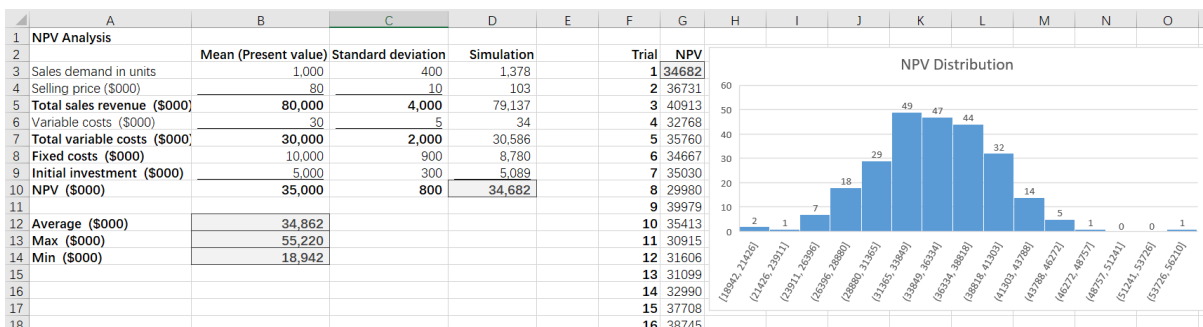
A clean simulation Excel Spreadsheet is available in the study pack with clear step by step guidance.

| | A | B | C | D | E | F | G | H |
|----|------------------------------|----------------------|--------------------|------------|---|-------|-----|---|
| 1 | NPV Analysis | | | | | | | |
| 2 | | Mean (Present value) | Standard deviation | Simulation | | Trial | NPV | |
| 3 | Sales demand in units | 1,000 | 400 | | | 1 | | |
| 4 | Selling price (\$000) | 80 | 10 | | | 2 | | |
| 5 | Total sales revenue (\$000) | 80,000 | 4,000 | | | 3 | | |
| 6 | Variable costs (\$000) | 30 | 5 | | | 4 | | |
| 7 | Total variable costs (\$000) | 30,000 | 2,000 | | | 5 | | |
| 8 | Fixed costs (\$000) | 10,000 | 900 | | | 6 | | |
| 9 | Initial investment (\$000) | 5,000 | 300 | | | 7 | | |
| 10 | NPV (\$000) | 35,000 | 800 | | | 8 | | |
| 11 | | | | | | 9 | | |
| 12 | Average (\$000) | | | | | 10 | | |
| 13 | Max (\$000) | | | | | 11 | | |
| 14 | Min (\$000) | | | | | 12 | | |
| 15 | | | | | | 13 | | |
| 16 | | | | | | 14 | | |

Tips: The following formulae could be used

1. Simulation, =NORM.INV(RAND(), B3, C3)
2. Average, =AVERAGE(G3:G252)
3. Maximum, =MAX(G3:G252)
4. Minimum, =MIN(G3:G252)
5. Insert chart by selecting G2-F251, and click Insert button, then Histogram

The solution can also be found in the Excel Spreadsheet.



Chapter 6 Capital Rationing

Contents:

- Single period capital rationing
- Multi period capital rationing

Referenced syllabus: A.2 (g); B.1 (a)

Single period capital rationing

Capital rationing means that a company is unable to invest in all projects with a positive net present value due to its limited funds.

Reasons:

- **Soft capital rationing** - unwilling to raise funds due to poor management skills; only focus on limited profitable projects.
- **Hard capital rationing** - unable to raise funds due to poor business performance or industry-wide limiting funds.

Ways to deal with capital rationing:

- Outsource business activities to the third party
- Seek joint venture with another party
- Seek new sources of capital finance
- Operate the business under the franchising agreement

Divisible projects:

These are projects which can be taken under any fraction.

- When capital rationing occurs in a single period, projects are ranked in terms of Profitability Index (PI) to determine the mix of projects.
- $PI = \frac{PV \text{ of future cash flows}^*}{\text{Present value of the capital investment}}$.
- Therefore, this compares the NPV per investment cost of each project, and those with high PI will be ranked first.
- *PV of future cash flows do not include the initial investment.

Indivisible projects:

- For non-divisible projects (impossible to undertake a fraction of a project, ie building ship), trial and error method would need to be used to test the NPV available from different project combinations.
- For example, when there are three projects, A, B, and C, we need to calculate the NPV of A + B, A + C and B + C, the project combinations with the highest NPV will be undertaken.

Multi period capital rationing

It means funds are limited not just at a time.

Steps: Mnemonics: DD computer

Step 1 - Define objective

- Maximise NPV by using up the funds available

Step 2 - Define constraints

- Indivisible projects: either 0 or 1
- Divisible projects: $0 < X < 1$

Step 3 - Slot into computer and let it do this.

Chapter 7 Free Cash Flow

Contents:

- Three important concepts
- Free Cash Flow to Firm
- Free Cash Flow to Equity
- Uses of free cash flow

Referenced syllabus: B.5 (b)

Three important concepts

- **Free cash flow to firm** – cash flows available to both debt and equity holders, ie interest expense should not be deducted.
- **Free cash flow to equity** – cash flows available to only equity holder, ie subtract interest net of tax AND net debt repayment.
- **Dividend cover** – **Free cash flow to equity/Dividend paid**. This refers to the cash (not profit) ability that business can pay dividends.

Free Cash Flow to Firm

| | | |
|--------------------------------|----------|--|
| PBIT x (1-Tax %) | X | Interest is not deducted as this is the free cash flows to both debt and equity holders. |
| Adjustment for non-cash items | X | Depreciation should be added back. |
| Adjustment for working capital | X | Deduct cash flows when there is an increase in working capital; add back cash flows when there is a decrease in working capital. |
| Investment activities | <u>X</u> | Deduct cash flows when business makes capital investments. |
| Free cash flow to firm | X | |

Free Cash Flow to Equity

Free cash flow to equity also deducts interest (net of tax) and any net debt repayments, as this is a measure of cash flows only to equity holders.

Two ways to calculate free cash flow to equity:

Way 1 – Start with PBIT (or EBIT):

| | | |
|---|-------|---|
| PBIT – Interest | X | This arrives at Profit Before Tax (PBT) |
| - Tax expenses | | PBT x Tax rate% |
| = Profit after tax | | |
| Adjustment for non-cash items | X | Depreciation should be added back. |
| Adjustment for working capital | X | Deduct cash flows when there is an increase in working capital; add back cash flows when there is a decrease in working capital. |
| Investment activities | X | Deduct cash flows when business makes capital investments. |
| Net debt repayments (Debt borrowings – Debt repayment) | x/(x) | <ul style="list-style-type: none"> ● Add when debt borrowings proceeds > debt repayment; ● Subtract when debt borrowings proceeds < debt repayment. |
| Free cash flow to equity | X | |

Way 2 – Start with Free Cash Flow to Firm:

| | | |
|---|-------|---|
| Free Cash Flow to Firm | | |
| - Interest net of tax | | |
| Net debt repayments (Debt borrowings – Debt repayment) | x/(x) | <ul style="list-style-type: none"> ● Add when debt borrowings proceeds > debt repayment; ● Subtract when debt borrowings proceeds < debt repayment. |
| Free cash flow to equity | X | |

Free cash flow needs to be assessed not in a single period because sometimes the company would spend money on expanding the business in the current year so the current year's free cash flow would be low but it does benefit the company for the long term.

Uses of free cash flow

- Investment appraisal using NPV methods
- Determine the value of the business – using free cash flow to firm
- Determine the share price – using free cash flow to equity
- Assess the dividend payment ability – using dividend capacity

Chapter 8 Real options (Black-Scholes Option Pricing Model)

Contents:

- Terminologies
- Types of options: (Real Options)
- Black Scholes Option Pricing Model Formulae (Given)
- Put Option Formulae: (Given)
- Black Scholes Option Pricing model
- The Greeks
- Call delta hedge
- Put delta hedge

Referenced syllabus: B2, B4 (d)

Terminologies

When appraising projects, the traditional NPV measure may not well incorporate the value of uncertainties, such as:

- **Timing uncertainties** – the project could be deferred
- **Expanding uncertainties** – the project could be expanded at a later stage, possibly in the form of making investments by stages, or to make the investment now and wait for bigger opportunities later.
- **Switching uncertainties** – the project could be switched into another project

To value these uncertainties, option comes in.

Types of options: (Real Options)

| | Description | Option types |
|---------------------------------|--|---|
| Option delay | <p>to This allows the business to defer the project.</p> <p>This is often found when the business has exclusive right to the product or market.</p> | Call option |
| Option expand | <p>to This allows the business to make further investments.</p> <p>This is usually found that the original project NPV is negative, but by considering the expansion option value, the whole project NPV would become positive.</p> | Call option |
| Option abandon | <p>to This allows the business the right to cease the project during its life and sell its cash flows.</p> <p>For example, a business may sell the venture to the investor at a specified period of time.</p> | Put option |
| Option redeploy (switch) | <p>to This allows the business the right to switch the productive assets to another project.</p> <p>This is suitable when switching value is higher than the switching costs.</p> | <p>Put option to switch;</p> <p>Call option to start the new project.</p> |

Call option and put option

- **Call option** – an option to buy
- **Put option** – an option to sell

Option styles

- **European style option** – option can be exercised only on the expiry date. For example, Black Scholes Option Pricing model.
- **American style option** - option can be exercised before the expiry date.

The whole project value

Project value= Traditional value (NPV) + Option value*

*Option value

Factors affecting option value:

| | | Call option value | Put option value |
|----------------|---|-------------------|------------------|
| Market price | ↑ | ↑ | ↓ |
| Exercise price | ↑ | ↓ | ↑ |
| Time to expiry | ↑ | ↑ | ↑ |
| Volatility | ↑ | ↑ | ↑ |
| Interest rate | ↑ | ↑ | ↓ |

Black Scholes Option Pricing Model Formulae (Given)

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

c= Call option value

P_a= Future cash flows from the investment

P_e =Project investment costs incurred

e= 2.7183 (exponential constant which is developed by scientist)

r= Risk free rate (not cost of capital)

t= Years remaining before costs incurred (for example, if the investment begins in 2 years' time, t=2 not 24 months)

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

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

Put Option Formulae: (Given)

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

Current exam

In the exam, you do not need to learn the Excel formulae of how BSOP model is calculated. However, you can directly click 'BSOP Calculator' and input numbers into the 'Variables' cells'. The final answer is automatically generated.

Example:

The screenshot shows the 'BSOP Calculator' interface. On the left, there are 'Requirements' (Requirements (50 marks)) and 'Response Options' (Word Processor, Spreadsheet, BSOP Calculator). A red arrow points to the 'BSOP Calculator' option with the text 'BSOP CALCULATION-CLICK HERE'. The main window displays a spreadsheet with the following data:

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|----|-----------------|----------------|-------|---|------|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | |
| 2 | P _a | P _e | r | t | s | | | | | | | | | | |
| 3 | 36,447 | 30,000 | 0.023 | 2 | 0.00 | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | d ₁ | #DIV/0! | | | | | | | | | | | | | |
| 6 | d ₂ | #DIV/0! | | | | | | | | | | | | | |
| 7 | Nd ₁ | #DIV/0! | | | | | | | | | | | | | |
| 8 | Nd ₂ | #DIV/0! | | | | | | | | | | | | | |
| 9 | c | #DIV/0! | | | | | | | | | | | | | |
| 10 | p | #DIV/0! | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | |

Red arrows and text annotations highlight key features: 'ONLY INPUT NUMBERS HERE' points to the input cells (A3-E3); 'OTHER CELLS ARE LOCKED' points to the #DIV/0! error cells; 'FINAL ANSWER IS CALCULATED USING THE INPUT VALUE AUTOMATICALLY' points to the 'c' cell (A9).

Characteristics of Black Scholes Option Pricing model:

- Transaction costs and taxes are zero;
- The share pays no dividends;
- The option has European exercise terms;
- The short-term (risk-free) interest rate is known and constant.
- The standard deviation of returns must be estimated and be constant over the life of the option.

The Greeks

Long and Short:

- Buy = Long (A right) – usually for corporate businesses.
- Sell = Short (An obligation) – usually for banks.

Delta:

$$\text{Delta} = \frac{\text{Change in option price}}{\text{Change in share price}}$$

This is the option value changes in proportion to changes in share price.

For example:

| | | |
|---|------|-------|
| Share Price | \$30 | \$31 |
| Call Option Value | \$3 | \$3.5 |
| Delta= $\$0.5/\$1=0.5$ | | |
| If the option writer hedges 500,000 shares using options, if the contract size per option is 1,000 shares per option contract, the writer needs to have $500,000 \text{ shares}/(1,000 \text{ shares} \times 0.5) = 1,000$ contracts. | | |

Gamma:

$$\text{Gamma ratio} = \frac{\text{Change in Delta}}{\text{Change in Share Price}}$$

This is the accelerator, ie

- accelerate gains for the option holder - Long (Buy) options (Call or Put options).
- accelerate losses for the option writer – Short (Sell) options (Call or Put options).

The **higher** the Gamma, the **higher** the **risk** will remain in the option.

For example:

| | | |
|-------------------|----------------------------------|---|
| Share Price | \$30 | \$31 |
| Call Option Value | \$3 | \$3.55 (include \$0.5 delta and \$0.05 gamma) |
| Gamma Value | 0.05 | |
| Delta Value | $\$3.55-\$3=0.55$ $\$31-\30 | |

Calculation of Gamma ratio:

Change in Delta

Change in Share Price

$$= \frac{\$0.55-\$0.5}{\$31-\$30} = 0.05$$

\$31-\$30

Gamma is the accelerator, ie

- accelerate gains for the option holder - call option value is \$3.55 rather than \$3.5.
- accelerate losses for the option writer – the option writer sells a call option and there is an increase in the share price of \$1, this increases the losses to writer by \$0.05.

Vega:

$$\text{Vega ratio} = \frac{\text{Change option value}}{\text{Change in standard deviation}}$$

Changes in volatility would result in changes in option value.

If Vega=0.35: 1% changes in volatility then 35% changes in option price.

To option holder (long the option):

- 1% increase in volatility will result in 35% increase in option value.
- This is a positive Vega as option holder wants volatility.

To option writer (short the option):

- 1% increase in volatility will result in 35% decrease in option value.
- This is a negative Vega as this creates an obligation to the option writer who does not want volatility.

Theta:

$$\text{Theta ratio} = \frac{\text{Change option value}}{\text{Change in time}}$$

- Theta is the change in an option premium over time.
- Option value would be lower as it's closer to the expiry date.
- When the option expires, it has no time premium because **Option value=intrinsic value + time value**
- For example, Theta = 0.05: Option value falls by \$0.05 per day as the option gets closer to expiry.

Rho:

$$\text{Rho ratio} = \frac{\text{Change option value}}{\text{Change in risk free rate}}$$

- This is the change of option premium in response to the interest rate changes.
- Rho=0.25 and changes in interest rate of 1% per year - the option price changes by \$0.25.

Call Delta Hedge

Call delta is used to decide:

From the option writer's perspective:

How many shares need to be purchased first in order that there is an increase in share price, and the option holder will exercise the call option to buy shares at a low price?

From the option holder's perspective:

How many call options to buy now in order to hedge against the risk that the share price increases in the future?

$$\text{Call Delta Ratio} = N(d1) = \frac{\text{Change in Option Price}}{\text{Change in Share Price}}$$

If $N(d1) = 0.8$ and this means if share price increases by \$1 then value of option would increase by \$0.8.

For example:

| | Last Year | This Year |
|-------------------|-----------|-----------|
| Share Price | \$10 | \$11 |
| Call Option Value | \$2 | \$2.8 |

This means that Delta Ratio = $\frac{\$2.8 - \$2}{\$11 - \$10} = 0.8$

Number of options and shares:

$$\text{Number of options to hold} = \frac{\text{Number of Shares}}{\text{Delta Ratio} \times \text{Contract Size}}$$

$$\text{Number of shares to hold} = \text{Number of options} \times \text{Delta Ratio} \times \text{Contract Size}$$

Put Delta Hedge

From the option writer's perspective:

How many shares that the business needs to hold if the option holder exercises the put option, to sell shares at a higher price compared to the current market condition.

The option writer can simply buy the existing shares at a lower current market price to hedge against the risks of decreasing in share price.

From the option holder's perspective:

How many put options that it needs to buy to hedge against the decrease in share price.

$$\text{Put Delta Ratio} = N(-d1) = \frac{\text{Change in Option Price}}{\text{Change in Share Price}}$$

If $N(-d1) = 0.8$:

If share price decrease by \$1, the option value increases by \$0.8.

Number of options and shares:

$$\text{Number of options to hold} = \frac{\text{Number of Shares}}{\text{Delta Ratio} \times \text{Contract Size}}$$

$$\text{Number of shares to hold} = \text{Number of options} \times \text{Delta Ratio} \times \text{Contract Size}$$

Chapter 9 Adjusted Present Value (APV)

Contents:

- Differences between NPV and APV
- Comment about APV
- APV Calculation

Referenced syllabus: B.3

Differences between NPV and APV

NPV:

- Cash flows are discounted at WACC (Weighted average cost of capital)
- WACC includes both business risk (equity finance) and financial risk (debt finance)

APV:

- It argues cash flows from business operations and finance should be separated, because future sales revenue and production costs are not directly associated with financial risk.
- Useful when appraising the project where its financial risk has changed.
- Cash flows from operations should be discounted at the K_e (ungeared).
- Cash flows from finance effect including issue costs, tax saving on interest, and subsidiary should be discounted at the risk free rate, or at the costs of debt (K_d). K_d should not net of tax as future tax law may change.
- Finance cash flows are discounted at R_f or K_d – totally acceptable from the exam's point of view.

Comment about APV

- **Subjectivity when choosing an appropriate discount rate for the finance cash flows** – either risk free rate or cost of debt could be used.
- **M&M assumptions are used when choosing the discount rate for the base case NPV** – such as they assume market is perfect and where there are no transaction costs.

APV = Base case NPV ± PV of Finance Effect

1. Issue costs
2. Subsidy
3. Tax savings on interest

Only include relevant cash flow from operations

Discount factor would only include Business risks (K_{eu})

But when Co is geared (2 approaches to separate (K_{eu}))

M&M proposition

2 Cost of equity

$$K_{eg} = K_{eu} + (K_{eu} - K_d) \frac{D}{E} (1 - T)$$

Geared

Beta

Ungeared

3 WACC

$$WACC(g) = WACC(ungeared) \frac{E}{E + D(1 - T)}$$

1. Ungeared

$$\beta_a = \beta_e \frac{E}{E + D(1 - T)}$$

2. CAPM

$$K_{eu} = r_f + \beta_a (R_m - R_f)$$

$$K_{eu} = r_f + \beta_a (R_m - R_f)$$

Discount finance effect at risk free rate or K_d :

1. **Issue costs** = (% x Amounts raised) x (1 - Tax rate%)

2. **Tax saved on interest** = Interest expense x Tax rate%

3. Subsidy:

- Step 1 – Discount tax saving on interest.
- Step 2 – Discount subsidy – (Difference % x Amounts raised) x (1 - Tax%)

Chapter 10 International Investment Appraisal

Contents:

- International Investment Appraisal Pro forma
- Predicted exchange rates
- Additional taxes
- Comments about international investment appraisal

Referenced syllabus: A.2 (e); A.5 (a iii); B.5

International Investment Appraisal Pro forma: (OTO | TTSO | E | O | DP)

The rest of the content will be shown in the course package.