

# FINANCIAL MANAGEMENT

FACILITATION BY HUSSAIN QAZI

COURSE NOTES & PRACTICE QUESTIONS



## ACCA FM – Syllabus Roadmap

FM course based of 9 modules and each modules further split into units.

Course also includes the assignment with self-attempt instructions and all of you have to submit the assignment and get the feedback. (Feed-back duration 3 to 4 days)

The sequence of the **modules** as follows:

1. **Investment Appraisal**
2. Business Finance - Cost of Capital
3. Business Finance – Equity Dynamics  
Interim Mock
4. Business Finance – Debt Dynamics
5. Business Valuation
6. Risk Management FOREX
7. Working Capital Management
8. Risk Management INTEREST
9. Financial Mgmt. Function & Environment

Final Mock

## MODULE 1

### INVESTMENT APPRAISAL

#### Exam Scope

- Marks: 20 to 25
- Exam Section: A/B/C
- Past Exam Analysis: 60% Calculation & 40% Theory

#### This Module Includes 8 Units:

1. Investment Appraisal by NPV Method
  2. IRR/Payback/ARR
  3. Asset Replacement Decisions
  4. Capital Rationing
  5. Lease OR Buy – Financing Decision
  6. Risk & Uncertainty
  7. Theory – Other than above topics
- Specific L.T. Decisions

## Unit 1: Investment Appraisal by NPV Method

This Unit includes following Topics:

1. DCF complications – Relevant Cash Flows
- NPV Complications:
2. Tax Complications
3. Inflation Complications
4. Working Capital Complications

**Q.1:**

*Level - Basic*

FM Company is considering a capital investment in new equipment. The estimated cash flows are as follows:

Year	Cash flow \$		
0	(240,000)		
1	80,000		
2	120,000		
3	70,000		
4	40,000		
5	20,000		

**Requirement:** Calculate the **NPV** of the project. Discount Rate **9%**

Long term investment can be appraised by following methods:

1. **Discounted Cash Flow Method** (NPV)
2. Internal Rate of Return (IRR)
3. Pay Back Method (Pay Back)
4. Accounting Rate of Return Method (ARR)

### Discounted Cash Flow Method (NPV)

Investment Appraisal by NPV is long term decision making method and the relevant complications for the calculations are as follows:

#### Relevant Cash Flow Rules

For any decision making (short term or long term) the relevant cash flows are under consideration and these are project related **Future Incremental Cash Flows and Opportunity Cost (If any)**.

- Past Cost (Sunk/Committed) is Irrelevant
- Incremental Cash Flows (Either Fixed OR Variable)
- Non-cash Items are Irrelevant (Like Depreciation or Apportion Cost)

**NOTE: DEBT HOLDER = Interest Cost & EQUITY HOLDER Dividend always Irrelevant because it's already part of Discount Rate (WACC).**

#### Discount Rate – Required Rate of Return

Here assuming this will be given.

**Q.2:**

*Level - Basic*

LCH manufactures product X which it sells for \$5 per unit. Variable costs of production are currently \$3 per unit, and fixed costs 50c per unit.

A new machine is available which would cost \$90,000 but which could be used to make product X for a variable cost of only \$2.50 per unit. Fixed costs, however, would increase by \$7,500 per annum as a direct result of purchasing the machine.

The machine would have an expected life 4 years and a resale value after that time of \$10,000. Sales of product X are estimated to be 75,000 units per annum. LCH expects to earn at least 12% per annum from its investments. Ignore taxation.

**Requirement: Decide whether LCH should purchase the machine.**

**What is about decision?**

- **Purchase Machine to save the cost**

Relevant Cash Flows

Machine

Residual Value

Savings of Variable Cost

Fixed Cost = Incremental

## NPV with Tax Workings

### Tax – The Relevant Cash Flow

- Tax consequence as a result of project:
  1. Tax Payments
  2. Tax Savings
- Calculate the taxable income and then apply the tax rate accordingly.
  
- Two Possible Approaches:
  1. Two Step Working Approach (As Normally Does in FM)  
  
1<sup>st</sup> Calculate the tax payments/savings based on with operating cash flows (ignoring tax depreciation/capital allowance)  
  
2<sup>nd</sup> Calculate the tax savings from capital allowance.
  2. One Step Working Approach  
  
Calculate the taxable income/loss (after incorporating tax allowable depreciation) and apply the Tax Rate to identify tax payments or savings.

**Q.3:**

*Level - Basic*

Duo Co needs to increase production capacity to meet increasing demand for an existing product, 'Quago', which is use in food processing. A new machine, with a useful life of four years and a maximum output of 600,000 kg of Quago per year, could be bought for \$800,000, payable immediately. The scrap value of the machine after four years would be \$30,000. Forecast demand and production of Quago over the next four years is as follows:

Year	1	2	3	4
Demand (kg)	1.4 million	1.5 million	1.6 million	1.7(0.6 million)

Existing production capacity for Quago is limited one million kilograms per year and the new machine would only be used for demand additional to this.

The current selling price of Quago is \$8.00 per kilogram and the variable cost of materials is \$5.00 per kilogram. Other variable costs of product are \$1.90 per kilogram. Fixed costs of production associated with the new machine would be \$240,000 in the first year of production, increasing by \$20,000 per year in each subsequent year of operation.

Duo Co pays tax one year in arrears at an annual of 30% and can claim capital allowances (tax-allowable depreciation) on a 25% reducing balance basis. A balancing allowance is claimed in the final year of operation.

Discount Rate 10%

**Required:**

Calculate the net present value of buying the new machine and advise on the acceptability of the proposed purchase (work to the nearest \$1,000)



## NPV with Inflation

### Inflation & Net Present Value

$$\text{NPV} = \text{Future Cash Flows} \times \text{Discount Rate}$$

Inflation is a real life problem which affects us all.

In relation to appraising investments there are two impacts of inflation that you need to be able to deal with.

These are firstly the impact on the estimated future cash flows and secondly the impact on the discount rate:

### Inflation with Discount rate(Investor's required return)

*Nominal/Money Rate of Return - Return (DR) adjusted with Inflation*

*Real Return – Return (DR) without adjusted with inflation.*

Fishers' effect developing the relationship between returns and inflation as follows:

$$(1+N) = (1+R) \times (1+I)$$

N = Nominal/Money Rate of Return

R = Real Rate of Return

I = General/Average Rate of Inflation

### Inflation with Future Cash Flows

Future **Real Cash Flows (Now/Current Terms)**: *Future cash flows in current terms without inflation adjusted.*

Future **Nominal Cash Flows (Money Term)**: *Future Inflation adjusted future cash flows.*

Future cash-flows either already inflation adjusted or need to incorporate inflation.

**Inflated Cash Flows are "Cash flows that will actual arise in future."**

**Inflation Classification is:**

**Specific Inflation** – Specific to cash flows like material, labor, overheads etc/

**General Inflation** – Like average inflation rate of a particular economy (Use for DR)

**Q4:**

*Level - Intermediate*

**Trecor Co** plans to buy a new machine to meet expected demand for a new product, Product T. This machine will cost \$250,000 and last for four years, at the end of which time it will be sold for \$5,000. Trecor Co expects demand for Product T to be as follows:

Year	1	2	3	4
Demand (units)	35,000	40,000	50,000	25,000

The selling price for Product T is expected to be \$12.00 per unit and the variable cost of production is expected to be \$7.80 per unit. Incremental annual fixed production overheads of \$25,000 per year will be incurred. *Selling price and costs are all in current price terms.*

Selling price and costs are expected to increase (SPECIFIC INFLATION) as follows:

	Increase
Selling price of Product T:	3% per year
Variable cost of production:	4% per year
Fixed production overheads:	6% per year

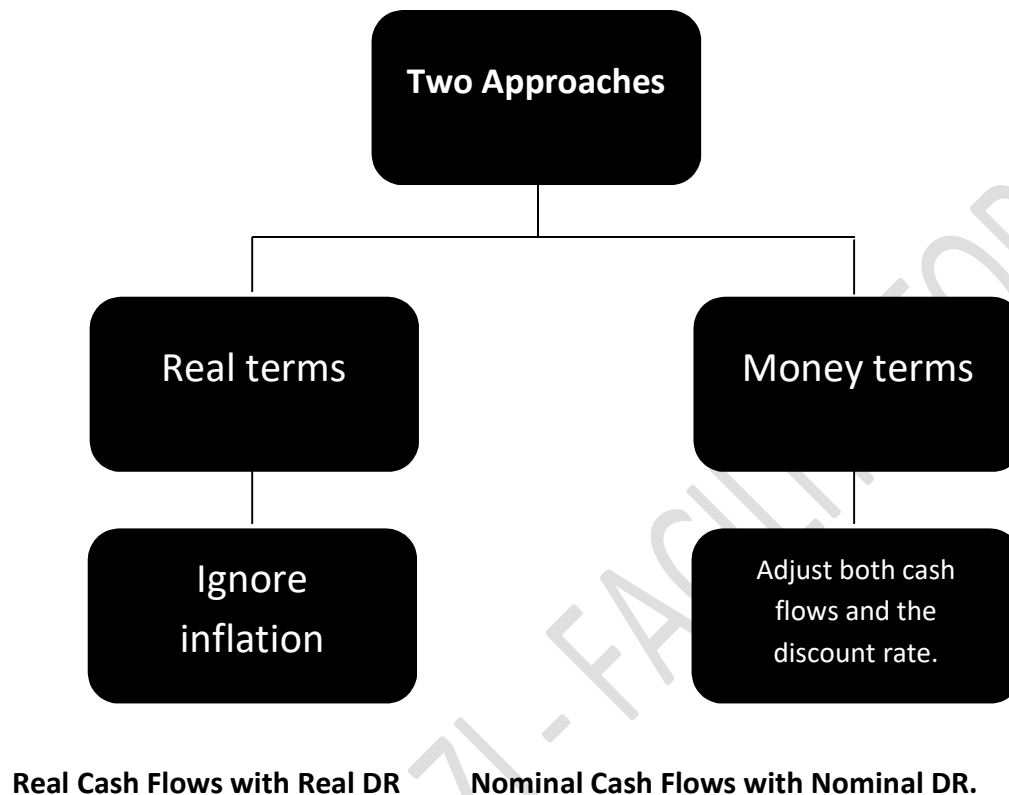
**Other Information**

Trecor Co has a real cost of capital of 5.7% and pays tax at an annual rate of 30% one year in arrears. It can claim capital allowances on a 25% reducing balance basis.

General inflation is expected to be 5% per year.

**Required:** Calculate the net present value of buying the new machine and comment on your findings (work to the nearest \$1,000).

## NPV & Inflation: Two Approaches



### Real terms approach

Under this approach we completely ignore inflation in the calculation. This means that we do not inflate estimated future cashflows using the specific rate of inflation. Instead we present future cashflows in current prices, or today's prices.

To be consistent we also want to ignore the impact of inflation on the discount rate. The discount rate represents the cost of capital, and we therefore need to discount using a real cost of capital.

### Money terms approach

Under this approach we inflate the cashflows using the specific rates of inflation applicable to each cash flow.

When discounting, we use a money cost of capital (sometimes called a nominal cost of capital). This is the cost of capital that includes the impact of general inflation on the returns that investors demand.

**Key Point: Any of the above method use for Investment Appraisal the NPV remain same**

Q5:

Level - Basic

Kevin manufactures digital radios. It is considering investing in a new factory. The factory will cost \$900,000 which would be payable immediately. The new factory is expected to generate an additional annual net cash inflow of \$500,000 per annum in current prices (REAL TERMS) for the next three years. The specific rate of inflation applicable to the net cash inflow is 10% per annum.

The real cost of capital is 20%, and the general rate of inflation in the economy is, in this case, 10%, the same as the specific rate applicable to the cash flows.

**Requirements**

- (a) What is the NPV in real terms?
- (b) What is the NPV in money terms?

***“The answer is exactly the same in real terms and money terms”***

**Assignment:**

Self-Attempt Question: M/J 2019 Pink Co [Q32]

## NPV Working Capital

When undertaking a major new investment, or project, there is often a need to invest in working capital in addition to non-current assets. In particular there will normally be a need to invest in inventory, and, if a credit period is offered to customers, a need to invest in receivables.

The cash invested in working capital needs to be taken into account in an NPV evaluation. Normally it is assumed that the cash invested is released at the end of the project's life, but because the time value of money is important, the timing of the investment in working capital, and the release of funds from the investment in working capital, becomes important.

How do we calculate the working capital adjustment?

The approach is as follows.

- 1 Calculate the **total working capital requirements** at each point in time. This is the total net amount that needs to be invested in working capital (the total amount of inventory and receivables less the level of payables).
- 2 Calculate the **net movement (incremental) in working capital** from period to period. This net movement in working capital represents the amount that is tied up in, or released from working capital during that period.

## Q6: HQ Session -

## Level - Basic

### Basic Question 1

Working Capital Investment required at the start of the project \$100,000

Project life 4 years

Working capital will increase in line of 5% inflation each year

All working capital will be flow back at the end of the project.

*Requirement: Working Capital Extract for NPV*

### Basic Question 2

The selling price per unit is expected to be \$100 (current price terms).

Selling price is expected to inflate at 4%

Project life 4 years.

Production & sales units 1000 per year

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

All working capital will be flow back at the end of the project.

*Requirement: Sales Value & Working Capital Extract for NPV*

## Self-Assessment

S/16: NPV WITH WORKING CAPITAL – HEBAC

## Unit 2: Investment Appraisal – Other Methods

1. Internal Rate of Return (IRR)
2. Pay Back Method (Pay Back)
3. Accounting Rate of Return Method (ARR)

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## 1. Internal Rate of Return

### Meaning:

The IRR of any investment is **the return that is delivered by the project (The Project's Potential)**. Alternatively, the IRR can be thought of the discount rate at which the NPV is equal to zero.

### How to Calculate?

$$IRR = a + \frac{NPV_a}{(NPV_a - NPV_b)} \times (b - a)$$

### Decision Rule

IRR > DR = PROJECT ACCEPT & VICE VERSA

### Example

A business undertakes high risk investments and requires a minimum expected rate of return of 17% pa on its investments. A proposed capital investment has the following expected cash flows:

YEARS	DESCRIPTION	CASH FLOWS
0	Investment	(50,000)
1	Returns	18,000
2	Returns	25,000
3	Returns	20,000
4	Returns	10,000

### Requirements

- (1) Calculate the NPV of the project if the cost of capital is 15%.
- (2) Calculate the NPV of the project if the cost of capital is 20%.
- (3) Use the NPVs you have calculated to estimate the IRR of the project.
- (4) Recommend, on financial grounds alone, whether this project should go ahead.

### **DECISION:**

**IRR = PROJECT POTENTIAL = 19%**

**Investor Required Return = 17%**

**IRR > DR = PROJECT ACCEPTED**



### Limitations of IRR:

#### **Non-Conventional Cash-flows:**

Conventional cash flows are those which stay positive after the investment rather than moving back to the negative side. E.g

Year	Conventional Cash-flow	Non Conventional Cash flow
0	\$ (1,000,000)	\$ (1,000,000)
1	\$ 500,000	\$ 550,000
2	\$ 650,000	\$ (300,000)

In case of Non-Conventional Cash-Flows there would usually be a problem of **Multiple IRR**, whereas there should be only one level of project's Potential.

#### **Mutually Exclusive Project**

When dealing with independent investments, the IRR should be the same as NPV but in mutually exclusive investments IRR fails to recognise the magnitude of the NPV and rather is unable to decide which project is superior.

E.g.

Time	Project A	Project B
0	\$(10,000)	\$(10,000)
1	\$ 12,000	\$ 1,000
2	\$ 625	\$ 13,200

@ Discount rate = 10%  
Calculate NPV and IRR.

<b>Solution:</b>	Project A	Project B
NPV @ 10%	1,426	1,818
IRR	25%	20%

In summary the NPV profiles differ due to two reasons:

1. Differences in the timing of the cashflows for each project.
2. Differences in the project sizes (or project scales).

#### **Re-Investment Rate**

The problem with selecting investments based on the higher IRR is that it makes an assumption that cash flows can be reinvested at the IRR over the life of the project.

In contrast, the NPV method assumes that cash flows can be invested at the cost of capital over the life of the project.

If the assumption that IRR as a reinvestment rate is valid, then IRR technique will be superior. However, it is unlikely that this will be the case and therefore the NPV method is likely to be superior. The better reinvestment rate assumption will be cost of capital used for the NPV method.

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## Payback Method Simple Payback & Discounted Payback

Payback period measures the length of time it takes for the cash returns from a project to cover the initial investment.



### Simple Payback Period

The main problem with payback period is that it does not take account of the time value of money and the full cash flows throughout the life of the project.

### Discounted payback period

Hence, the discounted payback period can be computed instead. Discounted payback period measures the length of time before the discounted cash returns from a project cover the initial investment.

Example: A project with the following cash flows is under consideration:

Year	0	1	2	3	4
\$000	(20,000)	8,000	10,000	6,000	4,000

Cost of capital 5%

**Required:**

1. Payback Period
2. Discounted Payback Period.

### Payback for Investor

The shorter the discounted payback period, the more attractive the project is. A long discounted payback period indicates that the project is a high risk project.

However, the problem with not taking, the full cash flows throughout the life of the project, into account persists.

The shorter the discounted payback period, the more attractive the project is. A long discounted payback period indicates that the project is a high risk project. However, the problem with not taking, the full cash flows throughout the life of the project, into account persists.

## Accounting Rate of Return (ROCE)

ROCE also known as accounting rate of return (ARR).

Another method for investment appraisal to support the decision of investor.

### Calculation Methods

#### *Method 1*

$$\text{ROCE} = (\text{Project Annual PBIT} / \text{Initial Investment}) \times 100\%$$

Alternatively:

#### *Method 2*

$$\text{ROCE} = (\text{Project Annual PBIT} / \text{Initial Investment Average}) \times 100\%$$

Average capital investment = (Initial investment + scrap value) / 2 (SIMPLE A.MEAN)

In the exam you should use the initial capital cost unless you are told otherwise.

Average capital investment is the method most commonly asked for in the exam. This will be made clear in the question.

### Decision rule:

If the expected ROCE for the investment is greater than the target or hurdle rate (as decided by management) then the project should be accepted.

### *Example*

A project requires an **initial investment of \$800,000** and then earns **net cash inflows** as follows:

Year	1	2	3	4	5	6	7
Cash inflows (\$000)	100	200	400	400	300	200	150

**In addition**, at the end of the seven years project the assets initially purchased will be sold for **\$100,000**.

### Requirement:

Determine the project's **ROCE using:**

1. **Initial capital costs**
2. **Average capital investment.**

## Investment Appraisal by NPV, IRR, Payback & ARR

**Q: Past Paper**

**Level - Exam**

PV Co, a large stock-exchange-listed company, is evaluating an investment proposal to manufacture Product W33, which has performed well in test marketing trials conducted recently by the company's research and development division. Product W33 will be manufactured using a fully-automated process which would significantly increase noise levels from PV Co's factory. The following information relating to this investment proposal has now been prepared:

The research and development division has prepared the following demand forecast as a result of its test marketing trials. The forecast reflects expected technological change and its effect on the anticipated life-cycle of Product W33.

Initial investment	\$2 million
Selling price (current price terms)	\$20 per unit
Expected selling price inflation	3% per year
Variable operating costs (current price terms)	\$8 per unit
Fixed operating costs (current price terms)	\$170,000 per year
Expected operating cost inflation	4% per year

The research and development division has prepared the following demand forecast as a result of its test marketing trials. The forecast reflects expected technological change and its effect on the anticipated life-cycle of Product W33.

Year	1	2	3	4
Demand (units)	60,000	70,000	120,000	45,000

It is expected that all units of Product W33 produced will be sold, in line with the company's policy of keeping no inventory of finished goods. No terminal value or machinery scrap value is expected at the end of four years, when production of Product W33 is planned to end. For investment appraisal purposes, PV Co uses a **nominal (money) discount rate of 10% per year** and a **target return on capital employed of 30% per year**. Ignore taxation.

**Required:**

1. Calculate the following values for the investment proposal:
  - a. Net present value; (5 marks)
  - b. Internal rate of return; and (3 marks)
  - c. Return on capital employed (ARR) based on average investment. (3 marks)
  - d. Discounted Payback Period (2 Marks)
2. Briefly discuss your findings in each section of (a) above **and** advise whether the investment proposal is financially acceptable. (4 marks)

**PART B SOLUTION**

**NPV**

The investment proposal has a positive **net present value (NPV)** of \$366,722 and is therefore financially acceptable.

*The results of the other investment appraisal methods do not alter this financial acceptability, as the NPV decision rule will always offer the correct investment advice.*

**IRR**

**The internal rate of return (IRR)** method also recommends accepting the investment proposal, since the **IRR of 18.2% is greater than the 10% return** required by PV Co.

*If the advice offered by the IRR method differed from that offered by the NPV method, the advice offered by the NPV method would be preferred.*

**ARR**

The calculated **return on capital employed** of 25% is less than the target return of 30%, but as indicated earlier, the investment proposal is financially acceptable as it has a positive NPV.

*The reason why PV Co has a target return on capital employed of 30% should be investigated. This may be an out-of-date hurdle rate which has not been updated for changed economic circumstances.*

**Discounted payback**

There is no target given for a payback period but payback 2.9 is expected to be well into the lifecycle of the project.

*The project's lifecycle is quite **short** at 4 years and it would therefore be useful to conduct a **sensitivity analysis** of demand to ensure the risk is acceptable.*

**Conclusion**

The NPV and IRR both indicate that the project is financially acceptable, and **subject to further analysis of the risks of the project**, it should go ahead.

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## Unit 3: Specific Investment Decisions

Discounted cash flow method also used about following decisions:

1. Asset Replacement Decision
2. Capital Rationing
3. Lease OR buy decision

### Asset Replacement decisions

**Decision About** - How often should the asset be replaced?

Once the decision has been made to acquire an asset for a long-term project, it is quite likely that the asset will need to be replaced periodically throughout the life of the project.

Where there are competing replacements for a particular asset, we must compare the possible replacement strategies available.

**Decision based on optimum replacement cycle**

The **optimum replacement period (cycle)** will be the period that has the lowest EAC, although in practice other factors may influence the final decision.

The method can be summarised as:

- (1) Calculate the NPV of each strategy or replacement cycle
- (2) Calculate the EAC for each strategy
- (3) Choose the strategy with the lowest EAC.

**Equivalent Annual Cost (EACs)**

In order to deal with the different timescales, the NPV of each option is converted into an annuity or an EAC.

The EAC is the equal annual cash flow (annuity) to which a series of uneven cash flows is equivalent in PV terms.

The formula used is:  $EAC = \frac{\text{NPV of Asset}}{\text{Annuity factor}}$

Annuity factor



A problem arises where

- Equivalent assets available are likely to last for different lengths of time or
- An asset, once bought, must be replaced at regular intervals.

### Replacement decisions

The factors to be considered when making replacement decisions are as follows:

- Capital cost of new equipment – the higher cost of equipment will have to be balanced against known or possible technical improvements.
- Operating costs – operating costs will be expected to increase as the machinery deteriorates over time. This is referred to as operating inferiority, and is the result of:
  - increased repair and maintenance costs
  - Loss of production due to ‘down time’ resulting from increased repair and maintenance time
  - Lower quality and quantity of output.
- Resale value – the extent to which old equipment can be traded in for new.
- Taxation and investment incentives.
- Inflation – both the general price level change and relative movements in the prices of input and outputs.

Determining the optimum replacement period (cycle) will largely be influenced by:

- The capital cost/resale value of the asset – the longer the period, the less frequently these will occur
- The annual operating costs of running the asset – the longer the period, the higher these will become.

### Key assumptions

- Cash inflows from trading are ignored since they will be similar regardless of the replacement decision. In practice, using an older asset may result in lower quality, which in turn could affect sales.
- The operating efficiency of machines will be similar with differing machines or with machines of differing ages.
- The assets will be replaced in perpetuity or at least into the foreseeable future.
- In most questions tax and inflation are ignored.
- As with all NPV calculations, non-financial aspects such as pollution and safety are ignored. An older machine may have a higher chance of employee accidents and may produce more pollution.

- Note that if required to compare different sets of cash inflows with differing lifespans, an equivalent annual benefit calculation can be done using the same principles.

### **Why not decision based on NPV?**

A special feature of replacement problems is that it involves comparisons of alternatives with different timescales. If the choice is between replacing an item of machinery every two years or every three years, it would be meaningless simply to compare the NPV of the two costs.

### **Limitations of replacement analysis**

The model assumes that when an asset is replaced, the replacement is in all practical respects identical to the last one and that this process will continue for the foreseeable future. However, in practice this will not hold true owing to:

However, this assumption ignores:

- Changing technology – machines fast become obsolete and can only be replaced with a more up-to-date model, which will be more efficient and perhaps perform different functions.
- Inflation – the increase in prices over time alters the cost structure of the different assets, meaning that the optimal replacement cycle can vary over time.

Changes in production plans – firms cannot predict with accuracy the market environment they will be facing in the future and whether they will even need to make use of the asset at that time.

## Investment Appraisal- Asset Replacement Decision

**Q11: HQ Session -**

**Level - Exam**

Bread Products Ltd is considering the replacement policy for its industrial size ovens that are used as part of a production line that bakes bread. Given its heavy usage each oven has to be replaced frequently. The choice is between replacing every two years or every three years. Only one type of oven is used, each of which costs £24,500.

Maintenance costs and resale values are as follows:

Year	Maintenance per annum £	Resale value £
1	500	
2	800	15,600
3	1,500	11,200

Original cost, maintenance costs and resale values are expressed in current prices. That is, for example, maintenance for a two-year-old oven would cost £800 for maintenance undertaken now. It is expected that maintenance costs will increase at 10% per annum and oven replacement cost and resale values at 5% per annum. The money discount rate is 15%.

**Required:**

**(a) Calculate the preferred replacement policy for the ovens in a choice between a two-year and three year replacement cycle. (12 marks)**

[Self-Attempt Question:](#)

MJ 2021: Question Name Cabrerias

*Self Assessment without video*

*Q12: Student Session -*

*Level - Exam*

Gadir Co plans to replace an existing machine and must choose between two machines. Machine 1 has an initial cost of \$200,000 and will have a scrap value of \$25,000 after four years. Machine 2 has an initial cost of \$225,000 and will have a scrap value of \$50,000 after three years. Annual maintenance costs of the two machines are as follows:

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Machine 1 (\$/year)	25,000	29,000	32,000	35,000
Machine 2 (\$/year)	15,000	20,000	25,000	

Where relevant, all information relating to the machines has already been adjusted to include expected future inflation. Taxation and tax allowable depreciation must be ignored in relation to Machine 1 and Machine 2.

**Other information**

Gadir Co has a nominal before-tax weighted average cost of capital of 12% and a nominal after-tax weighted average cost of capital of 7%.

**Required**

- (a) Calculate the equivalent annual costs of Machine 1 and Machine 2, and discuss which machine should be purchased. (7 marks)

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## CAPITAL RATIONING

Shareholders wealth is maximized if a company undertakes all possible positive NPV projects.

Capital rationing is a situation in which a company has a limited amount of capital to invest in potential projects, such that the different possible investments need to be compared with one another in order to allocate the capital available most effectively.

If an organisation is in a capital rationing situation it will not be able to enter into all projects with positive NPVs because there is not enough capital for all of the investments.

**Soft capital rationing** is brought about by internal factors and **Hard capital** rationing is brought about by external factors.

**Soft capital rationing** may arise for one of the following reasons.

1. Management may be reluctant to issue additional share capital because of concern that this may lead to outsiders gaining control of the business.
2. Management may be unwilling to issue additional share capital if it will lead to a dilution of earnings per share = PAT/NP OF SHARES
3. Management may not want to **raise additional debt** capital interest payments. tal because they do not wish to be committed to large fixed
4. Management may wish to limit investment to a level that can be financed solely from retained earnings = INTERNAL SOURCE
5. They may not want to grow the company too quickly.

**Hard capital rationing** may arise for one of the following reasons.

1. Raising money through the stock market may not be possible if share prices are depressed.
2. There may be restrictions on bank lending due to government control.
3. Lending institutions (LIKE BANKS) may consider an organisation to be too risky (eg, too highly geared, poor prospects) to be granted further loan facilities.
4. The costs associated with making small issues of capital may be too great.

ISSUE COST = STOCK MARKET FEES

This Capital Rationing Situation (Shortage of Funds) with respect to time period classified as follows

**Single and multi-period capital rationing**

Single-period capital rationing: Shortage of funds for this period only.

Multi-period capital rationing: Shortage of funds in more than one period (outside syllabus).

A single period Capital Rationing situation can be resolved with the following classifications of projects:

1. **Divisible Projects.** [Solution by Profitability Indexes (PI)]
  - a. **Two steps solution** like limiting factor.
    - 1<sup>st</sup> calculate PI of each project and allocate the ranking.
    - 2<sup>nd</sup> Allocation of funds according to rank to utilize the maximum finance.
2. **Indivisible Projects.** (Solution by project’s combinations with trial & error basis)

*Where:  $PI = NPV / PV$  of capital invested*

**Example.**

Peel Co has identified 4 positive NPV projects, as follows:

Project	NPV (\$m)	Investment at $t_0$ (\$m)
A	60	9
B	40	12
C	35	6
D	20	4

**Peel Co can only raise \$12m of finance to invest now.**

*Required:*

Advise the company which project(s) to accept **if the projects are:**

- (i) Independent and **divisible**
- (ii) Independent and **indivisible**
- (iii) Mutually exclusive

## Investment Appraisal - Capital Rationing

Q13: HQ Session -

Level - Exam

Basril Co is reviewing investment proposals that have been submitted by divisional managers. The investment funds of the company are limited to \$800,000 in the current year. Details of three possible investments, none of which can be delayed, are given below.

### Project 1

An investment of \$300,000 in work station assessments. Each assessment would be on an individual employee basis and would lead to savings in labour costs from increased efficiency and from reduced absenteeism due to work-related illness. Savings in labour costs from these assessments in money terms are expected to be as follows:

Year	1	2	3	4	5
Cash flows (\$'000)	85	90	95	100	95

### Project 2

An investment of \$450,000 in individual workstations for staff that is expected to reduce administration costs by \$140,800 per annum in money terms for the next five years.

### Project 3

An investment of \$400,000 in new ticket machines. Net cash savings of \$120,000 per annum are expected in current price terms and these are expected to increase by 3.6% per annum due to inflation during the five-year life of the machines.

Basril Co has a money cost of capital of 12% and taxation should be ignored.

### Required

Determine the best way for Basril Co to invest the available funds and calculate the resultant NPV:

- (a) on the assumption that each of the three projects is divisible;
- (b) on the assumption that none of the projects are divisible. (10 marks)

## Self-Attempt Question:

SD 2020: Question Name Crocket

## LEASE OR BUY DECISION

### Decision About?

Once the decision has been made to acquire an asset for an investment project, a decision still needs to be made as to how to finance it. The choices that we will consider are:

- Lease
- Buy.

### Cost Decision

The NPVs of the financing cash flows for both options are found and compared and the lowest cost option selected.

The finance decision is considered separately from the investment decision. The operating costs and revenues from the investment will be common in each case.

### Relevant Cash Flows

#### **Lease**

- The Lease Rentals.
- Tax relief on Lease Rentals.

The asset is never 'owned' by the user company from the perspective of the tax authorities.

#### **Buy**

The assumption is that buying requires the use of a bank loan (for the sake of comparability). The user is the owner of the asset.

### Relevant Cash Flows

- Machine cost
- Residual value
- Tax-allowable depreciation

Other cash flows may also be relevant but depends on circumstances.



## Discount Rate

Post-tax cost of borrowing = Interest Cost  $\times$  (1 – Tax rate).

Same rate is used for both leasing and buying, reflecting the risk level to the lender of providing finance to the company.

### Note:

- In some questions, you may find that a company is not paying tax and so the pre-tax rate would be appropriate.
- Do not include the interest payments or the tax relief arising on them in the NPV calculation, as this is dealt with via the cost of capital.

## Special Case – Investment & Financing Decision

Where the use of an asset is required for a new project, there are effectively two decisions to be made:

- Is the project worthwhile? **This is Investment Decision**
- If so, should the asset be leased or bought with a loan? **This is Financing Decision**

In this case you need to do first calculate the NPV of the project similar as normal investment decision. Project is worth only if NPV become positive.

Then you need to work for financing decision about Lease OR Buy

### Other considerations

There may be other issues to consider before a final decision is made to lease or buy, for example:

- Who receives the residual value in the lease agreement?
- Any restrictions associated with the taking on of leased equipment, e.g. leases may restrict a firm's borrowing capacity.
- Any additional benefits associated with lease agreement, e.g. maintenance or other support services.

## *Investment Appraisal - Lease or Buy Decision*

*Q14: HQ Session -*

*Level - Exam*

A firm has decided to acquire a new machine to neutralise the toxic waste produced by its refining plant.

The machine would cost \$6.4 million and would have an economic life of five years. Taxallowable depreciation of 25% pa on a reducing balance basis is available for the investment.

Taxation of 30% is payable on operating cash flows, one year in arrears.

The firm intends to finance the new plant by means of a fiveyear fixed interest loan at a pretax cost of 11.4% pa, principal repayable in five years' time.

As an alternative, a leasing company has proposed a finance lease over five years at \$1.42 million pa payable in advance.

Scrap value of the machine under each financing alternative will be \$500,000

Evaluate the two options for financing the machine and advisethe company on the best alternative.

## *Investment Appraisal - Lease or Buy Decision*

*Q15: HQ Session -*

*Level - Exam*

Prime printing plc has the opportunity to replace one of its pieces of printing equipment. The new machine, costing £120,000, is expected to lead to operating saving of £50,000 per annum and have an economic life of five years. The company's after tax cost of capital for the investment is estimated at 15%, and operating cash flows are taxed at a rate of 30%, one year in arrears.

The company is trying to decide whether to fund the acquisition of the machine via a five year bank loan, at an annual interest rate of 13%, with the principal repayable at the end of the five year period. As an alternative, the machine could be acquired using a finance lease, at a cost of £28,000 p.a for five years, payable in advance. The machine would have zero scrap value at the end of five years.

*Required:*

Assuming that writing down allowance of 25% per year, are available on a reducing balance basis, recommend, with reason, whether prime printing should replace the machine, and if so whether it should buy or lease.

## Self Assessment March/June 2017

### Q16: Student Session -

### Level - Exam

Vyxyn Co is evaluating a planned investment in a new product costing \$20m, payable at the start of the first year of operation. The product will be produced for four years, at the end of which production will cease. The investment project will have a terminal value of zero. Financial information relating to the investment project is as follows:

Year	1	2	3	4
Sales volume (units/year)	440,000	550,000	720,000	400,000
Selling price (\$/unit) R	26.50	28.50	30.00	26.00
Fixed cost (\$/year) N	1,100,000	1,121,000	1,155,000	1,200,000

These selling prices have not yet been adjusted for selling price inflation, which is expected to be 3.5% per year. The annual fixed costs are given above in nominal terms.

Variable cost per unit depends on whether competition is maintained between suppliers of key components. The purchasing department has made the following forecast:

Competition	Strong	Moderate	Weak
Probability	45%	35%	20%
Variable cost (\$/unit)	10.80	12.00	14.70

**VC EXPECTED VALUE**  
 $(10.8 \times 0.45) + (12 \times 0.35) + (14.7 \times 0.2) = \text{EV REAL TERMS}$

The variable costs in this forecast are before taking account of variable cost inflation of 4.0% per year.

Vyxyn Co can claim tax-allowable depreciation on a 25% per year reducing balance basis on the full investment cost of \$20m and pays corporation tax of 28% per year one year in arrears.

It is planned to finance the investment project with an issue of 8% loan notes, redeemable in ten years' time. Vyxyn Co has a nominal after-tax weighted average cost of capital of 10%, a real after-tax weighted average cost of capital of 7% and a cost of equity of 11%.

**Required:**

Calculate the expected net present value of the investment project and comment on its financial acceptability and on the risk relating to variable cost. (9 marks)

**comment = fa & risk**

## Self Assessment December 2011

### Q17: Student Session -

### Level - Exam

Warden Co plans to buy a new machine. The cost of the machine, payable immediately, is \$800,000 and the machine has an expected life of five years. Additional investment in working capital of \$90,000 will be required at the start of the first year of operation. At the end of five years, the machine will be sold for scrap, with the scrap value expected to be 5% of the initial purchase cost of the machine. The machine will not be replaced.

Production and sales from the new machine are expected to be 100,000 units per year. Each unit can be sold for \$16 per unit and will incur variable costs of \$11 per unit. Incremental fixed costs arising from the operation of the machine will be \$160,000 per year.

Warden Co has an after-tax cost of capital of 11% which it uses as a discount rate in investment appraisal. The company pays profit tax one year in arrears at an annual rate of 30% per year. Tax allowable depreciation and inflation should be ignored.

#### Required

- (a) Calculate the net present value of investing in the new machine and advise whether the investment is financially acceptable. **(8 marks)**
  - (b) Calculate the internal rate of return of investing in the new machine and advise whether the investment is financially acceptable. **(4 marks)**
  - (c) (i) Explain briefly the meaning of the term 'sensitivity analysis' in the context of investment appraisal. **(2 marks)**
  - (ii) Using the IRR you calculated in part (b), calculate the sensitivity of the investment in the new machine to a change in selling price and to a change in discount rate, and comment on your findings. **(6 marks)**
- (Total = 20 marks)**

HUSSAIN

## Investment Appraisal - Risk & uncertainty

**Q18: HQ Session -**

**Level - Exam**

Copper Co is concerned about the risk associated with a proposed investment and is looking for ways to incorporate risk into its investment appraisal process. The company has heard that probability analysis may be useful in this respect and so the following information relating to the proposed investment has been prepared:

Year 1		Year 2	
Cash flow (\$)	Probability	Cash flow (\$)	Probability
1,000,000	0.1	2,000,000	0.3
2,000,000	0.5	3,000,000	0.6
3,000,000	0.4	5,000,000	0.1

However, the company is not sure how to interpret the results of an investment appraisal based on probability analysis.

The proposed investment will cost \$3.5m, payable in full at the start of the first year of operation. Copper Co uses a discount rate of 12% in investment appraisal.

**Required:**

**(a) Using a joint probability table:**

- (i) Calculate the mean (expected) NPV of the proposed investment; (8 marks)
- (ii) Calculate the probability of the investment having a negative NPV; (1 mark)
- (iii) Calculate the NPV of the most likely outcome; (1 mark)
- (iv) Comment on the financial acceptability of the proposed investment. (2 marks)

**(b) Discuss TWO of the following methods of adjusting for risk and uncertainty in investment appraisal:**

- (i) Simulation;
- (ii) Adjusted payback;
- (iii) Risk-adjusted discount rates. (8 marks)

**(20 marks)**