SHORT TERM DECISION MAKING

Short term decision making

- Identifying relevant costs
- CVP Analysis (Single / Multiple Products)
- Limiting factor analysis (Graphical / Simplex method)
- Make or buy decisions
- Accept or reject decisions
- Outsourcing decision
- Shutdown decisions
- Further processing decision

Relevant cost

- They are **future** costs and revenues – as it is not possible to change what has happened in the past, then relevant costs and revenues must be future costs and revenues.
- They are **incremental** – relevant costs are incremental costs and it is the increase in costs and revenues that occurs as a direct result of a decision taken that is relevant. Common costs can be ignored for the purposes of decision making. In exam questions look out for costs detailed as differential, specific or avoidable.
- They are **cash flows** – in addition, future costs and revenues must be cash flows arising as a direct consequence of the decision taken. Relevant costs do not include items which do not involve cash flows (depreciation and notional costs for example).

Non-relevant cost

- **Sunk** costs are past costs or historical costs which are not directly relevant in decision making. *Ex. development costs or market research costs.*
- **Committed** costs are future costs that cannot be avoided, whatever decision is taken. *Ex. Insurance premium, rent*
- **Non cash** flow costs are costs which do not involve the flow of cash, for example, depreciation and notional costs.

A notional cost is a cost that will not result in an outflow of cash either now or in the future, for example sometimes the head office of an organization may charge a 'notional' rent to its branches. This cost will only appear in the accounts of the organization but will not result in a 'real' cash expenditure.

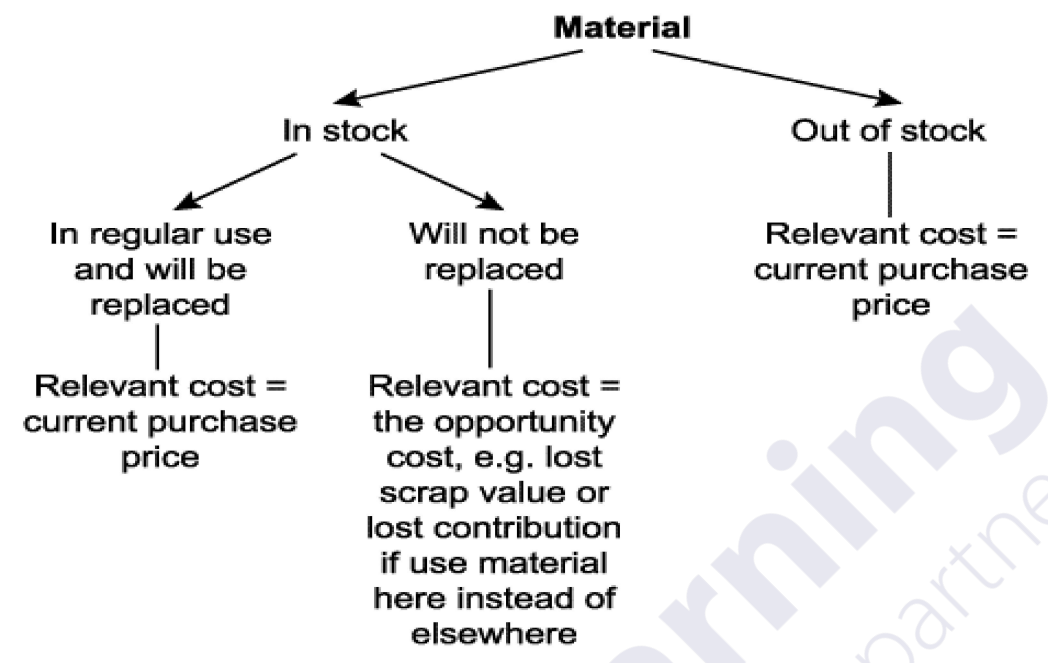
Non-relevant cost cont..

- **General fixed overheads** are usually not relevant to a decision. However, some fixed overheads may be relevant to a decision, for example stepped fixed costs may be relevant if fixed costs increase as a direct result of a decision being taken.
- **Net book values** are not relevant costs because like depreciation, they are determined by accounting conventions rather than by future cash flows.

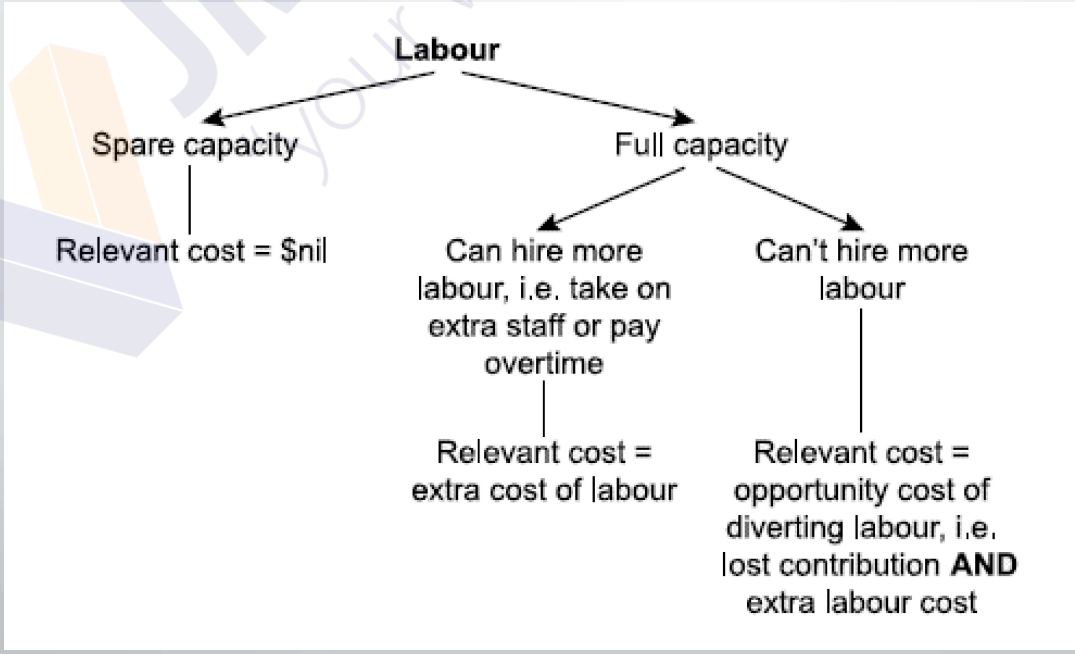
Avoidable cost & Opportunity cost

- **Avoidable costs –** Avoidable cost are costs which would not be incurred if the activity to which they relate did not exist.
- **Opportunity cost** - Opportunity cost is an important concept in decision making. It represents the best alternative that is foregone in taking the decision.
- The opportunity cost emphasizes that decision making is concerned with alternatives and that a cost of taking one decision is the profit or contribution forgone by not taking the next best alternative.

Relevant cost - Material



Relevant cost - Labour



Relevant cost – Plant and machinery

- The relevant costs associated with non-current assets, such as plant and machinery, are determined in a similar way to the relevant costs of materials.
- If plant and machinery is to be replaced at the end of its useful life, then the relevant cost is the current replacement cost.
- If plant and machinery is not to be replaced, then the relevant cost is the higher of the sale proceeds (if sold) and the net cash inflows arising from the use of the asset (if not sold).
- Machine maintenance cost.
- Machinery rental cost.

Relevant cost – Make or Buy Decision

- Make or buy problem involves a decision by an organization about whether it should make a product or whether it should pay another organization to do so. Here are some examples of make or buy decisions:
- The relevant cost would be:
  - Variable cost of production
  - Additional fixed cost
  - Opportunity cost

Cost Volume Profit (CVP) Analysis

Cost, Volume and Profit Analysis

- When considering output decisions (e.g. how many units to make and sell) in the short term, then decision making often focuses on contribution. Key decisions relate to the following:
- How many units do we need to sell to break even?
- What safety margin do we expect?
- How many units need to be sold to achieve a target profit?

CVP Analysis – Single Product

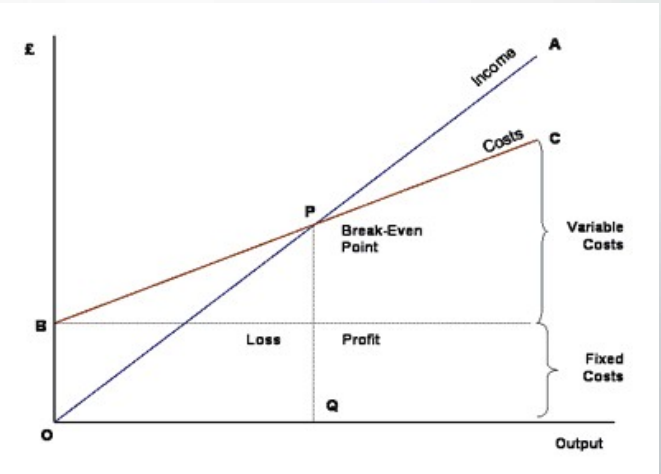
BEP Units	=	$\frac{\text{Fixed Cost}}{\text{Contribution per Unit}}$	BEP Sales	=	$\frac{\text{Fixed Cost}}{\text{C/S Ratio}}$
Target Profit Units	=	$\frac{\text{Required profit + Fixed Cost}}{\text{Contribution per Unit}}$	Sales to earn required profit	=	$\frac{\text{Required Profit + Fixed Cost}}{\text{C/S Ratio}}$
C/S Ratio	=	$\frac{\text{Contribution}}{\text{Sales}}$	Safety margin Units	=	Actual Units – BEP units

Traditional break even chart

Description

- The breakeven point is the intersection of the sales line and the total costs line.
- The **sales line**
- The **fixed costs line**
- The **total costs line**

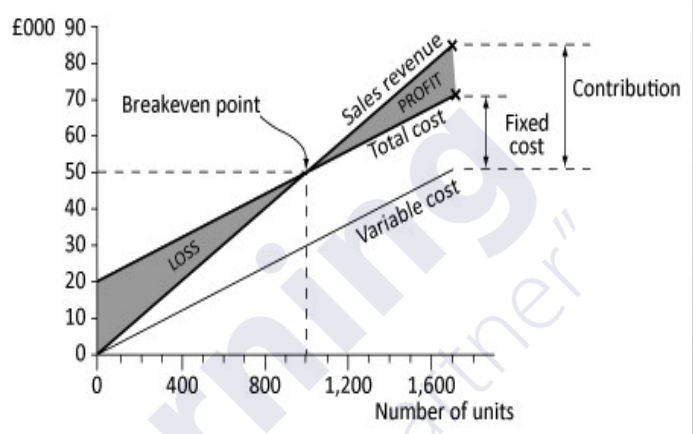
Chart



Contribution break even chart

Description

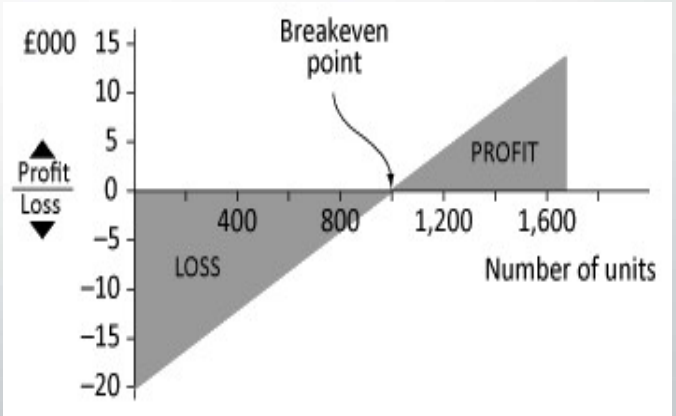
- The main problem with the traditional breakeven chart is that it is not possible to read contribution directly from the chart.
- The contribution breakeven chart remedies this by drawing the variable cost line instead of the fixed cost line.



Profit Volume Chart / Profit chart

Description

- A **profit-volume** (PV) **chart** is a graphic that shows the earnings (or losses) of a company in relation to its **volume** of sales. Companies can use **profit-volume** (PV) **charts** to establish sales goals, analyze whether new products are likely to be **profitable**, or estimate breakeven points.



CVP Analysis – Multiple Product

$$\text{BEP Sales} = \frac{\text{Fixed Cost}}{\text{Cumulative C/S Ratio}}$$

$$\text{Cum. C/S Ratio} = \frac{\text{Cumulative Contribution}}{\text{Cumulative Sales}}$$

Product	BEP Sales	BEP Units
A	BEP Sales* Product A sales /Cum. Sales on sales ratio	Product A BEP sales / Product A selling price
B	BEP Sales* Product B sales /Cum. Sales on sales ratio	Product B BEP sales / Product B selling price

Profit Volume Chart - Multiple Products

- This graph is used when there are more than one product. Steps preparing a multi-product profit volume chart are as follows;
- Compute the profit volume ratio of each product.
- Rank each product in order of profit volume ratio.
- Compute the cumulative sales value and the cumulative profit.

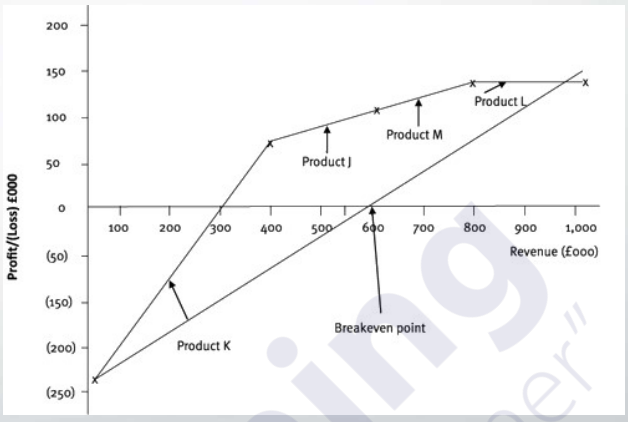
Sales Mix	Cum. Sales Rs.	Cum. Contribution Rs.	Fixed Cost Rs.	Profit Rs.
-	-	-	(20,000)	(20,000)
A	100,000	50,000	(20,000)	30,000
A,B	250,000	90,000	(20,000)	70,000

- Obtain the profit path and profit line.

Profit Volume Chart - Multiple Products

Assumption

- we have to assume that whenever x units of product A are sold, y units of product B and z units of product C are also sold.
- Such an assumption allows us to calculate a weighted average contribution per mix, the weighting being on the basis of the quantities of each product in the constant mix.



Limitation of BEP

- It can only apply to a single product or a single mix of a group of products.
- A breakeven chart may be time consuming to prepare.
- It assumes fixed costs are constant at all levels of output.
- It assumes that variable costs are the same per unit at all levels of output.
- It assumes that sales prices are constant at all levels of output.
- It assumes production and sales are the same (inventory levels are ignored).
- It ignores the uncertainty in the estimates of fixed costs and variable cost per unit.

Limiting factor analysis

- A key factor is anything which restricts the activity of an entity. An entity seeks to optimize the benefit it obtains from the key factor.

Examples:

- Market demand
- Machinery capacity
- Raw material importation barriers
- Skilled labour hours
- Energy limitation

Assumption of limiting / key factory analysis

- Fixed cost remains unchanged.
- Unit variable cost is constant.
- Resources composition for production of units are known with certainty.
- Estimates of sales demand is in known with certainty.
- Units of output are divisible.

Single limiting factor decision making

When there is a single limiting factor, the approach to determine the optimal production plan is as follows;

- Identify the key factor
- Compute the unit contribution for each product
- Compute required limiting factor for each product
- Compute the unit contribution per key factor
- Rank the products according to the contribution to the key factor

Multiple limiting factors with two products

- Where there is a more than one resource constrain, it is no longer possible to use the simple technique of ranking the products according to their contribution per limiting factor in order to determine the profit maximizing allocation of resources.
- In this case, the technique of linear programming should be used. There are two linear programming techniques.

  Graphical method

  Simplex method

Multiple limiting factors with two products

This method is used for the problems involving two products and more than one resource constraint.

- Following steps should be followed in graphical method solution.
- Define the decision variable
- Establish the objective function
- Establish the constraints
- Graph the problem
- Define the feasible region
- Determine the optimal solution (Corner point method / ISO profit line method)

Multiple limiting factors with more than two products

- The **simplex method is a method of solving linear programming problems with** two or more decision variables.
- The solution can be found following the similar steps under the graphical approach up to the point of drawing the initial tableau.
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Simplex Method

- In any feasible solution, if a problem involves n constraints and m variables (decision plus slack), n variables will have a positive value and (m – n) variables will have a value of zero.
- Feasible solutions to a problem are shown in a **tableau.**
- ***If the shadow prices on the bottom (solution) row of a tableau are all positive, the tableau shows the optimal solution.***
- The solution column shows the optimal production levels and the units of unused resource.
- The figure at the bottom of the solution column/right-hand side of the solution row shows the value of the objective function.

Simplex Method – Slacks

- Slack is the amount by which a resource is under-utilized. It will occur when the optimum point does not fall on a given resource line.
- is the amount by which a resource is under-utilized. It will occur when the optimum point does not fall on a given resource line. Slack is important because unused resources can be put to another use, e.g. hired out to another manufacturer.

Simplex Method – Shadow Prices

- The shadow price of a resource can be found by calculating the increase in value (usually extra contribution) which would be created by having available one additional unit of a limiting resource at its original cost.
- It therefore represents the ***maximum premium*** that the firm should be ***willing to pay*** for one extra unit of each constraint. This aspect is discussed in more detail below.
- Non-critical constraints will have zero shadow prices as slack exists already.

Calculating shadow prices

- **Step 1:** Take the equations of the straight lines that intersect at the optimal point. Add one unit to the constraint concerned, while leaving the other critical constraint unchanged.
- **Step 2:** Use simultaneous equations to derive a new optimal solution
- **Step 3:** Calculate the revised optimal Contribution. The increase is the shadow price for the constraint under consideration.

Simplex initial tableaux

Variables in solutions	X	Y	S1	S2	S3	Qty Solution
A. Matrial	5	2	1	-	-	**3,000**
B. Labour	1	3	-	1	-	**1,750**
C. Machine time	3	2	-	-	1	**2,100**
Contribution Solution	**20**	**16**	**-**	**-**	**-**	**-**

Simplex initial tableaux

A. The figures in each row correspond with the coefficients of the variables in each of the initial constraints. The bottom row or solution row holds the coefficients of the objective function.

B. The variables in the solution are S1, S2 and S3 (the unused resources). The value of each variable is shown in the solution column. We are testing a solution that all decision variables have a zero value, so there is no production and hence no resources are used. The total resource available is therefore unused.

C. The contribution per unit obtainable from x and y is given in the solution row. These are the dual prices or shadow prices of the products X and Y. A minus shadow price indicates that the value of the objective function can be increased by the amount of the shadow price per unit. Positive shadow price indicates the amount by which the value of the objective function would be decreased per unit of the variable introduced into the solution

Simplex final tableaux

Variables in solutions	X	Y	S1	S2	S3	Qty Solution
X	1	-	-	(0.2857)	0.4286	400
S1	-	-	1	0.5714	(1.8571)	100
Y	-	1	-	0.4286	(0.1459)	450
Contribution Solution	**-**	**-**	**-**	**(1.1428)**	**(6.2858)**	**(15,200)**

Simplex final tableaux

- The solution in this tableau is the optimal one, because the shadow prices on the bottom row are all negative.
- The optimal solution is to make and sell 400 units of X and 450 units of Y, to earn a contribution of Rs. 15,200,000.
- The solution will leave 100 units of material unused, but will use up all available labour and machine time.
- The shadow price of labour time (S2) is Rs. 1,142.8 per hour, which indicates the amount by which contribution could be increased if more labour time could be made available at its normal variable cost.
- The shadow price of machine time (S3) is Rs. 6,285.8 per hour, which indicates the amount by which contribution could be increased if more machine time could be made available, at its normal variable cost.
- The shadow price of materials is nil, because there are 100 units of unused materials in the solution.

Make or Buy Decision – Non-financial consideration

- Will the company have spare capacity if a product is outsourced. How should that spare capacity be profitably used? Are there hidden benefits to be obtained from subcontracting? Would the company's workforce resent the loss of work to an outside subcontractor, and might such a decision cause an industrial dispute?
- Will a subcontractor be reliable with delivery times, and would he or she supply work to the same quality as internal staff?
- Does the company wish to be flexible and maintain better control over operations by making everything itself?
- Are the estimates of fixed cost savings reliable?

Relevant cost – Accept or Reject Decision

- In general terms, a contract will probably be accepted if it increases contribution and profit, and rejected if it reduces profit.
- If an organization does not have sufficient spare capacity, existing business should only be turned away if the contribution from the contract is greater than the contribution from the business which must be sacrificed.
- The relevant cost would be:
  - Variable cost of production
  - Additional fixed cost
  - Opportunity cost

Relevant cost – Outsourcing Decision

- Outsourcing is the use of external suppliers for finished products, components or services. This is also known as contract manufacturing or subcontracting.
- There are also non-financial considerations to bear in mind when deciding whether to use external services. Ex. Security, IT, Cleaning, and etc..
- The costs relevant to such decisions are little different to those that are taken into account in a 'conventional' make or buy situation: they will be the differential costs between performing the service internally or using an external provider.

Outsourcing Decision - Performance

- Once a decision has been made to outsource, it is essential that the performance of the outsourcer is monitored and measured.
- Measures could include cost savings, service improvement and employee satisfaction. It is important to have realistic goals and expectations and to have objective ways to measure success.

Relevant cost – Shutdown Decision

- Shutdown/discontinuance problems can be assessed using relevant costing principles.
- (a) Whether or not to close down a product line, department or other activity, either because it is making losses or because it is too expensive to run.
- (b) If the decision is to shut down, whether the closure should be permanent or temporary.

Shutdown decision – Qualitative factors

- What impact will a shutdown decision have on employee morale?
- What signal will the decision give to competitors? How will they react?
- How will customers react? Will they lose confidence in the company's products?
- How will suppliers be affected? If one supplier suffers disproportionately there may be a loss of goodwill and damage to future relations.

Relevant cost – Further processing decision

- Joint products are two or more products separated in a process, each of which has a significant value compared to the other. A by-product is an incidental product from a process, and has an insignificant value compared to the main product.
- The point at which joint products and by-products become separately identifiable is known as the split-off point or separation point. Costs incurred up to this point are called common costs or joint costs.
- The main methods of apportioning joint costs, each of which can produce significantly different results, are as follows.

  Physical measurement

  Relative sales value apportionment method; sales value at split-off point

Relevant cost – Further processing decision

- Further processing will take place if incremental revenues exceed further processing costs.
- If a product has been produced in a process it is sometimes possible to make a choice as to whether to sell it without further processing or to process it further. As with other short-term decisions, a decision whether to further process a product should be based on the impact on contribution:
- If contribution increases by further processing a product goes ahead.