



Entrepreneurship Essentials

Manoj Kumar Mondal

Rejendra Mishra School of Engineering Entrepreneurship, IIT Kharagpur

**Topic: Cost, Volume, Profit Analysis –
Break-Even Point Analysis**

Lecture Note # 20



Relation between cost and volume of sales with profit



Break-Even-Point (BEP) analysis.



Advantages and limitations of BEP.



Margin of safety.



Operating and financial leverage.



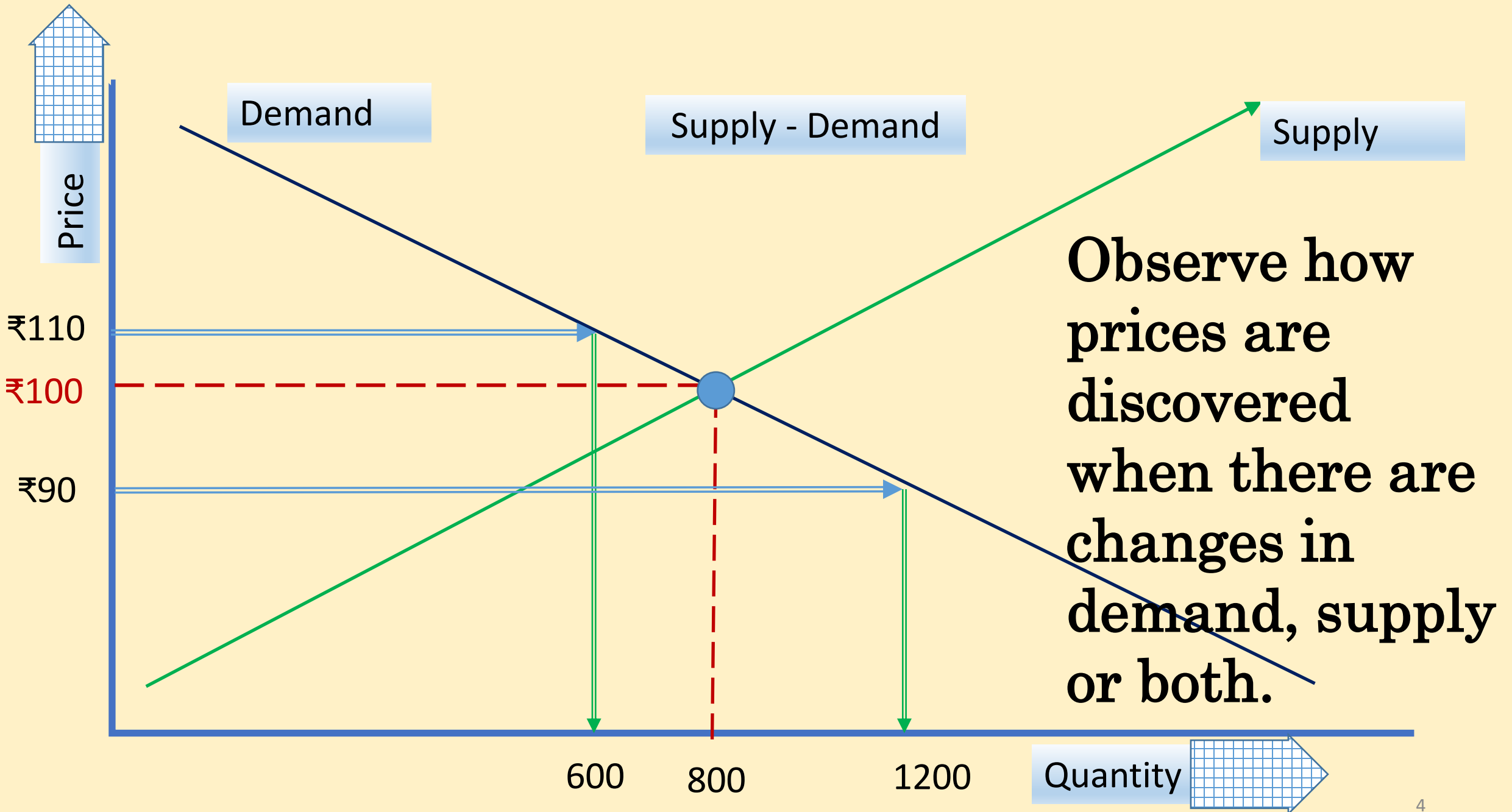
Cost-indifference point.

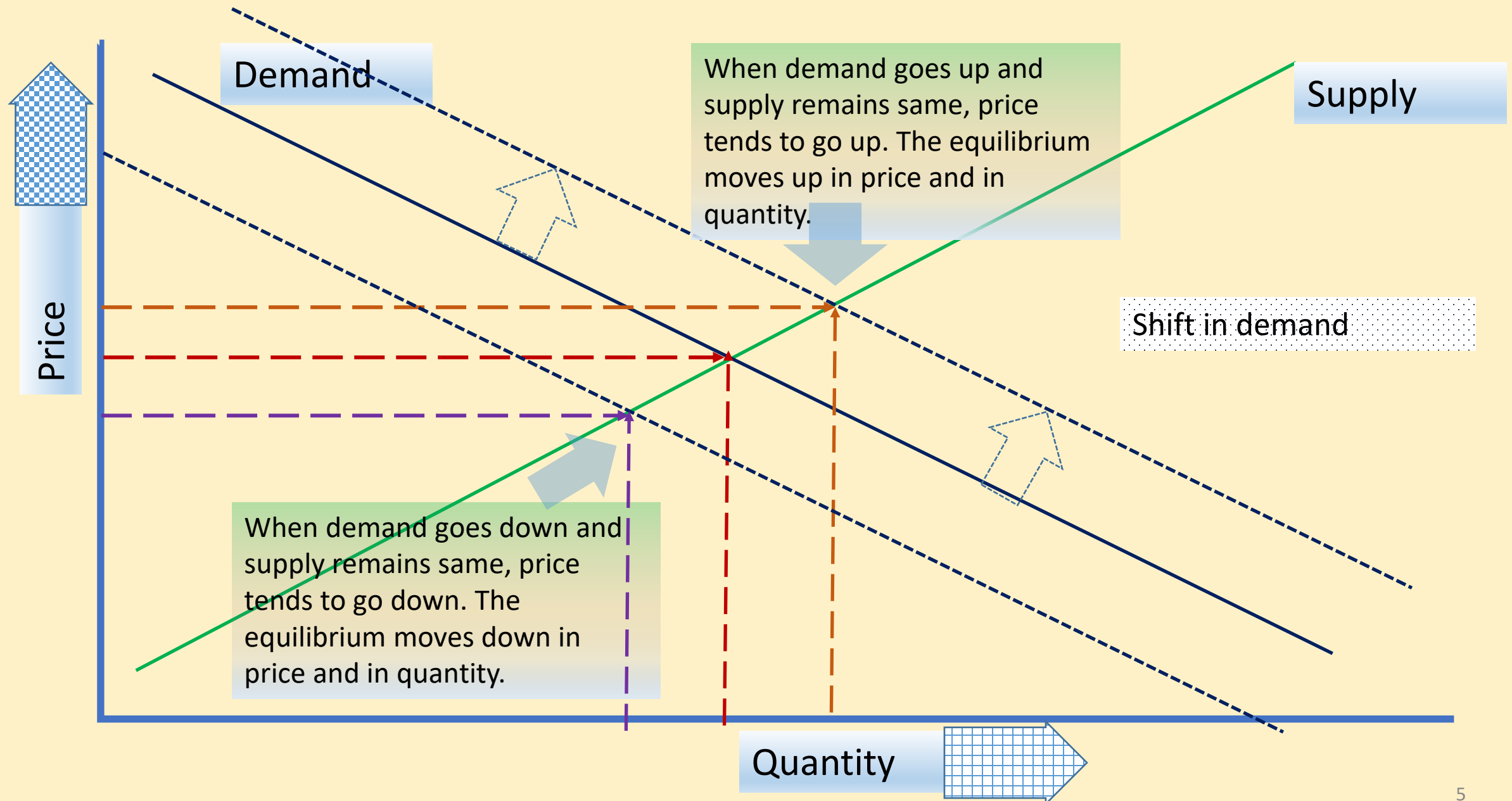
Classification of some regular cost items

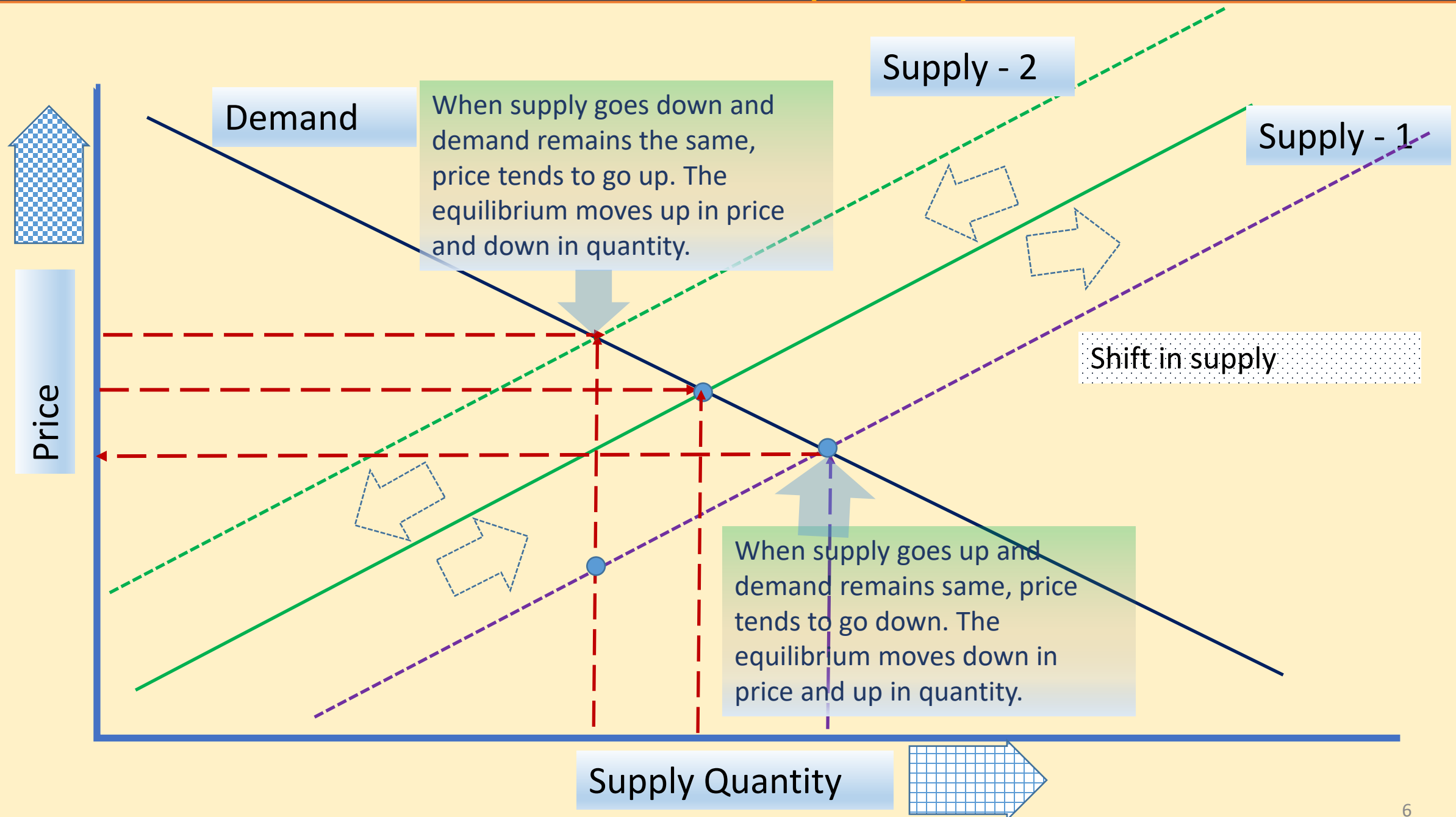
Depreciation	Fixed
Insurance	Fixed
Interest on Long-Term Loan	Fixed
Audit Fee, Trade license, Fire safety	Fixed
RoC Registration Fee	Fixed
Rent	Fixed
Salaries	Fixed
Raw-materials, consumable, Wages	Variable
Electricity Bill Payment	Variable
Fuel Cost	Variable
Transportation cost	Variable
Stationery	Variable
Annual renewal of export license	Fixed

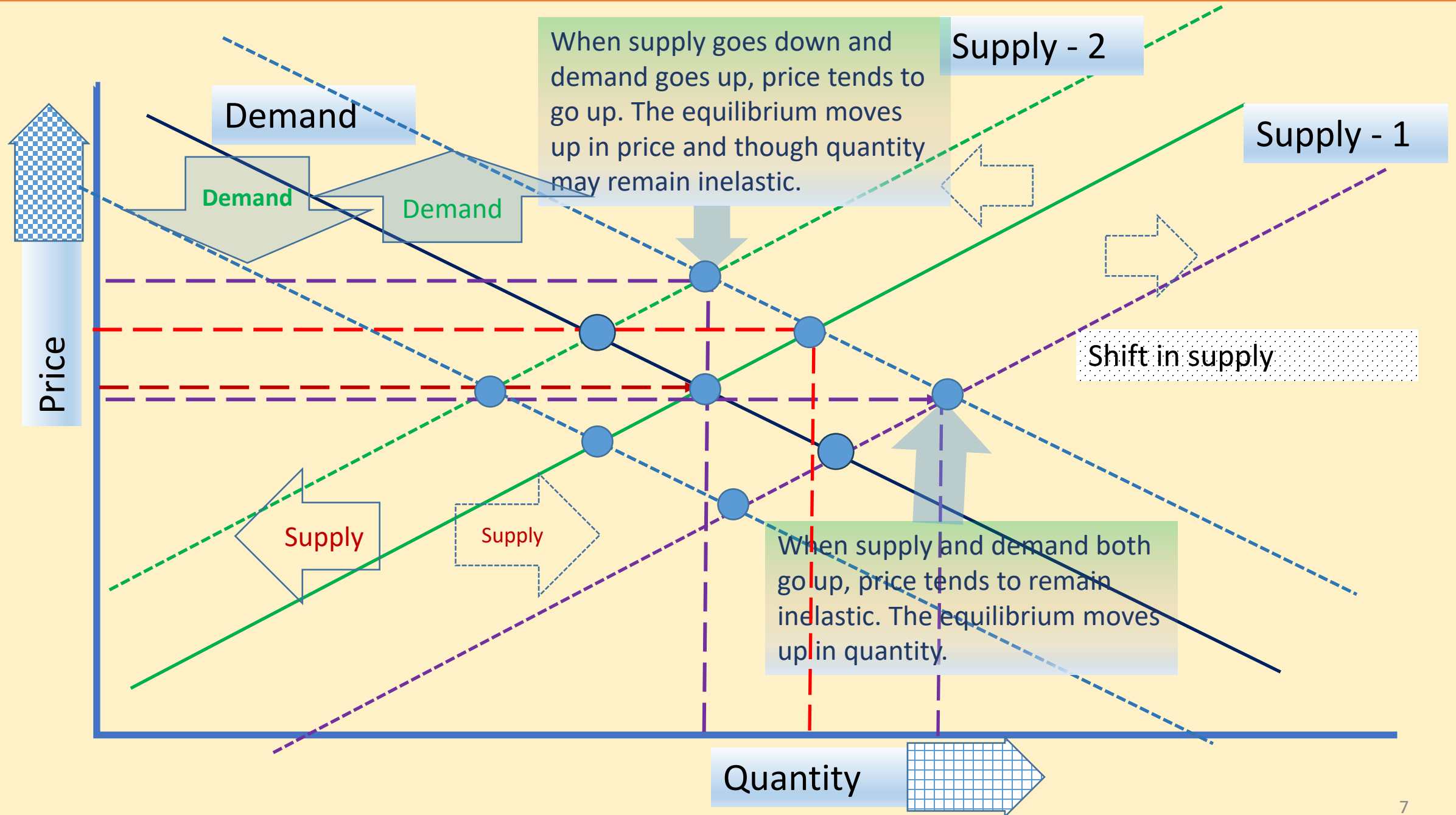
Printing	Variable
Internet and data plan	Fixed
Income tax	Not a cost
Web-hosting cost	Fixed
Cost of security	Fixed
Production bonus	Variable
Traveling expenses	Variable
Dividend	Not a cost
Telephone bill payment	Variable
Sales promotion	Variable
Amortization	Fixed
Wages	Variable
Maintenance	Variable

Insurance and maintenance are semi-variable cost









Break Even Point

- Selecting a business model out of multiple choices or analyzing the suitability of a particular business model based on market size.
 - How much minimum sales to be made to reach profitable operation?
- To estimate profitability at different scales of operation
- Scenario analysis or sensitivity analysis with respect to change in selling price or cost structure – how it impacts bottom-line (marginal cost & marginal revenue).
- Comparing two different technologies based on their cost structure or substituting one over another.
- Assessing the comfort under market distress
- Estimate how low value you can quote for a project

Relation Between Cost, Volume and Profit

Profit = Sales minus all the expenses

Price of a product is fixed.

But cost of single unit of product varies as production increases.

And it may be difficult, if not impossible, to sell beyond certain quantity.

Therefore, you need to find which business can potentially give profit at lower sales.

**But what if another business is profitable only at higher sales,
but the profitability is much higher.**

Cost and Cost Drivers

- Cost drivers are the factors or inputs which cause change in the cost of an activity. The cost of an activity may be driven by more than one cost drivers.
 - In the context of a restaurant, suppose the selling price of a particular item is to be determined based on its cost of production:
 - For every plate of this item, a list of ingredients will add to the total cost. Say for 'mixed veg' cost of vegetables, spices, cooking energy etc. directly add to the cost of the item. Each such item is a cost driver.
- Say, you want to manufacture a plastic bucket: you need plastic granules, electricity to heat and melt the granules, machine hours to mould, labor, rent of the premises, depreciation of the machine etc. If requirement or cost of any of these items increases, the cost of the bucket will rise and vice versa.
- When an item or service is procured and used up immediately, the cost is easy to allocate. But when it is used for a long period (and is used by multiple product processes), the cost is difficult to allocate.

Cost Classification

Two ways of classifying costs

Product specific: Costing

- **Direct cost** – directly **traceable** on each product such as raw-materials, direct labor costs.
- **Indirect cost** – difficult to estimate exact cost on each product.

This method of classification is used in the process of costing of an activity for manufacturing a product or rendering a service.

Company specific: BEP

- **Fixed cost** – Cost that is not related to activity level - a company has to bear it even if there is no activity.
- **Variable cost** – proportional to level of operation.

This method of classification is used in estimating break-even point.

Cost Drivers

A factor, change of which, causes a change in the cost of an activity.

An activity can have more than one cost drivers attached to it. For example, change in cost of fabric, wages to tailor, cost of button, machine hour, electricity, thread, interest rate and rent of space are cost drivers for a shirt.



Fixed and Variable Costs

- Fixed costs are defined as expenses that do not change as a function of the activity of a business, within the relevant period. For example, a manufacturer must pay rent of factory premises, utility bills, depreciation, salary to administrative staff, interest on term loans (long-term loans), etc. irrespective of the level of activities and sales.
- Interestingly, fixed cost on per unit basis decreases as production increases and
- Variable cost remains constant on per unit basis

Why separating cost into fixed & variable?

- Several costs do not change regardless of level of production. This means that these costs will be incurred no matter what.
- Therefore, sum of all such costs must be recovered before an organization can begin to make profit.



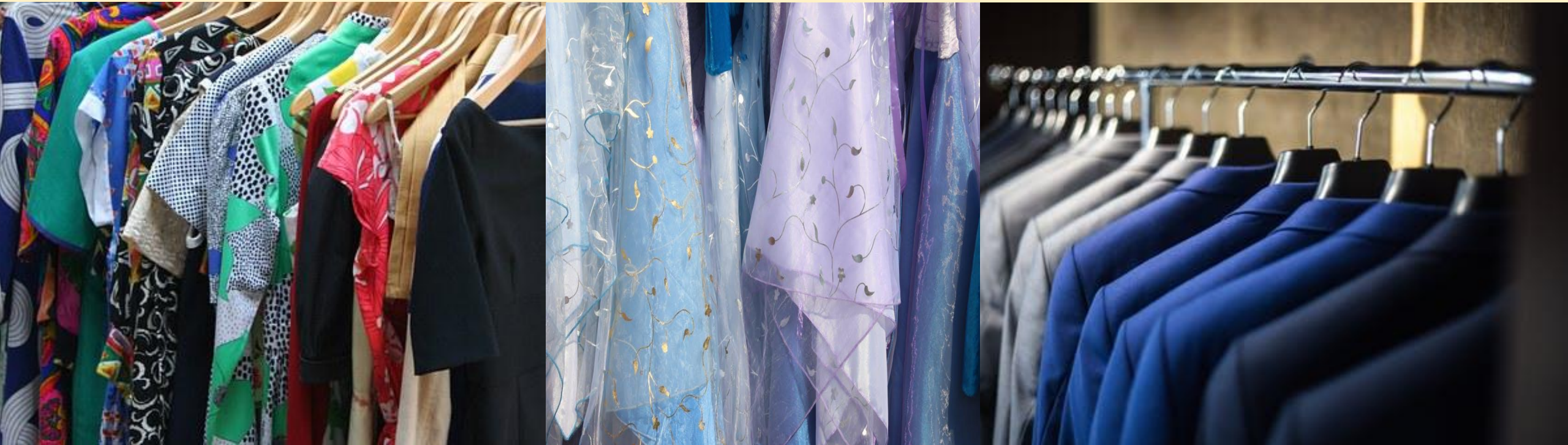
Fixed cost

The diagram illustrates the relationship between fixed costs and sales. A horizontal bar with a blue diagonal hatching pattern represents fixed costs, which remain constant regardless of the level of production. A blue speech bubble points to this bar with the label 'Fixed cost'. Below the bar, a grey arrow pointing to the right represents sales (number of units). The arrow is labeled 'Sales (number of units)'.

Sales (number of units)

- Knowing the total fixed cost helps to know the minimum level of sales at which all the expenses can be met and there will be no profit & no loss.

Suppose you intend to set up a readymade garment business. Let us see the cost structure



Rent

**Fixed Cost.
Indirect Cost.**





Machinery

Machinery: Money spent on machinery must be recovered in the form of annual **depreciation**.

Fixed Cost.

Fixed Costs [for a full year]

- Rent: ₹ 120,000
- Depreciation: ₹ 15,000
- Administrative overhead: ₹ 5,00,000
- **Total fixed cost for a year: ₹ 6,35,000**

- Fixed costs are mostly those which are paid periodically such as rent, depreciation, salary, etc.
- However, costs such as electricity bills, telephone bill, and other utilities, though paid periodically, are not fixed in nature.

Variable Cost

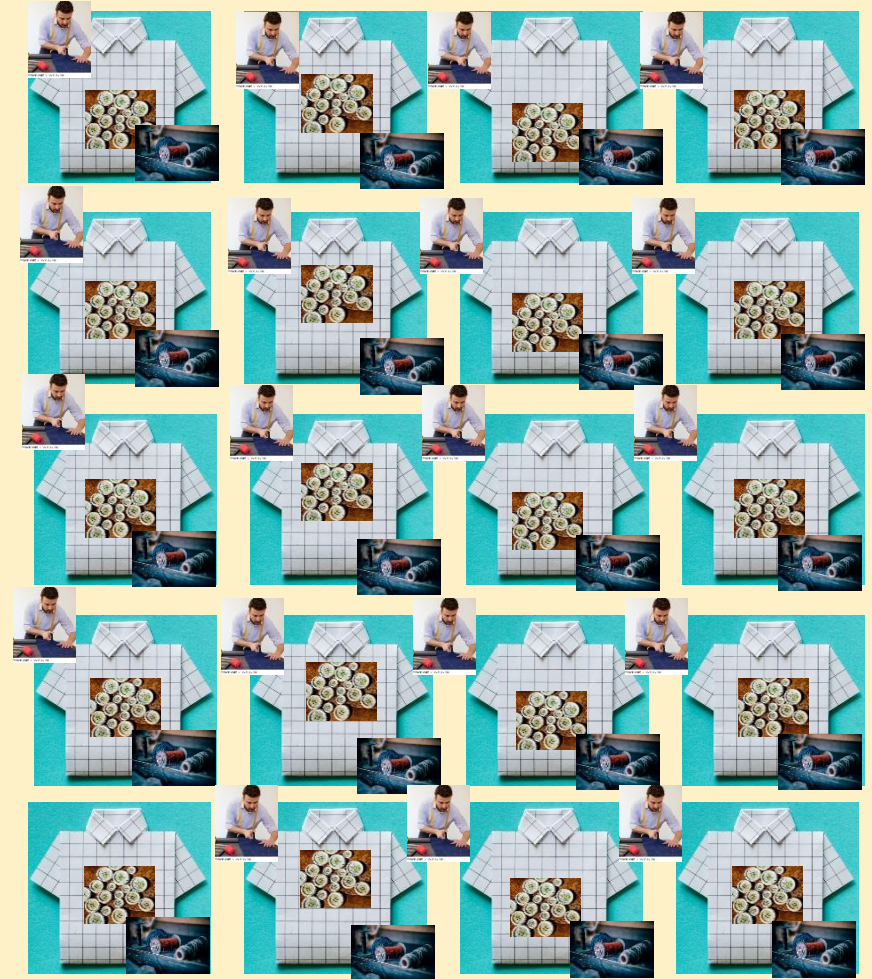


Materials

Materials & Labor cost



2 Shirts



Total variable cost = ₹530 per unit.

Variable cost for n number of units: $n \times ₹530$

₹1060 for 2 Shirts

$₹530 \times 20 = ₹10,600$ for 20 Shirts

Salaries paid to regular employees are Fixed Costs because these employees are permanent workers and must be paid every month.

Wages paid to contractual workers – Variable Cost



Variable Cost: Electricity



Maintenance: Usually variable. But may have both fixed and variable components. We shall consider it as variable



Suppose, you have both (i) schedule, routine or preventive maintenance and (ii) need-based or trouble-shooting maintenance. The first part is fixed cost and the second part is variable cost since the later will be related to level of operation.

Insurance can have both fixed & variable components. We shall consider it as **FIXED** for examination purpose



Insurance for fixed assets, if made exclusively, is fixed cost.

Insurance for inventory of raw-materials & finished goods is variable cost.

How to separate?

The percentage of the fixed component of insurance cost is determined based on historical ratio or based on assets' values.



- ❑ Interest cost for **long-term loan** (raised from bank to create **fixed assets**) is **fixed cost**.
- ❑ Interest cost on **working capital or short-term** loan (raised from bank to meet requirement of working capital) is **variable cost**.

Consumables are Variable Cost and Direct Cost



Variable Cost

Packaging and
Delivery



Transportation:
Variable Cost

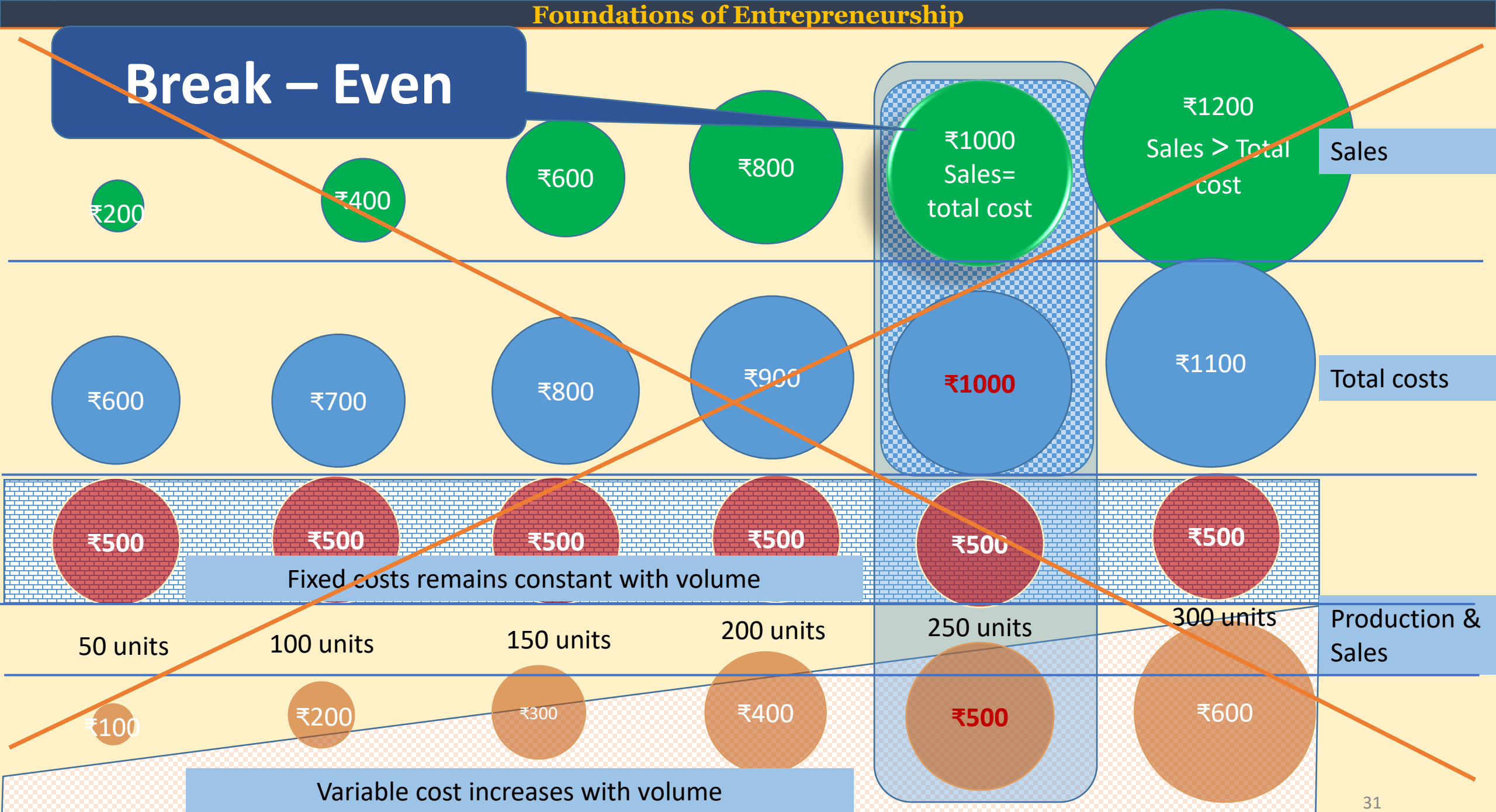
Variable Cost Per Unit of Shirt

- Direct material cost: ₹ 530 per unit
- Consumables: ₹ 15 per unit
- Packaging: ₹ 10 per unit
- Transportation, delivery and other miscellaneous: ₹ 20 per unit
- Total variable cost per unit: ₹ 575

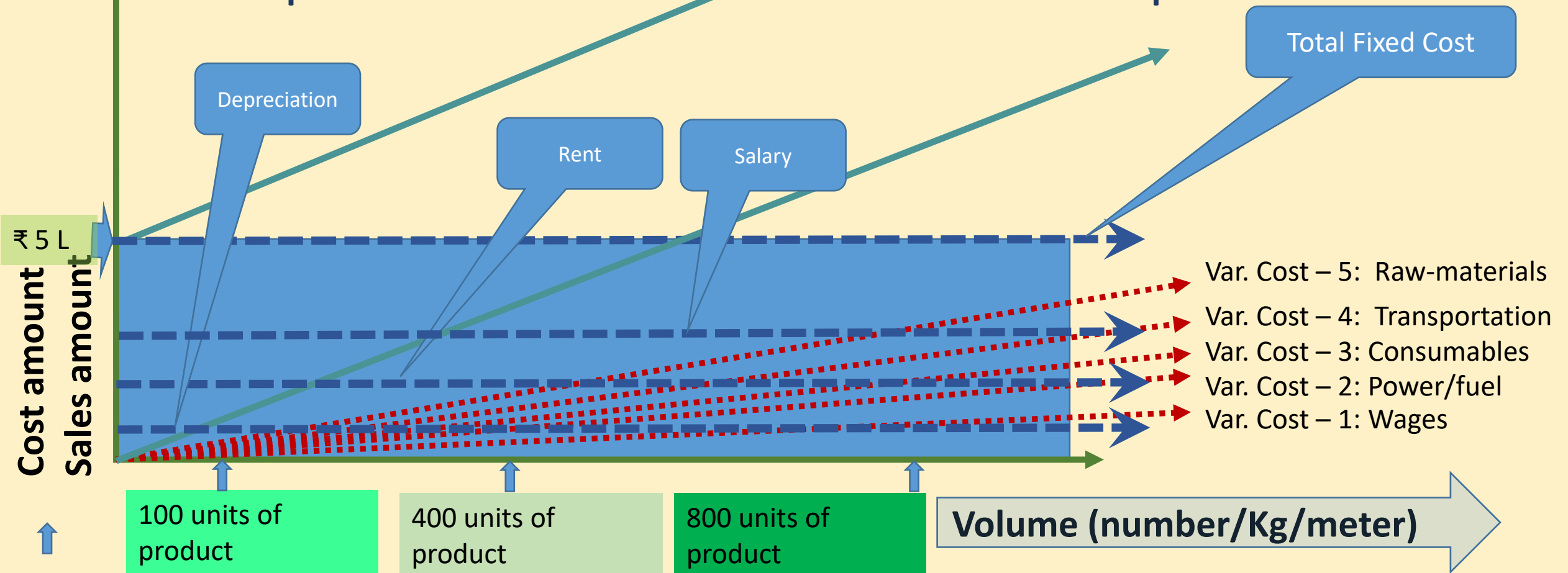
Variable Cost

- Any cost that is proportional to the level of activities is variable cost.
- Raw-materials, power, labor cost, consumables etc. are variable cost.

Break – Even



- Group all the costs into **FIXED** and **VARIABLE** categories
 - Fixed: Costs that do not change with volume of production – add them up for the **relevant period**.
 - Variable: Costs that change in proportion to volume – add them up and divide by the number of products to estimate the variable cost of one unit of product.



Using Formula: Estimating Break Even Point (BEP)

Profit P = Sales minus all the Costs

Costs: Fixed (F : total per period) and Total Variable (v : per unit v.c.)

Assume, Selling Price = S ; Quantity Sold = Q ; Profit = P

**Targeted
Profit**

Sales = $Q * S$; Total variable cost = $Q * V$; Total Cost = $Q * V + F$

$$P = Q * S - Q * v - F \quad \text{Or}$$

$$Q = \frac{(F + P)}{(S - v)}$$

Quantity to be Produced and Sold to Break Even

$$Q^* = \frac{(F + [P = 0])}{(S - v)}$$

$$Q^* = \frac{\text{Fixed Cost}}{\text{Contribution Margin}}$$

$$Q^* = \frac{F}{(S - v)}$$

$$Q^* = \frac{F}{(s - v)}$$

Unit selling price(S) – Unit variable cost(V) = Unit Contribution

Total sales – Total variable cost = Contribution (total contribution)

Contribution Margin

- Selling price per unit shirt: ₹ 800
- Variable cost per unit shirt: ₹ 575
- **Contribution margin (per unit)** = Selling price – unit variable cost
= ₹ 800 – ₹ 575 = ₹ 225

If you are manufacturing 'n' number of shirts, the contribution = ₹ $n \times 225$

Remember, you have to recover the fixed cost out of the contribution.

Example

- Selling price per unit: ₹ 800
- Variable cost per unit: ₹ 575
- Fixed cost: ₹ 6,35,000
- You plan to produce and sell: 5,000 units

$$Q^* = \frac{F}{(s - v)}$$

- BEP quantity, $Q^* = \frac{6,35,000}{(800 - 575)} = 2,822.22 = 2,823$
- Which means that you have to produce and sell **more than 2,822** number of shirts or 2,823 shirts to break even.

Contribution and Contribution Margin

- Selling Price of one unit of product (say one number or one kg) = S
- Variable cost **PER UNIT** (including materials, wages, electricity, transportation, fuel, maintenance, advertisement, etc.) = v
- Contribution per unit = $S - v$
- Contribution is equal to the price per unit minus the variable cost per unit.
- **CONTRIBUTION MARGIN (ratio)** =
$$\frac{\text{Unit selling price} - \text{Unit variable cost}}{\text{Unit selling price}}$$

CONTRIBUTION from unit product
 = Selling Price – Unit Variable Cost

Total Contribution = Total Sales – Total Variable Cost

Contribution margin (%) =

$$\frac{\text{Unit selling price} - \text{Unit variable cost}}{\text{Unit selling price}} * 100$$

Example

- Selling price: ₹ 800
- Variable cost per unit: ₹ 575
- Fixed cost: ₹ 6,35,000
- You plan to produce and sell: 5,000 units
- BEP quantity, $Q^* = \frac{6,35,000}{(800-575)} = 2,822.22$
- Which means that you have to produce and sell more than 2,822 number of shirts **or 2,823 shirts** to break even.
- The total cost = $2822.22 \times 575 + 6,35,000 = 22,58,225$
- Total sales = $2822.22 \times 800 = 22,58,22$

Contribution margin: 225

Numb of unit sold: 3823

BEP: 2823

Profit: $1,000 \times 225 = 2,25,000$

One can use BEP to decide on the minimum possible price of products to compete on price while remaining within the BEP.

Price

Volume

Competition

Cost accommodation

Profit plan

You Recover the Cost of Fixed Assets in the Form of Depreciation

- **Money spent on machinery has to be recovered in the form of depreciation.**
- **Any recovery of expense is done only through the mechanism of costing of your products or services – you add all the expenses to estimate total cost of a product and then set the price of the product accordingly.**
- **As customers pay you money, your cost is recovered.**
- **Money spent to acquire fixed assets such as machinery is charged in the cost in the form of Depreciation.**

Another Simple Example where 'REPAIR AND MAINTENANCE' is treated as semi-variable with a fixed component and a variable component.

The following are the fixed and variable costs of a company during a particular year. The unit price of the item is Rs 30. Estimate the BEP production. Note that repair and maintenance cost is a semi-variable cost. So part of it has been considered as fixed cost and part as variable cost.

	Fixed Cost (Rs/year)	Variable Cost (Rs/unit)
Depreciation	20,000	
Insurance	5,000	
Repair & Maintenance	5,000	0.50
Material		9.50
Labour and Power		10.00
Total	30,000	20.00

- Find the quantity to be produced to breakeven.
- If the production plan is 2,000 units annually, what is the profit/loss?

Solution:

Given

$F = ₹ 30,000$ per year, $V = ₹ 20$ per unit, $S = ₹ 30$ per unit

The breakeven production quantity is given by

$$Q^* = \frac{F}{S - v} = \frac{30,000}{30 - 20} = 3,000 \quad \text{units/year}$$

The production plan during the year is $Q_p = 2,000$ units/year.

Total revenue during the year = $(2,000)(30) = ₹ 60,000$

Total cost during the year = $30,000 + (2,000)(20) = ₹ 70,000$.

Cost is more than sales.

Therefore, loss for the year = $(-) ₹ 10,000$

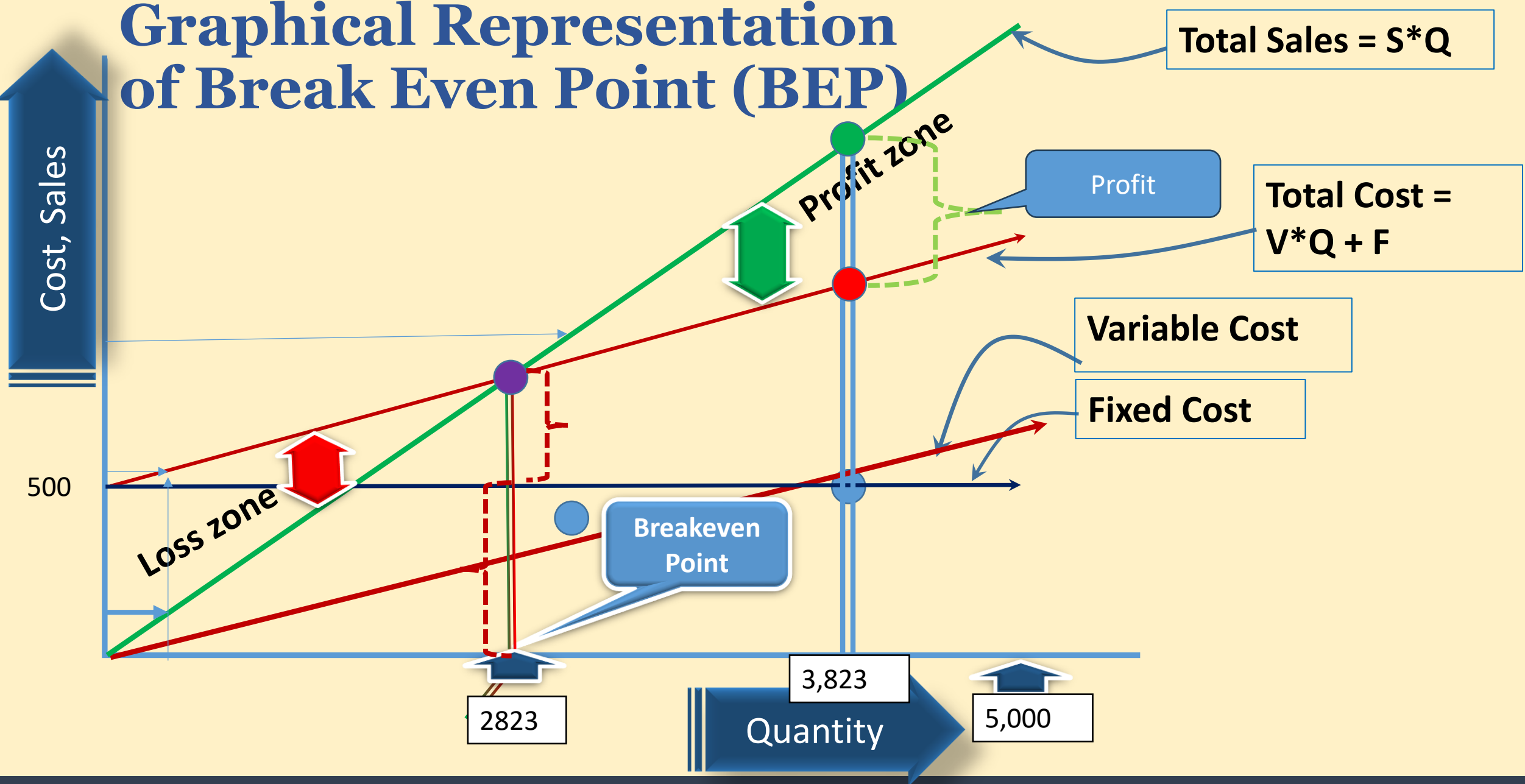
How many units need to be produced to make profit of ₹ 10,000

**BREAK-EVEN ANALYSIS
TELLS US THAT YOU
RECOVER ALL FIXED
COSTS OUT OF
CONTRIBUTION. ONCE
ALL THE FIXED COST IS
RECOVERED, EACH
UNIT OF ADDITIONAL
SALE RESULTS IN
PROFIT EQUIVALENT
TO UNIT
CONTRIBUTION**

Solution of Second Part

- To make profit of ₹10,000, your sales should exceed aggregate of fixed cost and the variable cost by ₹10,000.
- Therefore: $Q \times v + F + 10,000 = Q \times S$
- Or $20 \times Q + 30,000 + 10,000 = Q \times 30$
- Or $10 \times Q = 40,000$
- Or $Q = 4,000$, You have to produce and sell 4,000 units to make a profit of ₹ 10,000.
- Alternately: contribution margin is ₹10. BEP is 3,000 units. You have to produce $10,000/10 = 1,000$ extra units after BEP, which is = 4,000 units.

Graphical Representation of Break Even Point (BEP)



Margin of Safety

- **Margin of safety is the number/amount by which the planned sales exceed the break-even point.**
- **It indicates the number/amount by which the sales of a company may decrease without causing loss.**
- **Putting it differently, it signifies how sensitive is your present operation to the market fluctuation.**

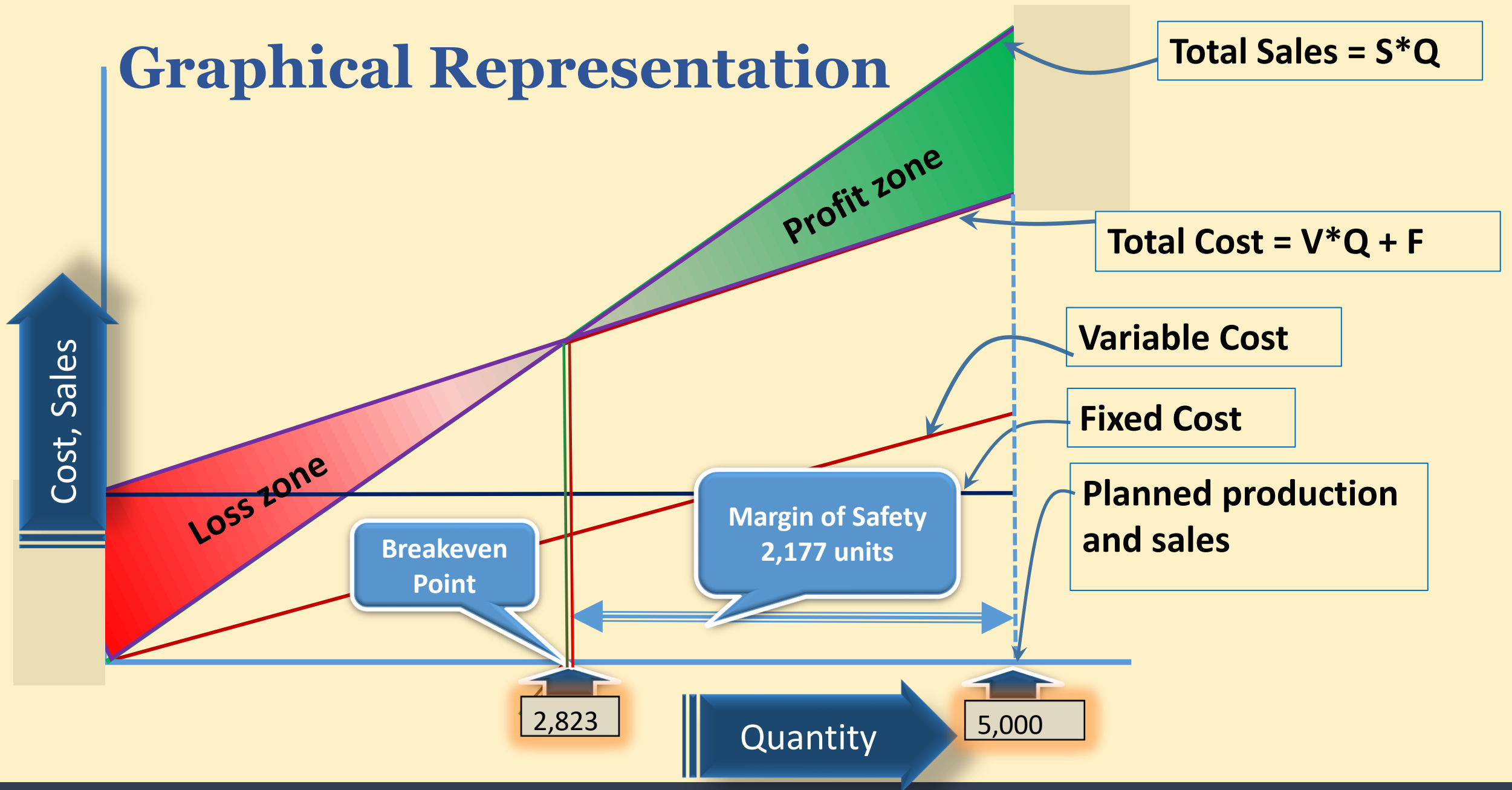
Break-even Point and Margin of Safety

- It is the number of units to produce and sell at which the total cost is just equal to total sales.
- The break-even point is the level of **production and sales** where total revenue equals total expenses.
- In other words, the break-even point is where sales of a company is exactly equal to total expenses or costs.

Margin of Safety

- Selling price: ₹ 800
- Variable cost per unit: ₹ 575
- Fixed cost: ₹ 6,35,000
- You plan to produce and sell: 5,000 units
- BEP quantity, $Q^* = \frac{6,35,000}{(800-575)} = 2,822.22$
- Which means that you have to produce and sell more than 2822 number of shirts or 2823 shirts to break even.
- Margin of safety = $5,000 - 2,823 = 2,177$

Graphical Representation



Some Assumptions and Limitations

- 1 Cost can be divided into fixed and variable (semi-variable subdivided)
- 2 Linear relation assumed.
- 3 Selling price, variable cost per unit, and total fixed cost remain constant.
- 4 Volume is the only cost driver for variable cost.
- 5 Relevant range of volume is specified within which assumptions hold.
- 6 No inventory build-up.
- 7 Sales mix is not changed for the estimation.
- 8 You sell all that you produce. No inventory build up.

Some More Assumptions

- | | |
|----|--|
| 9 | Change in volume of sales does not affect the price of the product. |
| 10 | Labour cost (wages) per unit of product remains constant. |
| 11 | Either estimate the BEP for one product category or the sales mix does not change during the estimation horizon. |

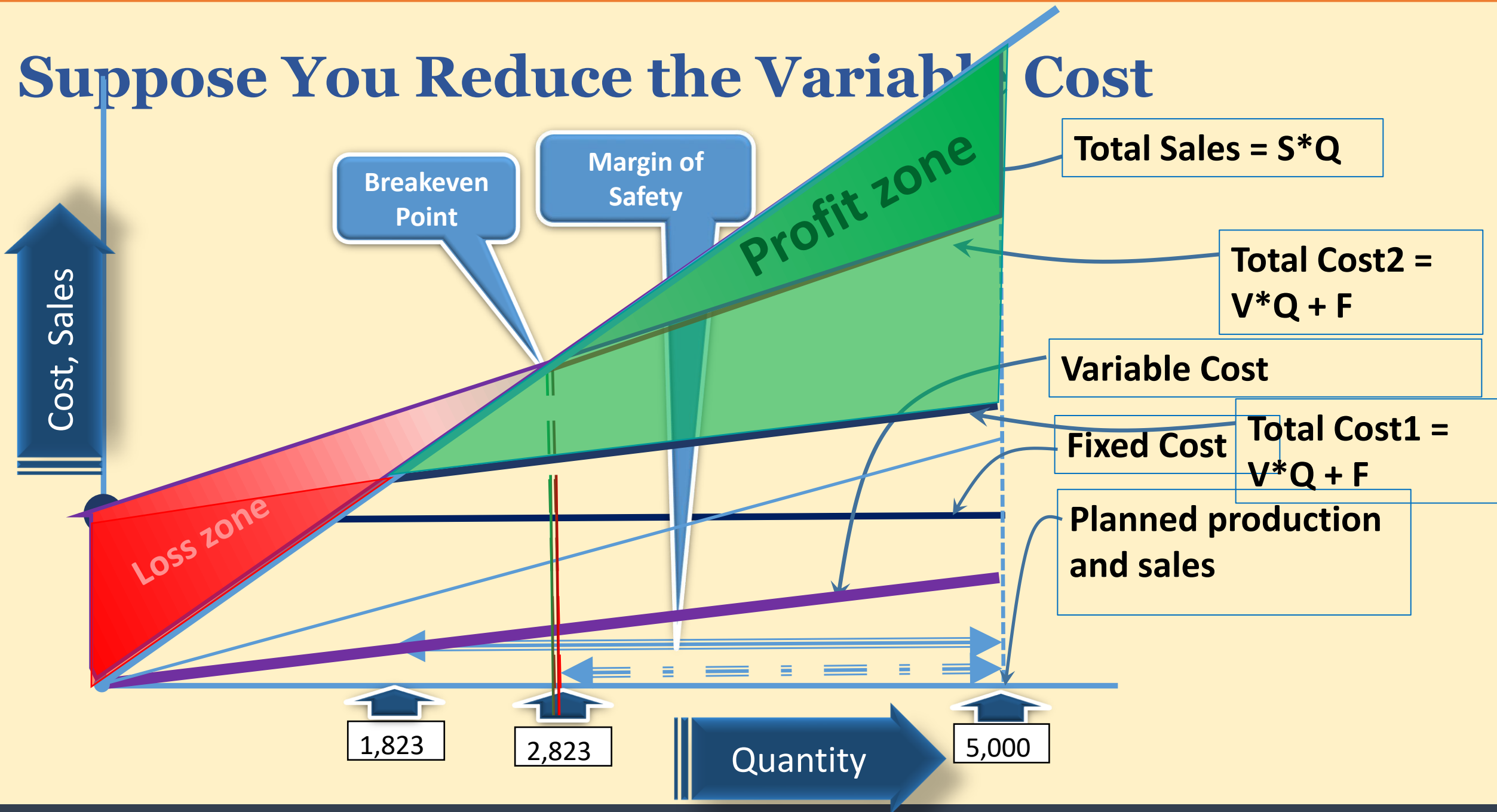
Limitations

Break-even helps only to analyze different scenarios. It does not tell us if particular context is achievable. For example, it presupposes that any desired quantities can be sold.

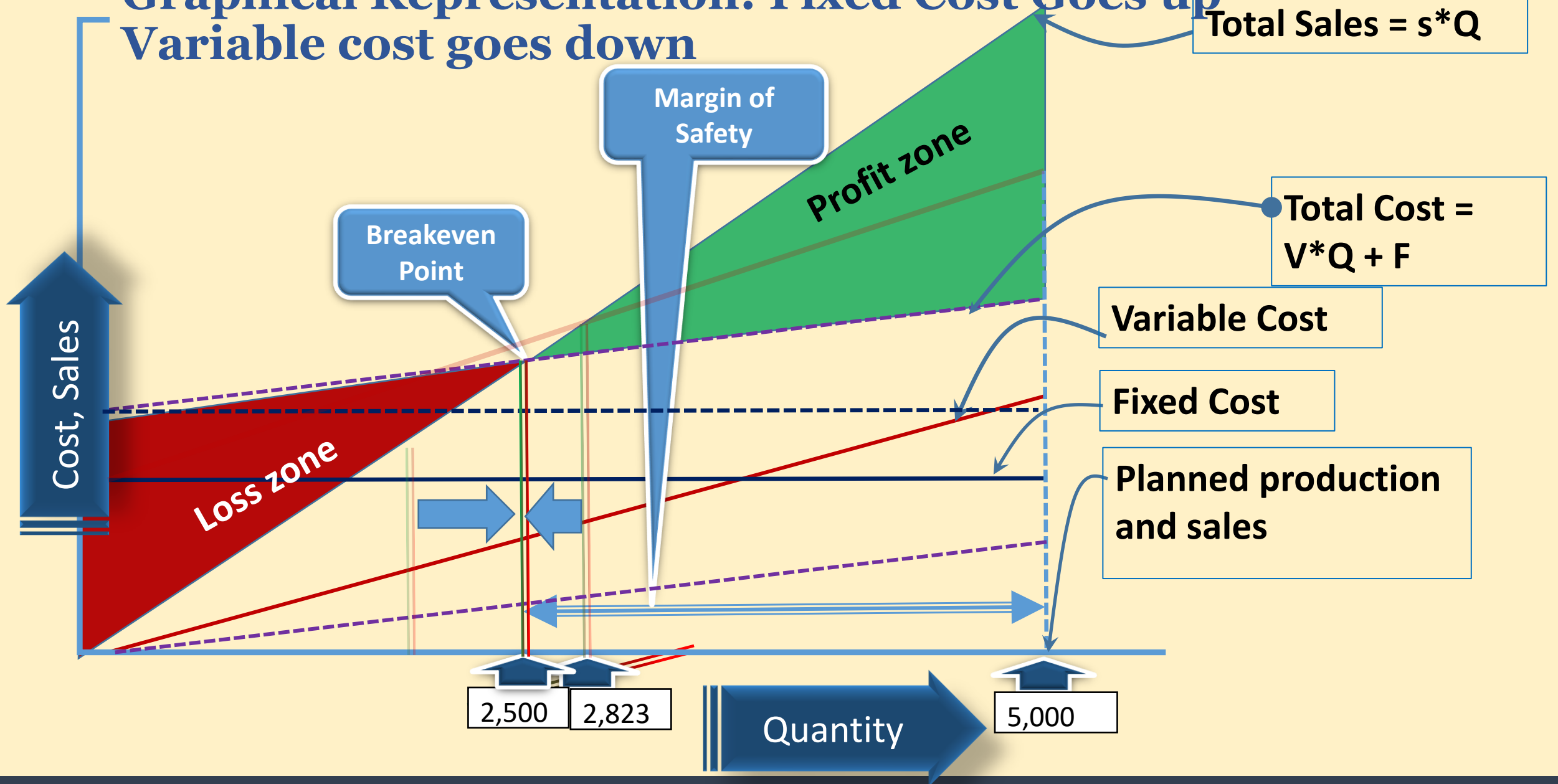
The 'no inventory buildup' assumption is hard to achieve in reality.

Under the 'multiproduct scenario', it assumes that the relative proportions of each product remain constant. It is likely to change in reality.

Suppose You Reduce the Variable Cost

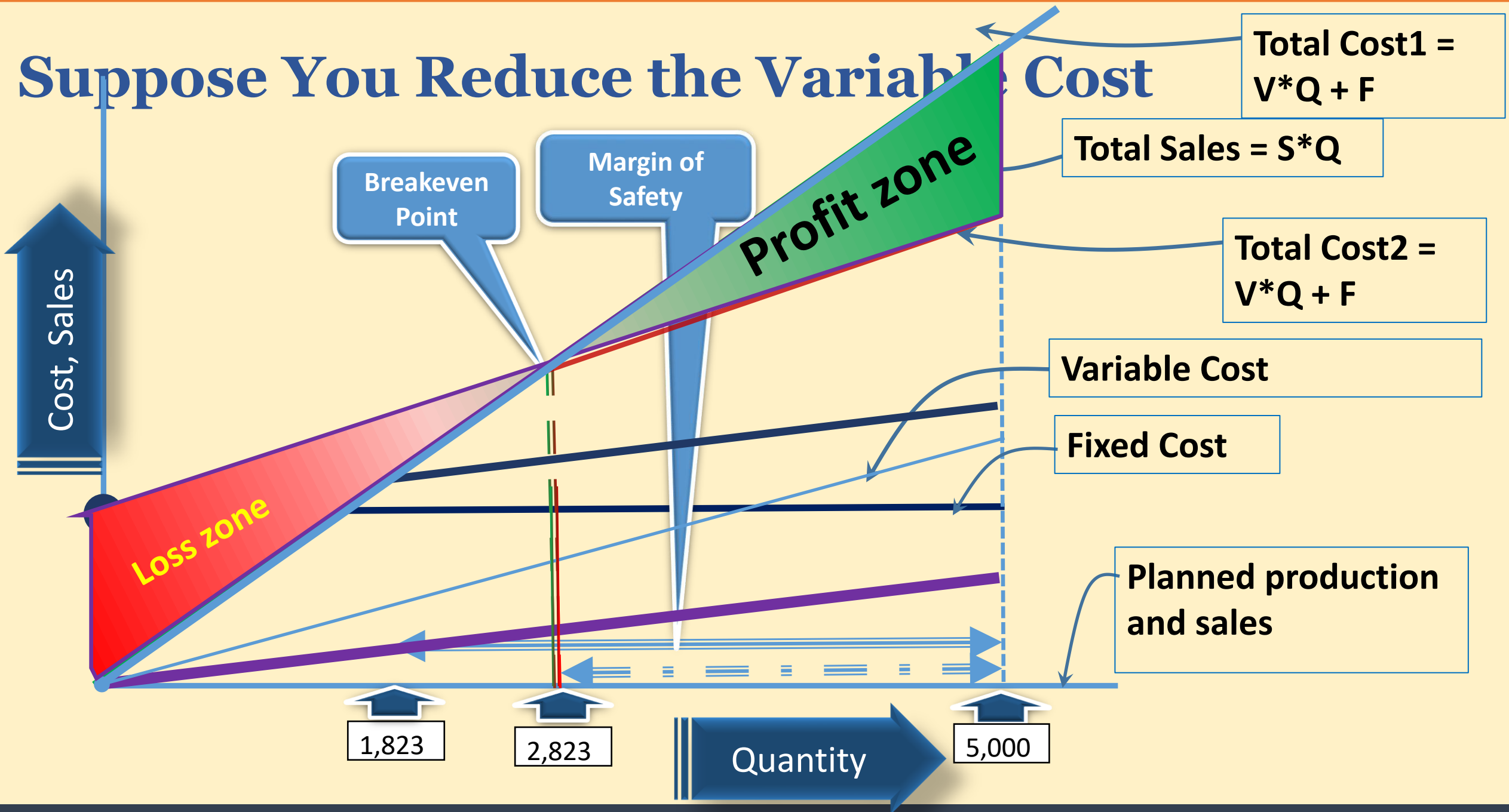


Graphical Representation: Fixed Cost Goes up Variable cost goes down

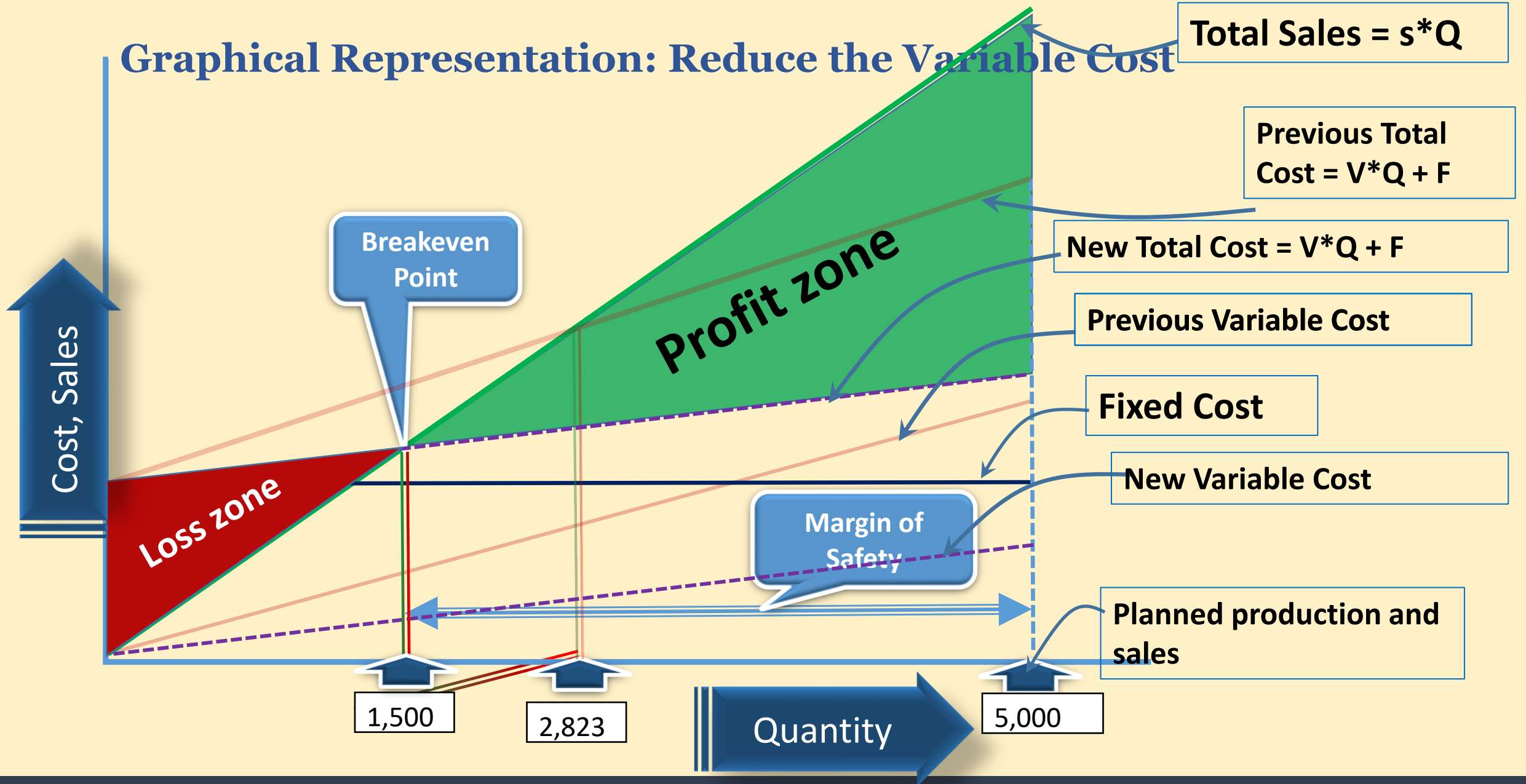




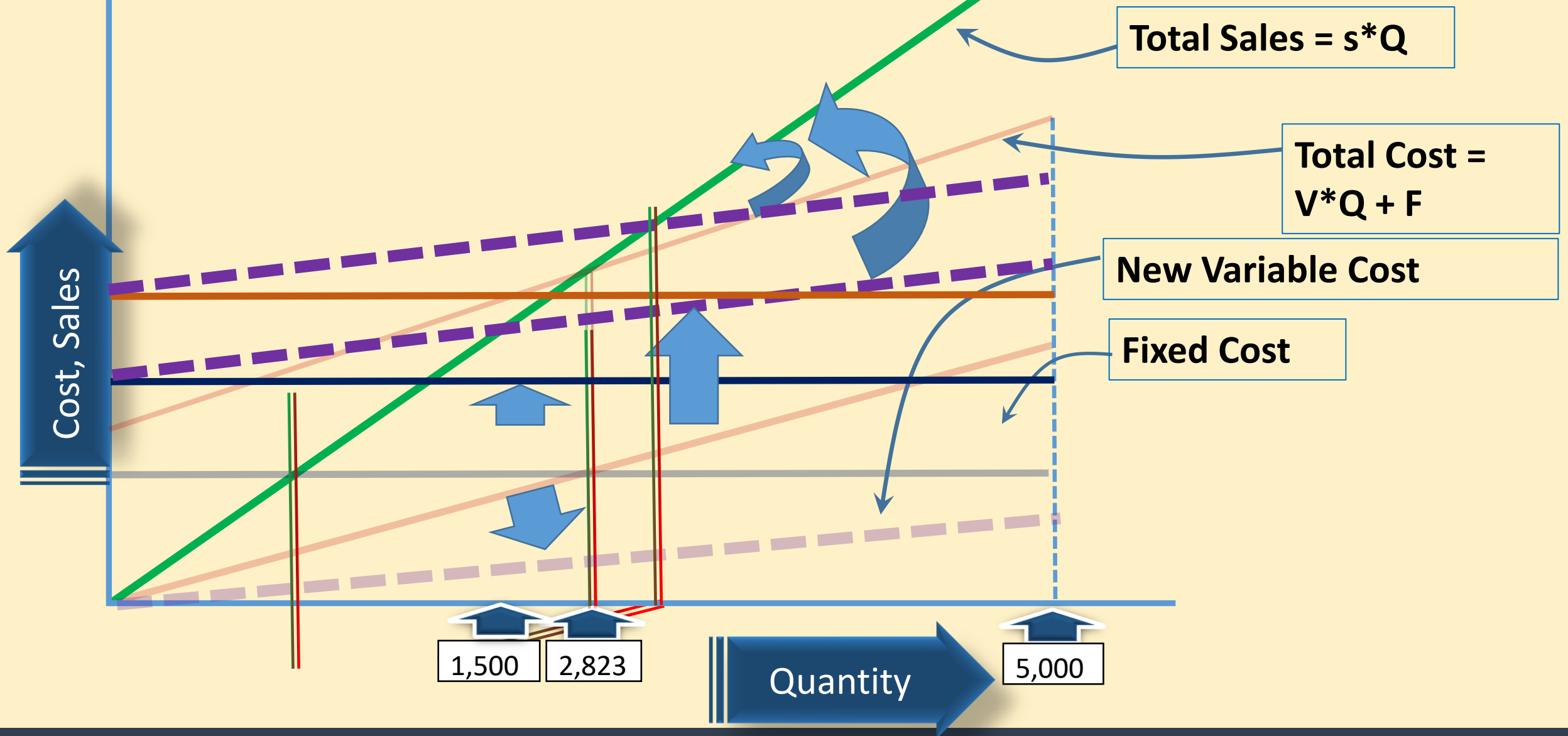
Syllabus up to here



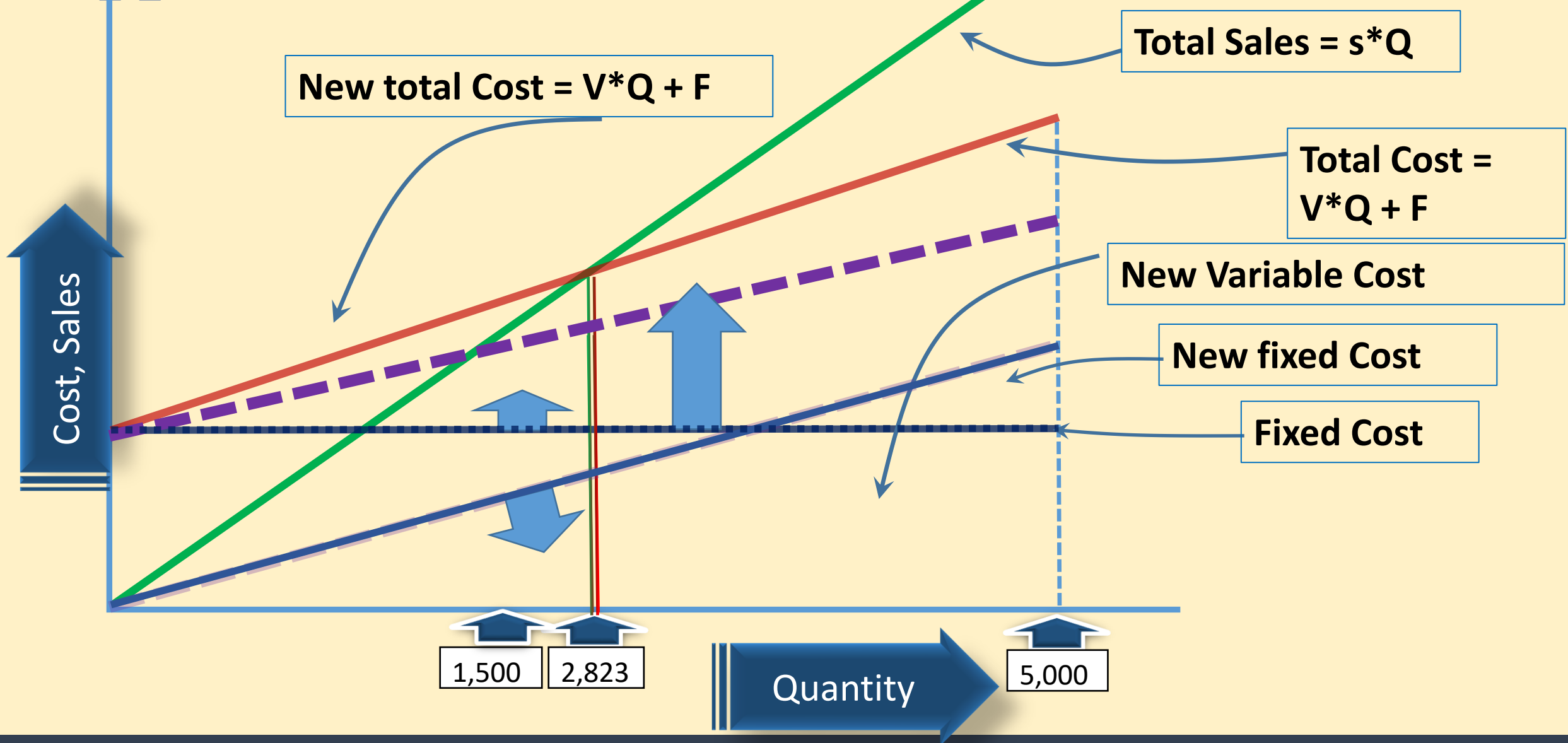
Graphical Representation: Reduce the Variable Cost



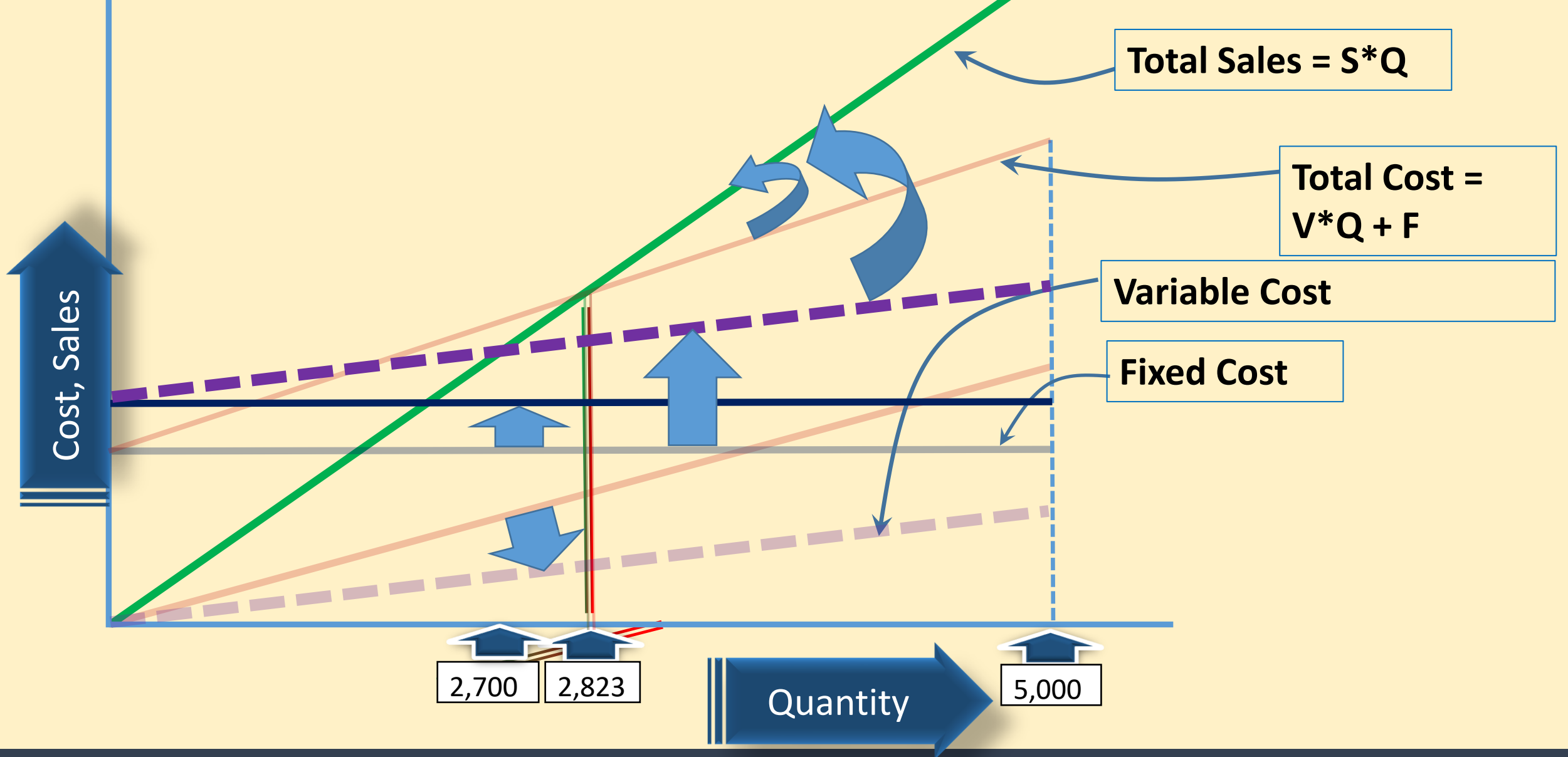
Suppose You Reduce the Variable Cost



Suppose You Reduce the Variable Cost



Suppose You Reduce the Variable Cost and increase the fixed cost



	Units	₹		BEP	
Sales	500	40,000			
Total variable cost	500	15,000			You have to classify fixed and variable costs
Total annual fixed cost		20,000		400	
What is the contribution margin?					
What is the contribution?					
Estimate BEP					
If the company produces 250 or 600 units, what are the margins of safety?					
If the company produces 250 or 600 units, how much are the profits?					

Classification of some regular cost items

Depreciation	Fixed
Insurance	Fixed
Interest on Long-Term Loan	Fixed
Audit Fee, Trade license, Fire safety	Fixed
RoC Registration Fee	Fixed
Rent	Fixed
Salaries	Fixed
Raw-materials, consumable, Wages	Variable
Electricity Bill Payment	Variable
Fuel Cost	Variable
Transportation cost	Variable
Stationery	Variable
Annual renewal of export license	Fixed

Printing	Variable
Internet and data plan	Fixed
Income tax	Not a cost
Web-hosting cost	Fixed
Cost of security	Fixed
Production bonus	Variable
Traveling expenses	Variable
Dividend	Not a cost
Telephone bill payment	Variable
Sales promotion	Variable
Amortization	Fixed
Wages	Variable
Maintenance	Variable

Insurance and maintenance are semi-variable cost. But we will consider Insurance and maintenance as VARIABLE.

Limitations of BEP

Many assumptions based on which BEP is estimated are unrealistic.

For example:

- Fixed cost may vary with turnover, over time
- Variable cost may go down as sales increases due to economy of scale,
- It is unlikely that you sell all you produce. Inventory either gets built up or reduces during course of business.
- Break-even estimation is easy for simple business such as one product company. It becomes difficult for multiple products.

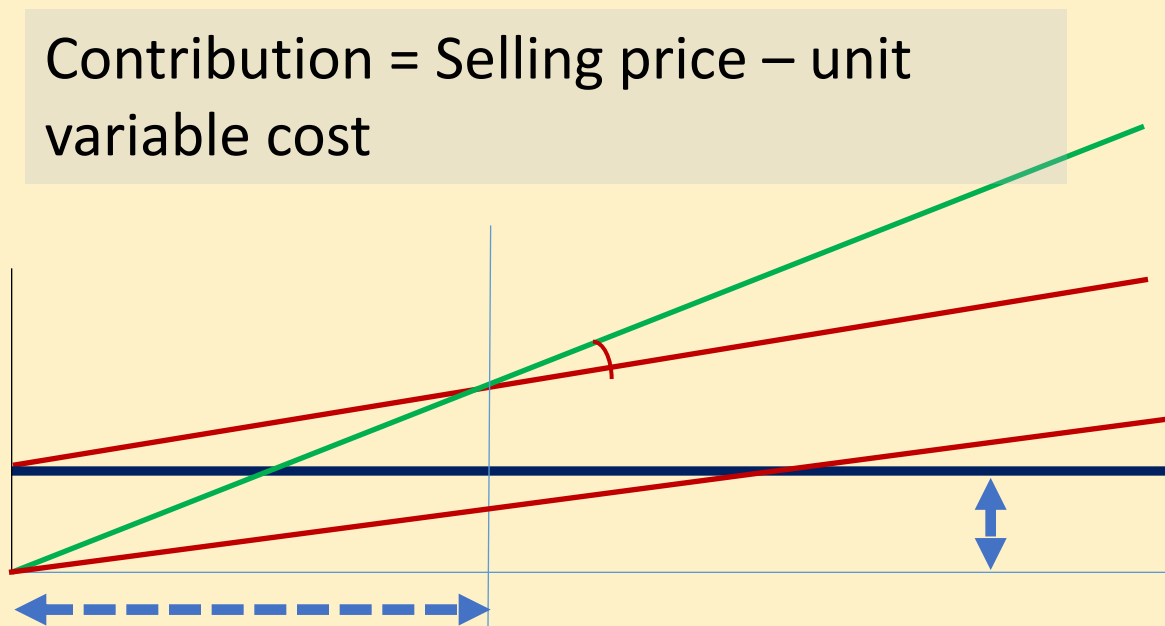
Final Thought

- Advantages outweigh limitations. Using it judiciously is very helpful in planning as also decision making.
- It is specially helpful for startups in selecting opportunities or projects out of many options and understanding level of operation to be profitable.

Operating Leverage

- Operating leverage is the degree to which a firm can increase operating income by increasing sales.
- Lower the variable cost, higher the operating leverage.
- Operating leverage refers to the percentage of fixed costs that a company has compared to variable cost. Stated another way, operating leverage is the ratio of fixed costs to variable costs.
- **Financial leverage** refers to the amount of debt in the capital structure of the company. If you can visualize a balance sheet, financial leverage refers to the 'Equity & Liabilities' side of the balance sheet.

- High operating leverage means that the fixed cost of a company is high compared to the variable cost. In this case, the firm, after break-even, earns a large profit on each incremental sale.
- But the break-even point of the company is at a high level indicating that the company must attain sufficient sales volume to cover its high fixed costs.
- Low operating leverage means the major part of the cost is variable in nature. In this case, the firm achieve break-even with small sales, but earns a small profit on each incremental sale post breakeven.



After meeting the fixed cost, unit contribution or contribution margin is more if the variable cost is less



Think in terms of marginal cost & revenue/contribution/profit

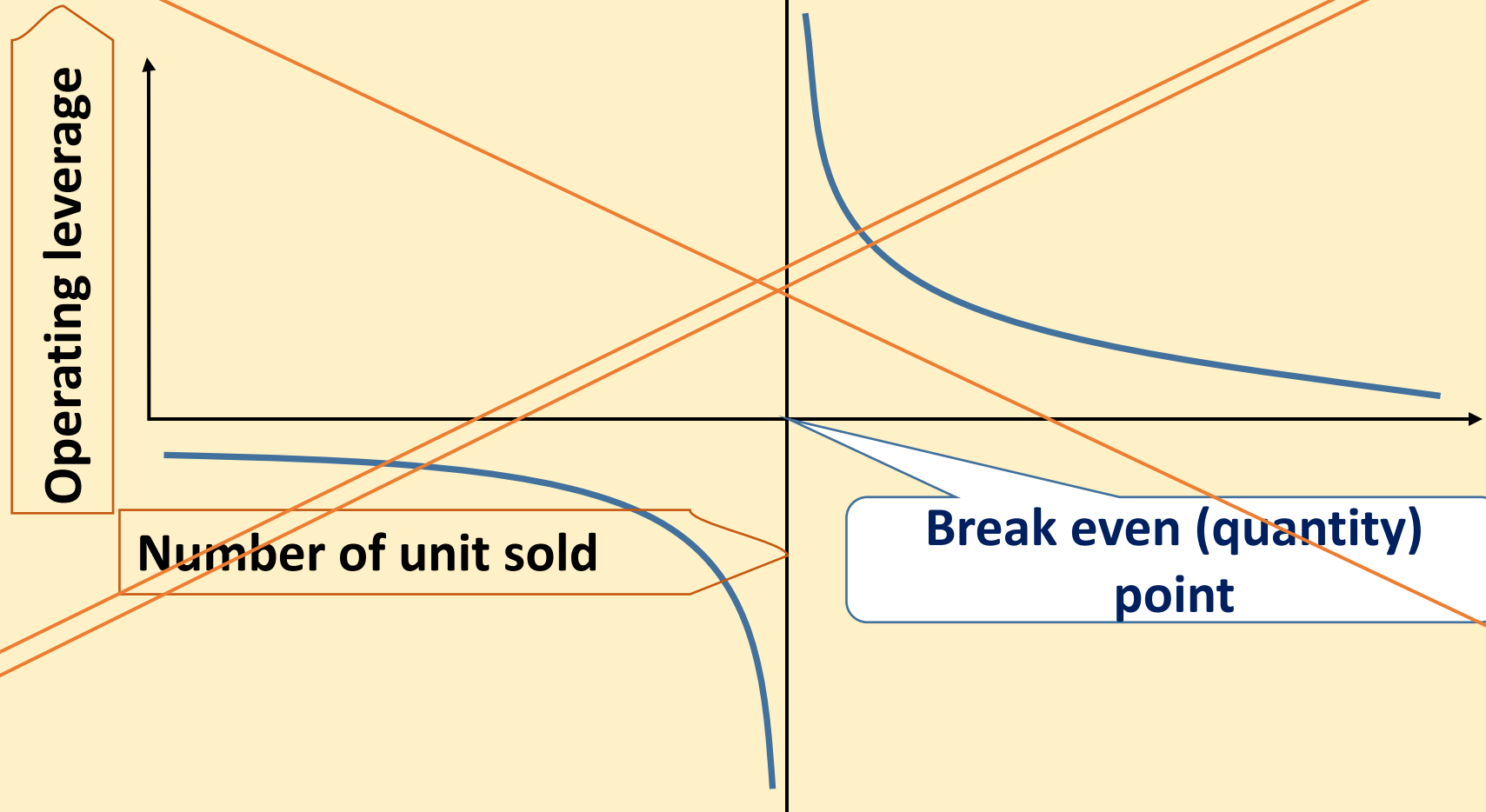
Uses of BEP

- **Provides information on minimum sales for achieving profit.**
- **Helps to compare multiple business opportunities and multiple options for executing a business.**
- **Estimate amount of goods to be sold in order to meet all expenses.**
- **Level of production and profit thereof.**
- **Act as a milestone for the entire team to achieve targeted sales.**
- **Gives idea about margin of safety and risk thereof.**
- **Understand the price sensitivity of profit and decide on price.**
- **Cost control, decide on cost structure, and quick estimate.**

Inventory Costs You Money. Try Keeping it Low.

- Suppose you maintain inventory of fabric, button, consumable and finished goods stock of ₹ 13 million (on an average) over the year.
- Suppose you have borrowed ₹ 10 million from bank to maintain this stock (inventory) as working capital loan.
- Let us assume that the rate of interest on bank loan is 15% p.a.
- You have to pay interest on ₹ 10 million on average loan of ₹1.5 million. Say, you incur loss of 0.5 million in a year.
- If you can smartly manage your inventory, perhaps you can smoothly manage the business with ₹7 million and reduce bank loan to ₹5 million.
- Therefore, your interest will come down to ₹ 0.75 million only.
- Just by managing the inventory efficiently, you have transformed loss into profit.
- In case you do not borrow working capital, still you incur opportunity cost.

The operating leverage (OL) would look like the following if one plots the OL over quantity



You may neglect this slide for examination purpose. It is included only for those who may have questions.

- For each unit of extra sales beyond BEP, Option 2 generates higher profit compared to Option 1.
- For each unit of lower sales from BEP, Option 2 inflict higher loss compared to Option 1.

Key Takeaways

- The degree of operating leverage (DOL) measures the change in operating income of a company in response to change in sales.
- The DOL helps analysts gauging the impact of change in sales on earnings.
- If sales increases in large measure for a company of high operating leverage, the profit will increase substantially.
- On the other hand, if sales declines beyond BEP, the loss will increase faster compared to a company with lower DOL. That is why DOL is a component of risk perception.
- DOL is exciting for companies operating beyond BEP and is too bad for companies operating below BEP.

The 10 carat gold jewelry cost indifference point

- Fixed cost per year: 1,00,00,000
- Variable cost per unit: 4,000
- Selling price per unit: 5,000
- Contribution (per unit): $5,000 - 4,000 = 1,000$
- At cost indifference point: profit in option 1 is equal to profit in option 2, say at quantity Q
- Therefore, $(5,000 - 4,000) * Q - 1,00,00,000 = (5,100 - 4,600) - 10,00,000$
- $Q = 18,000$
- Fixed cost per year: 10,00,000
- Variable cost per unit: 4,600
- Selling price per unit: 5,100
- Contribution: $5,100 - 4,600 = 500$

If you foresee sales much above 18,000 units, should go for automation model
If sales are to be much less than 18,000 units, adopt the labor-intensive model.
Both models are similar if sales is close to 18,000 units

Conclusion:

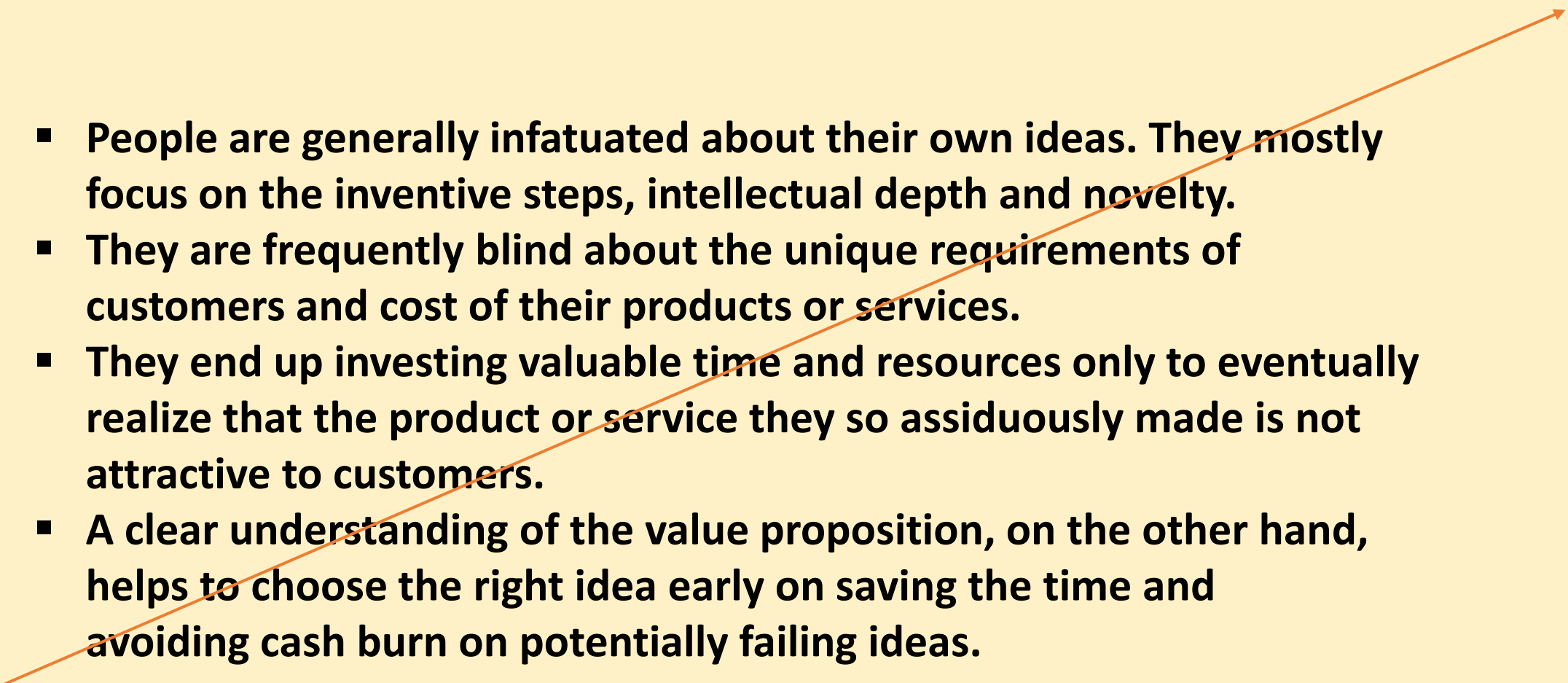
- BEP estimation is based on many assumptions that may not always hold.
- All data are futuristic and are subject to market change.
- However, most assumptions and future fluctuations would be neutralized when multiple businesses are compared.

Thank you

- The financial leverage ratio indicates the overall debt load of a company compared to its assets or equity.
- Putting it differently, it shows what portion of its assets has been financed by (and owned by) the shareholders (owners of the company) and how much by the creditors (lenders).
- Shareholders owning a majority of the assets: low leverage
- Creditors owning a majority of the assets: highly leveraged.
- In all, financial leverage is an indicator of risk of the capital structure.

Degree of Financial Leverage

- *Degree of Financial Leverage (DFL)* =
$$\frac{EBIT}{EBIT - Interest}$$
- Measures the capability of the company to service interest.
- Measures the sensitivity of a company's net profit on the fluctuation of its operating profit as a results of the changes in capital structure.
- “DFL is invaluable in helping a company assess the amount of debt or financial leverage it should opt for in its [capital structure](#). If operating income is relatively stable, then earnings and EPS would be stable as well, and the company can afford to take on a significant amount of debt. However, if the company operates in a sector where operating income is quite volatile, it may be prudent to limit [debt](#) to easily manageable levels.” – from Investopedia
- The DFL reflects the influence of debt on the difference between ‘Operating profit’ and ‘Net profit’. You may remember that Operating profit is profit before interest and tax.
- Higher the DFL, higher is the risk of debt on the financial performance of the company. Some stress on sales may turn the company into loss and enters into a vicious circle of higher losses.

- People are generally infatuated about their own ideas. They mostly focus on the inventive steps, intellectual depth and novelty.
 - They are frequently blind about the unique requirements of customers and cost of their products or services.
 - They end up investing valuable time and resources only to eventually realize that the product or service they so assiduously made is not attractive to customers.
 - A clear understanding of the value proposition, on the other hand, helps to choose the right idea early on saving the time and avoiding cash burn on potentially failing ideas.
- 

- Getting more out of less
- You get granular actionable insight
- Problem
- The solution
- The value
- Lead to the story
- Articulate value

Comparison between companies of high and low DOL

High DOL company

$$BEP = \frac{20,00,000}{25,000 - 15,000} = 200$$

One extra unit of sales will generate profit of 10,000

One less unit of sales will generate **loss of 10,000**

Low DOL company

$$BEP = \frac{2,00,000}{25,000 - 20,000} = 40$$

One extra unit of sales will generate profit of 5,000

One less unit of sales will generate **loss of 5,000**

On absolute basis

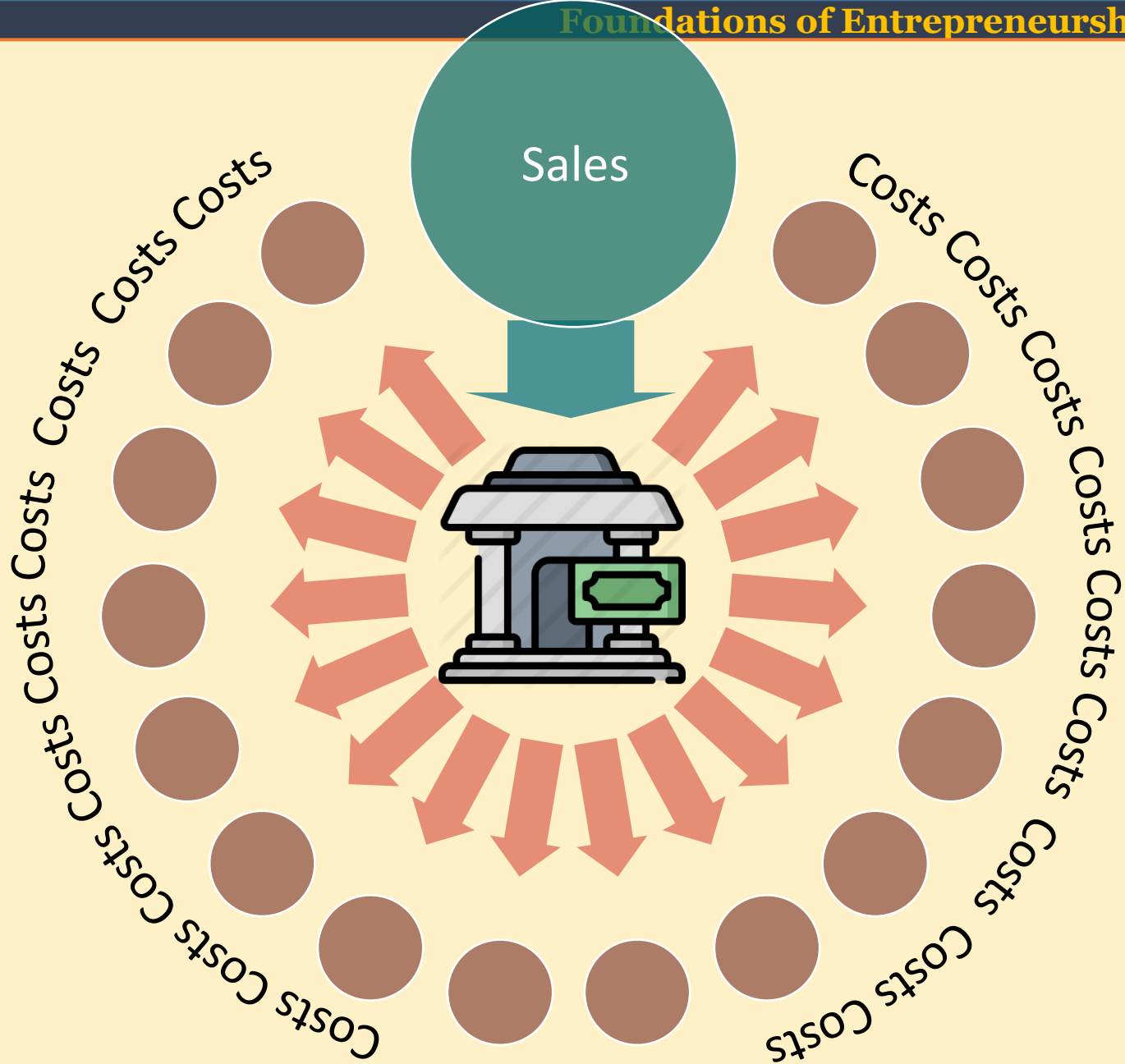
On percentage basis

At the present position, DOL for the 'High DOL' company, the DOL% is = $1000 \times 10000 / (1000 \times 10000 - 2000000) = 1.25$, which means that for 1% increase in sales the operating profit increases by 1.25% and vice versa.

The DOL for the 'Low DOL' company, the DOL% is = $1000 \times 5000 / (1000 \times 5000 - 200000) = 1.04$, which means that for 1% increase in sales the operating profit increases by 1.04% and vice versa.

On percentage basis, the DOL changes as volume of sales changes.

- At the present position, DOL for the 'High DOL' company, the DOL% is = $1000 \times 10000 / (1000 \times 10000 - 2000000) = 1.25$, which means that for 1% increase in sales the operating profit increases by 1.25% and vice versa.
 - The DOL changes to 1.02 at sales of 10,000 unit.
- The DOL for the 'Low DOL' company, the DOL% is = $1000 \times 5000 / (1000 \times 5000 - 200000) = 1.04$, which means that for 1% increase in sales the operating profit increases by 1.04% and vice versa.
 - The DOL changes to 1.001 at sales of 10,000 unit.
 - On percentage basis, the DOL changes as volume of sales changes.



Many items of cost (cash outflow)

One or very few revenue stream(s) – Cash inflow

Cost-Volume Analysis Helps to Resolve Multidimensional and Conflicting Problems

How much to spend on advertisement and what is the gain?

You advertise, but you incur cost in the process.

You try to sell more, but how do you achieve that?

Or reduce the cost!! How to achieve that? Use automation!
But the capital cost may be huge!

Alternately increase price, which may be unsustainable.

Your objective is to increase profit.



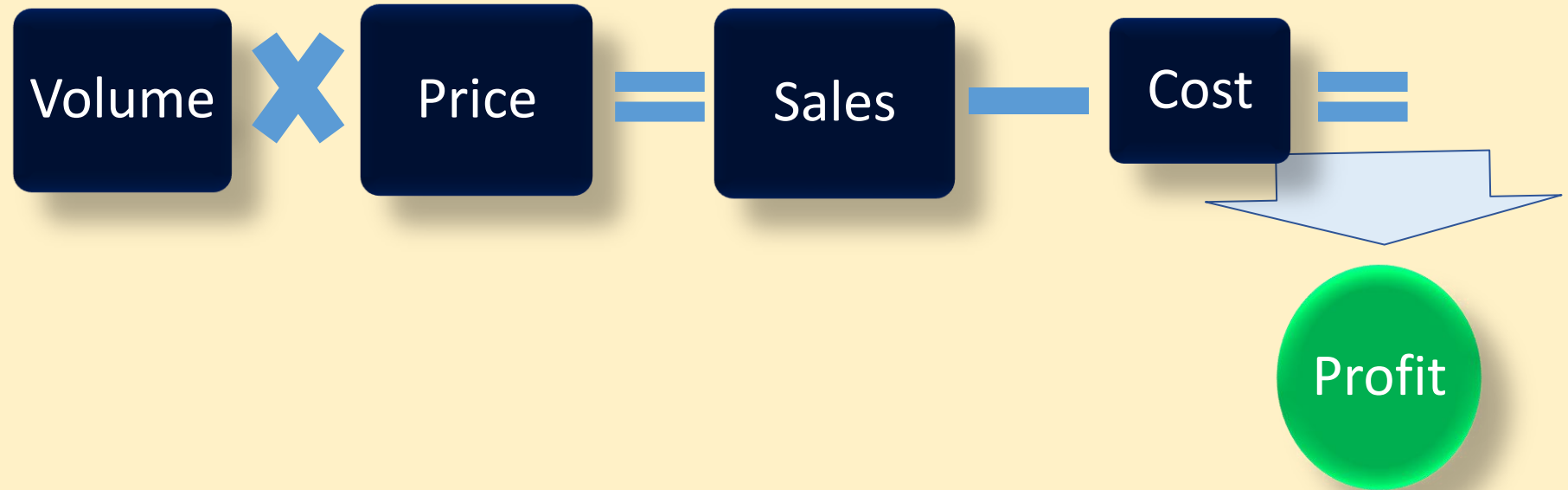
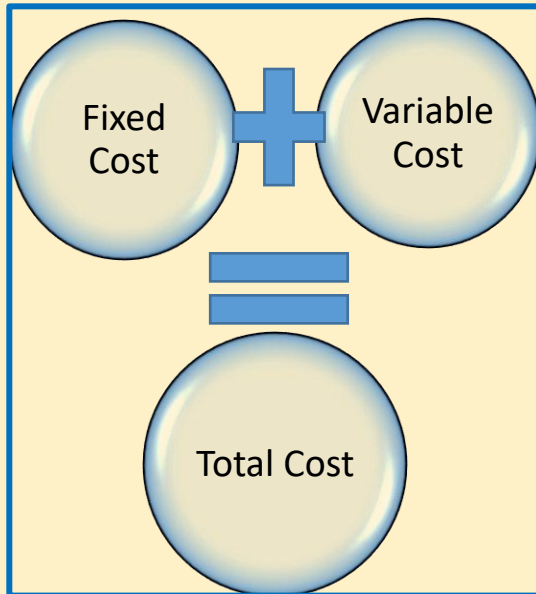
**Objective
is
Profit**

Profit is a percentage of sales (revenue).

To increase profit, needs higher sales.

Profit = Sales – Total Cost

Sales = Unit Price X Number of Products Sold.



Degree of Operating Leverage

Business ideas	Product A	Product B
Projected sales p.a.	5500	7000
Fixed cost p.a.	1000	3000
Variable cost p.a.	2500	2500

- Degree of Operating Leverage for Product A
- $= (\text{Sales} - \text{VC}) / (\text{Sales} - \text{VC} - \text{FC})$
- $= (5500 - 2500) / (5500 - 2500 - 1000) = 1.5$
- Degree of Operating Leverage for Product B
- $= (7000 - 2500) / (7000 - 2500 - 3000) = 3.0$

Given the above data, you would prefer to adopt product B for new businesses since you will make increasing profit with increasing sales, and you can justify investing in marketing activities to increase sales since increased sales will lead to higher profit.

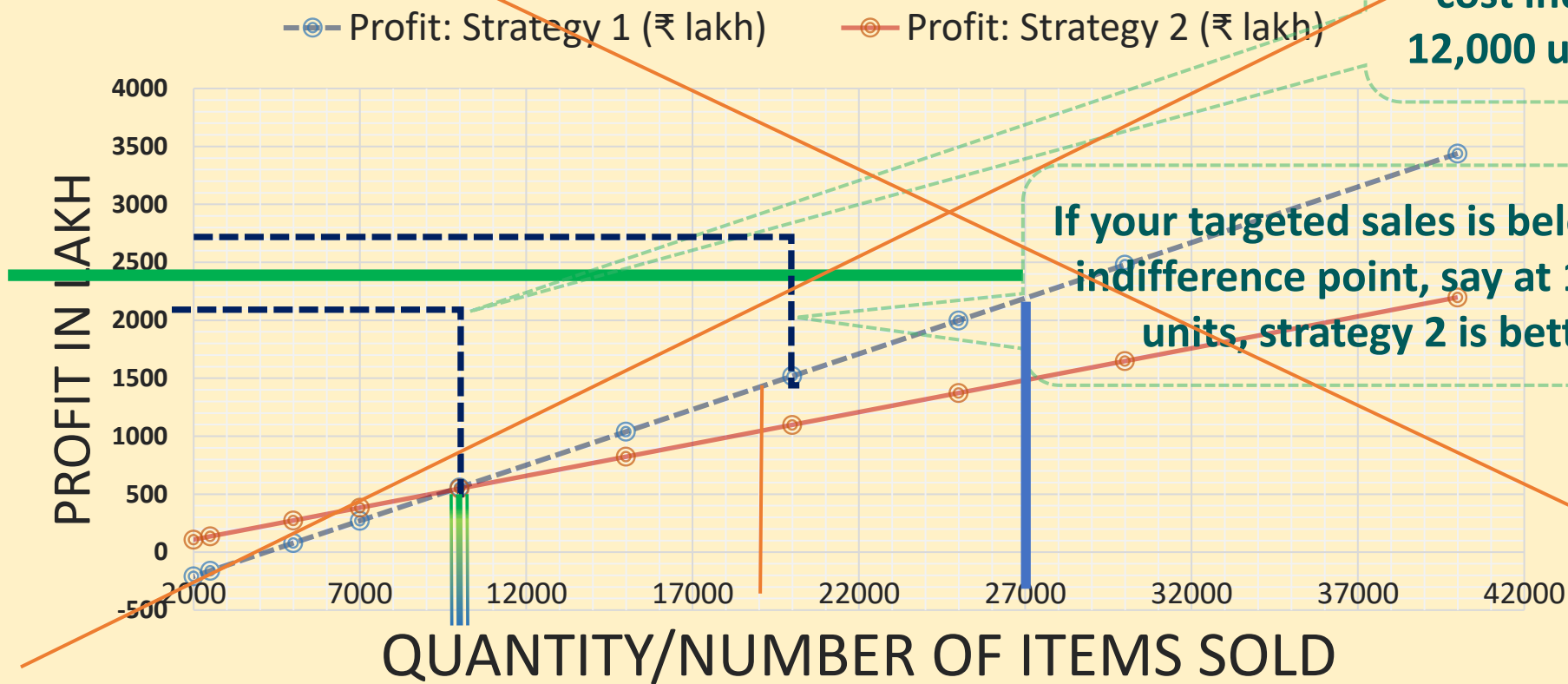
A company with low operating leverage has a large proportion of variable costs—meaning that it earns a smaller operating profit on each sale compared to one with comparatively lower variable cost. Notably, such companies begins to make profit with lower sales as their BEP is lower compared to ones with higher FC and lower VC. So, you check the potential sales data and select the business opportunity using the DOL metric.

Cost Indifference Point

- The cost indifference point is the level of production (and sales) at which the profit is indifferent of the two strategies with different cost structures.
- Used to compare two strategies, this analysis can be used to decide between different cost structures or selling prices.

Graphical Estimation of Cost Indifference Point

Cost Indifference Point Demonstration



If your targeted sales is above cost indifference point, say at 12,000 units, strategy 1 is better.

If your targeted sales is below cost indifference point, say at 12,000 units, strategy 2 is better.

Cost Indifference Point

- The cost indifference point is used to compare two different strategies for executing the same business.
- For example: You want to start a 10 carat gold jewelry business.
Strategy 1: putting up a fully automatic plant that would cost huge capital investment, say ₹ 1.0 crore, but recurring expenses are low, say ₹ 4,000 per piece.
Strategy 2: Setting up a labour-intensive unit with no automation. The capital investment is only ₹ 10 lakh. The capital cost is low but recurring expenses are high @ say ₹4,600 per piece and selling price is higher by (say) 100.
- First question is which business is more attractive?
- Where is the cost indifference point?

Cost indifference point: A company has two alternatives to implement a business: i. using automation, ii. Using labor intensive technology.

First alternative,

- Variable cost per unit: 40
- Total fixed cost per year: 50,000
- Selling price per unit: 100
- Contribution = $100 - 40 = 60$

Second alternative

- Variable cost per unit: 60
- Total fixed cost per year: 30,000
- Selling price per unit: 100
- Contribution = $100 - 60 = 40$

At cost indifference point, profit is equal in both alternatives.

- $60[\text{contribution}] * Q - 50,000[\text{fixed cost}] = 40[\text{contribution}] * Q - 30,000[\text{fixed cost}]$
- $60 * 1,000 - 50,000 = 40 * 1,000 - 30,000$
- At $Q = 1,000$, profit is same in both alternatives.

Revenue is all that you have for recovering all the expenses from. The surplus remaining after meeting all expenses is the profit that belongs to the owners.

