

Economics of Health and HealthCare
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Lecture - 17
Cost-Volume-Profit-Analysis

Taking this forward, we can do a cost volume profit analysis. A cost volume profit analysis is tries to give us an understanding about to get out you know it is known as CVP analysis as well.

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Cost-Volume-Profit Analysis (CVP)

$$\text{Profit} = \text{Total Revenue} - (\text{Variable cost} + \text{Fixed Cost})$$

Break-even point \Rightarrow Profit = 10,000

Price/unit = ₹ 500	Variable cost = ₹ 300
Profit = 0	Fixed cost = ₹ 80,000

Break-even point \Rightarrow $500 \times Q - 300 \times Q - 80,000 = 0$

$\therefore 200Q = 80,000$

$\therefore Q = \frac{80,000}{200} = 400$

So, cost volume the volume says the volume of production and profit analysis also known as CPP analysis or CVP analysis, right? So, this cost volume profit analysis says that given my desired output given the unit selling price given the unit fixed cost unit variable cost and eventually the total cost. What can be my output to get a certain level of profit or what can be my output to get to be on the break-even point.

Where my total revenue means the total cost that is primarily when I start a business I know or when I start a product production. Or when I start to deliver my services, I know that at the very beginning I may not get profit I may incur losses. But it is important to learn that where I my profit and cost are meeting each other. That means I am on a break-even point and I also know that after that I am going to make positive profit.

My total revenue will overcome my total cost so this is how many units of output I must produce I must sell. What should be the cost in terms of several administrative costs advertisements costs and so on and so forth. If I change my technology how much I gain and all. But basically these cost volume profit analysis just requires few basic inputs that the selling price the number of units I desire to produce.

Or I will produce, or I am producing the of the of the fixed cost the variable cost and that is all. So, as we know the breakeven point is where the total revenue and total cost make matches and in a production firm. I can calculate my profit as what is profit total revenue - total cost. So, I can calculate my profit given by my total revenue - variable cost - fixed cost is it not? Or I can keep this variable costs and fixed costs together.

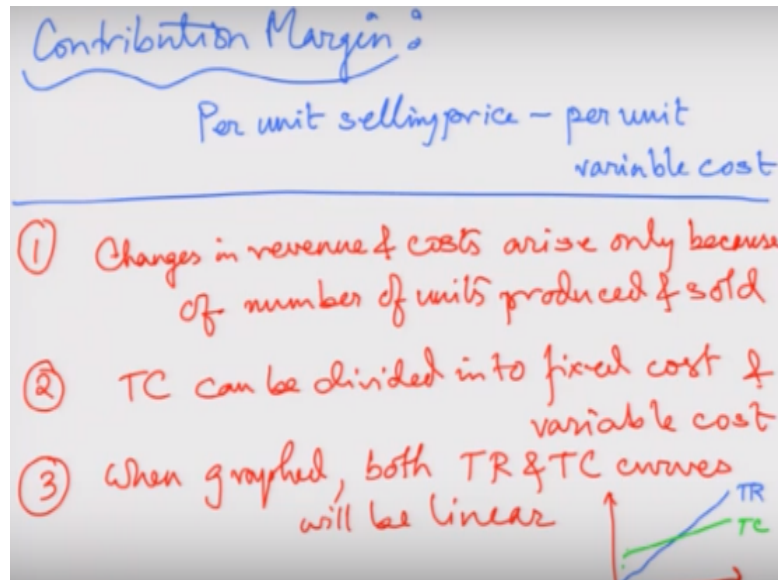
That is my total costs total revenue - total cost is my profit and in breakeven point this profit on breakeven point what happens my profit = 0. Or if I want say 10000 rupees of profit my profit becomes 10000. If I want to act in the break-even point this becomes 0. So, let us understand how we can get my profit or my breakeven point. Just for a simple example take a simple example that say my price per unit of sales, but you need to sales say this is rupees 500.

Yes, variable cost is rupees 300 my fixed cost is rupees 80000. Yes, this is my all the information given this see that what will be your profit or how much you want to produce? If I am in a break-even point so my profit is 0 on a break-even point. So, on a breakeven point I must produce to be on a break-even point. I must produce that amount which will take my profit to 0 and my profit becomes 0 when my total revenue which is $500*Q$.

I do not know what I am going to find Q - total variable cost is $300*Q$, 1 unit variable cost is 300 rupees and for Q number of production my variable cost will be $300*Q-80000$. This is my fixed cost this is not associated with production, right? So, whatever the production is Q 0 1 2 3 4 5000 it is the remaining 80000. And this all should equate to 0 because I am trying to find my breakeven point.

So, $500Q - 300Q$ will give me $200Q - 80000 = 0$ so I can get 80000 that side on my right hand side. So $200Q = 80000$ which eventually give me $Q = 80000/200$ which is 400. So, I get my quantity which is 400 to be to attain a breakeven point I must produce at least 400 units of product you know 400 units.

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There is a concept of contribution margin per unit when we do break-even point when we do cost volume profit analysis. So, contribution margin per unit is nothing but per unit the difference between the per unit selling price - per unit variable cost. So, this difference is known as contribution margin you know. So, now we take few assumptions while we do cost volume profit analysis.

Which are those assumptions I will just you know try to write them down. So, number 1 assumption is changes in the level of revenues. So, changes in revenue and costs arise only because of units or only because of number of units produced and sold. So, that means my revenue and cost will only depend upon Q that is the total amount of production I am, or the total amount of production I am manufacturing, and I am selling.

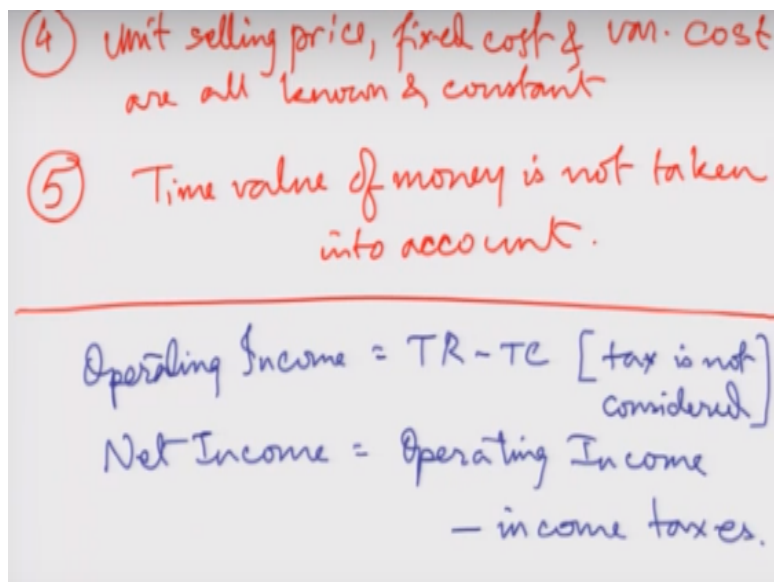
The second is total costs can be divided into fixed cost and variable cost. So, total cost can be divided into fixed cost and variable cost. Now fixed cost is fixed irrespective of the output of production of our production. Whereas variable cost is will change with respect to the amount of

production or the level of output. The third is when graphed both total revenue and total cost curves will be linear.

So, if I have my total revenue curve you know when I have my total revenue curve which we saw its to be a straight line and I had my total cost curve which like this note it will no more be like this. My total cost curve will something be now will be something like this you know will not be like this anymore will not be like this anymore. So, it will be something like a straight line.

So, this is my total revenue this is my total cost so this the green one is my total cost. And then the blue one is my total revenue curve. So, when graphed they will take a straight line approach.

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The next one is we know we have information about the unit selling price the fixed cost and the variable cost. We have information are all known and constant they are not changing while I am doing this CVP analysis. So, they will remain constant the fifth is that when we are talking about the revenue and cost, they can be added and compared without taking into account the time value of money.

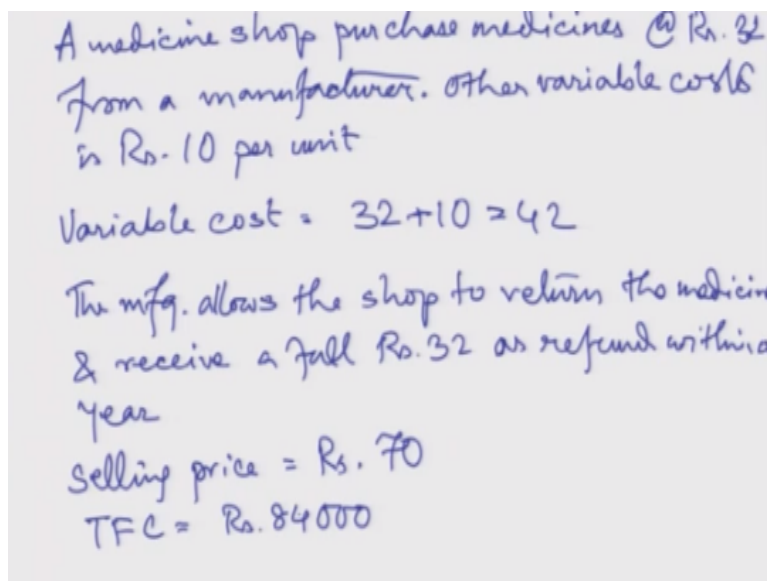
So, my when I am doing my CVP I do not take into account my time value of money is not taken into account. That means whenever I am estimating the revenue and I am estimating the cost and

I am doing a cost volume profit analysis to find a particular level of output to achieve the breakeven point or to achieve a certain level of profit. I do not consider that if there is any time lapse or you know so there is no cost associated with the time.

Therefore, we can whatever we talk about revenue we are talking in terms of we can also call it operating income Because that is the difference between this total revenue and total cost the difference between the total revenue from the operations and total cost from the production of goods and services as well as this operation cost operating cost. So, total revenue from the operations and total cost from the production of goods and services.

As well as this operational cost or other administrative costs and all which are essential for this production process. Here we are not considering tax, tax is not considered income tax yeah is not considered fine. But when we are talking about net income, so this is my operating income - income taxes. Yes, okay.

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A medicine shop purchase medicines @ Rs. 32
From a manufacturer. Other variable costs
is Rs. 10 per unit
Variable cost = $32 + 10 = 42$
The mfg. allows the shop to return the medicine
& receive a full Rs. 32 as refund within a
year
Selling price = Rs. 70
TFC = Rs. 84000

We will do a small problem now you know just to show how this thing works. Say assume a medicine shop that purchases medicine at a rate of rupees 32. So, a medicine shop purchase medicines at the rate rupees 32 yeah from a manufacturer. Other variable costs are rupees 10 cost is rupees 10 per unit so what is my total variable cost? My total variable cost here $32 + 10$ is 42, right?

Because 32 is to get the medicines you know purchase the medicines each medicine will cost me 32 rupees plus other variable costs pertaining maybe it is the transportation cost you know billing cost and all these things or ordering cost inventory cost is 10. So, the total variable cost is rupees 42 and the manufacturer, allows the medicine allows the shop to return the medicines and receive a full 32 refund as refund after a year or within one year within a year.

Yes, average selling price is 70 so the selling price per unit average is rupees 70. And total fixed cost is rupees 84000 let us see what happens.

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How much revenue will the medicine shop receive if 2,500 units are sold.

$$TR = 70 \times 2500 = 175,000$$
$$TVC = 42 \times 2500 = 105,000$$
$$\text{Profit} = 175,000 - 105,000 - 84,000 = 14,000 \checkmark$$

$$\text{Contribution Margin per unit} = 70 - 42 = 28$$
$$\text{Total contribution margin} = \text{Rs. } 28 \times 2,500 = \text{Rs. } 70,000$$
$$\text{Contribution Margin Percentage (Contribution ratio)} = \frac{28}{70} = 0.40 = 40\%$$

The question is how much revenue will the business or will the medicine shop receive if 2500 units are sold. Here I know my quantity I do not know my profit. So that is what are being asked it can be profit it can be lost you know so the total revenue is nothing but 70×2500 which is nothing but 175000. Yes, so the variable cost total variable cost is now I know $32 + 10$, 42 was the total variable cost.

So, 42×2500 which amounts to 105000 and then my total profit will be total revenue - total variable cost - total fixed cost which is 14000. So, this is how I can estimate my cost now what is my contribution? I mean I can estimate my profit yeah. So, what is my contribution margin per unit as I mentioned this is the difference between the per unit selling cost and per unit variable

cost.

So, per unit selling cost is 70 per unit variable cost is 42. So, my marginal cost per unit is rupees 28. So, this is contribution not marginal cost sorry this is contribution margin per unit which is the difference between the selling price and then the variable cost. If I want to know that total contribution margin, then I just multiply my margin contribution margin per unit which is rupees 28*2500.

Because that is my total sales or total production total sales in this example. So, rupees 70000 is my total contribution margin and the contribution margin % which is also known as the contribution margin ratio is estimated as the ratio between the contribution margin per unit and in the selling price. So, this is the ratio between contribution margin per unit which is rupees 28 and the per unit selling price.

So, 28/70 which can be 0.40 or 40% is the contribution margin percentage over the selling price. Therefore, you know we can have an idea about the contribution margin the breakeven point the profit level at various points. You know we can also estimate our break-even point we can also estimate our break-even point in terms of the contribution margin approach.

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Break-even point (contribution margin approach)

$$= \frac{\text{Fixed Cost}}{\text{Unit Cost Margin (Contribution margin per unit)}} = \frac{84000}{28} = 3000$$

Amt. of Prodⁿ given level of profit } $\frac{\text{Fixed Cost} + \text{Target Profit}}{\text{Contribution Margin per Unit}}$
Units
= Quantity needs to sold or manufactured to attain the target Π

So, we can estimate our break-even point by contribution margin following contribution margin

approach to the ratio between fixed expenses or fixed cost by the ratio between fixed cost and unit cost margin. So, unit cost margin is nothing, but I am sorry I should have mentioned it is nothing but the contribution margin per unit cost unit cost is nothing but the contribution margin per unit.

So, in my previous example if my you know the fixed cost 84000 and my contribution margin is rupees 28 so I can estimate my break-even point as $84000/28$ which is 3000 as my breakeven point. So, this is how we can estimate my breakeven point and I can also estimate the level of profit if amount of production given the level of profit. If I have as the similar to fixed cost+the level of profit.

Or the target profit/the contribution margin per unit. And then we will have an idea that how many units I need to sell, or you know output needs to be or units needs to be units or outputs needs to be sold or manufactured to attain the target profit. Okay that means it can also give us an idea target profit by pi. It can also give me the idea if I am starting my hospital that how many patients I need to treat or in IPD or in OPD.

Or in together to get my break-even point or to attain a certain level of output and or how many bids I need to keep when I will I will try to attain a certain level of output or production. Thank you.