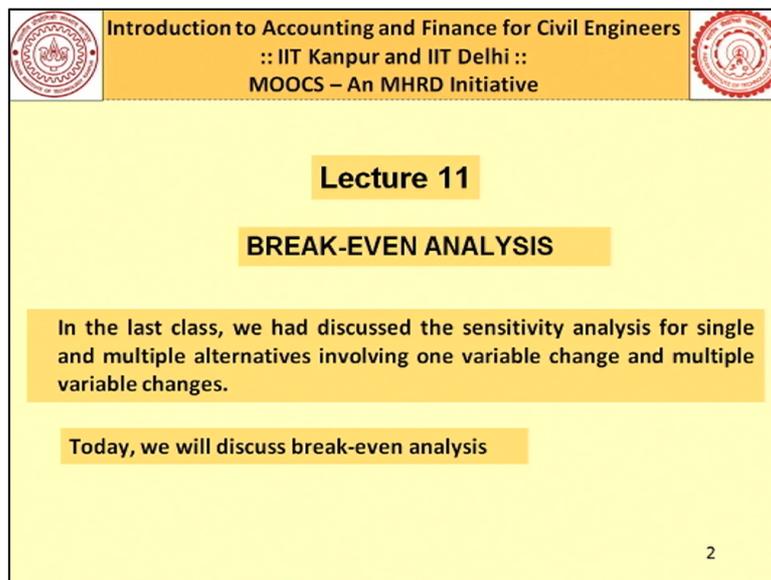


Introduction to Accounting and Finance for Civil Engineers
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Module No. #03
Lecture No. #11
Break-even Analysis (Part – 1)

Good morning, Namaskar, and Welcome to the course once again. In the last lecture, if you remember, we discussed, various cases of Sensitivity Analysis. It was involving, single alternative. Then, we later moved on to, more than one alternative. We changed, one variable at a time. We changed, two variables at a time. And then, we also discuss the case in which, more than two variables were changed at a time.

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The slide features a yellow background with a white border. At the top, there is a header bar with a light orange background. On the left and right sides of this bar are circular logos of IIT Kanpur and IIT Delhi. The text in the header bar reads: "Introduction to Accounting and Finance for Civil Engineers :: IIT Kanpur and IIT Delhi :: MOOCS – An MHRD Initiative". Below the header, the slide is divided into several sections. The first section is a yellow box containing the text "Lecture 11". The second section is a white box with a yellow border containing the text "BREAK-EVEN ANALYSIS". The third section is a yellow box containing the text "In the last class, we had discussed the sensitivity analysis for single and multiple alternatives involving one variable change and multiple variable changes." The fourth section is a white box with a yellow border containing the text "Today, we will discuss break-even analysis". In the bottom right corner of the slide, the number "2" is displayed.

In this class, we are going to learn, Break-even Analysis.

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Break-even analysis

- Another way of performing sensitivity analysis
- Here we are more concerned about finding the value (called the break- even point) at which the reversal of decision takes place.
- In the sensitivity analysis not much emphasis was given on finding this break even value.
- In sensitivity analysis we ask what will happen to the project if the invoice or billing declines or costs increase or something else happens.

3

Now, as you know, Break-even Analysis is another way of performing, Sensitivity Analysis. If you remember the last lecture, in the Sensitivity Analysis, we used to have one point at which, the net present worth used to change sign, from positive to negative. We did not emphasise this particular aspect, during our discussion on Sensitivity Analysis.

But, in the case of Break-even Analysis, this particular aspect is very, very important. We will find that, in this case, we are more concerned about finding the value, which we call it as, Break-even Point. As you can see it here, it is Break-even Point.

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Break-even analysis (cont...)

- We will also be interested in knowing how much should be produced and sold at a minimum to ensure that the project does not 'lose money'.
- Such an exercise is called break-even analysis and the minimum quantity at which loss is avoided is called the break-even point.
- The break-even analysis is also referred to as cost-volume-profit analysis.

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Now, this particular Break-even Point, is quite important, as you will see, very soon. If you remember, in the Sensitivity Analysis, we did not have much emphasis on, the Break-even value. Now, if you remember, we define the Break-even Point, at that particular point at

which, the reversal of decision takes place. So, maybe for some value, you find NPW is coming to be negative, and for some value, you find NPW is coming to be positive.

Now, when we say Break-even Point, you will find that, at that particular point, the net present worth is coming to be zero. Now, in Sensitivity Analysis, we ask, what will happen to the project, if the invoice, or say for that matter, billing declines, or for that matter, cost increase, or something else happens. In the case of Break-even Analysis, we are interested in knowing, how much should be produced. Listen this carefully, how much should be produced, and sold, at a minimum, so that it ensures, that the project does not lose money.

So, we are interested in finding, that particular production level at which, we are just able to recover our money. So, anything we produce, we are incurring certain costs. Now, we are selling it in the market, at some price. Now, we are interested in finding, that minimum production value at which, I am able to just recover my cost. Now, I will tell you, what I mean by cost. Now, the Total Cost, is the sum of, fixed costs and variable costs, when we talk in terms of manufacturing industry, let us say. We talk in slightly different terms, when we are talking of construction industry.

In construction industry, we are talking in terms of, mostly Direct Costs and Indirect Costs. So, first we would like to see, the various definitions, what is meant by fixed cost, what is meant by variable cost, what is Direct Cost, what is Indirect Cost, and then we move on to, the various details of Break-even Analysis. Now, Break-even Analysis is also sometimes referred to as, Cost-Volume-Profit Analysis. So, this is another name, given to Break-even Analysis, Cost-Volume-Profit Analysis.

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Break-even analysis (cont...)

- Addresses the decision of whether to make or buy a product, whether to own or rent an equipment. ✓
- Making the product involves two cost elements:
 - ✓ – Fixed costs such as machine renting cost and operation expenses
 - ✓ – Variable costs such as raw material cost
- Buying the product involves only one cost element, the purchase price. However, the price may either be constant or variable based on the quantity.

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Now, this Break-even Analysis addresses the decision of, whether to make a particular product, or buy a particular product. So, making versus buying, if we had to take a decision, we resort to Break-even Analysis. Likewise, it could be, whether to own a particular equipment, or rent it from an agency. This is again, another application of Break-even Analysis.

Now, when it comes to making the Product, again it consists of your fixed costs, such as the cost of renting machine, and its various operational expenses. And then, it also consists of variable costs. For example, it could be raw material cost, the cost of labour, and the cost of equipment, which is directly being utilised, in producing that particular goods. Now, when it comes to buying the product, it involves only one cost element, and it is very simple to understand, which is the purchase price.

However, the price may either be constant, or it could be variable, depending on the quantity. To start with, we will assume that, our price does not change, based on the quantity. So, whether I produce, or whether I sell, let us say, X unit, or whether I sell 2X unit, my price is not going to change. This will be the assumption, to start with. Later, we will try to relax this exemption, and we will do, Nonlinear Break-even Analysis also.

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Some definitions

- Fixed/Variable Costs - If costs change appreciably with fluctuations in business activity, they are "variable." Otherwise, they are "fixed."
 A widely used cost model is: Total Costs = Fixed Costs + Variable Costs
- Price is the amount of money, goods or services that must be given up to acquire ownership or use of a product.

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So, as I told you before starting, we would like to learn first, some definitions. And, in that we learn, what is fixed cost, what is variable cost. Now, as far as fixed cost is concerned, this is how it is defined. If costs changed appreciably, with fluctuations in business activity. That means, you are producing more, or you are producing less, right, if the cost is dependent on your production, then we call them as variable cost. Otherwise, they are fixed.

So, the moment your cost is getting affected, by the level of production, we call them as variable cost. However, if the cost does not change, with respect to the production level, we say that, this is a fixed cost. For example, let us say, there is a factory. Now, irrespective of whether the factory is running or it is closed, we will find, there are some costs, which you have to incur. For example, the security guards, the rent of that premises, the electricity charges. Of course, some electricity charges, will definitely depend, as far as the quantity of production is concerned.

But then, there are certain fixed electricity charges, that we have to bear. So, all these costs, we are categorising under fixed cost. Then, when it comes to variable costs, it is basically depending on, let us say, we are producing X unit of goods, I am incurring Y cost. If I am producing 2X unit of production, I am incurring some other cost. So, these are variable cost. In the same manner, in construction also, I define Direct Cost, and Indirect Cost.

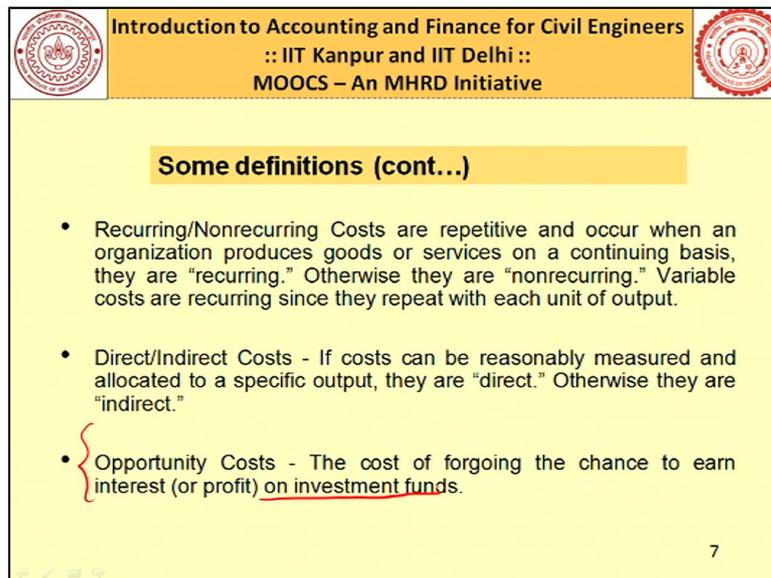
And, there is a very thin line between, a Direct Cost, and an Indirect Cost. Just to understand it very clearly, just remember that, anything that you can very easily identify that, this cost is going here, we call this as Direct Cost. On the other hand, if you are not sure, where the cost

is going, for which item the cost is being spent, we classify them under Indirect Cost. For example, let us say, there is a tower crane. Now, tower crane can be used for, let us say, concreting activity.

It can be used for, form work activity. It can be used for, reinforcement activity. Now, as long as I know that, ok, 30% of the time, it is going for concreting, 40% time, it is going for reinforcement, and another 30% time, it is going for form work, I can put them under these cost heads. But, if I am not sure, what fraction of time, the cost is being incurred, on these activities, it is always better to put them under, Indirect Costs.

So, this is one very simple example, through which, you will classify, whether the cost is direct one, or the cost is an indirect one. Now, when it comes to the price, it is basically the amount of money, goods, or services, that must be given up, to require ownership, or use of a product. So basically, price is the amount of money, goods, or services, that must be given up, to acquire ownership, or use of a particular product.

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The slide features a yellow header with the text: "Introduction to Accounting and Finance for Civil Engineers :: IIT Kanpur and IIT Delhi :: MOOCS – An MHRD Initiative". Below the header, the title "Some definitions (cont...)" is centered in a yellow box. The main content consists of three bullet points: 1) "Recurring/Nonrecurring Costs are repetitive and occur when an organization produces goods or services on a continuing basis, they are 'recurring.' Otherwise they are 'nonrecurring.' Variable costs are recurring since they repeat with each unit of output." 2) "Direct/Indirect Costs - If costs can be reasonably measured and allocated to a specific output, they are 'direct.' Otherwise they are 'indirect.'" 3) "Opportunity Costs - The cost of forgoing the chance to earn interest (or profit) on investment funds." A red bracket groups the last two points. The slide number "7" is in the bottom right corner.

Now, when it comes to opportunity cost, it is the cost of forgoing the chance, to earn interest, or for that matter, profit on investment funds. This is also very important. We will see in detail, what is meant by opportunity cost.

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Illustration

- A ready mix concrete (RMC) manufacturer wants to find out the minimum production of concrete which will just be able to recover its total cost incurred in a particular month.
- The total cost (TC) incurred in a month is the sum total of its indirect cost (IC) and direct cost (DC).
- The indirect costs in this example are those costs which are incurred irrespective of concrete production taking place or not.
- However, the direct costs are proportional to the volume or quantity of production.
- By definition the total cost $TC = IC + DC$

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Now, we try to understand, the concept of Break-even Analysis, with the help of one small example, and that too in the context of construction industry. Let us assume that, there is a ready mix concrete manufacturer, RMC manufacturer, which wants to find out, the minimum production of concrete, which will just be able to recover its Total Cost, incurred in a particular month.

So, let us say, there is a manufacture, who has set up a plant, ready mix concrete plant. And, it would like to know, how much concrete it should produce, so that, it is just able to meet all the cost, that it has incurred for that particular month. For that, now you know, the Total Cost is the sum of, Direct Cost + Indirect Cost. Now, I will just give you one small illustration, and then it will be more clear.

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$$TC = \underline{IC} + \underline{DC}$$

UDC - UNIT DIRECT COST

P - PRICE PER UNIT

R - REVENUE = n P

n - NO. OF UNITS PRODUCED

So, let us say, Total Cost, I represent it with TC. So, TC is nothing but, sum of your Indirect Cost + Direct Cost. Now, you already know, the difference between Indirect Costs, and you know the difference between Direct Cost. I will also define a term UDC, which I am calling it as, Unit Direct Cost. Then, I define another term P, which is price per unit. I define another term R, which is basically Revenue.

And, as you know, Revenue is dependent on, how much is the price per unit, and how much sale you have made. So, it can be defined as, N multiplied by P. So, N is the number of units produced, and P is the sales price per unit. Right.

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$$TC = IC + n(UDC)$$

AT BREAK-EVEN

$$\underline{TC = R}$$

$$IC + nUDC = nP$$

AT Break Even, $n = \textcircled{B}$

$$IC + B(UDC) = BP$$

$$B(P - UDC) = IC$$

What I can do is, I can write this whole expression, like this. TC is equal to, IC + N times UDC, where N is the number of units sold, and UDC is Unit Direct Cost. Right. Now, I define Break-even Point, at that particular point at which, I am just able to recover my cost. So, whatever cost I incur, in terms of Direct Cost, or Indirect Cost, I am able to recover it. So, what I am doing is, I am equating this Total Cost, equal to Revenue. So, at Break-even, what will happen. At Break-even, these two will be just equal. At Break-even, Total Cost will just be equal to Revenue.

Now, Total Cost, as you know, it is IC + N times UDC. And, R is nothing but, N times P. Now, at Break-even, let us assume, N is equal to B. And B, we are calling it as, Break-even production level. Right. So, I can write this expression as IC + B times UDC, is equal to B multiplied by P. So, this I bring it there. So, I can write, B, P – UDC, is equal to IC.

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The slide shows the following handwritten content:

$$B = \frac{IC}{(P - UDC)} \quad \text{--- ①}$$

↑
CONTRIBUTION

- ① Increase Sales Price
- ② Increase the Quantity of Prod.
- ③ Reducing the total cost of Prod.

Logos for NPTEL and ETSC, IIT DELHI are visible at the bottom of the slide.

And, thus I can write straight away, B is equal to IC upon P – UDC. Now, this expression is very simple. Break-even Point, I am able to obtain, by dividing this Indirect Cost, by a term P – UDC. Now, this P – UDC, I sometimes call this as, Contribution. So, if I divide my Indirect Cost, by the Contribution, I am saying, I am retaining a Break-even Point. Now, any company, or for that matter, any business, they would like to keep this Break-even Point, at a low level.

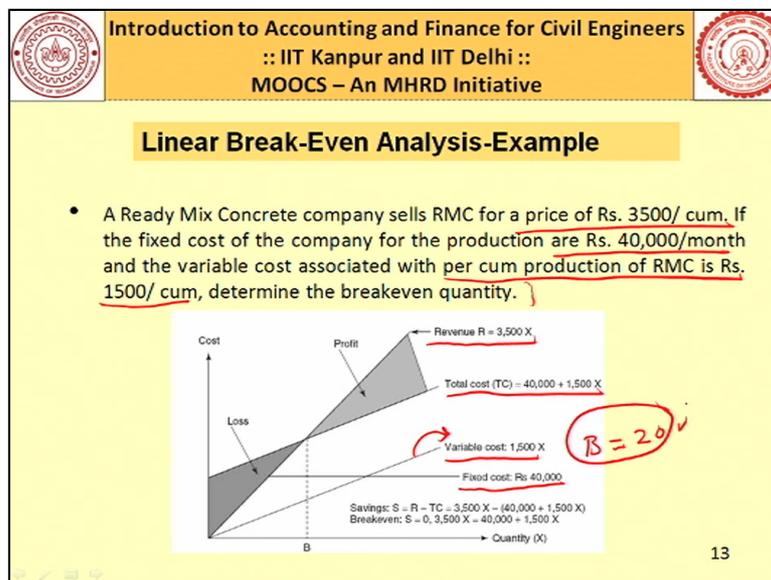
This is just to give them the confidence that, even in, let us say, in some month, they are not able to produce a very high quantity, they will still not be making loss. Now, B, we are defining in such a way that, as long as you are able to produce B, B amount, that is Break-

even amount, you are neither making profit, nor making losses. Now, below this Break-even Point, you are making losses. As long as, you are making production level greater than B, you are into profit.

That is how, you can say that, this particular Break-even Point, is of much importance to us. Now, from this expression, as you can see, there are different ways in which, you can lower down the Break-even Point. So, let us say, if I had to lower down this Break-even Point, what I can do. I can, first of all try to increase, my sales price. So, increase my sales price. Because, the moment this increases, my B become lower. So, increase sales price. This is one option. Second option is, increase the quantity of production.

So, the more you produce, the more money you make, increase the quantity of production. But, this will be beneficial only in the situation, if you are able to sell all the quantity, that you are producing. There is no point, producing a large number of goods, but not able to sell them. And, you can achieve this lowering of B, by reducing the Total Cost of production also. These are the ways through which, you try to bring down the Break-even Point.

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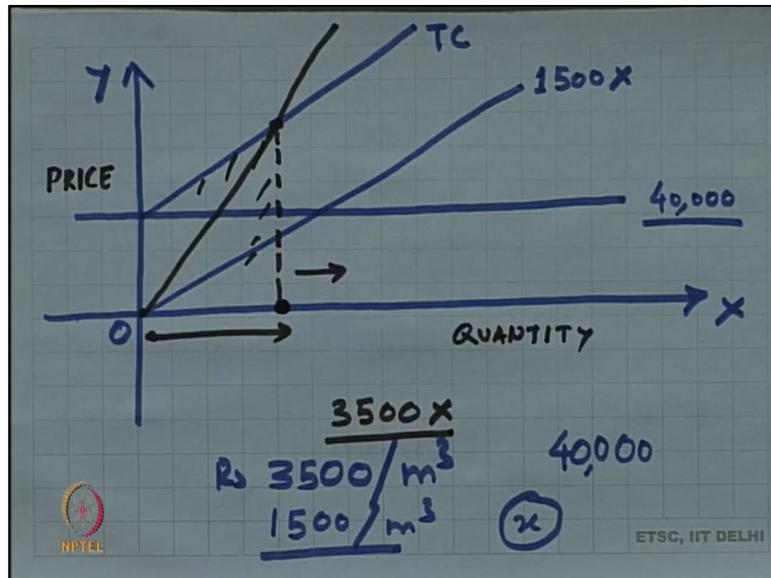


Now, this will be more clear, if we take this small example in which, we are giving some numerical values to it. We are saying, there is a ready mix concrete company, with sales RMC for a price of, Rupees 3,500 per cubic metre.

Now, if the fixed cost of the company for the production are, Rupees 40,000 per month. And, the variable costs associated with per cubic metre production of RMC is, Rupees 1,500 per

cubic metre. We have to determine, the Break-even quantity. Now, for determining the Break-even quantity, we can do either the simple calculation, or we can do with the help of one small graph also. So, we will try to go through this, graphical means.

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So, let us say, these are our two axis, X axis, and Y axis. Now, you are given that, concrete is being sold for Rupees 3,500 per cubic metre, and its Indirect Cost is Rupees 1,500 per cubic metre, and fixed cost is 40,000 per month. Right. So, what I do is, first I draw the fixed cost line, which will be like this. This is my fixed cost, 40,000. So, whether I produce any quantity or not, I am incurring this 40,000, every month. Right. Now, I draw a line for this variable costs, which is 1,500 Rupees per cubic metre.

So, depending on, whether I am producing 1 unit, 2 units, or X unit, it will be a line like this. So, this is a line 1,500 X, starting from the origin. Now, if I add these two, which is 1,500 X + 40,000, that will give me my Total Cost, and which will be something like this. So, this is my Total Cost line. On the same plane, what I will do is, I will also draw Revenue line. Revenue line is 3,500, multiplied by X. So, it will again pass through zero, and it could be like this.

Now, this is the point, we are talking of, which is Break-even Point. So, this is what we are saying, the level of production at which, the ready mix manufacturer would just be able to recover its Total Cost. So, that means, as long as, the ready mix manufacturer is producing this much quantity, on this axis, we are writing quantity, on this axis, we are writing price. So as long as the ready mix manufacturer is producing this much quantity, he is not making

losses.

Anything more than this, he is making profit. Because, his Revenue is more than the Total Cost. But, as long as, he is in this side of production, they are making losses. So, this is how, you have to find out, the Break-even Point. This graph has been very clearly drawn, in this computer slide. If you see here, this is the Revenue line, which is, R is equal to $3,500 X$. Total Cost line is, $40,000 + 1,500 X$. This is the variable cost line, $1,500 X$. This is the fixed cost line, $40,000$.

And, if you solve the equation, Revenue is equal to Total Cost, you will find that, the Break-even production level is, B is equal to 20. So, if the company is producing 20 cubic metre, on a monthly basis, they will not make losses. Anything less than that, they are going to make losses. And, anything more than this, they are definitely going to earn money, or profit from this particular investment. Now, this is as far as, Linear Break-even Analysis is concerned. Now, you must have already seen, what are the assumptions behind this analysis.

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The slide is titled "Assumptions of linear break-even analysis" and is part of a presentation on "Introduction to Accounting and Finance for Civil Engineers" from IIT Kanpur and IIT Delhi. The slide lists three assumptions:

- Income is only from the productions under study. In the previous example it was assumed that the ready mix concrete manufacturing company is into concrete production only.
- Whatever quantity is produced is sold out. ✓
- The per unit direct cost, indirect cost, and sales price associated with the production are constant over the study period. These are also constant over the quantity produced.

Handwritten annotations include "UDL" written vertically next to the third assumption, and a red circle around the title. The slide number "16" is in the bottom right corner.

So, I will just quickly tell you, what are the assumptions, that we are using, for carrying out this particular analysis. This analysis assumes that, income is only from the productions, under a study. So, in other words, you can also say that, the company is into only one business. So, if the company is producing RMC, we will say, okay, this company is only into this. So, this is the assumption, that we are making, that the companies into, only one business.

Now, the another assumption we are making is, whatever quantity is being produced, they are all sold out. So, that means, there is nothing in the store. So, whatever quantity I produce, I am just able to sell it out. Now, another assumption, which is very important is the, Per Unit Direct Cost in our example, we use the term UDC, the Indirect Cost IC, and the sales price P, associated with the production are constant, over the study period.

This is the assumption of, Linear Break-even Analysis. When we take up Nonlinear Break-even Analysis, all these assumptions will not hold good. So, in another words, you can say that, we are not considering, any quantity discount. So, whether I buy, 1 unit of goods from a manufacturer, or 100 unit of goods, they are going to give me, at the same price. Right. So, irrespective of the quantity that we are producing, our prices remain same.

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✓ Dumping

- In order to utilize the full capacity some products are sold at price P while the remaining products are sold at lesser price P'.
- $Gross\ Profit\ Z = n(P-UDC) + n'(P'-UDC) - F$
- The Dumping may sometime lead to some problems to the company practicing it.
- Countries prevent such practices by levying heavy duty on imports.

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These are the assumptions. Now, this another phenomenon, which we will also come across, in case of Break-even Analysis, and this phenomenon is known as, Dumping. Now, you will find that, let us say, there is a manufacturer, who is producing certain goods. Now, what happens, no matter how hard they are trying, there are not able to sell, beyond a particular point. Let us say, they are able to sell, 1,000 pieces of a particular item.

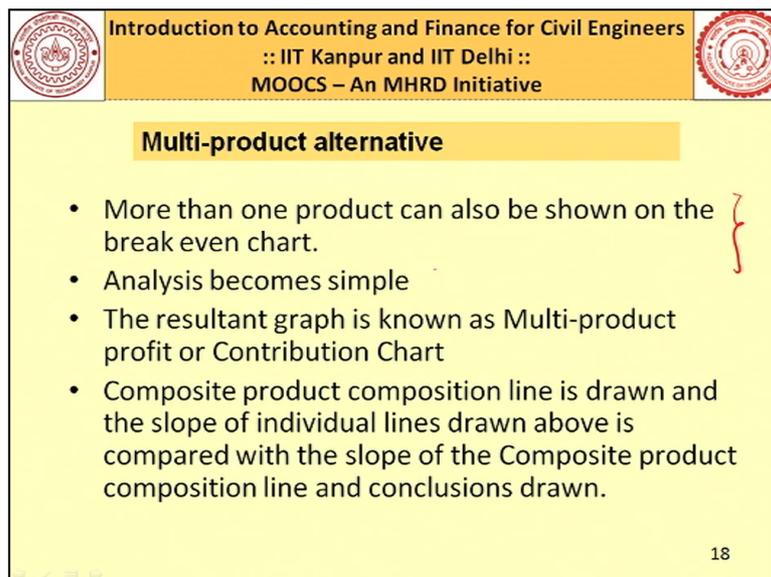
By producing this 1,000, they are finding that, they are not able to utilise, 100% of their equipment. Let us say, the equipment utilisation percentage is only 60%. Whereas, they would like to utilise it to 40% more, that means 100%. So, what they do is, they would like to find some other market, where they can sell their goods. Now, while finding the market, it is quite possible that, they may even like to sell their Product, at a very cheap rate.

So, the same product, with slight variation, in let us say branding, in let us say packaging, they will sell that particular goods, at a very low price, in some other market. So, this is sometimes also referred to as, Dumping. So, Dumping is essentially a phenomenon in which, a manufacturer dumps his goods, at a very cheap price, so that, the production, or the utilisation of his equipment, achieves the maximum value.

Now, let us say, for this example, we are assuming that, N unit of goods, he is selling at a Contribution of $P - UDC$. You remember, the difference of P and UDC, we are calling it as Contribution. So, N unit, he is selling it at, $P - UDC$ Contribution. And, remaining N dash, he is selling it at, $P - UDC$. So, by doing this, he is able to increase his profit. Profit is what, your Revenue – Cost. Now, F here is, fixed cost.

So, you can find that, by adding this much extra, even though at a lower Contribution, the company is in a position to, maximise his utilisation percentage of equipment. Now, in some countries, the Dumping is prohibited. And, if the country finds out that, some manufacturer is deliberately Dumping their goods, at a cheaper rate in our country, they may levy heavy duty on such imports, as well. Right. So, this is one such situation, which companies would like to face. But, they would also not like to pay, heavy penalties.

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The slide features a yellow header with the course title "Introduction to Accounting and Finance for Civil Engineers" and logos of IIT Kanpur and IIT Delhi. The main content is on a light yellow background with a title "Multi-product alternative" and a bulleted list of four points. A red bracket is drawn on the right side of the list, grouping the first two points. The slide number "18" is in the bottom right corner.

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Multi-product alternative

- More than one product can also be shown on the break even chart.
- Analysis becomes simple
- The resultant graph is known as Multi-product profit or Contribution Chart
- Composite product composition line is drawn and the slope of individual lines drawn above is compared with the slope of the Composite product composition line and conclusions drawn.

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Now, we will also like to see, the situation in which, let us say, a company is into multiple products. So far, we have seen a company into, only one product. And, we have seen, how to carry out the, Break-even Analysis for that. Now, we will take a case in which, we are

assuming that, the company is into multiple businesses. Now, we will see, how to carry out, the Break-even Analysis, for such situation.

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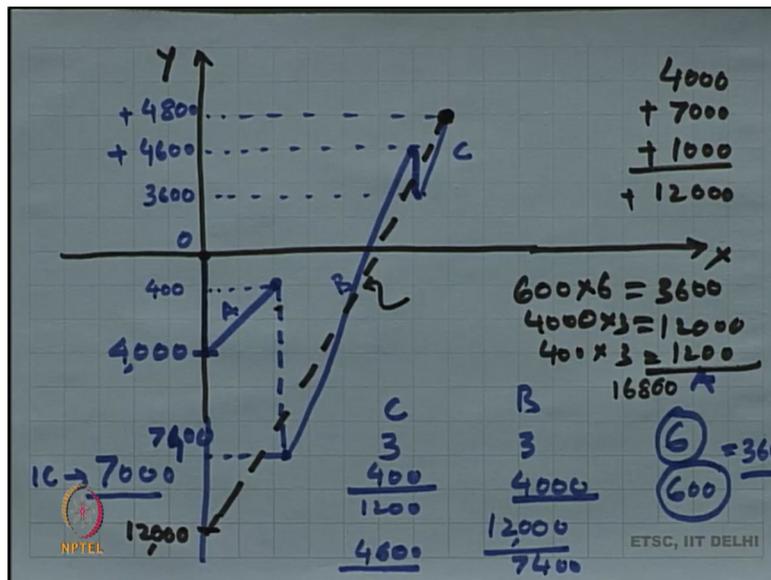
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Illustration			
	A	B	C
Selling price per unit	8 ✓	5 ✓	4 ✓
Contribution per unit	6 ✓	3 ✓	3 ✓
Fixed cost	<u>4000</u>	<u>7000</u>	<u>1000</u>
Number of units sold	<u>600</u>	<u>4000</u>	400

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Now, for this, what we do, we take a small example. This example is given in your slide here. Let us say, a company is producing three products, Product-A, B, and C. Now, A is being sold at, 8 Rupees per unit. B is being sold at, 5 Rupees per unit. C is being sold at, 4 Rupees per unit. Now, Contribution is directly given to you, for each of these products. So, for A, the company is getting 6 Rupees as Contribution, for B it is 3 Rupees per unit, for C it is 3 Rupees.

The fixed cost, corresponding to each of these products, are also known. 4,000 Rupees for A. 7,000 for B. 1,000 for C. The number of units, that are sold for A is, 600. For B, it is 4,000. And, for C, it is 400. Now, with the help of this small example, we try to show you, how to carry out the Break-even Analysis, for multiple products.

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For this, I take this again, X Y plane. So, let us assume, this is X axis, this is Y axis. Now, first I want to draw for, Product-A. Now, if you remember, for Product-A, the fixed cost is 4,000. So, this is its origin. So, whether I produce any goods or not, I will be incurring, let us say, 4,000 Rupees, as far as, Product-A is concerned. So, straightaway, I am here. So, whether I produce A, or not product A, I am straightaway incurring 4,000 Rupees.

Now, if you remember, A is giving me a Contribution of 6 Rupees. And, we are selling, 600 units of A. So, if you are selling 600 units, for a Contribution 6 Rupees per unit, you will earn how much money. This would be, 3,600. So, what I will do is, when I sell these 600 units, I will be somewhere here. So, the line would go, something like this. And, right now, we are at 4,000 - 3,600, so it would be 400. So, this is the line corresponding to, Product-A

Now, what I do, on the same line, I am going to superimpose the fixed cost, for Product-B. Now, the fixed cost for Product-B, if you remember, it is 7,000. So, I will again go down by 7,000. That means, whether I produce Product-B or not, irrespective of that, I am incurring this much cost. So, that means, this would be 7,400. Because, already we were at 400, now we have gone down by 7,000, so we have reached 7,400.

Now, for B, if you remember, the Contribution is Rupees 3, and we are selling total number of 4,000, so my total income is going to be 12,000. So, now I again move, and it would be somewhere here. So, 12,000 - 7,400, it would be 4,600. So, I am here, 4,600, in plus side. So far, I was in negative, now averaged positive. Now, this was for A, this was for B. And now, I will draw for C. If you remember, for C, the fixed cost was 1,000.

So, I come down again. It should have been drawn in a dotted line, does not matter. Now, this point is 3,600. Because, you went down. Irrespective of, whether you produce C or not, you are incurring 1,000 Rupees. And, now for, Product-C, it was given that, it is contributing 3 Rupees per unit, and you have sold 400 units, so 1,200 is the money, that we are generating. So, it would be somewhere here. So, $3,600 + 1,200$, it would be somewhere at, 4,800.

So, this is how, individually, you can show the Break-even lines. Right. Now, what I have to do, on the same paper, I have to draw a composite line, which is sometimes known as Multiproduct Profit, or Contribution Chart. And, for drawing that, what we have to do is, we have to add up, all the fixed costs. So, the sum of fixed costs are like this. $4,000 + 7,000 + 1,000$. So, it is 12,000. So, 12,000 straightaway, you are down. Whether you produce it or not, you are somewhere here.

So, let us say, this is 12,000. So, whether you produce A, B, or C, or not produce any one of them, you are going to incur 12,000. And, if we add the Contribution, from each of these, A, B, or C, it would be 600 multiplied by 6, which is 3,600 from A, 4,000 into 3, so it is 12,000 from B, and 400 multiplied by 3, 1,200 from C. So, if you add all of them, so it is going to be, 16,800. Now, $16,800 - 12,000$, we will be here, 4,800.

Now, I joined them, like this. So, this is called, Multi-Product Profit Line, or Multi-Product-Contribution Line. Right. So, we have drawn this Multi-Product. That means, we have combined these, all three products, and draw in a single chart. Now, looking at this chart, we can very easily find out, which product is doing well, and which product is not doing well. So, how do we find it out. What I do is, I compare the slope of individual product lines, from this Multi-Product-Composite Lines.

If I find that, the slope for Product-A, is steeper than the composite line, we say that, the product is doing good. However, if I find that, the slope is flatter, compared to the multiple product line, or the composite line, I say that, product is not doing good. Now, when I find, some product is not doing good, what do I do. I try to lower the Break-even Point. How do I do it. I do it, either by increasing the sales quantity, or increasing the sales price, or by decreasing the cost.

Now in practice, you will find that, these are not easy task. You try to cut down the cost, you get resistance, from your own staff. Because, nobody would like to cut down its cost. Suppose, today, you are given an opportunity, to fly business class. You have eligibility of business class. And tomorrow, you are told that, no, you cannot fly business class, you have to fly only economic class, you do not like this.

So, you have to judiciously find it out, the best options, whether to increase the sales price, or whether to cut down your cost. Most of the times, companies try to go all out, and then they try to tackle from all the corners, and then they try to lower down the Break-even Point. So, in this lecture, we essentially focused on, finding the Break-even Point, especially for linear problems.

When I say, Linear Break-even Analysis, we had certain assumptions like, we said that, companies into only single product. We said that, whatever quantity is being produced, is being sold out. We said that, irrespective of the quantity sold, the prices do not vary. So, these were certain assumptions. And, based on these assumptions, we understood, how to find out the Break-even Point. We also understood the phenomenon of Dumping, wherein we understood, how companies try to sell their products, at even a cheaper price, so that, the efficiency of your equipment increase.

We also learnt, how to carry out the Break-even Analysis, wherein a company is into multiple products. We said that, we have to compare, the slopes of individual Break-even lines, from the slopes of this multiple Product-Composite lines. If I find that, the slope is a steeper, that means, the product is doing well. If I find that the slope is not a steeper, rather it is flat, then I say that, the product is not doing good. Accordingly, I have to take decisions.

So, I stop at this particular point. And, in the next class, we will discuss, some of the cases, wherein, Nonlinear Break-even Analysis, has to be carried out. So, till then, thank you very much, and see you next time.