Financial Mathematics
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Lecture – 50
Introduction to Cost of Capital and Ratio Analysis

Welcome you welcome to the lecture on, Introduction to Cost of Capital and Ratio Analysis. So now in this lecture, we are going to have the knowledge about the cost of capital before and after tax. You know, the cost of capital, what it is, and what are the different ratios which are required to you know analyze in the case of the, you know, this cost related to capital. So, that, we will discuss in this lecture.

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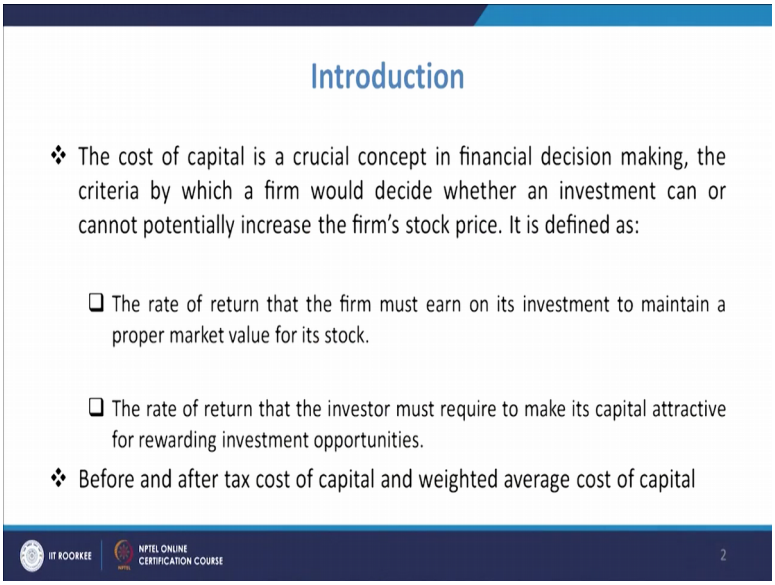

Now the Cost of capital is a crucial concept in financial decision making and it is the criteria by which a firm would decide whether an investment can we can or cannot potentially increase the firm's stock price. So basically it will help you in making that decision and it will be defined as that is the rate of return that the firm must earn on its investment to end maintains a proper market value for its stock.

So that will be one thing which will be required and then also the rate of return that the investor must require to make its capital attractive for rewarding the investment opportunities. So certainly the, you know, the investors will try to reward the person who is purchasing these stocks or you know, the shares of his company. So he will try to reward him, and you know, how much, you know, return the investor must be getting.
So that certainly is the one point which is in his mind. Now we must be knowing that, what is the before and after tax cost of capital so and also the weighted average of cost of the capital.

So if we try to define the, you know, so basically, the firm will be using the like those firms which use the long term debts, like so if the firm is using these, you know, long term debts like, you know, bonds, selling bonds to finance its cooperation its operation.

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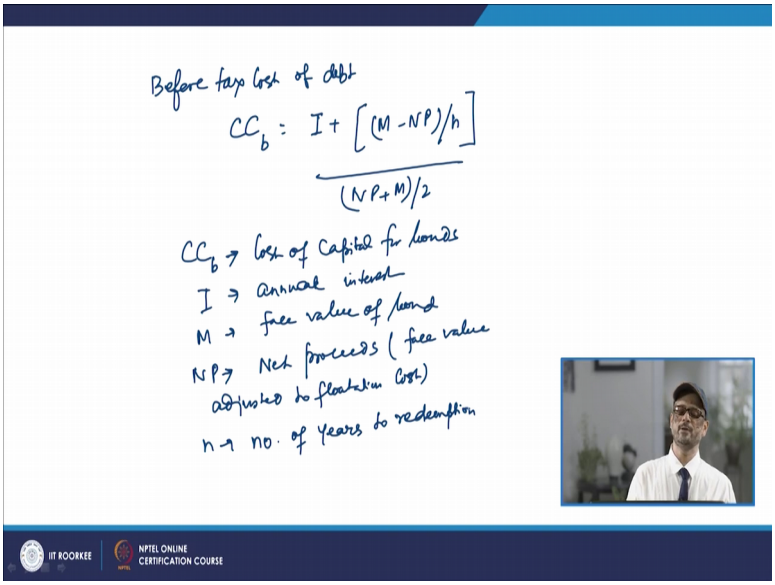

So in that case, you can calculate, the before tax cost of debt. So the before tax, cost of debt can be computed, in those cases, when you know the firm is using that long term debt, by like selling bonds. So in that case, before tax cost of debt, that is known as CCb, so that is basically found as the, you know, I plus then M minus NP and then divided by n, and then that will be divided by NP plus M by 2.

So, the average of the NP + M now what are these values? So here, first of all, we must know that this CCb, this is the cost of capital of, you know, for bonds. Now for that, I what is I is known as the annual interest then M is the face value of the bond. So M is the one which is known as the face value of the bond, similarly NP, so NP basically will be the net proceeds and then so that is what it is.

So net proceeds, is nothing but, so that is you know it is the face value adjusted to flotation cost. So basically you have to take into account, this floatation cost obligations, and then you will have the net proceeds, and n is the number of years to redemption. So once you know these values, then you can find the before tax, you know, cost. Cost of capital for the bonds.

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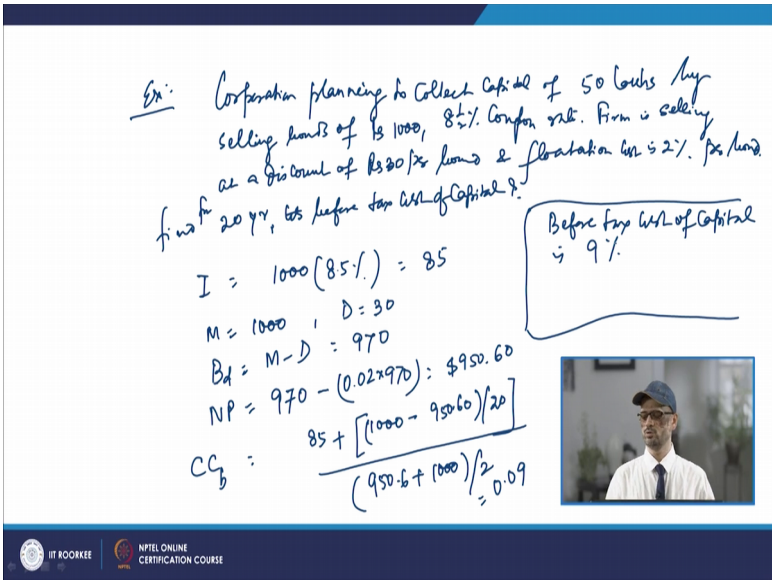

Let us say for example, suppose you have a, so one corporation is there, and it is planning to you know, collecting capital C, corporation planning to collect capital. So capital of suppose say, 50 lakhs. Now you know, so it will be by selling its bonds. So it will be selling, you know, bonds of you know, one thousand you know, 8 1/2% coupon rate. So that is you know the bonds of rupees 1000 and the coupon rate will be 8 1/2%.

Now, now the firm is, you know the firm is selling at a discount of you know rupees 30 per bond and also the flotation cost that is involved so flotation cost is two percent per bond. Now if you are, if you have to find you know the before tax cost of the capital and also given the 20 years. So, so 20 years find 20-year you know, for 20 year, you know before tax cost of capital. So suppose you are to find say let us say, the before tax cost of capital and n becomes 20 years.

So if you look at this, in this case, you need to find all this parameter, like you need to find I M and P, n is 20. So that way, you can find. Now I if you look at, if you have to find I, I will be 8 1/2% is the coupon rate. So, your 1000 multiplied by 8.5%. So it will be 85. So that will be your I. Then the expression is M, M - NP / M. M is the face value of the bond. NP is the net proceeds.

So if you look at the; you know M, M is basically given as 1000. Now if you look at these discounts, discount is given as the 30 per bond. So your bond discount is you know so that is so that is why the, Bd will be M - D, that is discounted, this discount is given as you know 30. So it will be Bd will be 970. Now the net proceeds, net proceeds basically will be because your production cost is 2% so net proceed will be 2% will be subtracted so it will be 0.02

times 970 and that will be subtracted or you can multiply with 0.98 to 970 and it becomes 950.60.

So that becomes your net proceeds and this is the face value of the bond because it gives, giving a discount so your value is becoming you know. So this BD becomes M - D. Now what are happening, that you have to find this, you know, before tax, you know, cost of capital. So that will be I plus, so I will be your 85, then you have to, have the difference, that is the face value anyway is 1000 and net proceed is 950.60.

And this will be divided you know by 20, so that is on the numerator, and then in the denominator, you will have you know the 950.6. So and then you have 1000 is the face values that M and this divided by 2. So what you get is, in this case, you are getting a value of 0.09. So now what you can write, coming to the interpretation of the value of CCb as 0.09, it can be written that you know the before tax you know before tax, the cost of capital is 9% okay.

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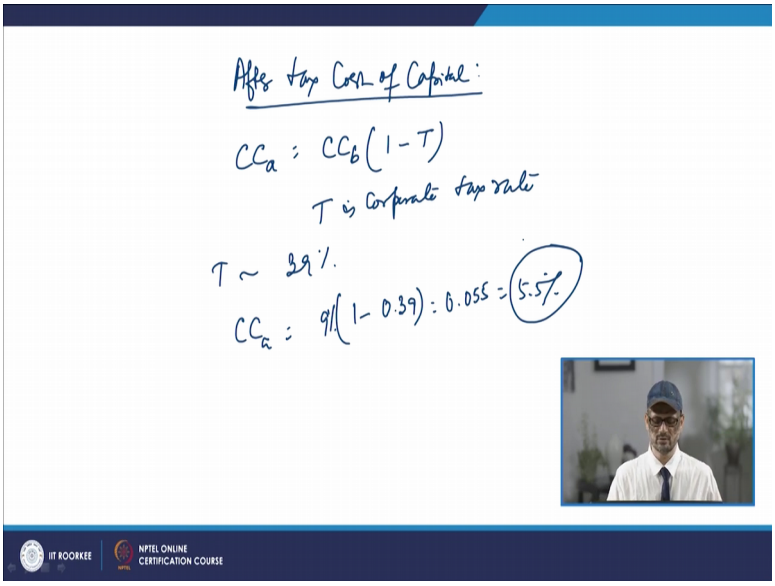

So you know if you have to find the after-tax cost of the capital, now for the, finding the after-tax cost of capital, you have to find you have to know the you know tax rate and if you know, for finding the after-tax cost of capital, now after-tax cost of capital for that you need to have the value of the tax rate. So, after-tax cost of capital, now that is CCa and it will be before tax cost of capital multiplied by 1 - T. So that T is the corporate tax rate.

So once you know the corporate tax rate in that case once you have found the cost of capital before tax so after tax it will be something like 1 minus T. So suppose it is if T is suppose given as 39% in that case, it so in this case CCa will be 9 percent multiplied by 1 - 0.39. So that way it will be 61 and into 0.61 into 9, so it will be 0 point you know 055. So, so 9

percent it is. So that will be 5.5%. So it will be 5.5%. So that way, you know, you can calculate the after-tax cost of the capital also. so this is about that.

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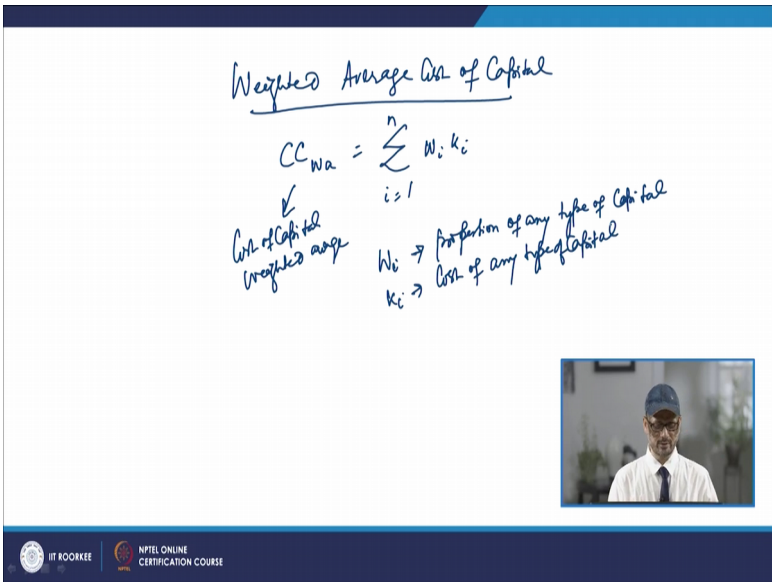

Now we will discuss about you know the different terms like also like weighted average, so we had also said. One is the weighted average cost of the capital. Now if you come to the weighted average cost of capital, now this weighted average cost of the capital, it is so as the name indicates it will be taking the weights in fact. Now in this case, the cost of capital for the weighted average, it will be summation of I = 1 to n and this will be Wi Ki.

So you have you know in this case, this CCWa, this is basically the cost of capital weighted average and the Wi and now in this case the Wi is basically the proportion of any type of capital, and the Ki is the cost of any type of capital. So in the, you know, firms capital structure, you will have different types of the the capital in the, you know, in the firm and it will have certain you know proportion.

So that way you will get the Wi and also the cost of that particular type of capital so if you get the summation of all them all of them so that will be telling you the you know cost of capital weighted average. So that can be understood by, you know, again one example say, if you have, you know, a corporation's capital structure is there.

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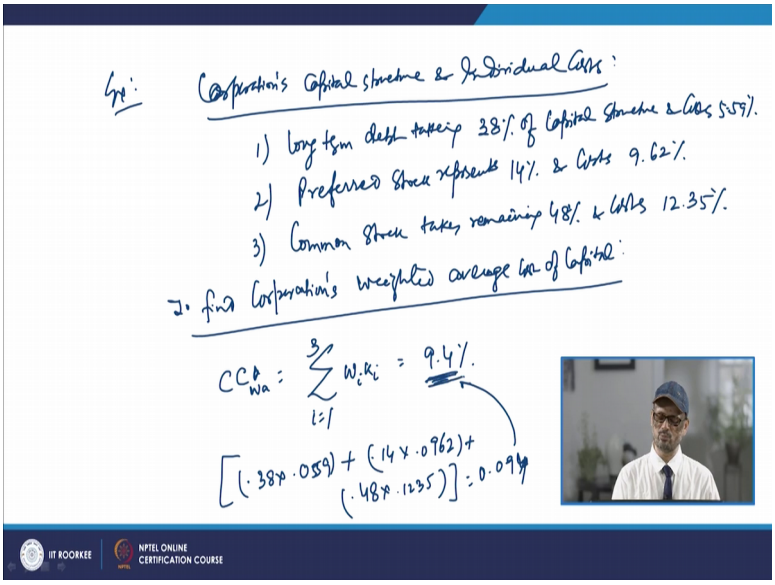

So suppose corporations you know capital structure and the individual costs are like this. So the corporation's capital structure and individual costs. So if you look towards, you know, the different you know capital structure and the usual cost suppose the long-term debt, it will be taking 38% of you know, capital structure and costs, 5.59%. So suppose the long-term debt which is taken it will be the 38% of the any capital structure of that corporation, and it will be costing about 5.59%.

Then you know the preferred stock, so that preferred stock will be representing. So that represents 14% and it will be and it will be costing 9.62%. Similarly, you have the common stock in the end and the common stock you know takes remaining 48% and costs about 12.35%. So this is, you know the, you know capital structure cup corporations capital structure and also the individual costs. So if you have to find, so you have to find the corporations weighted average. So you know mm cost of capital corporations weighted average cost of capital now, and we will try to also interpret what does it mean.

So if you try to find these corporations weighted average cost of capital so you can have it you know table and what you see is that, you know, you have the long term debt which is taking to 38% of capital structure, it costs about 5.59%. Similarly, preferred stock 14% cost 9.62. So your Wi and Ki. So Wi is in this case you have 0.38 and this is 5.59%.

So now if you find the CC you know the weighted average, in that case, you have to, see that it is done with from I equal to 1 to 3, you have 3, you know types of you know the long term debt and preferred stock and common stock and you have to multiply Wi Ki. So these values are given and you can multiply and then you can add so if you add them, it becomes 9.4%. Now the value of 9.4% that is that will be basically coming as 0.38 * 0.0559.

Similarly so that will be, you know 0.38 * 0.0559 + 0.14 times 0.0962 and then if you take 0.48 * 0.1235, so if you take its sum so that comes out to be you know 0.094. So that is what it is 9.4 percent. Now it means that the; you know as this so this will be basically the weighted average calculation. And, you know, in this case this 9.4%, this return it tells that corporation will be able to accept all the investment projects it will be able to accept if that earns more than or equal to you know the this 9.4%.

So, that is, if it is less than that, then certainly it will not be able to sustain. So it way if it you know if it is able to earn more than that then corporation will be able to you know accept all the investment you know projects. So that is, what the meaning of the corporation's capital structure and individual cost and based on that how you find the weighted average cost of the capital.

Now we are going to discuss about the ratio analysis. Now what happens that many of the you know, in this investment sector, many a times you wish to compare that how you are getting the returns, and you know there are different you know ratios which are defined. Now these ratios we must be able to you know we must be acquainted with which basically you know they will be many a times, we try to see that how much return you are getting and what is the trend of the returns, what are the risks?

So, you know based on that you have to you know what to do is there are different types of performance measures which are defined in terms of ratios and we must be also acquainted with the different type of these ratios. Now among them you have the ratios like the profitability ratio. because these ratios will be, you know, addressing this specific type of you know specific aspects of the performance.

So you will have the profitability ratio or the liquidity and the operations. So you will have different ratios which are defined basically, and it will be indicative of the performance of the firm. So we are going to talk about the different type of ratios.

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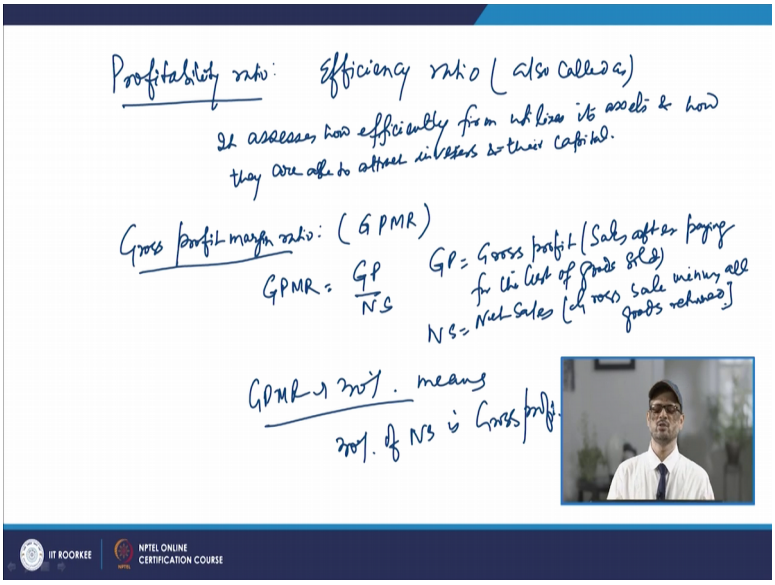

Now one first is the profitability ratio. So if you talk about the profitability ratio there also known as the efficiency ratio, so also called as. Now you know they are basically used, they are usually used to assess basically how efficient efficiently the firm is utilizing its assets and you know assets. So it assesses how efficiently firm utilizes its assets and how they are able to attract investors and their capital.

So, for that you know these profitability ratios are basically calculated or efficiency ratios are calculated. Then the next ratio, which is very important, is the gross profit margin ratio. So this is also you know known as so it will be indicated by GPMR. So this is gross profit margin ratio and it all these ratios or the ratios we will have in the numerator something and the denominator something.

Now in this case the GPMR are basically is basically the ratio of GP and NS. So GP is the gross profit, so GP will be gross profit so that will be sales after paying for the cost of goods sold. So that will be your, you know, gross profit and you know NS is the net sales. So NS will be net sales, so that will be gross sale minus all goods returned. So that will be gross sale minus all goods returned. So that will be your net sales.

So this gross profit margin ratio is one of the; you know ratio which is used to see that you know how efficient you know how good the company is. So suppose you if your gross profit is given and also your net sales are given then you just take the ratio of these two and that will give you the GPMR. So you know the GPMR will tell that for every rupee of the net sale, what is the gross profit.

So once you have the net sale, you know, then if you are getting 30% as the GPMR. GPMR is supposed 30% means, you know, 30% of net sale is the gross profit. That is what you know,

so larger will be, you know, the GPMR, it means that larger percentage of the net sale will be your gross profit. So that is, you know, one of the you know parameter, one of the ratio, which is described.

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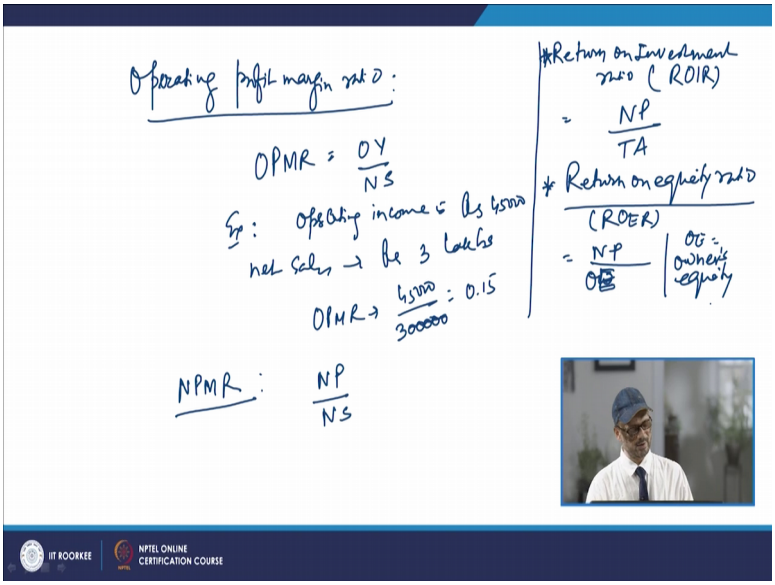

Then next may be Operating profit margin ratio. So operating profit you know margin ratio it will be defined as the ratio of you know in this case you are not taking the gross basically profit, but you are taking the; you know, in this case, it is this is also represented by OPMR and it is here, you have, you know, you know, you take the ratio of all OY to NS. So it will be talking about the, operating profits, you know, as related to the net sales.

So it will be talking about the operating income and that way it will be same as the EBIT sorting before you know income and taxes. So, so that way, you calculate these you know OPMR, Operating profit margin ratio. For example the, you know, if the operating income is say so if so operating income is rupees 45000 and net sales is rupees 3 lakhs. So in that case the operating profit margin ratio, it will be computed as, 45000 / 3 lakhs.

So this way you can calculate. So it will be 45 / 300 and it will be calculated as 0.15. So you know, it means that, how much of the net sale, you know, will be going to the operating income budget. So that is what it will be representing. Next the ratio which is again important is the Net profit margin ratio. Now, net profit margin ratio again it is related to the net profit. So it will be ratio of a net profit by net sales. So you are given the net profit value and you have net sale.

So that way, you can if there is some percentage is given, if the net sale is known to you, then that percentage of the net sale will be your net profit. So, so that way, you can directly

calculate this net profit margin ratio, that is NPMR. Another you know ratio that is important is the Return on investment ratio. So that is also known as Return on investment ratio ROIR. Now in this case, it will be taken as the total, so it will be compared to the total asset of the firm, and here you will be talking about the net profit will be ratio of net profit to the total assets.

So return on investment that is your total asset must be that is mentioned, and the net profit if it is mentioned, so this ratio if it is known, and if you know the total assets then you can say that this will be the net profit of the you know the organization. So that is your return on investment ratio. Then there is a Return on equity ratio. So this return on equity ratio, that is, you know ROER and ROER basically, it will be the net profit and it will be on the denominator, you have owner's equity.

So OE and this OE is basically, owner's equity. So that way, you will have the net profit. So once you know the, owner's equity and you know for both the preferred, as well as the common stocks, then it will be telling you that, you know, how much of the money of the firm will be going into the profit. So that way you can calculate these, you know, return on equity ratio.

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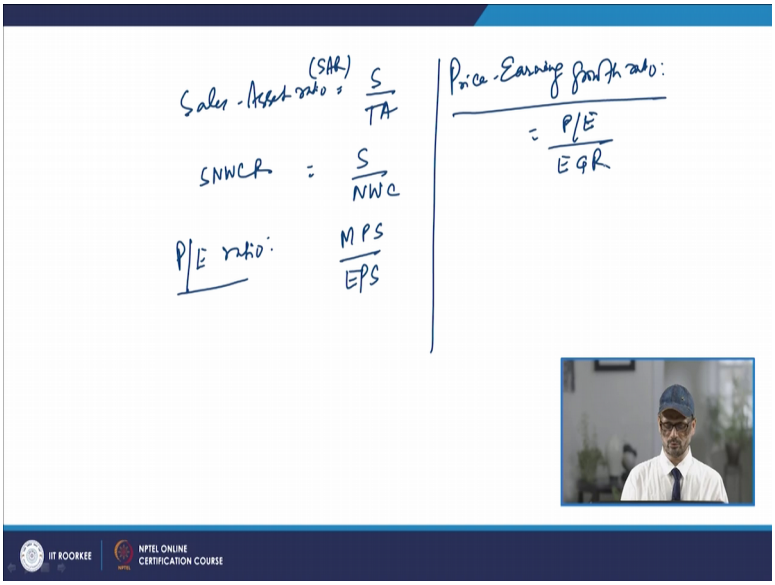

Apart from that, you have, you know, many types of ratios like, you have, Sales asset ratio. So that will be the ratio of, you know, so it will be, how efficient you are using the resources, and it will be referring the sales to total assets. So it will be sales to total assets. So that will be your sales asset ratio. Similarly you have sales to net working capital ratio.

So that will be sales to net working capital ratio, this will be sales to asset ratios as they are, so it will be, in this case, you have to find the sales by net working capital. So that way, you have, many kind of ratios, you have also ratios based on the, you know, market based and in that case the different ratios are like, you know, price by earning ratio. So, so price by earning ratio that will be basically depending upon the market price of the common stock and then the earning per share.

So that will be your price by earning ratio. So that way price by earning growth ratio also, also that will be being computed and the terms like earning per share, so you can calculate like you have price, then earnings growth ratio. So that will be price by earning divided by the, you know, your growth rate, the expected growth rate, for the years. That will be price earnings growth ratio. So this way, you will have the, different types of ratios, which basically come across when you discuss all these things. Thank you very much.