Security Analysis and Portfolio Management
Professor J P Singh
Department of Management Studies
Indian Institute of Technology Roorkee
Lecture 30
Equity Valuation - VII

Welcome back. So, before the break I discussed the concept of adjusted present value and the concept of capital cash flows. The basic issue that involves both these methods is that of interest tax shields in the adjusted present value, we can discount the, the interest tax shields at an appropriately decided, appropriately determined rate by the analyst based on his perception of the realizability of interest tax shields. In the case of the CCF model, we discount this interest tax shields at the pre-tax weighted average cost of capital.

Now, that discretionary rate that I mentioned in the adjusted present value could range from the cost of debt, where the risk in the realizability of the interest tax shields mirrors the risk of in the default of the debt. If you are going to pay, if you are able to pay interest, then the presumption is that you are also able to earn sufficient profits for the realizability of the interest tax shields.

Of course, at the other end of the spectrum, you could use the unlevered cost of equity which mirrors the business risk of the firm. And if you believe that the interest tax shields would be realized or otherwise, in tandem with the realization of profits or otherwise of the firm. In other words, the risk and realizability of the interest tax shields mirrors the risk of the business of the firm you can use the unlevered cost of equity.

So, let us know move on to how are the relationships between the levered cost of equity and the unlevered cost of equity. That is a very important for whatever I have discussed so far. Now, there are two important propositions that go into determining these relationships.

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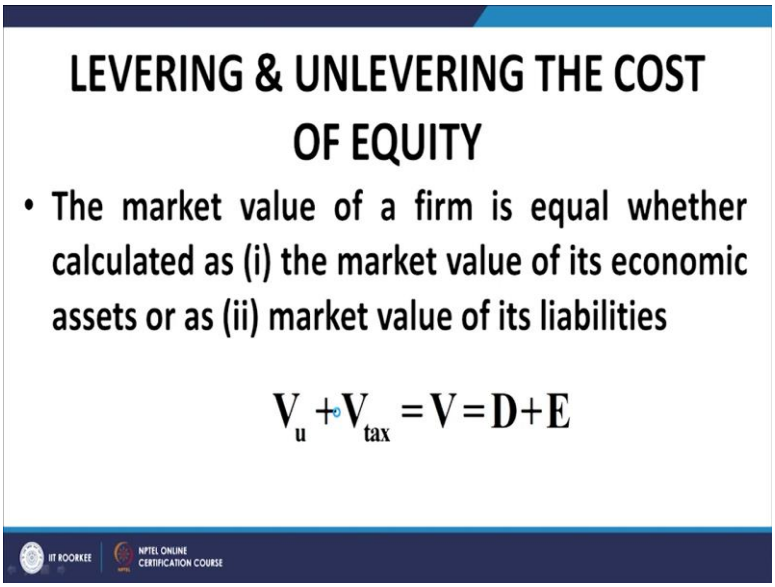

The first is, proposition one is the market value of a firm is equal whether calculated as the market value of its economic assets, that is the value of its asset side in the balance sheet, market value of the asset side of the balance sheet or the market value of its liabilities. In other words, what the presumption is that the market value of the assets of a firm will equal to the market value of the liabilities.

In other words, and what is the market value of the assets, the market value, the of the economic assets of the firm is the value of the assets of the firm is totally equity financed plus the value of the tax effects. Let me repeat, the total value of the firm can be split up into two parts on the basis of which the economic structure, number one, the market value of the assets on the premise that they are totally equity finance or the value of the unlevered firm plus the value of leverage or the value of the tax effects.

And this must be equal to the debt plus equity from the liability side both measured in terms of market values, debt as well as the equity being measured in terms of market values. So, what we are getting is value of the unlevered firm plus value of the tax effect is equal to market value of debt plus market value of equity. Now, the second proposition is that the weighted average cost of capital is indicative of the risk profile of the firm.

It will be the same whether calculated from the asset side or the liability side I repeat the weighted average cost of capital that pre-tax weighted average cost of capital, pre-tax weighted average cost of capital is indicative of the risk profile of the firm, it will be the same whether calculated from the asset side or the liability side.

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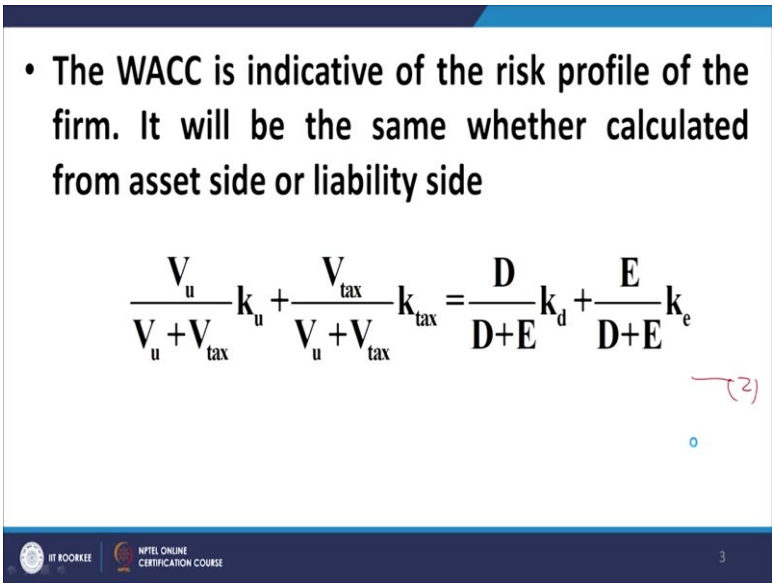

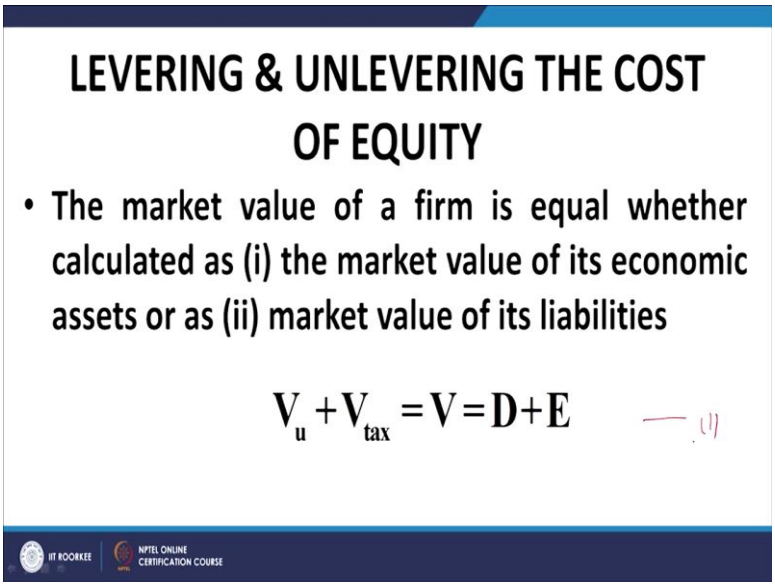

This gives us this equation let us call it equation 2. And let us just call this equation 1. Using these two equations, equation 1 and equation 2, we can arrive at relationships between Ku, K tax, Kd and Ke. And we further need to make some assumption about one of these parameters or one of these components of this equation Ku, Kd, K tax or Ke in order to arrive at a relationship between these values. Now there are some special cases of this set of equations, which I have already alluded to earlier.

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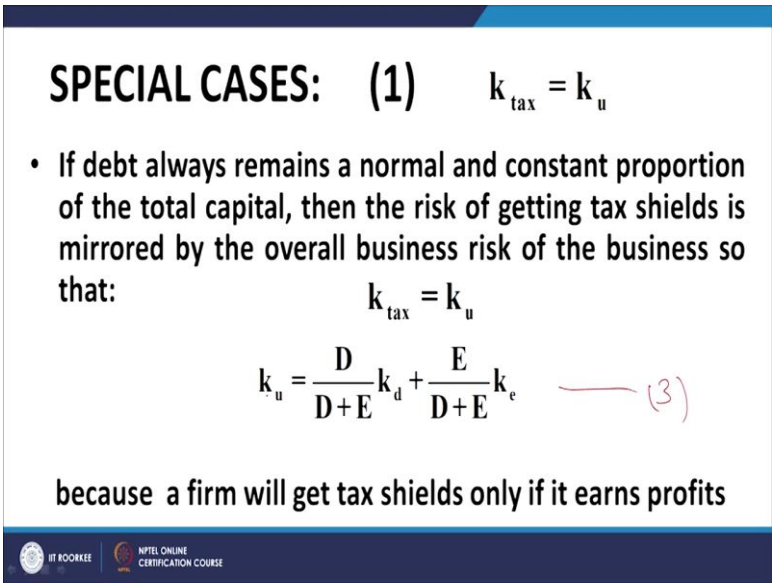

The first case that I mentioned here is K taxes if Ke is equal to Ku, in other words, the realizability, or the riskiness, realizability of the tax effect, income tax effects, income tax shield and so on, if is the mirror of the business risk of the firm, in other words, if the firm is earning profits, it would be able to realize the interest tax shields, and if the firm is not in profit, it would not be able to realize their interest tax shields.

And on that premise, we assume that K tax is equal to Ku. Let me repeat in this, in this case, we are making the assumption that the business risk determines the realizability of the interest tax shields, and as a result of it, the riskiness of the interest tax shields mirrors, the riskiness of the business and Ku is equal to K tax.

And if I use that assumption, I arrive at equation number 3 which gives me a relationship between the unlevered cost of equity and the levered cost of equity. The relationship between Ku remember Ku is the unlevered cost of equity and Ke, which is the levered cost of equity.

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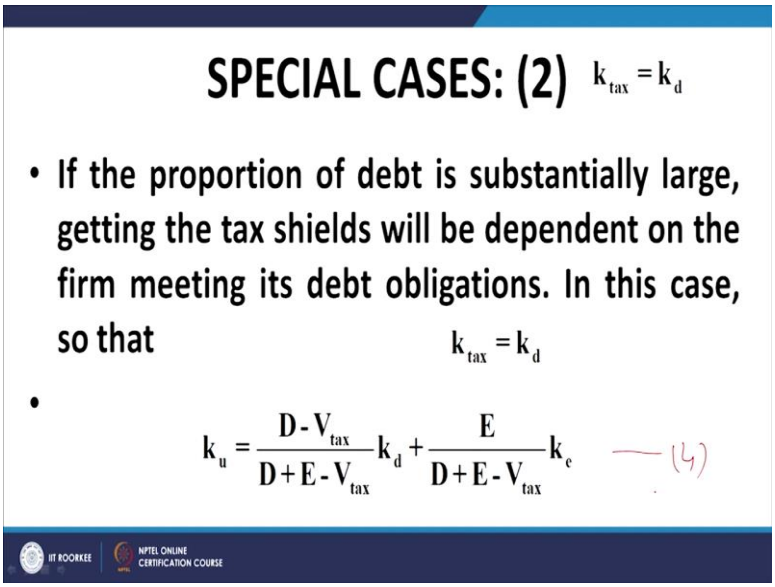

Now, the other case, in the other case, what we assumed was that the payment, the payment of interest, and the repayment of debt meeting the obligation of debt will determine the realizability of the tax shields. And in that case, we have K tax is equal to Kd, in which case we get equation number 4. So, these are the two extremes of the spectrum, one is K tax is equal to Ku, that is the business risk determines the riskiness of the tax effects, tax shields.

On the other is the risk, the credit risk, or the default risk in the, of the debt determines the realizability of tax shields. So, these are the 2 extremes that we normally use as the determinants of the cost of equity. So, we get these two results, we get these two equations. Now, if debt is a constant amount, if kept is a constant amount, we can simplify the situation a little bit further.

Annual interest payment would be equal to the amount of debt into the cost of debt which is Kd, your tax shield would be T, tax rate into the amount of interest that is T into d into Kd and the value of this IT asset, assuming that it is a perpetuity at a riskiness of Kd would turn out to be T into d. I repeat the annual tax rate works out to T into d into Kd you value this as a as a perpetuity at the cost of debt, and you get the value of the tax effect as the contribution of the tasks effects to the appreciation in the value of the firm as T into d.

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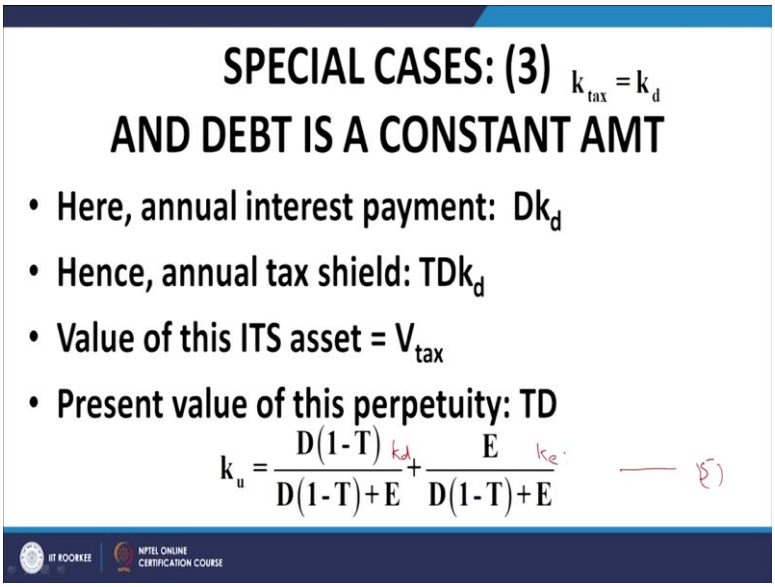

This leads us to equation number 5 for calculating the unlevered cost of equity and the levered cost of equity.

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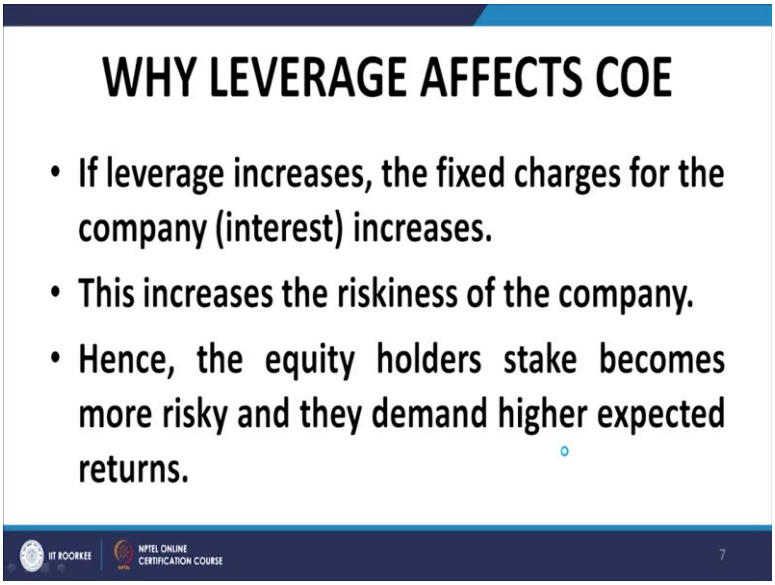

So, why does leverage affect cost of equity? Well, the reason is simple, if you, when you introduce a debt into the firm, what happens is the there is an increase in the fixed charge on the firm, naturally, the riskiness of the firm increases, and therefore, for those who are investing in the equity of the firm, the firm the investment becomes more risky and therefore they require a higher return on their investment.

Let me repeat, it is quite simple. When you introduce more and more debt into the firm, the firm that fix charges on the firm on account of interest increases and as a result of which in

the event that the firm falls on bad days, the effect is magnified, the impact of the poor situation gets magnified. And the in other words, the riskiness as placed by the equity shareholders because of fixed charges becomes more and therefore they demand a higher return and therefore the cost of equity increases.

And therefore, the cost of equity of a levered firm is definitely more than the cost of equity of equivalent unlevered firm. Now, leverage determines or leverage effects the cost of equity, because leverage changes the risk faced by the equity shareholders and therefore, they demand a higher return.

Levered and unlevered beta, well, there we have just talked about a relationship between levered and unlevered cost of equity, we just worked that out a couple of minutes back. Here we have a relationship between the levered and unlevered beta using the cap m model. So, the cost of debt is the standard equations of this cap m are being used here.

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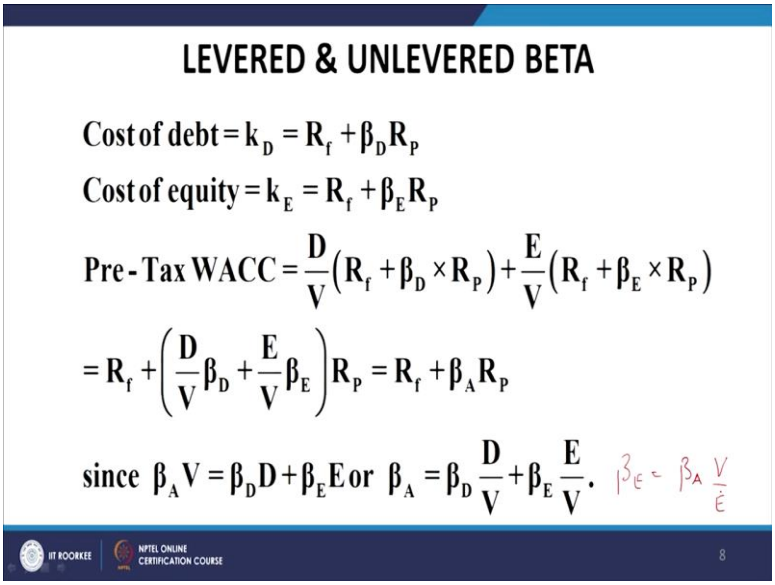

Cost of debt Kd is equal to Rf plus beta D into RP cost of equity, that is the levered cost of equity is equal to Rf into plus beta E into RP, what is RP? RP is the equity risk premium. Now, when we work out the pre-tax WACC we that is equal to D upon V into Kd plus E upon V into Ke, we substitute the values of Kd and Ke and we simplify a little bit, we end up with a relationship between beta A.

Beta A is the unlevered beta; it is also called the asset beta. So, beta A is the asset beta which is independent of the capital structure. This is in fact the WACC pre-tax WACC of the betas of the company where we are using beta E as the levered beta. So, the debt you see if the you

need to look carefully here, to note carefully here that beta D is usually very small. Sometimes we approximate it by 0.

Because the sensitiveness of the value of market value of debt to market value or to a market index or market equity indexes insignificant is very small in any way in any case. So, that being the case, beta D is very small. And therefore, beta A depends on the, beta A is equal to or approximately equal to beta E or E upon V. Now, in this equation, it is beta A which is usually constant, it is beta A, which is approximately independent of the capital structure and it is beta E which varies.

So, it is better if we write this equation in terms of beta E. Beta E is equal to beta A into V upon E. So, it is the ratio of V upon E which determines beta E with beta A being constant. Rather than beta E being constant and beta A being determined by the value or equity to value ratio, it is the other way around. Beta E is the variable beta A is usually the constant beta and we can determine beta E by reference to the constant asset beta. So, we have talked about the unlevered and the asset beta.

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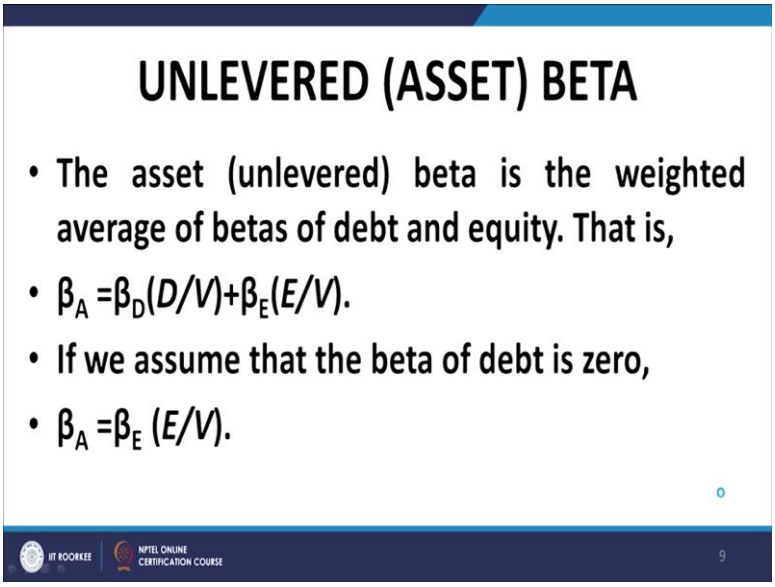

The asset because the weighted average returns of debt and equity that is what we have in this expression.

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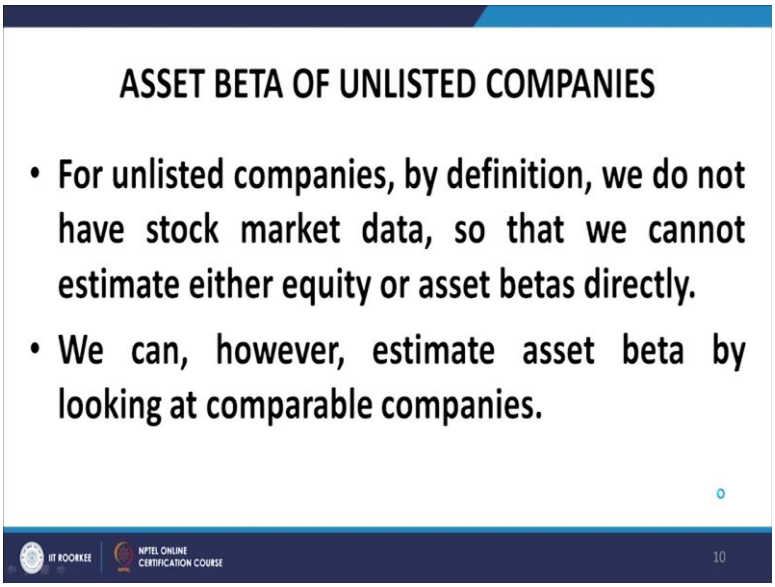

Asset beta of unlisted company this point I had alluded to earlier, what we do is we for unlisted companies, because we have no trading data of the stock of unlisted company, so, it is difficult to determine directly the asset beta or the equity beta of unlisted companies, what we do is, we have we construct a sample of comparable companies, we have, we construct a set of comparable companies, let us call it the comparable set.

The companies which are similar to the company that we are trying or for which we are working out the asset beta with several set of companies which are similar in terms of the dimensions in terms of the riskiness in terms of the growth rates and in terms of the magnitudes of the cash flows and so, on.

So, having identified a set of comparable companies, we work out their betas from, we assume that this set of comparable companies is of listed companies and therefore, we have stock market data for all of these companies from which we determine the beta equity, beta E of each of these companies. This can be done easily by using any kind of software, they are simply regression coefficients.

So, we can determine the equity beta and on that equity beta of each company, we unlever the beta of each of these companies is using the debt to equity ratio of that company. Preferably the market based dept equity ratio, but if that is not available, then we use the company based dept equity ratio as available from its financial statements, but we unlever the beta of each of these companies, and then we take some kind of a leverage of these unlevered betas of all these companies.

And using this average unlevered beta, we use it as a proxy for the unlevered beta of our target company. So, that is how we work out the unlevered beta of the unlisted company. And of course, if we want to work out the levered beta of that unlisted company, we simply use the debt to equity ratio for that list, that target company and lever the beta, lever the unlevered beta of that company. So, that is how we go about it.

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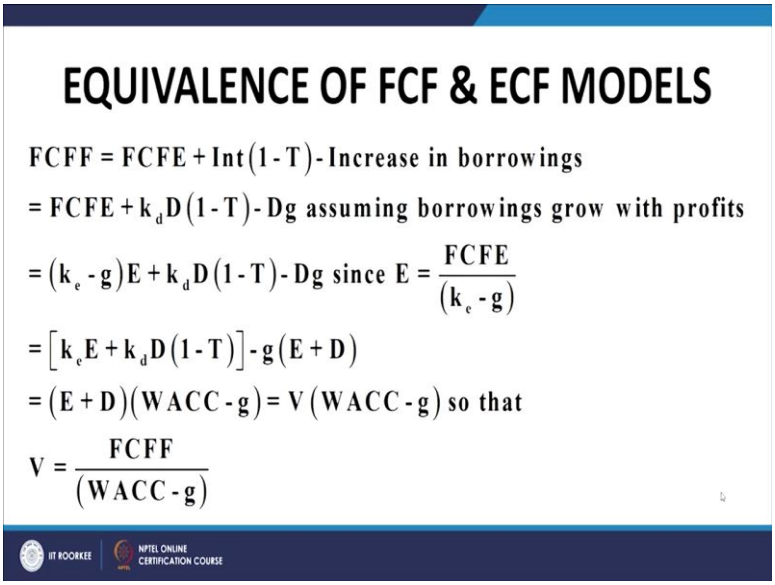

Now equivalence of the free cash flow and the equity cash flow models are enterprise DCF model and the equity cash flow model, I will not spend time on this it is the derivation really, which is based on certain assumptions, the fundamental assumption is that the borrowings are increasing are growing in tandem with the profits of the company and the growth in the equity shareholding or the results of the company.

So, on that premise on that assumption, we can show that the value of the equity of the company worked out indirectly using the enterprise DCF model and deducting there from the value of debt or the direct model, where we use the FCFE and discounted at the equity rate, levered equity, cost of equity, levered cost of equity, they converge to each other. Then we have the equivalence of the free cash flow or the enterprise DCF model and the APV model provided, we are discounting the interest tax shields at the unlevered cost of equity.

As I mentioned the time and again in the adjusted present value method, we have the discretion to use the discount rate in the case of discounting of interest tax shields, and this equivalence exists on the premise on the assumption that we are using the unlevered cost of equity for discounting the interest tax shields.

Now, we move to the next method, next approach to equity valuation, which is called the income-based model, income based methods. Now, just like we had free cash flow to the firm and free cash flow to equity, the indirect method that is that follows from the use of the free cash flow to the firm model and the direct approach where we model the equity or value the equity based on the free cash flows to the equity directly we have two different models where of income valuation for the valuation of equity of the firm.

The first which corresponds to the free cash flow to the firm model or the enterprise DCF model is the economic profit model and the second one, which corresponds to the equity cash flows model, the FCFE model discounting at the levered cost of equity is the residual income model.

So, I repeat parallel to the approaches that we have using free cash flows, free cash flow to the firm or enterprise DCF model, here we have the economy profit model and the other model the equity DCF model corresponding to that we have the residual income model. Now, how do we work out the economic profit?

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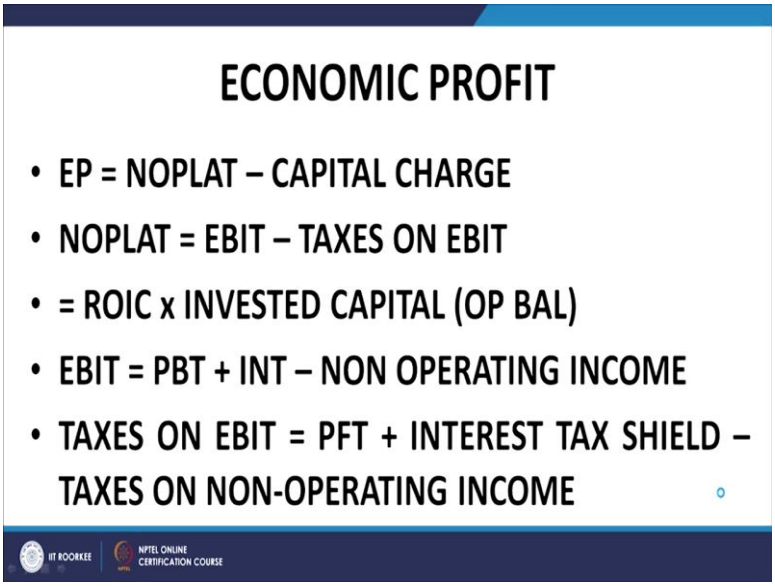

Economy profit is worked out as the net operating profit less adjusted taxes minus capital charge, net operating profit, less adjusted taxes minus capital charge and what is NOPLAT, NOPLAT is that is net operating profit, less adjusted taxes equal is equal to EBIT minus taxes on income that is equal to return on invested capital into invested capital. Opening balance of the year for which you are working out the NOPLAT.

What is EBIT? EBIT is equal to profit before tax plus interest minus non-operating income and what are taxes on EBIT provision for taxation plus interest tax shield minus taxes on non-operating income. So, these are some basic definitions that go into the economic profit model. Let us repeat, recap, economic profit is equal to NOPLAT minus capital charge. NOPLAT is equal to EBIT minus taxes on EBIT that is equal to return on invested capital into opening balance of invested capital.

EBIT is equal to PBT plus interest minus non-operating income and taxes on EBIT is equal to provision for taxation plus interest tax shield minus taxes on non-operating income. The capital charge is equal to WACC into invested capital. Invested capital is what is invested capital invested capital is net operating assets that is equal to net fixed assets plus net working capital. I shall continue from here in the next lecture. Thank you.