Security Analysis & Portfolio Management
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Lecture 31
Equity Valuation - VII

Welcome back. So, let us continue from where we left off. But before that a quick recap. We had completed the discussion on cash flow-based valuation of a firm. Let us recap the salient features of the cash flow-based valuation, and then we will move over to income-based valuation, which I started talking about in the last lecture.

So, there are four variants of the free cash flow-based models. We have the enterprise DCF, which uses the post tax free cash flow to the firm and discounts it at the post tax WACC. Then we have the equity cash flow model, we use the equity cash flows or the cash flows that are available for distribution, available for distribution to equity shareholders and we discount them at the leeward cost of equity. I reiterate leeward cost of equity.

Then we have the adjusted present value approach where we segregate the various components of free cash flow. Usually, it takes the form of the firm being evaluated, as a pure equity firm without any depth and then the value addition due to the introduction of debt being considered separately.

The rate that is used usually for arriving at the value of the unlevered firm is obviously the unlevered cost of equity, and then we have the discretion, the analyst has the discretion to use an appropriate rate in tandem with the risk profile of the realization of interest tax shields for the discounting of interest tax shields and then the composite or the sum of the two is deemed to be the adjusted present value of the entity.

Then we finally have the capital cash flow model where we use, where we calculate explicitly the interest tax shields based on the relevant provisions of taxation legislations and then discount the some of the free cash flows and the interest tax shields at the unlevered cost, at the pre-tax cost of capital that is WACC pre-tax.

Now, the important thing is that in the enterprise DCF, we have accounted for the interest tax shields by considering the post-tax WACC, whereas, in the case of capital cash flow model, we are explicitly introducing interest tax shields into the numerator and therefore, we are discounting it at the pre-tax WACC. So, these are the salient features of the free cash flow-based models. This is the competition of free cash flow to the firm. We have discussed it in a lot of detail earlier. So, I will not spend time on it.

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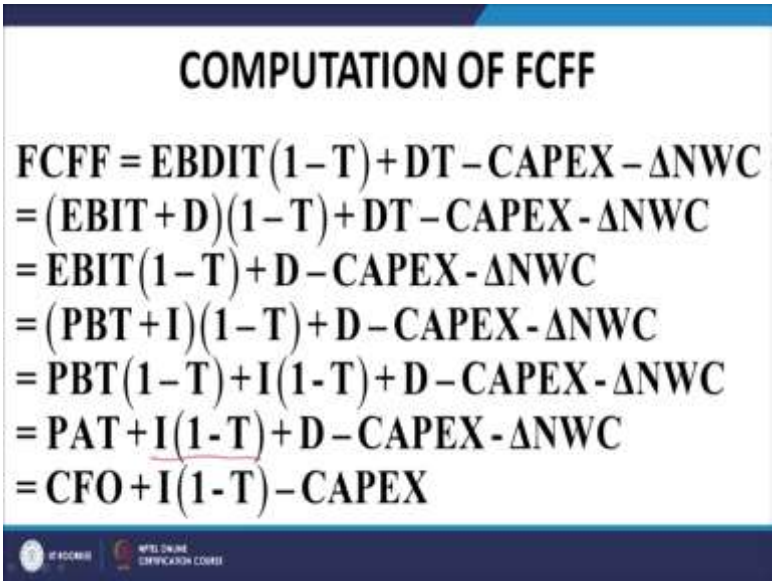

The important thing that you need to notice here is, that if we start with the PAT or the profit after tax, then we add back the post-tax component of interest, as well as, deposition and deduct the capex and the change in net working capital.

And as far as capital cash flows competition is concerned, it is the sum of as I mentioned just now it is a sum of free cash flows to the firm plus the interest tax shield. So, we add back another factor of I into T to the original factor and that results in the various expressions that are given in equations 1, 2, 3, 4 and 5 starting from various points in the profit and loss account.

Now then, we also discuss the issue of short-term depth in WACC. The usual view of analysis that short term debt being of a short-term nature does not contribute to the growth of the firm and therefore should be excluded when we calculate the, when we consider the stakeholders that are entitled to the free cash flow to the firm.

In other words, the basket of stakeholders on the basis of which we calculate the free cash flow to the firm should normally comprise of the long-term lenders, the preferred shareholders and the equity shareholders. However, there is not a complete consensus of this view. And some of them, some of the analysts believe that short term debt being in the nature of debt should also be considered, should also be added to this basket of stakeholders that on the premise of which from the perspective of which we calculate the free cash flows to the firm.

There are positive as well as negative issues associated with the inclusion of short-term debt as I explained just know. If you consider that it is a short-term seasonal debt, then you should not include it in the basket of stakeholders for the calculation of free cash flows to the firm and if you feel, but the important thing here is that if the short-term debt which is given in the financial accounts or the statements of the company is more of the character of a quasi-permanent debt.

In other words, it is in the nature of a working capital facilities like cash credit facilities, which remain outstanding literally throughout the year from year-to-year from year-to-year, then it partex the character of a permanent debt. In that event, of course, so, we should include this as part of the long-term debt when we calculate the free cash flow to the firm.

So, it is essentially to be decided by the facts of the case, by the facts of each individual case, whether short-term debt is to be included in the stakeholders or the stakeholders from the perspective of the free cash flows to the firm or it is to be excluded. It would really depend on the singularities of each case.

Now, the important thing however, is, that whatever view we take, whatever view we take on the basis of empirical evidence that we have at the historical accounts of the company, historical financial statements of the company, whatever we will take the calculation of free cash flow to the firm and the interest tax shields must be done on a consistent basis.

In other words, if we include the short-term interest or the short term depth, as part of the stakeholders for the calculation of FCFF, then we must also include the interest they are on together with or in line with or parallel with the treatment given to interest or long term lending.

On the other hand, if we exclude short-term debt from the basket of stakeholders for FCFF, then that interest would appear above the line. And with the interest that we calculate for calculation of interest tax use and for adding back here in this expression, for adding back in this expression for FCFF will only be I reiterate the long-term interest.

So, the interest that has to be added back here must correspond to the how we define the basket of stakeholders with respect to which we define the free cash flows to the firm. If it is whether if it includes short-term lenders, then this interest will also include the interest due on short-term lenders. If it excludes short term lenders, then this interest will also exclude the

interest on short-term landings. So, it is necessary that we be consistent. And whether it is to be included or excluded would really depend on the circumstances.

If the lending or the borrowing partex the character of some sort of permanence, it is appropriate to include it, otherwise, you may, if it is a short term lending like bank overdraft and not like cash credit facilities then usually bank overdraft is of a temporary nature and therefore, you can exclude it while calculating the interest component and the free cash flows to the firm.

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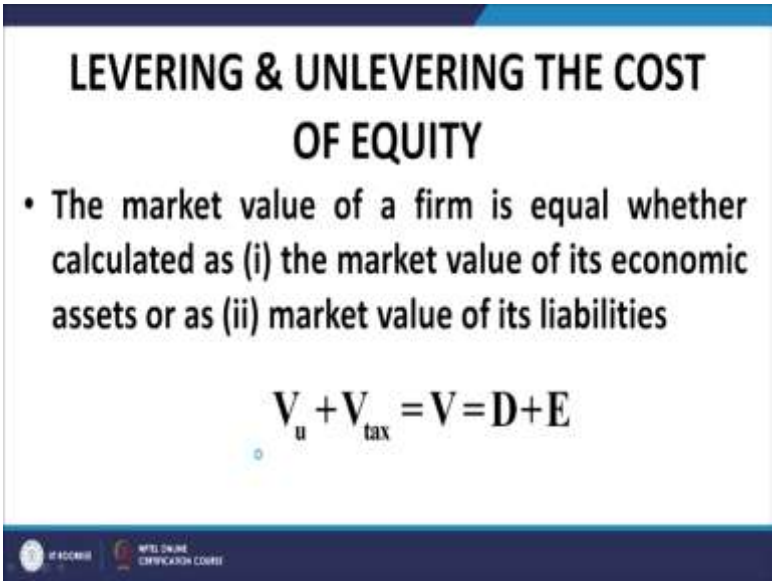

Then I discussed about the levering and early weighting of the cost of equity. We had two equations, we derived them on the basis of two propositions. The first proposition was that the market value of a firm is equal whether calculated as the market value of its economic assets or the market value of its liabilities.

The market value of the economic assets can be expressed as the sum of the value of the unlevered firm and the value added all by the implication or the by the tax effect by introducing debt into the capital structure. So, that is how the left-hand side is explained. The right-hand side is straightforward, it is the sum of the market value of the debt and equity of the firm.

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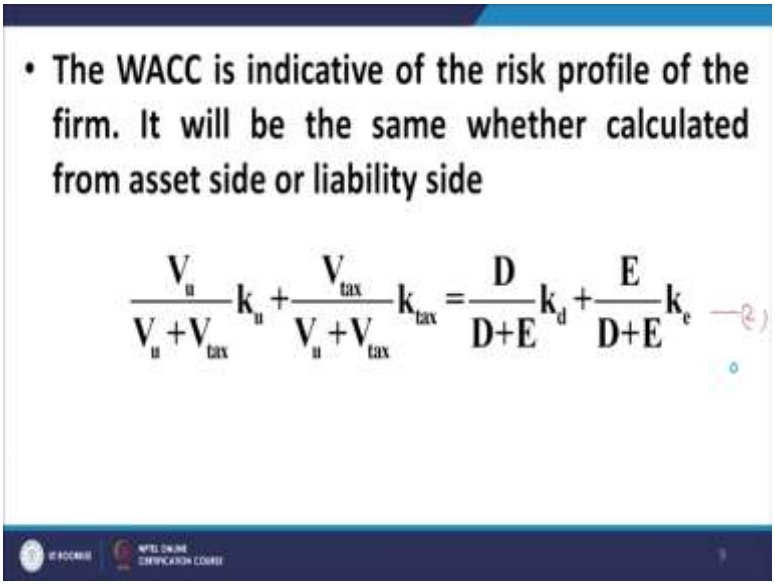

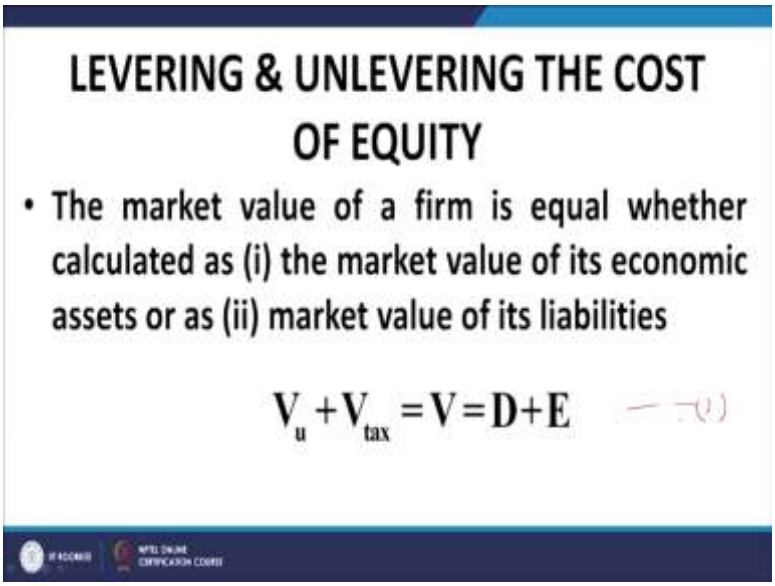

Then the second expression of the second proposition that we have is the WACC our weighted average cost of capital pre-tax, please note this, is indicative of the risk profile of the firm, and therefore, it would be the same whether calculated from the asset side or the liability side. This gives us equation number 2 here. And the previous equation, let me number it as equation number 1.

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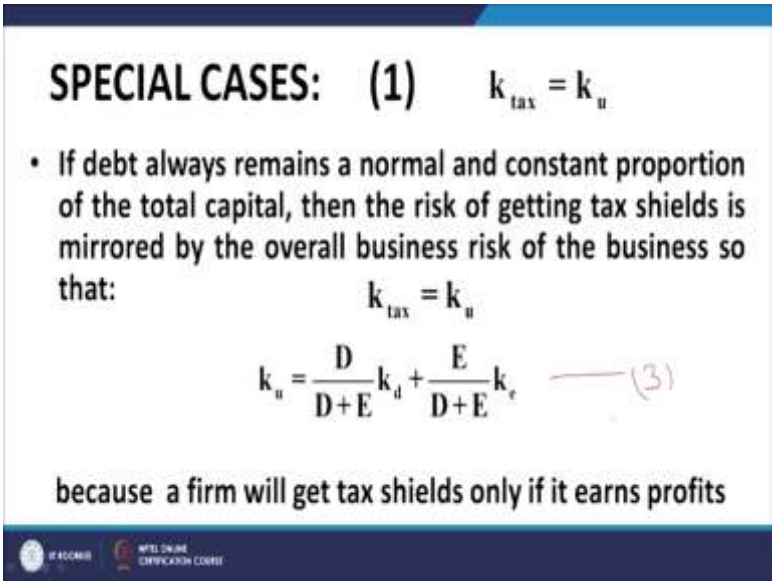

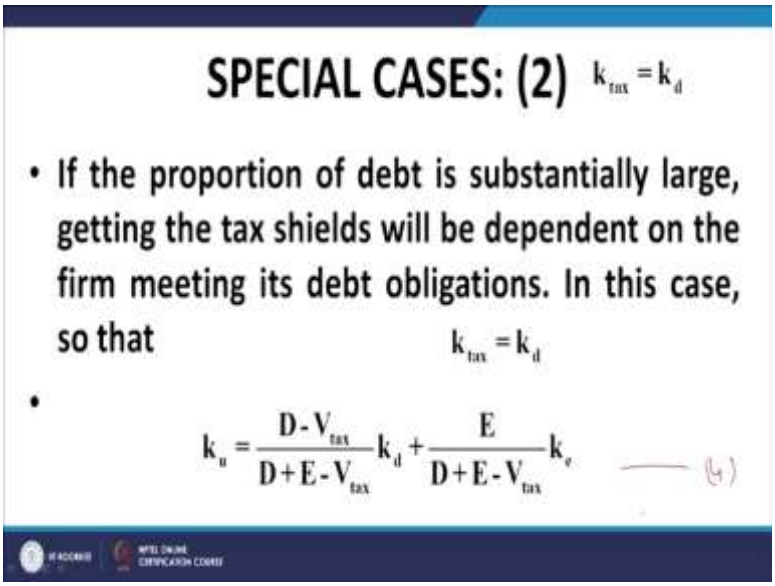

Then using these two equations so we can arrive at relations between the leeward cost of equity, the unlevered cost of equity and the cost of debt. Provided we make certain assumptions about the behavior of k tax that is the risk profile of the tax effects and incorporated arising out of the incorporation of debt into the capital structure.

So, if the k tax is equal to Ku that is the realization of tax shields and other tax effects is in line with the business risk of the firm. And in other words, if the business earns profits, we shall get the tax shields, we get the benefit of tax shields, and if the business falls on bad debts incurs losses, then we shall not cut the tax shields. If that is the presumption, then we can approximate k tax by Ku, and if we do that approximation, we arrive at the relationship between Ku, Ke and Kd which is given by equation number 3.

Now, I would like to emphasize here that contrary to the immediate reaction, immediate perception on per using this equation, Ku is the constant quantity and Ke is the variable which would depend on the amount of debt or the debt equity ratio of the company. Ke is the levered cost of equity Ku is the unlevered cost of equity. Ku would be dependent on the basis or what would be worked out on the basis of the unlevered firm whereas, Ke is the levered firm that is which includes debt, as well as, equity in its capital structure component.

So, the important thing is, the Ke is the variable it would change with respect to the debt equity ratio as the debt equity ratio increases the riskiness of the firm of the equity investment increases, because debt entails a fixed charge on account of interest. And therefore, the riskiness faced by the equity shareholders increases, and therefore, the levered cost of equity will also increase with the increase in the debt equity ratio. Ku is a specific cost of capital or a cost of capital corresponding to a specific capital structure, which is the all-equity capital structure and therefore, it will remain constant.

The second situation is, when we say that the company has a substantial amount of depth and therefore, the regularity or otherwise rather in the meeting of the obligations of the lenders would also, would determine the realization or otherwise of the interest tax shields. In other words, if there is no default in the payment of interest and repayment of capital, repayment of debt capital, then the tax shields would also be realized and vice versa, then we can approximate k tax by the cost of debt in which case we get the expression for the unlevered cost of equity as equation number 4.

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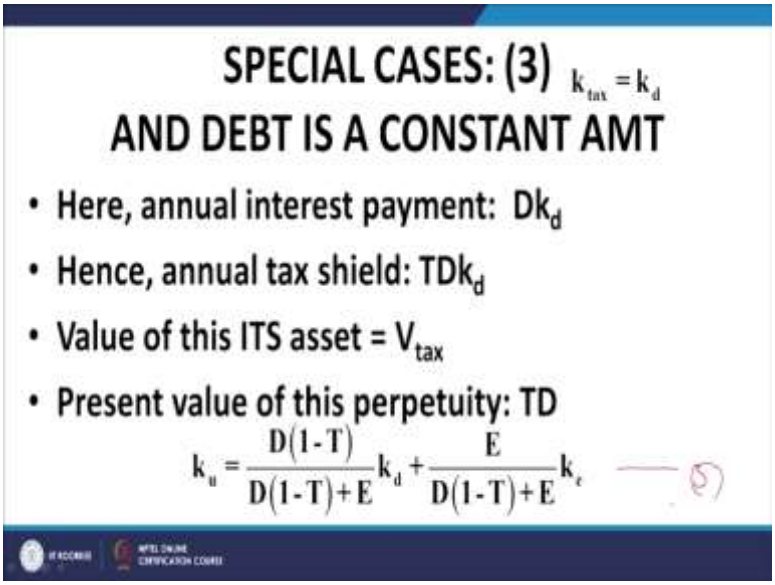

And furthermore, if in addition there too if the amount of debt is constant over the life of the firm, then we can simplify the expression further by as shown in this slide. And we end up with a formula, which is given in equation number 5.

Here we are assuming the interest tax shields, as a perpetuity and then discounting this perpetuity as the cost of debt, which leads to the present value of the perpetuity as the tax rate into the amount of debt and which has been substituted in equation number 4 to get equation number 5.

By leverage FX cost of equity, I have already discussed this. If you increase leverage, you are increasing the fixed charges that need to be debited into the profit and loss account, and as a result of which if the company falls on bad debts, the damage or the detriment to the equity shareholders is more is magnified, and therefore, the risk faced by the equity shareholders the equity investors is magnified and therefore, they would demand a higher rate of return. So, higher the leverage higher would be the levered cost of equity.

Levered and unlevered beta can be explained straight away in a very straight forward manner as is shown in this slide. Using this CAPM model. I shall not devote much time to this, it is quite straight forward.

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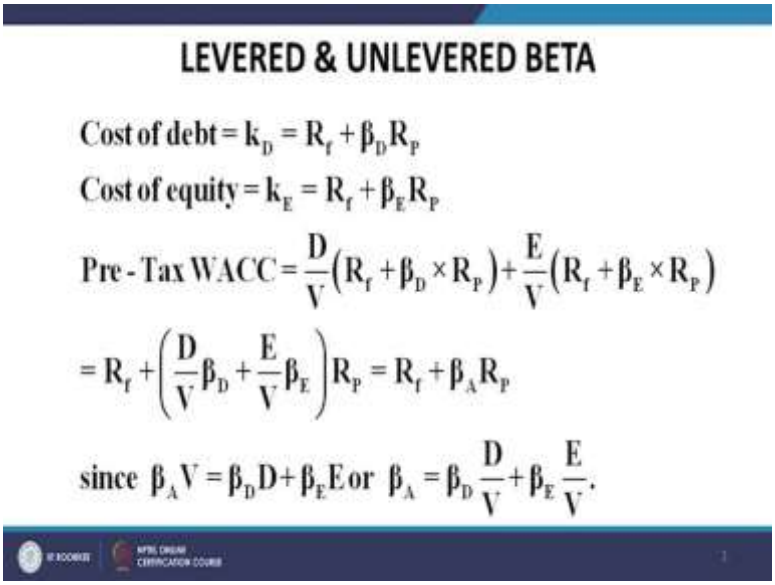

The basic thing is the formula for the unlevered beta mirrors the formula for the unlevered cost of equity that we worked out in the equation number 3 earlier few minutes back. So, the derivation is quite straightforward it is quite elementary, and we arrive at the value of the beta A which is the beta unlevered beta or which we also call as the asset beta, as beta D into D upon V plus beta E into E upon V. The E upon V that is in other words, the asset beta is the weighted average betas of the debt and equity of the firm. Debt and equity betas of the firm.

Again, I reiterate, it is beta A, which is the constant quantity, and it is beta E, which is the levered beta which will change with the amount of leverage. Then I talked about the calculation of unlevered beta how it is done in practice. And usually, we have a comparable set of companies we unlever the were the betas of those set of companies, take an average and then re-lever it with the leverage of the target company to arrive at the beta livered of the target company.

As I mentioned at the beginning, cash flow-based valuations is the method of choice. As far as possible, whenever the circumstances admit a cash flow-based valuation the recourse is taken to the valuation based on the discounted cash flow method. However, there do exist situations in practice where the cash flow-based valuation is either too cumbersome or inappropriate or impossible. So, we look at alternative methods of valuation like the income-based approach. We have the relative valuation, and we also talk about the asset-based valuation. So, let us get start with the income-based approach.

Just as we have free cash flow to the **firm and we** have free cash flow to equity, two different methods with different perspectives. We have the economic property approach, which looks

at the problem from the perspective of the total long-term stakeholders of the firm that is, I repeat, the long-term lenders, the preferred shareholders and the equity shareholders. And we have the residual income approach which looks at the problem from the perspective of equity shareholders.

The economic profit approach would naturally give us the value of the firm, which would include, as I mentioned, the long-term lenders, the preferred and equity shareholders from which we can deduct the market value of debt and preferred shareholders to arrive at the value of equity. This is the indirect method, we have discussed it earlier, and whereas, the residual income approach directly gives us the value of the equity of the firm.

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We now come to a few definitions. Let us quickly read them through. Economic profit is equal to NOPLAT minus capital charge. What is NOPLAT, NOPLAT is, Net Operating Profit Less Adjusted Taxes, net operating profit less adjusted taxes. And what is it equal to? It is equal to EBIT minus taxes on EBIT. And what is EBIT? EBIT is profit before tax plus interest minus non-operating income. EBIT is profit before tax plus interest minus non-operating income. As I emphasized earlier, here again, we are in a same situation where we are considering the valuation of operations of the firm.

If the business or if the entity possesses some idle non-operating assets and they need to be valued separately and the value added on to arrive at the overall value of the firm, the process that we are going through now would give us the value of the operations of the business or operations of the entity, the routine or regular activities of the entity.

So, taxes on EBIT, well, that is equal to the provision for taxation plus interest tax shield minus taxes on non-operating income. Why are we adding the interest tax shield here? We are adding the interest tax shield here because in economic profit, as I mentioned, is the profit from the perspective of the long-term lenders, the preferred shareholders and the equity shareholders.

So, whatever tax shields you are getting is added back because the perspective includes the long-term lenders also. If there is any preference dividend, then of course, that would not impact this because preference dividend does not give you any tax shield. But as far as the tax interest payments on long-term landings, that would be a tax shield on that figure would be added back because we are considering the profit that is available for distribution.

Now, I repeat, it is not the cash flow, it is the profit that is available for distribution to whom, to the basket comprising of the long-term lenders, the preferred shareholders and the equity shareholder. So, it is basket of profit that is available for distribution to all these components.

So, taxes and EBIT will be equal to provision for taxation plus interest tax shield, minus taxes or non-operating income. NOPLAT is equal, NOPLAT can also be written as the return on invested capital into the invested capital or the opening balance of the investing, invested capital.

What is capital charge? Capital charge is the charge that needs to be or that is required for investing in the firm, and that is given by the weighted average cost of capital post-tax. Why post -tax? Well, it is post-tax because you are defining accounting profit as NOPLAT minus capital charge. NOPLAT is post-tax, it is net operating profit after tax and therefore, the capital charge must also be after tax to ensure consistency.

So, capital charge is equal to WACC post-tax into invested capital. Opening balance again, to maintain consistency. What is invested capital? Invested capital is the net operating assets and that is equal to net fixed assets plus net working capital. Please note all these things with reference to the operations of the firm to ensure compatibility, consistency. If there are non-operating assets, they are not part of invested capital when we work out these quantities. Now, we come to residual income.

Residual income is defined, as net income minus equity charge. And what is net income? Net income is the profit again, that is available for distribution to the equity shareholders. So, that means, it would be after preferred dividend and, of course, the interest and so on. Therefore,

we can also define net income, as the return on equity into the equity capital, and we define the equity charge as the cost of equity into equity capital.

So, in some sense, if you look at the formula one thing you would have inferred by now, is that, both economy profit and residual income are in some form the surplus that is available to stakeholders, the stakeholders of course being defined differently. In the case of economic profit, the lenders, the preferred and equity shareholders, but the basic thing is that these quantities, economy profit and residual income represent the surplus that is available for distribution after meeting a certain rate of return, which is the required rate of return and by the relevant stakeholders.

Whatever stakeholders you are considering in the basket on the basis of which you are calculating the profit, the same stakeholders the weighted average of that required returns by those stakeholders will determine what is their minimum requirement to sustain their investment in the business. And if there is a surplus over and above that, then that surplus over and about that is called economic profit or residual income, as the case may be. Economic profit, if we have this gross invested and residual income if we are considering only equity investors.

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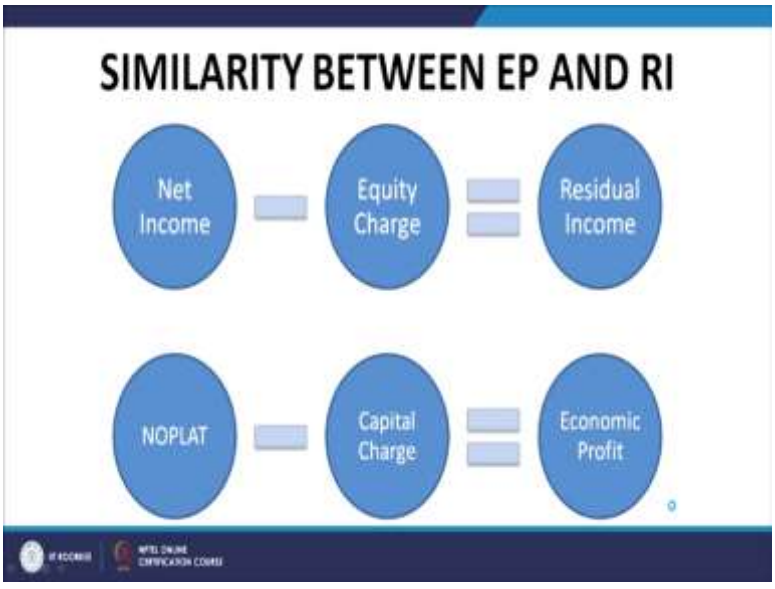

So, similarity between economy profit and residual income, this is pretty much apparent. Residual income is net income minus equity charge, the economy profit is NOPLAT minus capital charge. So, the similarity is much too obvious except for the fact that the perspectives are different. The basket with respect to which these quantities are calculated are different, the perspectives are different.

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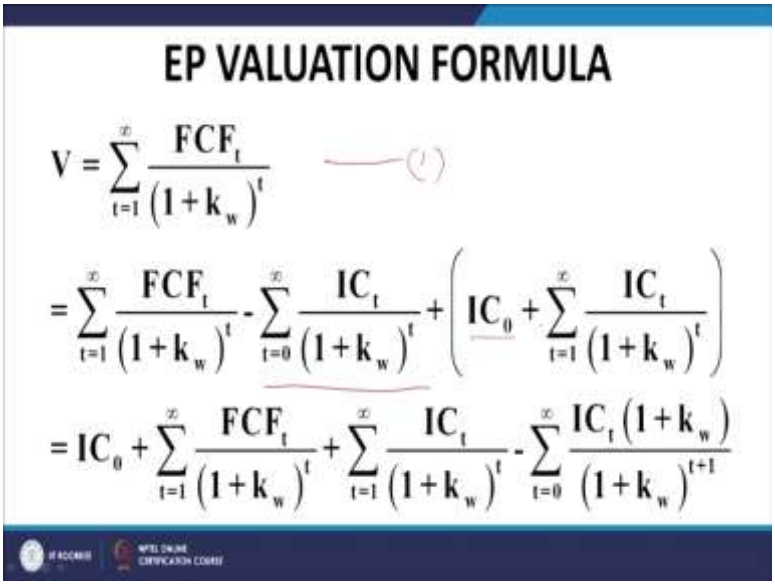

Now, the economic profit valuation formula. We need to devote some time to this. We start from the free cash flow-based valuation. The free cash flow-based valuation is given by equation number 1, which is straightforward, which is what we have done in a lot of detail. It is the enterprise DCF-based valuation, free cash flow, summation or discounted at the weighted average post-tax weighted average cost of capital.

We write it in a different form. We add the quantity, this quantity which I underlined now. We add this quantity, and we subtract this quantity. However, when we subtract, when we add this quantity, we split it up into two parts, we split it up into IC0 which is the initial invested capital and we sum over the remaining time or the series of invested capital over at different times t.

In other words, if you look at the summation indices, and this summation in case of the term which is outside the round bracket is from t equal to 0 to infinity, and the summation which is inside the round bracket is from t equal to 1 to infinity. So, we need to add one term here the initial term in order that the two be equal which is what is done here.

We rewrite it in a better form, in a simple form. We start with IC0, then we sum up the free cash flows that is the second term. The third term is the term that sums up the investor capitals over t equal to 1 to infinity the discounted value of invested capitals.

And then, we as far as the other term is concerned which involves a summation of invested capital from, discounted invested capitals from t equal to 0 to infinity we multiply numerator and denominator by 1 plus Kw, that is the last term here on this slide in the right-hand corner.

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$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t}{(1+k_w)^t} + \sum_{t=1}^{\infty} \frac{IC_t}{(1+k_w)^t} - \sum_{t=1}^{\infty} \frac{IC_{t-1}(1+k_w)}{(1+k_w)^t}$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t + (IC_t - IC_{t-1}) - k_w IC_{t-1}}{(1+k_w)^t}$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t + Net\ Inv_t - k_w IC_{t-1}}{(1+k_w)^t}$$

EP VALUATION FORMULA

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+k_w)^t} \quad (1)$$

$$= \sum_{t=1}^{\infty} \frac{FCF_t}{(1+k_w)^t} - \sum_{t=0}^{\infty} \frac{IC_t}{(1+k_w)^t} + \left(IC_0 + \sum_{t=1}^{\infty} \frac{IC_t}{(1+k_w)^t} \right)$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t}{(1+k_w)^t} + \sum_{t=1}^{\infty} \frac{IC_t}{(1+k_w)^t} - \sum_{t=0}^{\infty} \frac{IC_t(1+k_w)}{(1+k_w)^{t+1}}$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t}{(1+k_w)^t} + \sum_{t=1}^{\infty} \frac{IC_t}{(1+k_w)^t} - \sum_{t=1}^{\infty} \frac{IC_{t-1}(1+k_w)}{(1+k_w)^t}$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t + (IC_t - IC_{t-1}) - k_w IC_{t-1}}{(1+k_w)^t}$$

$$= IC_0 + \sum_{t=1}^{\infty} \frac{FCF_t + Net\ Inv_t - k_w IC_{t-1}}{(1+k_w)^t}$$

We continue from the last equation there, and we simply reorganize the index of the last, of the first equation here. The summation, in this last term, in this equation is from t equal to 0 to infinity. Now, the summation has been changed from t equal to 1 to infinity. Therefore, the quantities within the summation are renumber accordingly ICt will now become ICt minus 1 because the summation index has been changed from 1 to infinity.

So, because we have to include IC0 also so we start summing from t equal to t minus 1 that shift is there. And in the denominator, we had 1 plus k to the power t plus 1 and this will now become 1 plus k to the power t. We know have all the submissions from t equal to 1 to infinity, and therefore, we can put them together, what we get is the second term in the summation that is free cash flow 40 plus ICt minus ICt minus 1 minus Kw into ICt minus 1, the discounting is of course as usual.

Now, ICt minus ICt minus 1 is the net investment during the year t. ICt is the balance as at year t, ICt minus 1 is the balance, as a t minus 1th year. So, the difference between them is the net investment during the year t. The free cash flow for the year t plus the net investment for the year t will give me what, will give me the total profit for the year t which is here, and which is called the NOPLAT.

So, **what we end up with, as far as the** first two terms in this summation are concerned, term number 1 and term number 2, these two added together will give me NOPLAT and therefore the numerator becomes NOPLAT for the year t minus Kw into ICt minus 1 which is the closing balance of invested capital of the previous year, and that is equal to the opening balance for this year. So, this expression will be nothing else, but the economic profit for the year t.

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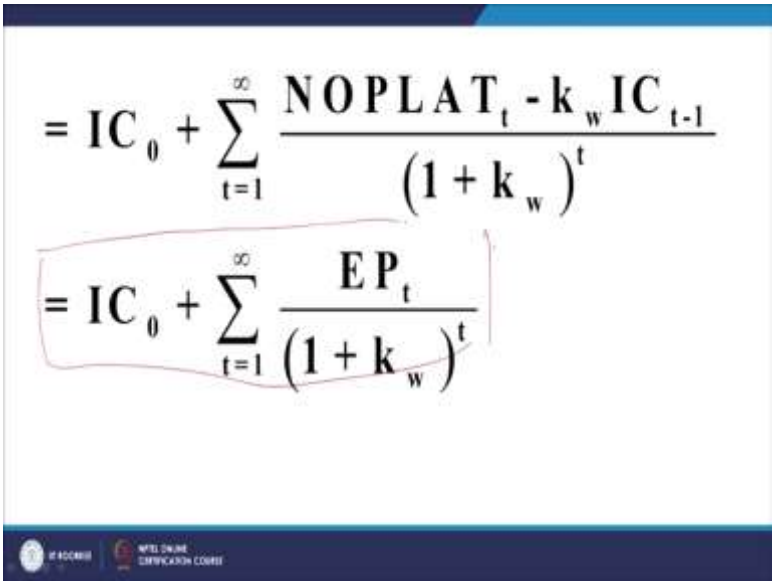

So, the final formula that we end up is the last equation on this slide, which is IC0, which is the book value of invested capital at t equal to 0 plus the present value or the discounted present value of the economic profit over the remaining life of the firm, the discounting being done at the post tax WACC.

I repeat, the value of the firm, as per this economic profit model is equal to the initial value of the invested capital at the point at which you are doing the valuation that is IC0 plus the present value of all future economic profit discounted at the weighted average post-tax weighted average cost of capital.

Now, we come to a relationship, which is normally assumed when we use the income-based formula. This relationship is called the clean surplus accounting. And what it assumes is, that the change in equity during a particular year is caused by the retained earnings for that year. In other words, if net income for the year is NIT and the dividend paid is DT then naturally the retained earnings are NIT minus DT and it is only these retained earnings, which when added to the initial value of equity give us the final value of equity.

So, other than retained earnings nothing else is contributing to the change in equity. So, if for a firm this particular formula holds, this particular expression holds that the change in equity is only due to the retained earnings of the firm then we assume or then we call that firm to be following the clean surplus accounting. This is necessary for arriving at a compact formula for the residual income approach as we shall see just now.

The residual income valuation formula. Again, we start with the dividend discount model. Recall that when we talked about the economic profit formula, we started with the free cash flow-based or enterprise discounted cash flow-based model. Here what we are doing is we are starting with the dividend discount model. And we are therefore, we are discounting the stream of dividends at the equity, cost of equity.

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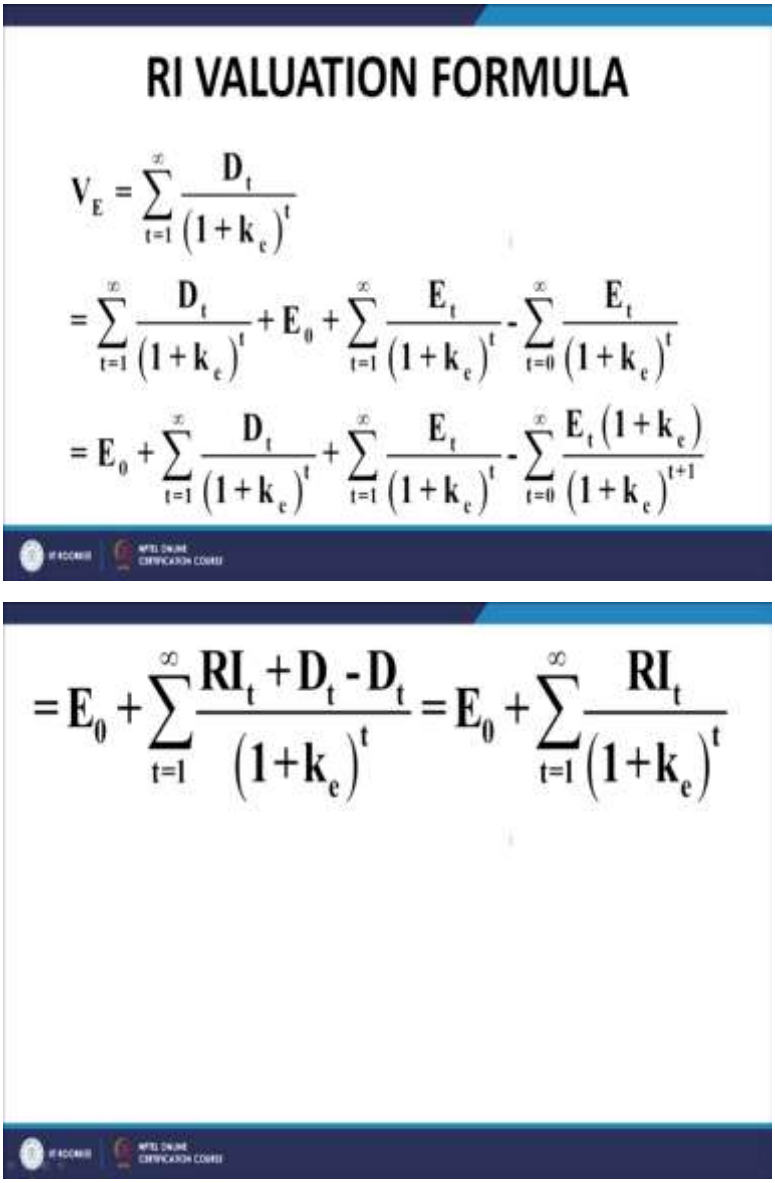

Again, we use a methodology, which is more or less parallel with what we had used earlier. And when we follow all the steps that were followed in that case or equivalent steps, which are followed in the case of calculation of, arriving at the formula using economic profit, what we end up with is that the equation that is here on this slide E0 plus summation of Dt plus Nit minus Dt minus Ke to E to the power t minus 1.

Now, this Dt and minus Dt cancel out, what we are left with is Nit minus Ke, E to the power t minus 1 which is nothing, but the residual income. So, the formula that we get is here in the right-hand side of your slide E0 plus the present value of the future stream of residual income, the discounting being done at the cost of equity, levered cost of equity.

I repeat, the value of equity of the firm. I repeat, the value of equity of the firm is equal to the current book value plus the present value of the future stream of residual income discounted at the levered cost of equity. So, this is the equivalent of the formula, as far as the valuation of equity or direct valuation of equity is concerned. We have already discussed the formula for the indirect valuation of equity or direct valuation of the overall firm of the value of the firm of the overall stakeholders or long-term stakeholders of the company.

Now, cash flow versus income models. When are the cash flow models appropriate? And what are the salient features of the cash flow model and the income-based model? What is the important differential between them? The important, let us look at the cash flow models a bit carefully. Cash flow models, as far as equity is concerned, they work out the present value of equity cash flows and discount it at the required return on equity levered required return on equity. And the equity value is equal to present value of the early cash flows plus the terminal value.

Therefore, there is a large weight on later cash flow because terminal value is usually going to be quite significant. So, there is a significant weight on the far term cash flows to the company which are captured by the terminal value. In the case of income models, what we have is, the residual income model uses discount rate, which is the same, the levered cost of equity, and the equity value is equal to initial book value, initial book value, now, here lies the difference.

In the case of the cash flow-based models, we are, the focus or the emphasis of the valuation or a predominant contributor to the valuation is the terminal value, which is the value long time into the future. Here, the major contribution comes from the book value, which is the present value, present accounting value of the equity. So, that is the fundamental difference between the cashflow model and the income model.

And this is what renders the income model relatively superior in the sense that the book value is more authentic than the terminal value, which is an estimate were distant in the future. Normally terminal value would be worked out on some premise either a multiple or the

Gordon growth model, and that assumes that the assumptions that go into either of those two valuations are quite not, imprecise too.

So, what are the strengths of the residual income models? As I mentioned just now, the residual income model puts less weight on the terminal value, uses available accounting data, is useful for the valuation of non-dividend paying companies, is useful for firms without free cash flows is useful when cash flows are unpredictable and is based on economic value.

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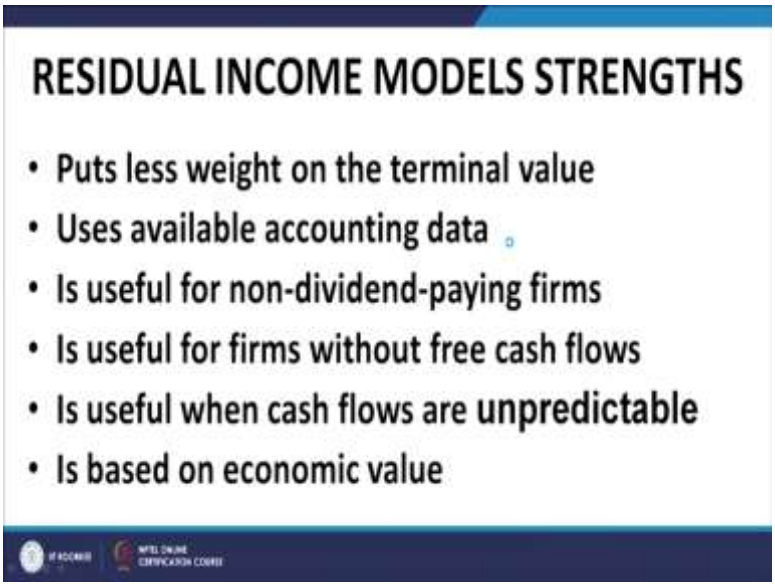

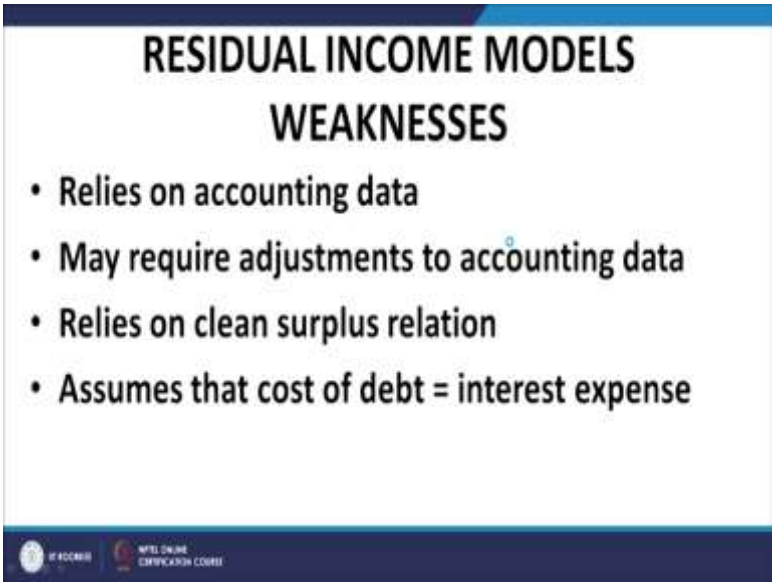

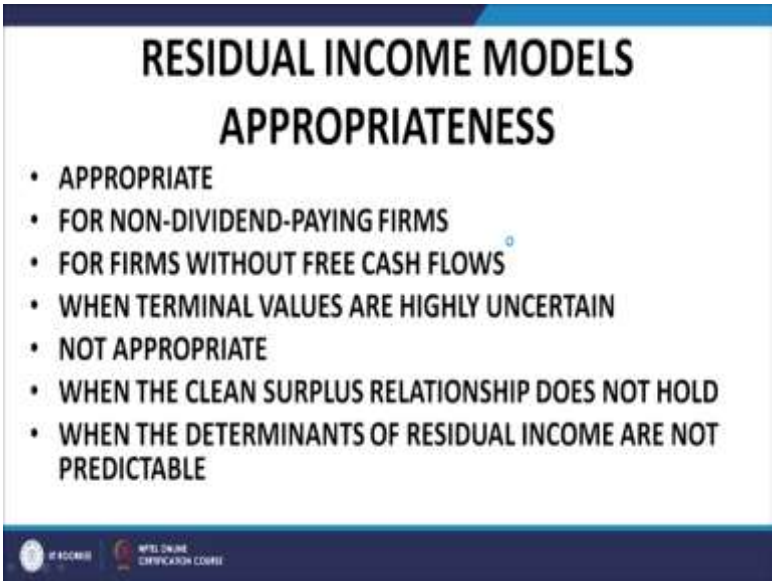

Residual income model, the weaknesses. It relies on accounting data, it may require adjustments to accounting data, relies on clean surplus relation which may or may not be followed by the company, and assumes that the cost of debt is equal to the interest expense which is debited to the profit and loss account.

When is this residual income model appropriate for non-dividend paying companies for companies that do not have free cash flows, and when terminal values are highly uncertain that is what I mentioned a few minutes back. And not appropriate when the clean surplus relationship is not being followed and when the determinants of residual income are not predictable or are not precisely predictable. We shall now discuss the equivalence of the dividend discount model and the residual income model for a firm with a finite life after the break. Thank you.