Financial Mathematics
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Lecture – 42
Stock Valuation

Welcome to the lecture on stock valuation. So, in this lecture we are going to continue from where we left in the previous lecture and we will discuss about the stock valuation you know procedure. So, in that we have seen; we are discussing that how you know we get the you know current price of the stock and we had seen that you know P0 we got these derivations that P0.

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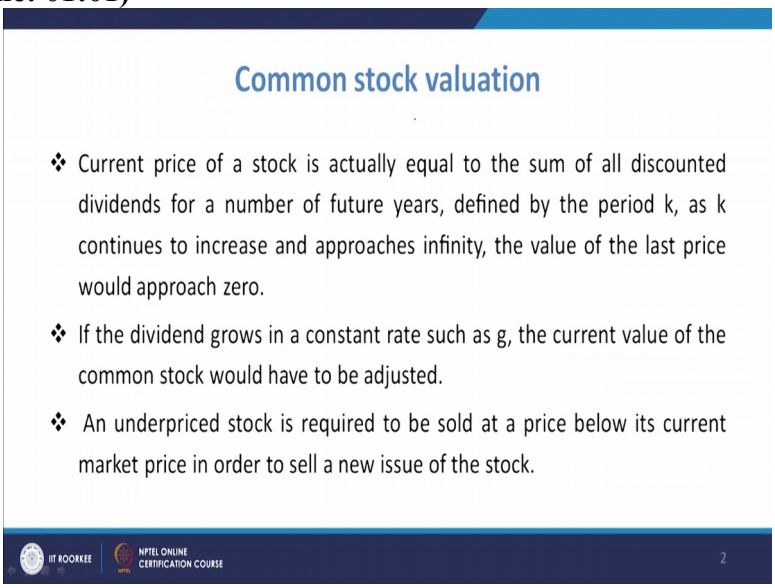

So, the current price of the you know stock so it will be summation and that will be t = 1 to K so in that you had the Dt / 1 + r raised to the power t and then there will be a separate term that is for the PK so that PK / 1 + r raised to the power K so that is what was there so you know Dt are the dividends and that will be in the year 1, 2, 3 or so. So, that dividend which you are getting and basically you are getting its you know present worth values so that is what you see that D1 / 1 + r raised to 1 so D1 will be dividend in the first year and that will be divided / 1 + r so it will be its present value prevalent today.

Then D2 if it is the dividend in the second year then that will be divided / 1 + r raised to the power 2 so that way MCR is there so r that is market capitalization rate or rate of interest. So, based on that this term will be this and then in the end you are getting this PK and it will be divided by you know 1 + r raised to the power K because you are getting the you know value

in the that Kth period after that Kth period. So, that is divided by that is divided / 1 + r raised to the power K so that is how you get.

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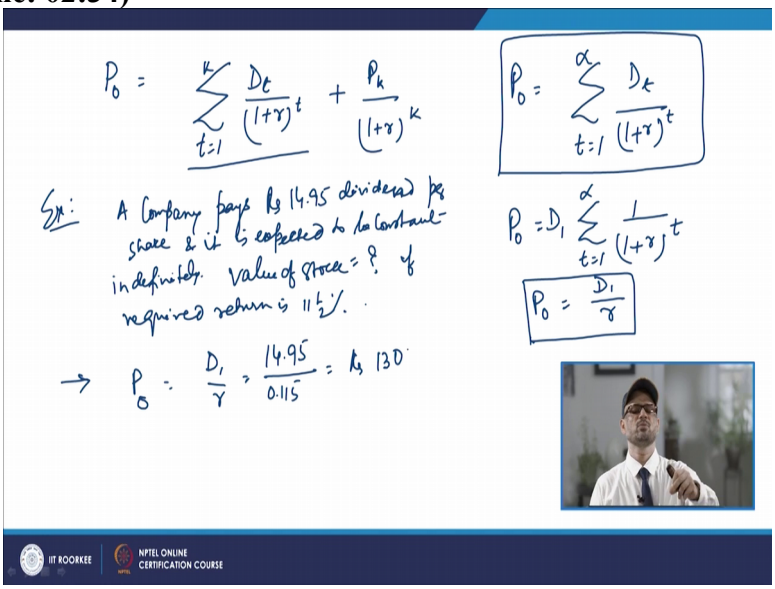

And from this you can you can see where say the current price of his stock is actually equal to the sum of all discounted dividends for a number of future years defined by the period K. So, that is what you know we have seen that in this case this is the you know this is a division that is for the K periods so that we are stocking about this only and then you know further and also you are taking that price also that price is also you know made equivalent for the today's time.

So, that is divided / 1 + r raised to the power K so PK is divided so that is that term is basically added. Now what is further written or what we can further understand is that in this case as K will continue to increase and K will approach towards infinity in that case the last price will be certainly approaching 0, so in this you know in this expression if the K is approaching towards infinity then in that case this term will be basically equal to 0.

So, you can we can write that this P0 as the K will be approaching to 0 then it will be summation of t = 1 to infinity and it will be Dt / 1 + r raised to the power t so and then since K is approaching towards infinity so this term will be vanishing and you will be getting you know this P0 as you know the Dt / 1 + r of t summation t = 1 to infinity so that is what further you know it is written that the value of the last price will be approaching towards 0.

So, this will be approaching toward 0 and you are getting the P0 as this now what we say that if the you know dividend amount is assumed to be same you know for all the years when it is paid now in that case you know we can write so if the if it is only D1 for all the years it is not varying so in that kind and there is no growth of the dividend. So, basically dividend may

change there may be growth in the dividend or there may not be growth in the dividend. So, if the dividend remains you know same in that case you will write P0 or P0 will be you know summation and then this D1 since being constant it will come out and it will be t = 1 to infinity and 1 / 1 + r raised to the power t.

So, this is nothing but a factor and we know that this factor basically it is nothing but the summation of you know this is nothing but you have you are getting the present value from the future value so for that factor is there and that factor being summed up it will give you this summation of 1 / 1 + r raised to the power t and if you get you should try to see the further if you are getting this is basically a geometrically infinite series.

So, you can get its value and it will be 1 by R so basically you can write P0 will be D1 / r so that is how you can get the expression for you know P0 as the t is basically approaching towards this you know infinity. So, that is how you calculate the; you know P0 values under such circumstances. Now you can say that if you try to see you can solve through certain examples suppose that a person is there.

So stock company there and any company basically is paying so it will be paying you know rupees 14.95 dividend per share and expected it and it is expected to be constant indefinitely so you are going to get the you know this dividend for a very large time. Now in that case value of stock will be what you have to find the value of stock if the you know required return is 11 and1/2% suppose in such cases when you are you know going to get this return of element and 1/2%.

In that case if you have to find these values so in those cases simply you have to say that you get this P0 and this P0 will be D1 / r so dividend is fixed that is 14.95 and it will be divided by r so it will be 0.14 for you so one it is a you know 115, so it is 11.5% so if you try to see it will be something like you know rupees 130. So, you know this is how you can find the current price of the stock you know and that can be calculated.

Now the situation is that many a times these dividends are not constant they grow as we had discussed also we had given you the light even in the last lecture that when you have the dividend not being constant it is basically you know increasing by certain you know amount or at certain rate in those cases you have to you know do the adjustment in this formula. So that is what it is that if the dividend grows in a constant rate such as g.

So, g is that constant rate at which the dividend is growing in that case the current value of the common stock would have to be adjusted. So, that way you have the change in the formula.

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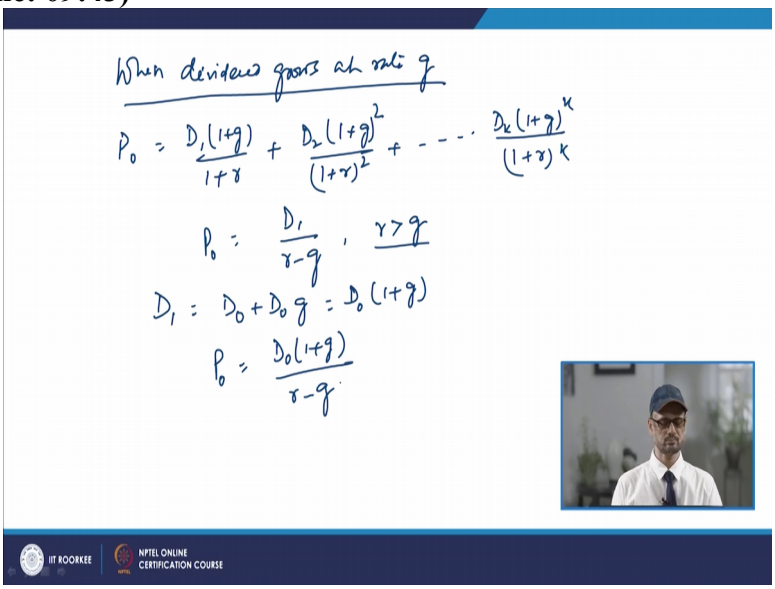

And in that case so when dividend grows at a rate g so every year it is growing at the rate of g so what happens that you will have the expression that is you will write P0 so what will happen that that will be adjusted by D + Dg so every time it will be D* 1 + g so g is the growth rate so P0 in the earlier case with respect to the earlier case it will be going like D1 * 1 + g / 1 + r then you have you can write 1 + g square / 1 + r square so this will be going to DK 1 + g then K and divided / 1 + r raised to the power K.

Now in this case if again that evident remains the same so we get this P0 value as D1 / r - g because so in this case what we assume that the r is basically more than g so the interest rate, rate of interest which is applied a market capitalization rate it is basically more than the growth rate of the dividend and this formula basically is known as the Gordon's formula and this formula is utilized for you know finding these current price in terms of D1.

Now you know what happens as we discussed that now this D1 basically this will be nothing but you know D0 + D0 g so it will be D0 * 1 + g so you can further do the modification in this formula and you can write you know in such cases you can write the P0 as so this will be D0 into 1 + g and plus and then that divided by r - g so this way you get so that when you know the growth rate at which this dividends will be increasing in those cases you are using this formula to find the price of the stock.

Now you can further take one example and we can see that how such cases are represented and how you solve when you face such you know problems.

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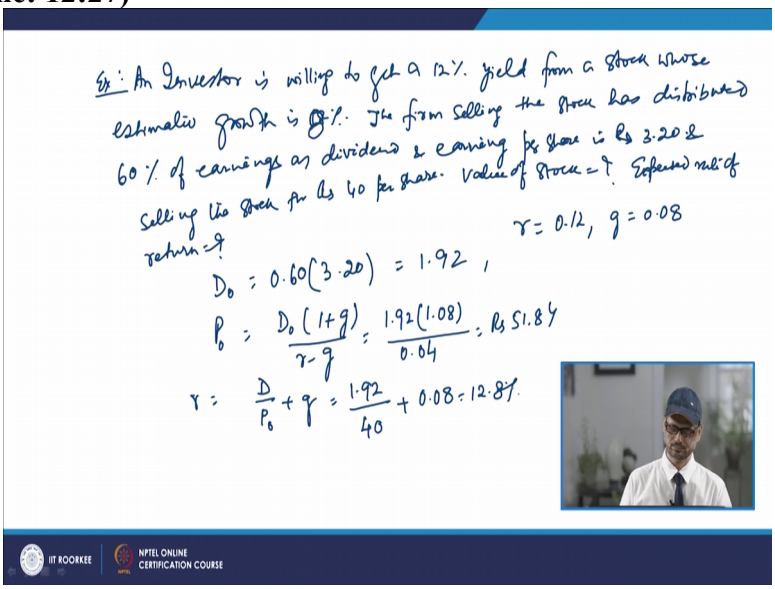

Suppose you have an investor and he is willing to you know get a 12% yield so an investor is willing to get a 12% yield from a stock whose estimated growth is 18%. Now suppose you know not 18% is it which is not more than that that case will be different when the; you know growth rate is more than the interest rate so it is only 8% in this case. Now suppose the what is supposed that the firm selling the stock it has distributed 60% of its are these as dividends.

So, 60% of its earning will be you know given as dividend and earnings per share is you know is 3.20 so in that case and selling the stock for rupees 40 per share so in that case you have to find the value of stock and also expected rate of return. So, this way there may be you know situations so how to handle that. Now in this case what you see that you have you know dividend as 60% of the earning and adding a par series rupees 3.20.

So, in that case if you find the D0 it will be 60% so it will be 0.6 times you know 3.20 so that will be your 1.92 so that will be your so earning per share is 3.20 and 60% is earning as dividend so it will be 1.92 rupees. Now you have to find the price of this stock. So, the value of this stock so that will be again P0 and P0 will be again we know D0 so we know D0 into 1 + g by r – g.

So, are we know it is given that r is you know it is 12% and g is 8% so 0.08 so you will put in this formula it will be 1.92 times 1. +g so it will be 1.08 divided by r - g so it will be 0.04 so that will be your value. Now if you get that you will be getting you know rupees 51.84. So, this will be the current price of the stock. Now if you want to find the expected rate of return so expected rate of return will be nothing but you know this will be D by P0 and then +g.

So, that you can get from the formula so that formula we have already written so from here you can get this r so expected rate of return will be you know this will be coming like this so it will be D1 / P0 + g so you can get that so it will be you know 1.92/40 +g so it is 0.8. So, now that will come out to be something like 12.8%. So, this is you know we are basically using for finding this expected rate of return in such cases and also finding the you know the current value of the stock when the dividend is growing at certain rate.

We can also find the g value basically and that also can be found if your future value and current value is given in that case also future value and current value based on that you know the formula to become in a nth root future value by current value - 1 that will give you the you know g value so that also can be you know calculated if that is required you know in such in some of the cases. Now there is another way you know to this to find this g and that is your return to equity methods.

So, there are many methods by which you can calculate all these values and you can find these values of stock then either value of stock is required or maybe sometimes the maturity time is required or maybe sometimes the growth is required or the rate of interest is required so that way using the formula you can find it. Now one thing more which is required to be understood in many circumstances will be your cost of new issues of the common stock.

So, what we see that when we talk about you know no new issues of the common stock now in these cases you have some market capitalization read formula and that basically has to have certain consideration and among the considerations you have one of the concentration is that the underpriced stock so underpriced stock we know that you know it is sold at price below its current price. So, whatever release you know it will has to be sold at its below its current price.

Now in that case you know because it is in necessary for the firm to you know to sell that you know stocks for issuing the new stocks so in those cases the amount of underpricing which we calculate that is to be you know understood so what will be the amount of underpricing.

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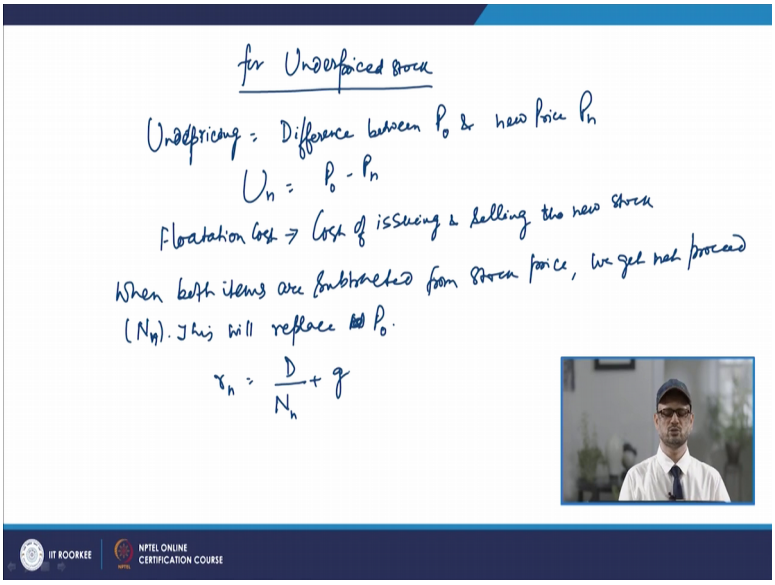

So the under pricing so for you know undervalued stock underpriced stock so what happens that you will have the amount of underpricing so underpricing amount under pricing means it is value will be less than its you know price so that will be you know difference between P0 and new price Pn so it will be now you know that is the divide represented by P0 – Pn. Now there is another cost which is also involved that is your flotation cost.

So, this flotation cost basically it is the cost of issuing and selling the new stocks so this will be cost of issuing and selling the new stock now what happens that in such cases because there will be cost associated with the issue and also the selling of the new cost so that will be known as the you know flotation cost. Now you know this both these items they are to be subtracted you know to find you know the stock price.

So, after subtracting both these you know quantities what you get is known as the net proceed. So, the net proceed will be so when both items are subtracted from stock price we get net proceed so that is known as Nu so this is because of the under pricing and the net proceed Nu will be so that is Nn so that is net proceed and Nn certainly and then it will be replacing the P0 so this will replace so P0 so this is P0 because you have subtracted the underpricing amount as well as the floatation cost.

And this both the things are subtracted and then so you are using in place of P0 you are using the Nn so your rn that is the you know for new formula for finding the cost of the new stock so that will be D /Nn and then +g. So, this way you can find the value of the you know stock when you have the these cases of underpricing and in such cases you have to first find this Nn. So, for example suppose you have a news, issue of stock and in the previous example

what we have seen in that example where you have the you know price of you got this you know the firm basically will be deciding that it will underpriced it by rupees 1.55.

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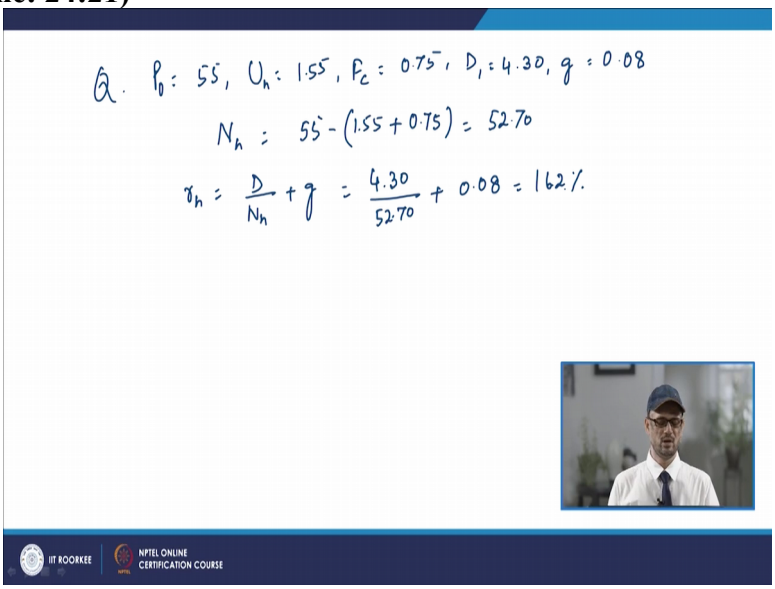

So, there is a common stock so we will discuss the problem. Now the problem is that you know a common stock is there and it is selling for the 35 per sale and in that case what happens that you have the expected dividend is rupees 1.15% and earnings per share also is given as you know 2.30. So, now let us see that the question tells that your P0 is given as 55 rupees and then you have it is assumed that it will be under priced by 1.55.

So, your underpricing will be 1.55 and the FC that is floatation cost what has been you know taken is at the 0.75 per share FC we can write as 0.75 now in this case the dividend which you are getting it is written as D1 as a 4.30 and the growth rate is also given as suppose 0.08 now in such cases if you have to find you know Nn and also the you know the rn basically for the case of the underpricing and this is N basically indicates for the news stock so you can simply find the Nn as so you will be subtracting this 55 with the value of the degree of underpricing that is 1.55.

And then we will also be doing that for with you know we have to add into this the flotation cost so it will be 2.30 so it will be coming as 52.70 rupees so that is your the value which is basically the net proceed that is 52.70 and if you have to find the rate so for this new stock so rn basically will be D / Nn +g so as we know that dividend is 4.30 and then this will be divided by Nn so Nn is 52.70 and then +g is given as 0.08.

So, you are telling that this growth is at the rate of 8% so in those cases your value that becomes 16.2% so this is how you are basically using these formulas and when you have to find that you have to this is the cost of the new stock and you have to go for underpricing and

since you have to you have to pay these flotation charges because of the you know because of you have to sell these stocks so that also is to be no subtracted and you are getting that value of the issue of the cost of the new stock and then the rate of the return.

Now cost of this new stock will be basically greater than the cost of the you know current stock because you know you the dividing thing this you know dividend by the new net proceeds so that is how this you know you see that you are getting these new net proceeds so it is less than the net price, so, the current price of the cost if you find by the formula this P0. Now so this is something about you know the finding the price current price in the case of the new issues.

Now what happens that many a times we also are required to know that what will be the stock value when you have to stage growth? So, many a times you have the stage growth you have growth rate will be you know going to certain value and also the growth rate may change also. So, that become maybe become more than r. So, in those cases how these current prices are required to be calculated they also need to be understood.

So, that is done by another formula and in those cases because when the growth rate becomes quite high and that exceeds the you know rate of return that are so when g becomes r in those cases there will be negative value r –g. So, in those cases using the formula basically that formula does not you know remain valid so in such cases you have to you know find these you know pricing a lot to find the current price using the stage.

In stage wise so that is known as the stage dividends two stage dividend growth so they are formulas and that we will discuss maybe and also we can discuss about the other cost valuation methods in our next lecture, thank you very much.