Financial Mathematics
Prof. Pradeep K. Jha
Department of Mechanical and Industrial Engineering
Indian Institute of Technology – Roorkee

Lecture – 41
Introduction to Stocks

Welcome to the lecture on introduction to stocks. So, we are mostly conversant with the term these stocks or bonds which are basically you know used by the financial you know company's financial I mean investors use these stocks and bonds. So, in this lecture we are going to have the introduction about these stocks. How these stocks are evaluated how these stocks are valuated? So, how valuation of stock is done and then what are the terminologies which are into picture when we deal with these buying or selling of the stocks. So, these are the facts which we are going to discuss in this lecture.

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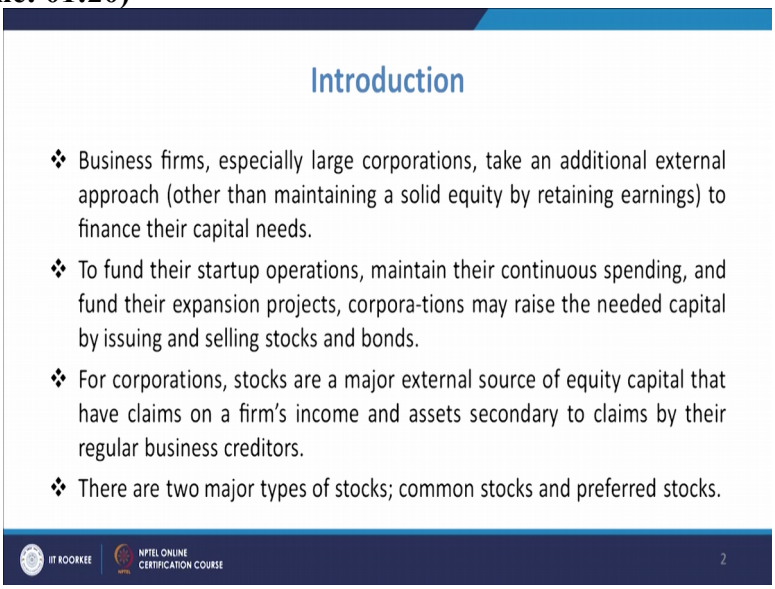

Now as we know that the business forms especially for the large corporations where you require quite you know a large fund for you know infrastructure or other amenities. So, they take additional external approach that is other than the maintaining solid equity by retaining their earnings you know to finance their capital needs. And for funding their start-up operations they maintain the continuous spending and for maintaining their continuous spending and fund their expansion projects these corporations they raise these needed capital by issuing and selling stocks and bonds.

So, these are the one they basically issue and sell and then they generate these you know capital from the public. People try to invest their money by purchasing these stocks and these companies sell their stocks and then they are benefited also in the long run because

depending upon the conditions under which these are purchased kind of stocks which are purchased.

For corporations these stocks are major external source of equity capital that have claims on a firm's income and assets secondary to claims by their business creditors. So, they have certainly once you have the stocks you one should purchase the stocks then certainly you have the claim on the firms income. Now when we talk about you know these stocks you have two types of stocks so that is a common stock and the preferred stock.

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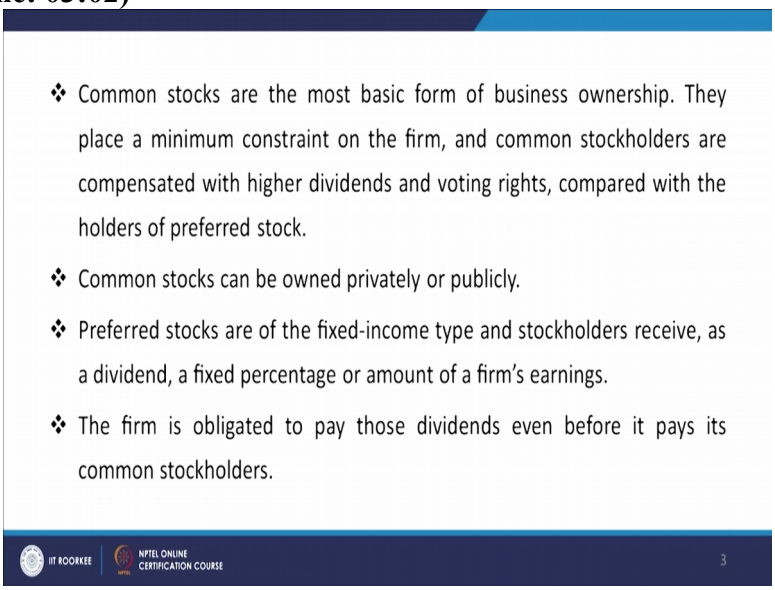

Common stock are the most basic form of business ownership they place a minimum constraint on the firm. So, you have basically two types of as we discussed common and preferred and that will be the most basic and they are basically compensated with higher dividends and they also enjoy the voting rights because the management level you have many times the decisions are taken.

So, they have say there and they have the voting rights so as compared to the holders of the preferred stock so common stock also can be owned privately or publicly then about the preferred stock it is told that the these are of the fixed income type and stockholders receive as a dividend the fixed percentage of amounts or amount of firms earnings. So, they are first paid and they are paid as fixed percentage of the amounts of the firm's income and certainly they are as the name indicates they are preferred over the common stockholders.

And the firm is really obligated so that is why they are preferred because the firm is obligated first to pay these dividends to you know the preferred stockholders and then it has to go to the you know to the common stockholders.

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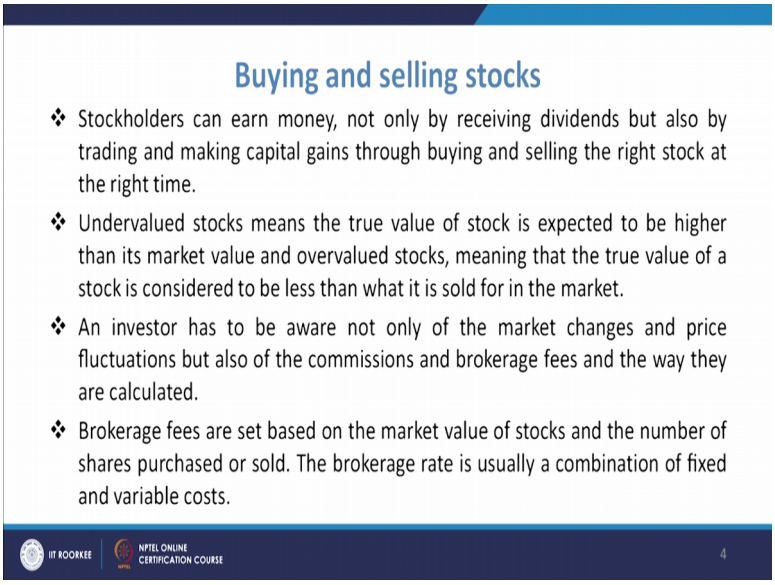

Now when you have you know when we deal with so people what we people will do is that people have to purchase the stock and they have to get the benefits so they get benefit you know time by time. So, the stockholders can earn money not only by receiving dividends but by also trading and making capital gains through buying and selling. The right stock at right time basically the stocks you know which is being purchased by any person.

Now he has the freedom you know either he can get continuously the dividends or by I mean as the time progresses depending upon the value of that you know if he has purchased the stock at lower price and if the value of that stock is increased in that case it can sell it at a larger you know rate so he can earn capital you know it can have capital gain by selling those stocks.

So, basically that way you have the definition of undervalued and the overvalued stocks. So, as we know that undervalued means whatever it should have the value it is lesser than its value is less than that so undervalued the stock means the true value of stock is expected to be higher than its market value and overvalued stocks means that true value of stock is considered to be less than what it is sold for in the market.

Now it is also affected you know by investor has to be aware about when you are selling or you are buying then you have the; there because there will be you know price fluctuations as the time progresses there may be I mean up in the value of the stock or there may be downfall in the value of the stock and also while buying or selling you will have to pay the brokerage fees and the commissions.

And there are ways to calculate these brokerage fees and these are basically set on the value of this stock and also the number of shares which are purchased or sold. So, this brokerage

how much brokerage you have to pay or the Commission how much you have to pay it will be depending upon the you know the market value of the stock and also how many stocks you are purchasing or selling.

And normally it is say this brokerage which is calculated it will be a combination of the fixed part and the variable part. So, there will be fixed cost you know calculation and plus so the variable means how many numbers you are you know selling. So, based on that there will be variable cost also so that way they are calculated. For example suppose you want to see the example that for a now first of all whenever we deal with these finding these value of the stock or finding the cost of the sale which is sold.

What is the capital gain or capital loss so you will have a table which say which will tell you that what will be the brokerage fees?

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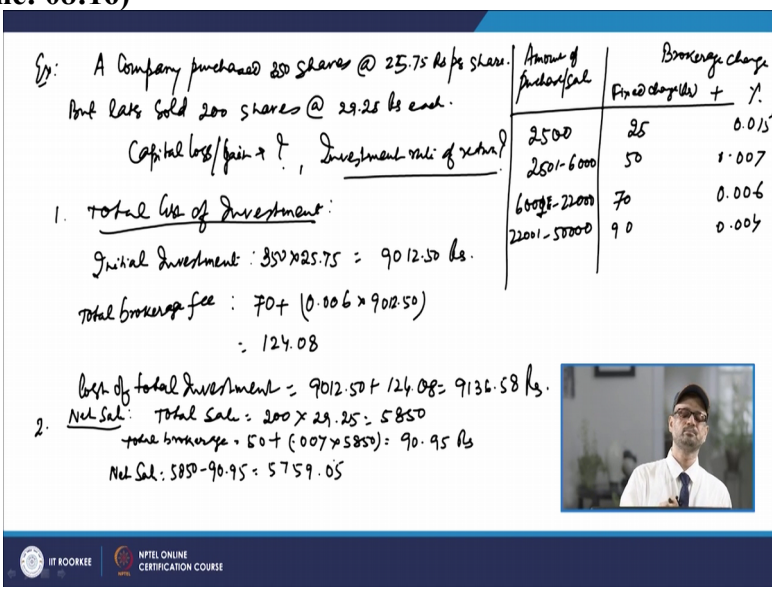

So, let us you can understand by looking at the example where we will be calculating these values. Suppose a company is there and it has purchased 350 shares, so a company purchased 350 shares and you know it has purchased at the rate of 25.75 rupees per share. Suppose this company has purchased you know 350 shares at this price and then but later sold you know 200 of its shares you know it has sold and it has sold at 29.25 rupees each.

So you have to find the capital gain or capital loss in these transactions and also the investment rate of return in such cases. Now in these cases you will you have to know that what is the brokerage fee which is there while transacting these shares or all these stocks or sales so that will be basically denoted by the table and the table tells that if you have amount of you know purchase or sale so it will be depending upon that and on that basically you will have a brokerage charge.

So, brokerage charge as we indicated there will be fixed charge that will be rupees and then you will have the percentage. So, both you know added that will tell you the whole brokerage charges so maybe on 2500 it is something like 25 rupees plus 0.015. Similarly you know on 2501 to 6000 you give something like 50 and here you give .007 and then from 6000 you know 1 to 22000 you are giving seventy and the .006 something like that and maybe from 22001 to 50000 you are giving you know 90 and .004.

Let us say you have you may have another rule now if these rules are there in that case how then what will be the capital gain or loss of the company or gain will be what and also the rate of return you know what will be that investment rate of return. So, how you will calculate all these things so now let us see that what will be your total cost of investment. So, first of all you will find the total cost of investment.

So while finding the total cost of investment we know that you have purchased 350 shares at 25.75 rupees per share so your initial investment is 350 shares multiplied by 25.75 per share so it will be around 9012.50 rupees. So, this is your initial share now in this basically you have to see that what is your you know brokerage charges. Now in this case this is 60001 here 90001.

So you see that this 9012 will be coming in the this bracket so you will have the brokerage charges and the brokerage charge will be you know .006% of this amount and plus 70 rupees so brokerages percentage so total brokerage charge so total brokerage fee now that will be rupees 70 plus you know this is you know .006 and multiplied by this is you know 9012.50% or 7%. So, it is the .06 means point 6% so you cannot say this is percentage it will be 0.15% so this is basically the there is a factor by which it should be multiplied.

So, now if you calculate that it will be you know 124.08 it is not basically percentage you can say percentage will be 1.5 so that is how you should take it like this. So, this will be your brokerage fees. So, the cost of total investment if you look at it will be your initial investment price that is 9012.50 + 124.08 and that will be your 9136.58. So, this is the cost of investment.

Now you have to sell this your stock so or share so now you are selling it so now further net sale if you calculate. Now selling you are doing for 200 shares and 200 share is being sold at 29.25 rupees per share so total sale will be you know 200* 29.25 so it will be 5850 and if you look at the brokerage on the percentage sale this broker is on percentage sale will be 50+ .

007* 5850, so total brokerage will be you know 50 plus and this is 0.7% so .007 * 5850 so if this is multiplied you will be getting like 90.95 rupees.

So, now you are now in this case when you have found the total cost of investment you have to add the brokerage fee to the initial investment whereas when you are selling you have to subtract this amount so net sale will be 5850 – 90.95 so now it will be 5759.05 so this is your cost of 200 shares, this is the cost of 200 shares. Now what we have to calculate is that since we are doing for 200 only so we have to find the cost of 200 shares based on this value which we have got so if you try to find the cost of 200 shares in that case this amount 9136 this will be multiplied by 200 by 350. So that will tell us the cost of 200 shares are sold.

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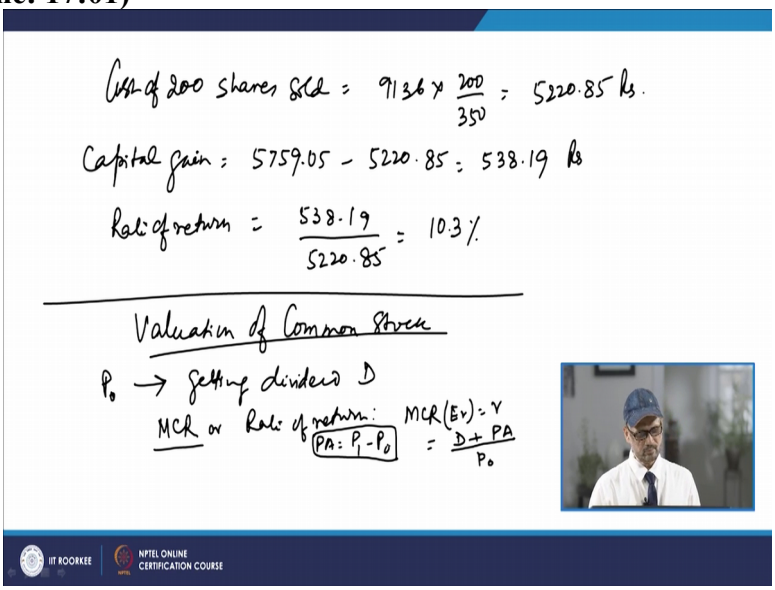

So, cost of 200 shares basically you know which sold so you have 9136 * 200 / 350 so that will be your you know 5220.85 now what you see that this is the cost of the 200 shares which were sold earlier and you have sold a net sale is coming as 5759.05, so you know capital gain will be you know whatever you have sold. So, capital gain will be something like 5759.05 - 5220.85 so now this will come out as 538.19 this is the capital gain while you are selling because we have to calculate only for 200 shares earlier we call got the cost of shares for total cost of investment as for 350 you know shares.

So, this is your capital gain and that is why the rate of return if you have to find you are getting rate of return will be on 538.19 and this we are getting for the you know 5220.85 and that will be multiplied by 100 so that will talk about percentage so it will be 10.3% so it will be .103 so that will be 10.3 percent so this is how you calculate these you know cost rate of return and the capital gains when we are buying or selling the stocks.

And we try to find the you know what is the income on the you know net gain or capital gain on that and based on that we find its return. now we will talk about the you know stock valuation how to value the how to see what is the value of you know the stock because you are purchasing and you are getting a certain amount every year you may get a fixed amount every year or the amount which you are getting a dividend on that stock that may be changing that may increase every year by certain amount.

So, basically ultimately you need to you know to find how to find these you know what is the rate expected rate which you are getting or I mean rate of return which you know that is investor is expecting to receive that is known as the market capitalization rate MCR or also we call it as rate of return because everybody is looking for that rate of return. So, in this case basically we will see that how these you know valuation of this common stock is done.

So what is happening that there are two terms so when we talk about the evaluation of common stock in that case we are concerned basically to find few parameters and you know we call it as suppose the investor basically it will be purchasing a certain stock on a price so P0 and then he will be trying so he will be purchasing that on P0 and he will be getting dividend D.

So, dividend he will be getting the dividend D every year. So, he may be getting this dividend as long as he is keeping that. So, that will be you know as long as he will be having that because there is no maturity date for this it will be going on as long as he is having that you know stock you know with him. Now in this case there will be certain rate of return that his that is defined and that is what this you know market capitalization rate is all about.

So, it will talk about you know how you know he is getting what you know he is getting when he is going was proposed he is going to sell that at some point of time. So, it has certain value at that moment of time. So, P0, that will be having so once he sells that in the next year he will be selling at certain price and in between he will be getting these you know dividends and he may be selling at a higher price.

So he will be getting certain returns and that will be known as the market capitalization rate or the rate of return. Now we have to see that see this is defined so this is market capitalization rate or this is the; you know expected rate also it is also known as the expected rate that is your Er. So, this is basically or the rates of return so this basically is defined as the dividend and then you have the PA so that is your appreciation in the; so that is your stock

price appreciation so that is the difference between the current you know purchase price and the expected price P1.

So, that will be your price appreciation and divided by then P0 so PA will be the price appreciation and this will be P1 and P0. So, P0 will be the current price and then P1 is the appreciated price of the stock. So, once you know that and respect to P0 you will be getting the value that is rate of return so what on what rate of return is stock is you know and can be evaluated as.

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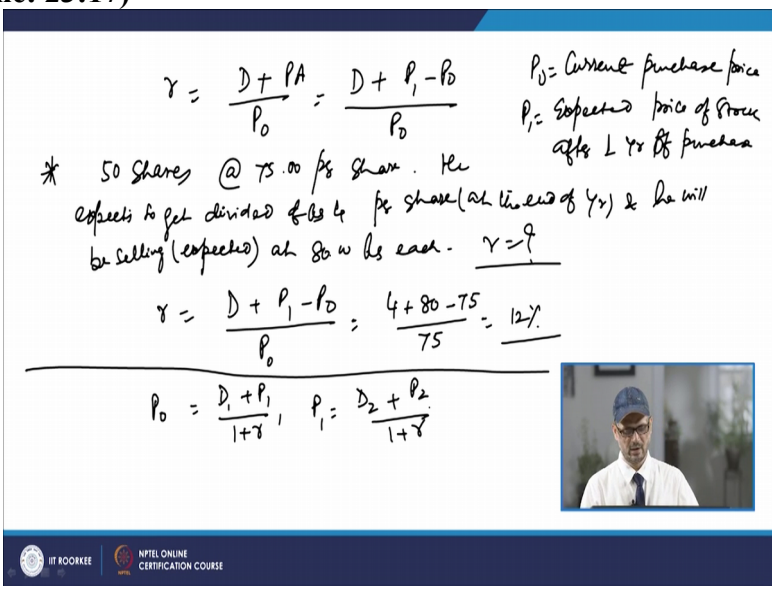

So, you can calculate this rate of return as you know as we discussed that it will be D + PA / P0 and PA is nothing but P1 – P0 / P0 so this is how now you know P0 is the current purchase price and P1 is basically the expected price so after one year after of purchase. So, now what we see that in this case you can have the value of the rate of return. So, you can say that suppose for example someone has purchased suppose a person purchased a certain say 50 shares a person purchased 50 shares of you know you know stock in a local firm.

And at the rate of you know 75 rupees per share now he will be expecting he expects to get you know dividend so he expects to get dividend of rupees 4 you know per share and also selling so this will be selling he will be getting at the end of year. And then he will be selling so expecting so he is not be selling because it is only his expectation that he will be selling at 80 each.

So, what you see that he has purchased at 75 and then getting dividend also of rupees 4 and then selling at 80 so in that case what will be you know the expected rate of return so r will be what. So, you can find r will be D + P1 – P0 / P0 so we know that the dividend he is

getting 4 and value is 80 and then he is getting 75 and divided by 75 so he will be getting 9 / 75 basically and that will be at 12%.

So, 12% is the rate of return in that case. Now we can use different type of formulas you know because what happens that it is rate will be changing every year. Now we have calculated that the P0, if you calculate P0 will be D1 + P1 / 1 + r so basically what you see is that D1 / D1 + P1 / P0 will -1 will be r so from here you get this expression as P0 will be D1 / + P1 / P1 + r similarly you know P1 will be D2 + P2 / 1 + r so you know when the r is the market capitalization rate so P1 will be defined as D2 + P2 / 1 + r.

Now we can put the value of P1 you know into the P0 formula so if you put this formula into that so let us start fresh.

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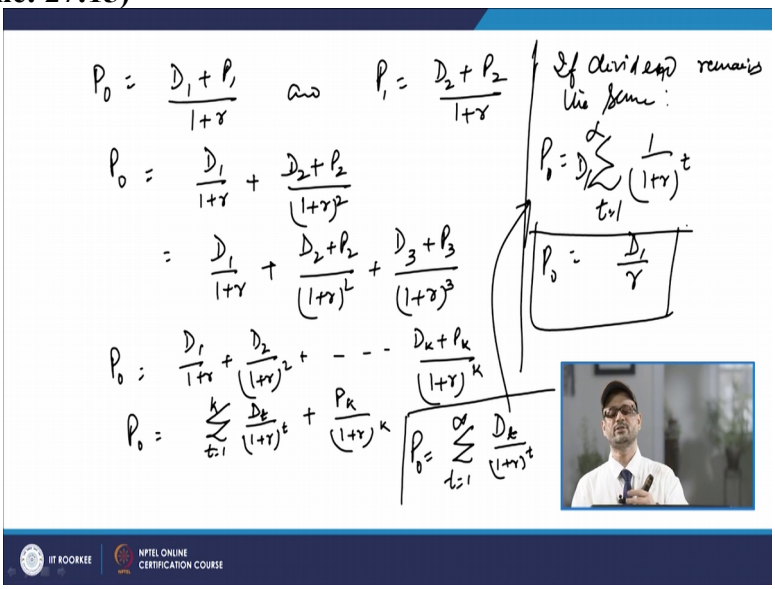

We calculated we found that P0 is defined as D1 + P1 / 1 + r and D P1 will be D2 + P2 / 1 + R so if you find P0 you get this P1 value from here so it will be D1 /1 + R + P1 / 1 + R so it will be D2 + P2 / 1 + R square. Basically it will be same because it will be D1 / 1 + r + P1 / 1 + R and P1 is this much so it will be D2 + P2 / 1 + r raised to the power 2. So, similarly you can go for the so this is also real can be written as D1 / 1 + R and then + D2 + P2 / 1 + r raised to the power 2 + D3 + P3 / 1 + R raised to the power 3.

So, this will continue to go and if you write in general if you have suppose you talk about some something like in future for K years so in that case you can write P0 as D1 / 1 + r +D2 / 1 + R raised to the power 2 something like and it will go up to DK + PK/ 1 + r raised to the power K. So, if you try to summarize and if you write to try to write in a standard manner you can write P0 as summation of t equal to 1 to K and then you can write D1 / 1+r and that will be raised to the power t.

And then you will have finally you have a + PK /1 + r raised to the power K because in the develop to this DK / 1 + r to the power K will be encompassed in this term and then ultimately your term which is remaining will be PK by 1 + r raised to the power K so that is how you can find these present value of the stock and this key this formula can be used. So, what you see that in this case you can see that the present value of this you know current price of the stock it is interpreted in these terms.

And in the talked about the some of these discounted dividends you know for the number of their future years so this is the discounted dividend because you are getting you know its values nothing but you are getting it is you know corresponding value at the present time. So, it is this is discounted value of these shoes or dividends and for the number of future years. Now if that year is approaching towards infinity in that if the K is approaching towards infinity then this term will be vanishing you know that will be 0.

So, in that case you can write so you will be writing when this K will be approaching towards infinity so you can write that P0 will be summation of t = 1 to infinity and then there will be only you know Dt / 1 + r raised to the power t. So, this is how now in these cases you have this is your Dt you know this is changing basically D1, D2 and D3 so you will have this term coming up and you can find these values like that.

Now if the D remains the same if the dividend remains the same in that case this D can come out so if dividend remains the same so you can say that this P0 will be; now from here you will get summation and you will have t = 1 to infinity and here you know D1 will come D1 is the fixed dividend which you are expecting to get and then it will be 1 / 1 + r raised to the power t and if you look at this sum so it will be nothing but 1 / 1 +r - r so being a geometric series so it will be D1 by r.

So, P0 will be you know D1 / r in case of when these t approaches towards the; K approaches towards infinity you have P0 as the D1 / r so that is how you know you calculate these you know present price of the stocks you are calculating. You can also use another formulas which we have discussed that if there is a growth in the dividend by you know certain factor then you have the 1 + g factor coming into picture and in that case you know you will have P = D1 * 1 + g / 1 + r then + D2 * 1 + g * 2 / 1 + r raised to power 2.

So, that way it will move and then if it goes towards you know if you find it sum then it will be P0 will be or P0 will be D1 multiplier however divided by R – g. So, that type of formula

also you can get in such cases and you can find these you know formula that is a current price of these you know stock that when we calculated using these formulas. So, this is the you know concept about these you know stock valuation when we talk about these common stocks and we will talk about more aspects of the about these talks and also about the preferred stocks in our coming lectures, thank you very much.