Economics of Banking and Finance Markets
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Lecture - 11
Determination of stock prices - I

Hi, welcome. In this session we will discuss how stock prices are determined.

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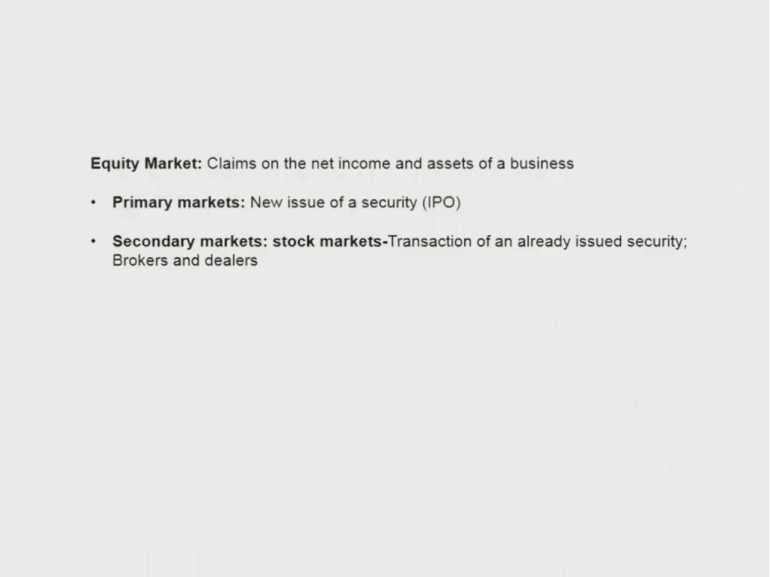

In the previous session, we have defined equity market the holder of equities has the claims on the net income and assets of the business. We also discussed that there are two markets; one is primary markets where new issue of a security or new issue of a share happens. And then about the secondary markets where transaction of an already issued security happens where brokers and dealers are there.

And in today's session we will focus on the secondary market that is called as the stock markets, and their how stock prices are determined. And what are the other factors that would affect the stock prices. For example, how would the interest rate, which we discussed in the one the previous sessions, and some monetary policy tools affect the stock prices.

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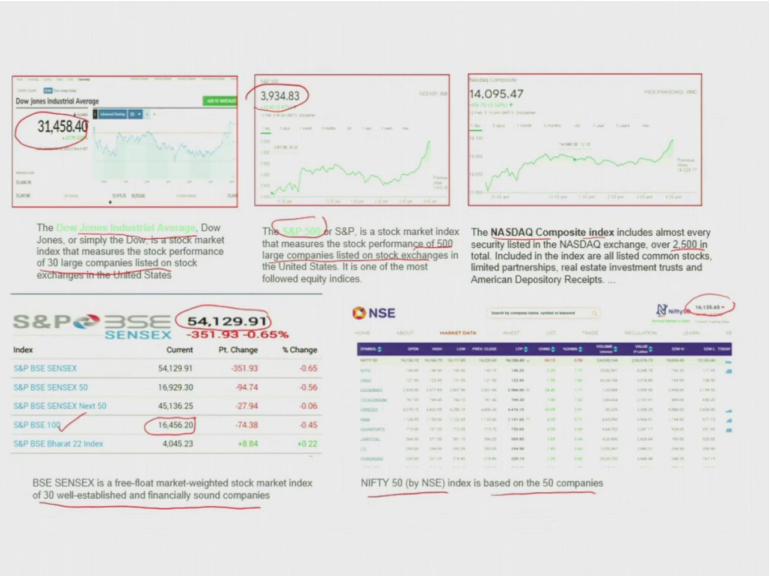

In this slide, I have taken some screenshots of some leading stock exchanges. You can see, the first one, Dow Jones Industrial Average. You can see here that this is the index, this computed by looking at the stock prices of 30 large companies listed on Stock Exchange in the U.S. You can see the SNP 500. This also developed using the stock performance of 500 large companies listed on Stock Exchanges in the U.S.

Loot at Nasdaq, this is a composite index computed from over the stock prices of 2500 companies listed in the Nasdaq. So, this built, you can see that, it has been built based on the stock prices and the index, and it has been followed over time. So, when it comes to Indian context, I think you are familiar that we have two major stock exchanges: one is Bombay Stock Exchange (BSE) powered S&P, this is the stock index; here NIFTY also is given.

In the case of the SP's BSE, you can see that is a weighted stock market index of 30 well established and financially sound companies. And there are different types of indices for example, top 100 companies, this is another index. Whichever you want, accordingly, you can follow. Similarly, you can see NIFTY 50 index is based on the 50 performing company listed in NIFTY, and this index has been built.

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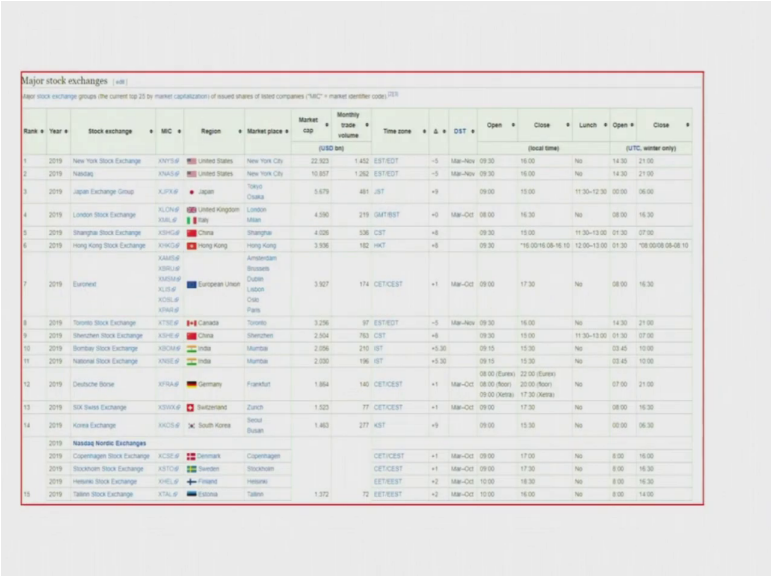

I am also giving the screenshot of major stock exchanges in the world starting- New York Stock Exchange Nasdaq etcetera. This is just for your information. What is happening in these stock exchanges? I am sure you know it; that is, the transaction of already existing stocks.

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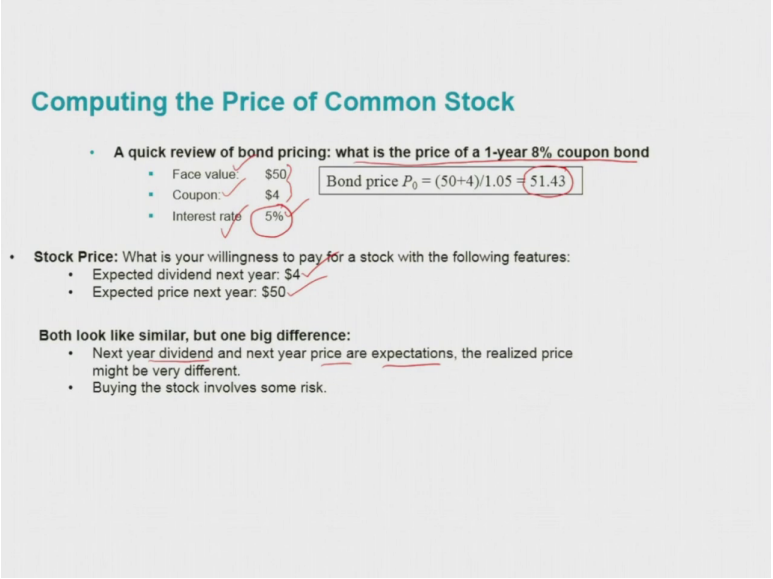

How we calculate the price of a common stock? What is the current price of a stock? From a given certain information about a company, how do we calculate the price of a stock? Before answering these, let us make a quick review of bond pricing. Here, what is the price? For

example, the let us start with the basics that we have done in one of the previous classes: what is the price of a 1 year 8 percentage coupon bonds.

For it, we need the following information: what is the face value, what is the coupon rate, and what is the interest rate. Suppose the interest rate is 5 percentage, we have this information about face value, we have coupon rate, and the interest rate is, for example, 5 percentage. Then, using this formula, which we have used in the previous class, we know that the price of this bond with a face value given the coupon rate of 5 percentage, the current bond price is going to be 51.43.

Let us now think about the stock price. What is your willingness to pay for a stock with the following features: that means, instead of coupon, let us say that the expected dividend the stock is going to give you in the next year is going to be 4 dollars and expected price next year is going to be 50 dollars. So, in this scenario, what is your willingness to pay for a stock with the following these features?

It is not that easy to calculate though both (bond and stock) look like similar, but one big difference is there. The big difference is that next year dividend, for example, the next year dividend, which I said here is dollar 4, and next year price. Both are in fact expectations; the realized price might be different. So, buying the stock involves some risk.

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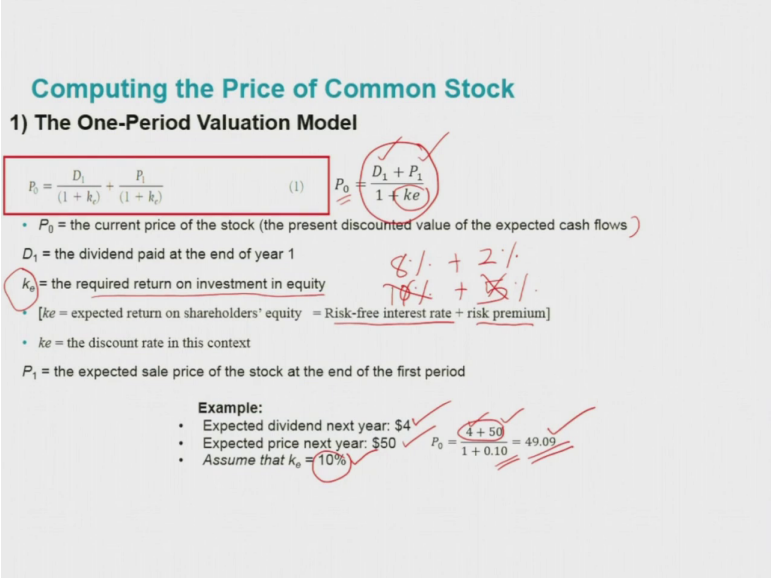

In this scenario, we think that computing the price of common stock we need to investigate some values. What is going to be the next year dividend, the expectation we need to compute, what is going to be the next year price, we also need to see what the discount factor is.

For example, in the case of bond, we have interest rate, but here in the case of stocks we do not have any interest rate. So, we need to find out some value that can be used as a discount.

To compute the price of common stock; one of the widely used method is the one period valuation model. it shows that the price of stock at present current; that means, P_0 means, current the current stock price is equals the dividend that you are going to get in the next year plus the price of stocks in the next year discounted by 1 plus ke.

So, what is this ke? So, let us point out that the P_0 that I already mentioned current price of the stock, that is the present discounted value of the expected cash flow. This is the current price of the stock, the present discounted value of the expected cash flows, and D_1 is the dividend paid at the end of next year, ke the required return on investment in equity. This is determined by so many other factors including what is your return on alternative investment.

For example, investment in a bond. Suppose you are getting a 10 percentage as the interest income, 10 percentage interest from investing in a bond that going to influence your ke required return on investment in this equity; obviously, you need to get more than that because this investment in equity involves some more risk than as compared to the investment in a bond.

This is the required return on investment in equity. The expected return on shareholders' equity is equal to risk free interest rate, for example, 10 percentage plus some risk premium. As investing in stocks involves uncertainties, you do not know what is going to happen after 1 year, even the company may collapse. So, to incentivize you need a risk premium. Maybe for example, you need, for example, 5 percentage as a risk premium. So, that is how this value of this ke is determined. So, in this case, ke, we can also say that this is a kind of discount rate, that is, this is going to be a discount rate. So, $P_{1,}$ which we have already mentioned the expected sale price of the stock at the end of the first period.

Now let us illustrate, using an example, what is the price of a stock using this one period valuation model. Suppose you have been given this information; that means, the expected dividend next year is going to be 4 dollar, and expected price next year is going to be 50

dollar, and assume that just for the sake of simplicity, let us assume that your ke is going to be 10 percentage maybe we can build it like that, 8 percentage is the current interest rate and 2 percentage is the risk premium.

So, let us assume ke is going to be 10 percentage. So, plugging these values in the formula, that we got here, we can calculate the price of the stock. We are going to get, with the given this features that is the dividend and D_1 and P_1 with the ke of 10 percentage, that is, 1 plus 0.10, then we can see that the price of this stock in this market given for an individual who is willing to pay, who is having this ke, expected value the required return on investment in equity, given these information, the current price of the stock is going to be 49.09. This is from the one period valuation model.

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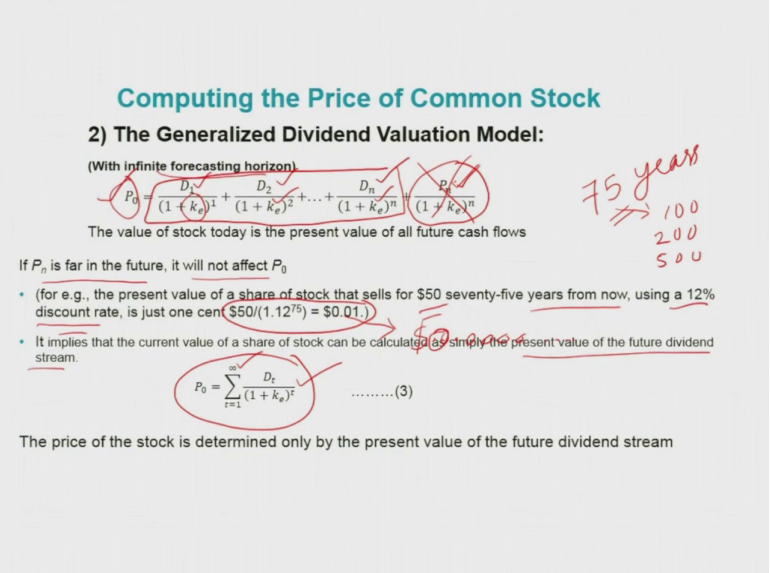

But you know that, stocks are not just for a 1 year investment. So, this is for its lifetime. It is a long-term investment; that means, you are getting the share of a company as long as the company exists, you are the shareholder of that company.

So, the life of your investment in a stock is for infinite time period. So, your current stock price should reflect not only just next year dividend and stock price, but the infinite forecasting horizon. So, in this case, what how you we are going to develop; this formula expands this formula, this formula has two components now. The first component is the present value of future cash flow from dividend; that means, dividend in year 1, year 2, year 3, plus you can see dividend for nth number of years.

So, here we need to discount it with the value of ke; this one. The ke is same. The present value of all future cash flow from the dividend plus we also need to calculate the present value of the price of stock in nth year. This is the formula that we are going to get, but one of the issues here is that if Pn going to be far in the future because we already know that the share means it's a long term investment.

So, in this case, we are going to see that when the Pn is far in the future, it would not affect P_0 at all; how come? So, let us see this for example, the present value of a share of stock that sells for example, for 50, 75 years from now. For example, let us take it for sake of simplicity, we are just taking 75 years is the time period for the stock; actually it should be more than that.

Assume that this is 75 years. A stock that is selling today with 75 years from now, using a 12-percentage discount rate, that is the ke. What we can see that if you calculate here. if plug valued here, the present value of this stock going to be 0.01s; that means, very meager amount, almost near zero.

Suppose if you increase the number of years to 100 or to 200 or to 500 years, you know that this value is going to be 0.000.

So, from this, what we can see that in the calculation of the current price of stock (today) is going to be going to exclude this part, and is going to include only the first component, that is the dividend stream that is going to the cash flow, that is, the present value of the cash flow from the dividend alone.

Accordingly, it implies that the current value of a share (stock) can be calculated simply by estimating the present value of the future dividend stream alone. Therefore, we can redefine this formula in this way. That is the t; that means, infinite time only looking at the dividend aspects, that is the dividend from the stocks. So, to summarize this point, the price of the stock is determined by the present value of future dividend stream alone.

We found that this is going to be the formula for computing the stock price, that is, only looking at the future dividend stream. But, again, we are getting the n number of year the infinite time for the dividend calculation as well. Maybe we can forecast the dividend for year 1, 2, 3, 4, but beyond that its practically difficult to know what is going to be the dividend a company is going to give in the 3rd year, 4th year, 5th year and so on.

It is practically difficult because we can only see what is the actual dividend that the company is giving. And to address this, you know that most companies prefer to give a stable rate of dividend every year. Suppose the company is doing well and are earning lots of profit, thus, they can distribute lots of dividend, but sometime the company may do bad in the year after next.

So, in that case, if they see that there is going to be some fluctuation in their business, normally what the companies do is that they do not distribute all their profits in the form of dividend, and they retain some of their profit as undisturbed profit. That will be used for financing the operating cost of the company and will contribute to the internal finance of the company.

In addition, some fraction of the undistributed profit will be used to compensate the dividend payment if there is a decline in profit in the future. This will ensure that the shareholders get a fixed amount or a certain amount of dividend regularly. Most companies normalize their dividend distribution to compensate if there are some ups or down in their profit. Therefore, we assume that companies will try to give a constant amount of the dividend to its shareholders, that is, at a constant rate.

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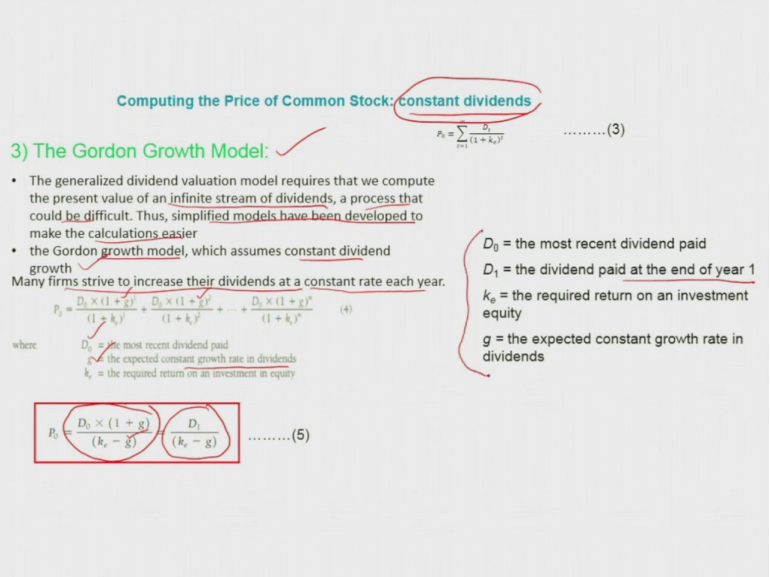

So, we can see that, by using this one- constant dividends, suppose company is going to give 3 percentage this year, next year also they try to stick to 3 percentage, 3 percentage next to next year, like that. If the company is really doing well then; obviously, we can say they are

going to increase to four percentage, but they will try to stick to that amount. But note that they will not try to give 4 percentage in one year, 20 percentage in next year and again 3 percentage in the next-to-next year.

So, looking at this idea that the practical aspect, most companies would give a dividend at a constant rate, one more model is recommended for calculating the stock price, which is called as the Gordon Growth Model. This is a generalized dividend valuation model that requires that we compute the present value of an infinite stream of dividend, a process that could be difficult, thus a simplified model have been developed to make calculation easier.

The Gordon growth model assumes a constant dividend growth. So, as I already mentioned that many firms try to increase their dividends at a constant rate each year, we can see that this is the growth rate dividend growth rate, we can see here. So, this is the formula accordingly if you state this one.

This is the dividend that the company has given in the most recently, maybe you can say that today or yesterday or tomorrow (most recent dividend). g is the expected constant growth rate in dividend, ke is the which we have already discussed- the required return on any investment in equity.

Accordingly, the Gordon growth formula is like this; price of stock, that is, the present value of the stock is going to be D_0 times 1 plus g divided by ke minus g. So, the g is the expected constant growth rate in dividends. So, rewriting this formula, we can get a very simplified formula that the current price of the stock is going to be D_1 that is the dividend paid at the end of year 1 divided by ke minus g. These are the explanation for that.

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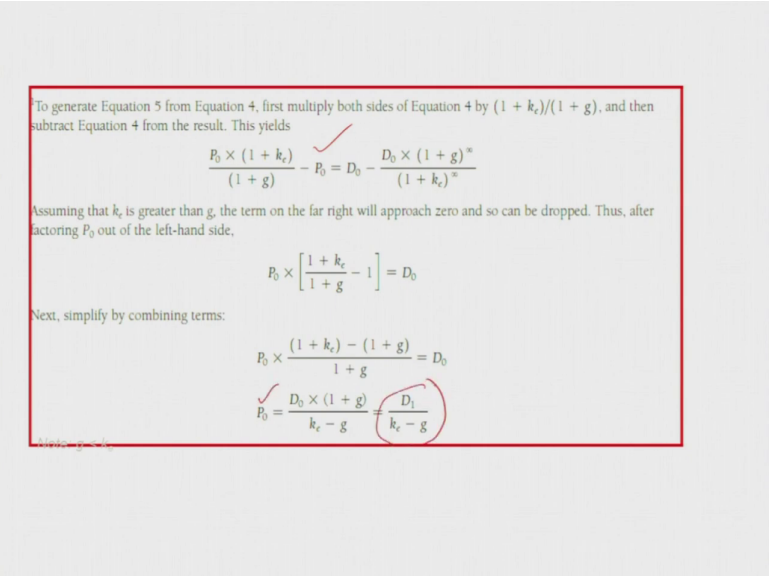

This is the formal derivation for this formula.

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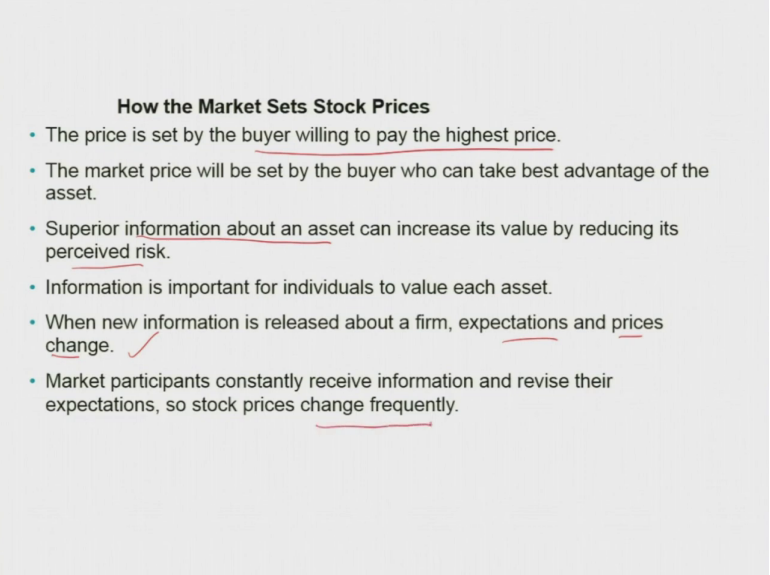

Let us now see, based on this Gordon formula, how the market sets stock prices, how do we apply this Gordon formula in understanding how market sets stock prices. Importantly, a stock market is one of the places where demand and supply really plays its role. So, given that demand and supply, the price is set by the buyer willing to pay the highest price.

So, market price will be set by the buyer who can take advantage of the asset superior information about an asset that can increase its value by reducing perceived risk. So, because we have already seen that a stock price reflects investor's required rate of return that, the ke, it includes not only the return from alternative investment but also plus a risk premium.

So, superior information about an asset can increase its value by reducing perceived risk. Thus, information is important for individuals to value each asset. So, if the value of your ke is subject to the information that you are having about a company. Moreover, when new information is released about a firm whether its firm is going to do well or the financial condition of the firm or the business condition of the firm is bad then; obviously, you know that all these going to affect expectation and the prices of the stock.

Accordingly, expectation and prices of the stock are going to change. Market participants constantly seek information and revise their expectations. So, stock prices change very frequently.

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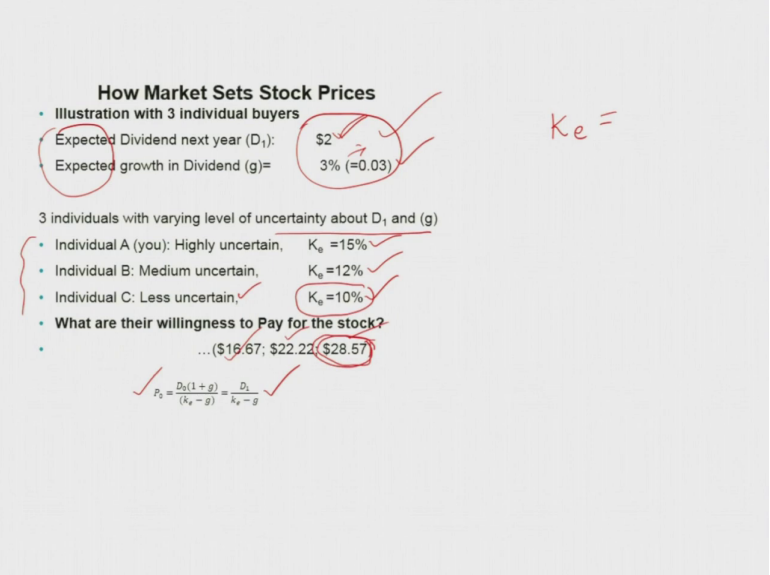

Given this information, let us now apply the Gordon formula to calculate what will be the maximum willingness to pay for a particular stock by 3 individual buyers. The information available commonly to all the three individuals are i) the expected dividend next year is going to be 2 dollar and ii) expected growth in dividend is going to be 3 percentage, that is 0.03. In this case we have information about the dividend D_1 we have g, and but we also need information on ke.

But ke varies from individual to individual because this is based on their perception about the market. About the rate of return that they are required to make an investment, which we have already seen, the expected return Ke consists of the expected return that they are going to get from alternative investment plus the risk premium; this varies from individual to individual.

So, let us assume that that these 3 individuals with a varying level of uncertainty about D_1 and g about their information because these are all expected values. So, the uncertainty about the D_1 and g, suppose individual A is very highly uncertain about this D_1 and g, he/she expects that the company may not give these D_1 and g at the expected rate.

So, in this case assume that the ke of this individual; individual A is going to be 15 percentage, and for the individual B who is slightly hold uncertainty level lower than of individual A, and he needs only 12 percentage ke. The individual C is less uncertain, he/she is confident that these values are going to be same. This individual C needs a ke of 10 percentage.

Note that the dividend and the expected growth rate is a function of the general business condition that the macroeconomic risk plus the systemic and some of the firm specific risk as well, hence individual investors' uncertainty level depends on these factors.

If you plug these values into this formula, we know that we are going to get three different prices or the willingness to pay for the P_0, that is, we are going to get three different values for these three different individuals. We can see here that what are their willingness to pay for the stock.

If you calculate this one, you can see that the individual A's willingness to pay is 16.67 dollar, the individual B's willingness to pay is 22.2 and individual C's willingness to pay is going to be 8.57.

You know that here individual C his ke is low as he is less uncertain about the expected values of the parameters of the stock. So, he is willing to pay a high price for this stock, which is going to be a dollar 28.57.

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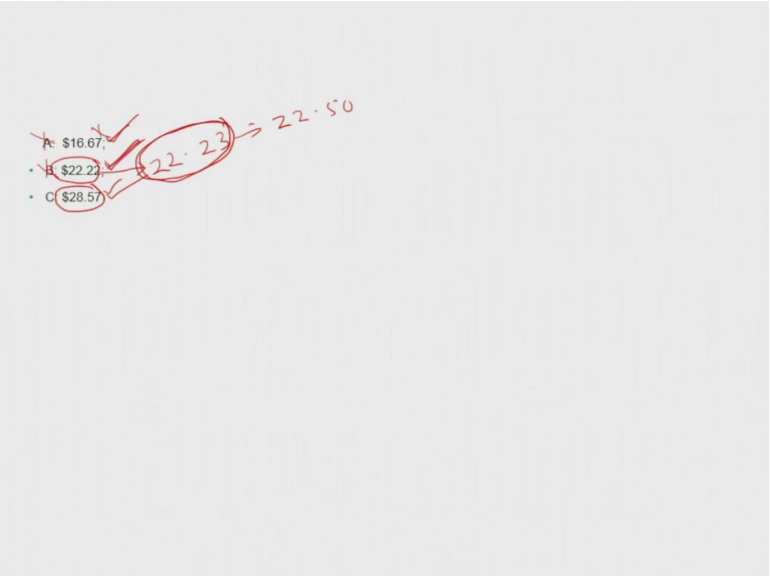

So, from this example, you can see that in this market there are these three individuals only, and they do not know each other and some individual who is holding this stock is desperately looking to sell this stock, then in this case, we already know these three individual A, B, C's willingness to pay.

Individual A, he is willing to pay maximum this much, and individual B, he is willingness to pay maximum this much, and individual C, his maximum willingness to pay is 28.57. In this case what is going to be the stock price? So, obviously, the seller of the stock wants to get the maximum.

This will not be the stock price because this individual A he is willing to pay 22. So, this individual A is out of the market. Then, when individual B his willingness to pay is maximum 22.22, but individual C is willing to pay 28.57. So, assume that there are only 3 individuals here, you know that anyway they are not sharing each of this willingness to pay, but this person he is willing to pay 28, but since the second person is going to pay maximum this much.

So, the stock price is going to be a little bit above this one; that means, for example, 22.23 or maybe we can make it as a round figure or maybe we can just make it to 22.50.

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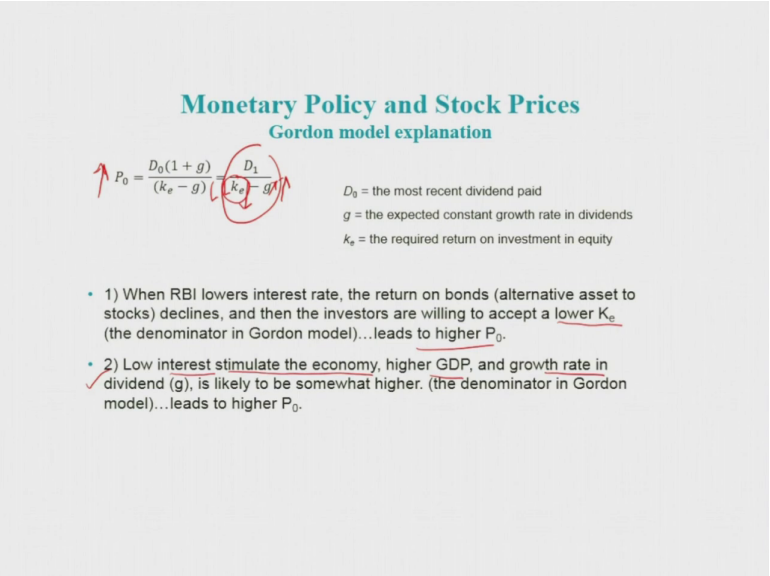

Applying this formula, suppose most often you hear that sometime central bank, the governor of RBI, or any policy makers, when the stock prices are low in the market when overall the economy is really doing bad, sometimes they make an announcement that they are going to increase the stock price through reducing the rate of interest.

How can we explain this one using the Gordon formula. Let us take the Gordon formula here, suppose when RBI lowers interest rate, what is going to happen here? The return on bonds which alternative asset to stocks declines, then the investors are willing to accept a lower ke; that means, the ke is going decline, that is, investors are willing to accept a low value.

If you reduce this ke value, you know that the value of Pe is going to increase; this is one mechanism or one pathway. And another thing is that when policy makers reduce the interest rate, the cost of borrowing for the firms also declines; that means, the cost of production reduces and then producers increase production, then it will lead to higher GDP and the growth rate in the economy also increase; that means, the dividend also increases.

This is because the cost of borrowing declines the profit also increase. So, this means the g increases. When the g increases you can see that again the stock price is going to increase.

This is the pathway to explain how monetary policy expansion increase the stock prices.

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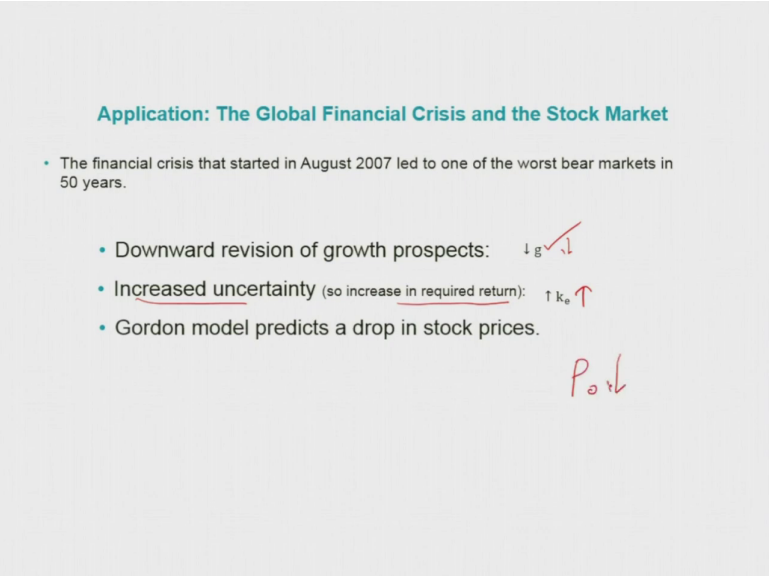

Similarly, we can also see that, the same formula we can apply during the global financial crisis. You know that during crisis the g rate declines because financial crisis leads to the economic crisis as well. You then you know that there is increased level of uncertainty in the economy. So, the required return on investment also increases. As a result, the g is declining and ke is increasing, and because of both, you know, as per the Gordon formula the stock price is going to decline.

Thank you.

Keywords: stock price, dividend, uncertainty, expected return on investment, one-period valuation model, generalized valuation model, Gordon growth formula