Video 17 - Stock Valuation: Gordon Growth Model

The following is a supplementary transcript for tutorial videos from

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Welcome back to the series on how to calculate the price of a stock. For part 2, we will be learning about the Gordon Growth Model, and how it can be used to calculate the price of stocks with dividends that grow at a constant rate. Let's just jump right into it!

Video at 00:20

With the perpetuity formula approach to calculate stock prices, the crucial assumption is that every period pays the same dollar amount dividend, which is why the perpetuity approach is also known as the zero-growth dividend model. Although this may be realistic for firms in stable, mature industries (such as breakfast cereals, tobacco, and household appliances), many firms will experience steady growth, and with higher earnings, these firms may pay increasingly more with each dividend. If the value of the dividends keeps growing, how can we calculate the price of the stock without having to individually discount each dividend back to today?

Video at 00:57

The Gordon Growth Model allows us to do just that for firms that raise the size of each dividend at a constant rate. and there are two versions of the Gordon Growth Model: with the ex-dividend formula, the price of the stock with growing dividends is equal to

$$price = PV_{ex} = \frac{D_1}{r_E - g}$$

where D_1 is the amount of next periods dividends; "g" is the constant growth rate of the dividends; and r_E is still the appropriate discount rate that reflects the riskiness of the firm's equity relative to the rest of the stock market.

The cum dividend formula calculates the price of the stock with growing dividends:

$$price = PV_{cum} = \frac{D_0(1 + r_E)}{r_E - g}$$

where D_0 is the amount of this period's dividend that we, as the investor, anticipate on receiving. Note that the ex and cum dividend formulas are two sides of the same coin, being that they both help us to calculate the price of a stock with a constant dividend growth rate.

Video at 01:55

However, choosing between applying the ex dividend formula versus the cum dividend formula depends on the scenario. The ex dividend formula is used to calculate the price of a stock that just paid a dividend, and thus, the numerator uses D_1 to reflect next period's dividend. On the other hand, the cum dividend formula is used to calculate the price of a stock that has yet to be paid, and thus, the numerator uses D_0 to reflect this period's dividend that we are anticipating to receive.

Video at 02:23

In both the ex and cum dividend formulas, each consecutive dividend gets smaller in today's terms, as it is divided by the period rate; yet, each term is also experiencing growth, so it is multiplied by the growth rate "g". We can anticipate that, because these dividends are growing, the price of the stock will be greater than the price of a stock that didn't grow, and we can also see that this makes sense mathematically, since subtracting "g" in the denominator increases the present value, since we are dividing by a smaller number. Please check out part 4 to this video ("Deriving the Ex and Cum Dividend Formulas") where we will be going over how the Gordon Growth formula is derived and further exploring the ex and cum dividend variations of the Gordon Growth Model.

Video at 03:05

In finance, we have learned that there are many synonyms for the cost of capital that all mean the same thing, such as the discount rate, the rate of return, and so on. Thus, you can also think of r_E (the cost of capital) as the expected return from investing in stocks. This becomes clear when the ex dividend formula is rearranged to isolate r_E, and we can see that

$$price = PV_{ex} = \frac{D_1}{r_E - g}$$

$$r_E = \frac{D_1}{P} + g$$

where $\frac{D_1}{P}$ represents the dividend yield, which is the return on investment the investor can expect to earn from buying the stock today at price "P", and "g" is a constant future growth rate of the dividends. In short, r_E (the cost of capital) is also the expected rate of return on stocks, because r_E reflects the two ways in which a stockholder can earn returns on investing in stocks: first, from the dividend, as reflected in the dividend yield, and second, from capital gains,

as reflected in the growth rate of the dividends, which captures the increasing value of the company.

Video at 04:05

Let's practice using the Gordon Growth Model. Please read the following practice scenario, and pause the video and try using the Gordon Growth Model to calculate the price of Nike yourself.

The current market price for Nike is $81. Michael just missed the annual dividend of $2/share that was paid this morning. Based on Nike's financial data, the effective annual discount rate for Nike's equity is 11%, and its dividends will grow at a rate of 8%. Should Michael invest in Nike?

Video at 04:18

Let's summarize the information we have. Right off the bat, we know that we will be applying the ex-dividend version of the Gordon Growth Model, as Michael just missed the annual dividend that was paid this morning, and so he's interested in the cash flows starting with next year's dividend. The problem clearly gives us r_E = 11% and g = 8%. We also know that a dividend of $2 per share was paid today, but in order to apply the Gordon Growth Model, we need to know the dividend that is paid next year (D_1). This is not a problem, as we know that the dividend paid next year will be 8% greater than the dividend that was just paid today. Thus,

$$D_t = D_0 \times (1+g)^t$$

$$D_1 = D_0 \times (1+g) \; = \; \$2 \times (1.08) \; = \; \$2.16$$

In other words, if Michael decides to buy Nike's stock today, then he can expect that the first dividend he will receive will be a year from now.

Video at 05:10

By plugging the values for D_1, r_E, and "g" into the ex dividend formula, we can calculate that the price of Nike's stock is

$$price \; = PV_{ex} = \frac{D_1}{r_E - g} = \frac{\$2.16}{0.11 \; - 0.08} \; = \; \$72$$

Michael realizes that the value of a Nike share is actually less than the market price of $81, and thus, you could recommend to Michael that he should not invest in Nike stock - just don't do it!

Video at 05:31

Now, what would happen if Nike's dividends were, instead, expected to grow at 0%? This means that all the future dividends would remain at the same value of $2 per share that was paid today. If we plug g = 0 into the formula, we can see that we would be left with the perpetuity formula that we learned about at the beginning of part 1 ("Stock Valuation: Zero Growth Stocks").

$$price = PV_{ex} = \frac{D_1}{r_E - g} = \frac{D_0 \times (1+g)}{r_E - g} = \frac{D_0 \times (1+0)}{r_E - 0} = \frac{D_0}{r_E} = PV\ perpetuity$$

It may seem like black magic, but these formulas are all related because, at the end of the day, these formulas are all pricing the present value of a stream of future dividends.

Video at 06:03

This brings us to the end of part 2. The key takeaway from this video is that, for dividends that are expected to grow at a constant rate "g", we use the Gordon Growth Model to calculate the price of these constantly growing stocks. So, by now, you have learned how to calculate the price of a stock with constant dividends, as well as the price of a stock with constantly growing dividends. In the next video, we will be exploring the Multistage Growth Model. Hope to see you there!