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**FOR FIN 4310 MANAGERIAL FINANCE**

**LECTURE 6**

***FINANCIAL ANALYSIS, CORPORATE VALUATION AND CAPITAL FORMATION***

by

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# **LECTURE 6 STOCK VALUATION**

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A corporation’s stock represents an ownership interest in the company, based on the number of shares one owns compared to the total number of shares that have been issued. Such an ownership interest has value on a per share basis from the cash flow that the interest will generate for the owner. The cash flow inherently must come from dividend payments. Any company that announces that it will never pay dividends must have a fundamental value for its stock that is equal to zero, for there is no other way for the firm’s management to transfer earnings to its owners than through dividends. Dividends in this broad sense includes the cash payments associated with stock repurchases, and even special deals that stockholders may receive from owning a particular firm’s stock, such as lower subscription rates on magazines that the firm may publish.

Stocks derive fundamental values from the stream of cash flows associated with dividend payments. This does not mean that firms must regularly pay cash dividends, for there are firms that currently pay no dividends. However, it does mean that a firm must ultimately transfer earnings to its stockholders for stocks to have value, and this ultimate transfer requires a cash dividend. Dividend policy therefore involves the decision concerning the timing of cash dividend payments, and not whether dividends are to be paid at all.

Whether the timing of the cash dividend payments affects the stock price has received much attention in the literature. The classic paper by Miller and Modigliani (MM, 1961) showed that the value of the stock or return to the investor is invariant to the payment of a (cash) dividend, with investors indifferent between the receipt of value from a dividend payout or share repurchase. This issue has to do more with the timing of the payment rather than whether a payment is to be made at all. Indeed, MM showed that an investor’s ability to create homemade dividends or homemade capital gains is critical for support of their corporate dividend policy irrelevance proposition. No one has significantly challenged the basis for this theory, even though empirically it is obvious that dividend policy is eclectic.

The “Bird in the Hand” theory [Gordon (1963) and Lintner (1962)] attempted to argue for higher value for stocks paying dividends sooner rather than later, making dividend policy relevant, because dividends now are preferable to dividends later due to its lower risk (lower cost of capital). However, Miller and Modigliani argued that this view is fallacious, insofar as the riskiness of the firm depends on the riskiness of its earnings stream rather than its dividend stream.

Overall, these results leave us with the “dividend puzzle”, concerning the question of why firms would employ a policy involving the payment of cash dividends now rather than later, or vice-versa. Some of the answers to this question rely on market imperfections. These include taxes which generally favor capital gains because as gains can be deferred, so can taxes; and signaling effects where management can use dividends to overcome information asymmetry and signal stockholders that the firm’s future prospects are good by raising dividends. Other reasons include clientele effects that suggest that management tailors its dividend policy to the preferences of the stockholders, which also reduces their transaction costs in dealing in the stock, and agency costs when dividends serve to bond managers and owners. Differential costs in raising capital internally and externally, leading to a pecking order theory, also impact dividend policy, such that dividends are only paid when the firm’s cheaper, internal capital (retained earnings) is not needed. A final more recent motive is that dividend payments reduce the sensitivity of the stock’s value to a change in its cost of equity, affecting the riskiness of the stock to its owners.

**6.1. General Fundamental Stock Valuation Model**

As cash dividends are necessary in order to give a stock value, the general fundamental stock valuation model has the following form:

 (6.1)

where d*0* represents current dividend payments, d*1* , d*2*, and d*3* represents dividend payments in years 1, 2 and 3, such that if the g is defined as the growth rate of dividends and assumed to be constant, then

 (6.2)

where the series of dividend payments extends from year one to infinity.

**6.2. Constant Growth Stock Valuation Model**

The constant growth model shown in (6.2) can be simplified to equal:[[1]](#footnote-1)

 (6.3)

To illustrate the use of this model, imagine a stock where *d1* equals $1, *ke* equals 9%, and *g equals* 4%. According to the constant growth model in (6.3), the fundamental value of this stock is $20. Since , it follows that:

$20 = $1 / (.09 - .04)

Assume now that underlying the $1 dividend (per share) is earnings (per share) of $1.6667 - that is, *d1* of $1 comes from EPS*1*  of $1.6667. Now, what is the fundamental value of the stock if the firm is a cash cow? A cash cow is a firm that pays out all its earnings as dividends, such that it retains no earnings, and as a result has a zero growth rate (as explained later). Under these conditions, the fundamental value of this stock is $18.518, as calculated below.

$18.518 = $1.6667 / (.09 - 0)

It is noteworthy to observe that the fundamental value of the stock when the firm is a cash cow is lower than when it is not. We will explore the reasons why this is the case a little later in this chapter.

But first, let’s return to our initial situation. Recall that the $20 fundamental price was based on *d1* equals $1, *ke* equals 9%, and *g equals* 4%, such that since , it follows that:

$20 = $1 / (.09 - .04).

The $20 price is the fundamental price now, in year 0. However, the constant growth model can be more generally applied to obtain prices for other years besides year zero. To illustrate this point, what is the fundamental price of this stock in year 1? The key to this calculation is to recognize that fundamental price is lagged relative to the dividend. Thus, to obtain the fundamental price in year 0, we needed the dividend in year 1. Similarly, to obtain the fundamental price in year 1, we needed the dividend in year 2. The dividend in year 2 can be easily calculated since it equals the dividend in year 1 compounded one year at the growth rate, that is *d2* equals *d1* (1+*g*).

Therefore, the fundamental price in year 1 is:



or

0.80 = $1(1.04) / (.09 - .04) = $1.04 / (.09 - .04).

Some other fundamental characteristics of a stock’s value concern the determinants of the dividend yield and capital gains yield, assuming that the stock is fundamentally priced (in equilibrium). The dividend yield is conventionally understood to equal next year’s dividend divided by the current year’s price, or *d1* / *P0*. Therefore, the dividend yield in our example is:

dividend yield = *d1* / *P0* = $1.00 / $20 = 5%.

Notice that the dividend yield is fundamentally equal to the difference between the stock’s cost of equity and growth rate, or (*ke* - *g*), which equals (.09 - .04) or 5%.

The capital gain yield results from the change in the price of the stock from year 0 to year 1, such that

capital gain yield = (*P1* - *P0* ) / *P0* = ($20.80 - $20) / $20 = 4%.

Notice that the capital gain yield is fundamentally equal to the growth rate, as it is growth rates that are at the core the determinants of growth in stock prices.

**6.3. Role of the Return on Equity and Retention Rate in the Constant Growth**

**Stock Valuation Model**

Now, we proceed with a new example concerning the use of the constant growth stock valuation model. Imagine a stock where *d1* equals $2, *ke* equals 12%, and *g equals* 5%. According to the constant growth model in (6.3), the fundamental value of this stock is $28.57. Since , it follows that:

$28.57 = $2 / (.12 - .05)

As a test of our previous discussion of the dividend and capital gain yield, try to calculate this stock’s dividend yield (equal to 7%) and capital gain yield (equal to 5%).

Imagine now that the firm that issued this stock has a return on equity of 15% and earnings (per share) of $3 (EPS*1* = $3). What is this firm’s retention rate (rr), that is what percent of earnings does this firm retain?

rr = 33% = $1 / $3

Under these conditions, what is the growth rate of its earnings and dividends (and indeed its capital gain rate). The growth rate is defined as the Return on Equity (ROE) times the Retention Rate (rr), such that[[2]](#footnote-2)

*g* = ROE x rr = 5% = 15% x 33%

Thus, the growth rate of 5% that was initially given at the start of this example is derived from a calculation such as this.

**6.4. Value of Firm as a Cash Cow versus as an Earnings Retaining Firm**

Now, what is the current value of this stock if the firm is a cash cow? Recall that when the firm is a cash cow, it pays all its earnings out in dividends, leaving it with zero percent growth rate. Therefore, the current value of this stock when the firm is a cash cow is:

$25 = $3 / (.12 - 0)

Why is the value of the stock when the firm is a cash cow lower than when it is not?

Notice that this firm’s Return on Equity (ROE) is 15%, and that this return is greater than its Cost of Equity (*ke*), i.e. its required return to equity, of 12%.

This firm earns a greater return on any money it retains than what the stockholders can earn on their own when dividends are paid out. Therefore, a strategy of retaining earnings improves the value of the stock, and as a result, as well, there is positive value, $3.57 equal to $28.57 - $25, in its 5% growth rate.

What would happen if this firm’s ROE was equal to 10%? Then, if the retention rate is 33%, the growth rate is 3.33% instead of 5%, that is:

*g* = ROE x rr = 3.33% = 10% x 33%

The current value of this firm’s stock then, given constant growth conditions such that:



results in a value of

$23.07 = $2 / (.12 - .0333)

The current value of the stock if the firm is a cash cow remains the same, that is

$25 = $3 / (.12 - 0)

In this case, why is the value of this firm’s stock when the firm is a cash cow greater than when it is not?

Notice that now this firm’s Return on Equity (ROE) is 10%, and that this return is less than its Cost of Equity (*ke*) of 12%.

This firm earns a lower return on money it retains than what the stockholders can earn on their own when dividends are paid out. Therefore, a strategy of retaining earnings reduces the value of the stock, and as a result, as well, there is negative value, -$1.97 equal to $23.07 - $25, in its 3.33% growth rate.

It is critical to notice that positive growth rates do not automatically produce positive values, for in this case the positive growth rate is associated with negative value.

*A firm with positive growth can hurt its value, if the positive growth comes from returns on equity that while positive are less than the cost of equity. This type of firm is effectively an investor in negative net present value projects.*

**6.5. Investment Patterns in the Valuation of Stocks Given the Constant Growth Stock Valuation Model**

Let’s go back to our example with the following conditions: *d1* equals $2, *ke* equals 12%, and *g equals* 5%, such that the current fundamental value of this stock is:

, or $28.57 = $2 / (.12 - .05)

As this stock also has a Return on Equity of 15% and Earnings per Share (EPS*1*) of $3, the percent of earnings that this firm retains (rr) is

rr = 33% = $1 / $3

And the growth rate of its earnings and dividends (and indeed its capital gain rate) is

*g* = ROE x rr = 5% = 15% x 33%

Recall as well that the value of this firm as a cash cow is:

$25 = $3 / (.12)

Let’s analyze how the value of the stock increases based on the company’s investments - the value of its growth opportunities.

Now, this firm expects to earn $3 per share in year 1, that is EPS*1* = $3. It plans to retain 33% of its earnings, or $1 per share, and these funds will then be available for it to invest for a 15% return on equity.

What is the value (the net present value) of this investment in year 1 assuming (for the sake of convenience) a perpetuity in cash flow?

The Value of the Investment in Year 1 is:

-$1.00 + [($1.00)(0.15)]/.12 =

-$1.00 + ($0.15)/.12 =

-$1.00 + $1.25 =

**$0.25**

Now, this firm’s earnings per share are expected to grow by 5%, so that it expects to earn $3.15 per share in year 2, that is EPS*2* = $3.15. This amount is equal to EPS*1* of $3 compounded by its growth rate for one year (times 1.05). And, as before, it plans to retain 33% of its earnings, or $1.05 per share for year 2, and these funds will also then be available for it to invest in year 2 to earn a 15% return on equity.

What is the value (the net present value) of this investment in year 2 assuming a perpetuity in cash flow?

The Value of the Investment in Year 2 is:

-$1.05 + [($1.05)(0.15)]/.12 =

-$1.05 + ($0.1575)/.12 =

-$1.05 + $1.3125 =

**$0.2625**

Let’s proceed for one more year in this analysis. Now, this firm’s earnings per share are again expected to grow by 5%, so that it expects to earn $3.3075 per share in year 3, that is EPS*3* = $3.3075. This amount is equal to EPS*2*  of $3.15 compounded by its growth rate for one year (times 1.05); or EPS*1* of $3.00 compounded by its growth rate for two year (times 1.05 x 1.05). And, as before, it plans to retain 33% of its earnings, or $1.1025 per share for year 3, and these funds will also then be available for it to invest in year 3 to earn a 15% return on equity.

What is the value (the net present value) of this investment in year 3, again assuming a perpetuity in cash flow?

The Value of the Investment in Year 3 is:

-$1.1025 + [($1.1025)(0.15)]/.12 =

-$1.1025 + ($0.165375)/.12 =

-$1.1025 + $1.378125 =

**$0.275625**

Thus, the value of the three consecutive investments of retained earnings in years 1, 2, and 3 are $0.25, $0.2625, $0.275625:

Value of investment in: year 1 year 2 year 3

$0.25 $0.2625 $0.275625

Notice that the growth rate in the value of the investments that the firm makes from its retention policy is also 5%, that is the growth from $0.25 to $0.2625 is 5%, and from $0.2625 to $0.275625 is 5%.

What is the value of the firm’s growth opportunities based on the value of all the investments it can make through time given its retention policy?

Once again, resort to the constant growth model, because the growth in the value of the investments, as shown above, is constant at 5%.

Therefore, the firm’s net present value of its growth opportunities (NPVGO) is:

NPVGO = $0.25/(1.12)1 + $0.2625/(1.12)2

+ $0.275625/(1.12)3 + to perpetuity

or

NPVGO = $0.25 / (12 - .05) = $3.57

In total, the value of the growth opportunities together with the value of the firm as a cash cow equals the total value of the firm, that is $3.57 + $25 = $28.57 on a per share basis, which is what has been calculated above.

**6.6. Extension Question on the Value of Growth**

Imagine, as we did initially in this chapter, that a stock exists with the following conditions:

*d1* = $1, *ke* = 9%, *g* = 4%

What is the current value of this stock?

Given 

Obtain $20 = $1 / (.09 - .04)

Assume that the dividend paid comes from earnings (per share) of $1.6667 (EPS*1*=1.6667). Then, what is the value of this stock if the firm is a cash cow? (Recall that a cash cow pays all its earnings out as dividends, and as a result has zero growth.)

Given 

Obtain $18.518 = $1.6667 / (.09 - 0)

Now show using a Net Present Value analysis, and assuming perpetuity, why this firm’s growth of 4% under its initial conditions has a value of $1.482 [equal to ($20 - $18.518)], such that the value of this stock when the firm is a cash cow is lower than when it pays $1 in dividends?

While the answer to this question is shown next, it is recommended that the reader first attempt to solve it before reading further.

This firm’s retention rate (rr) is 40%, as it retains $0.6667 per $1.6667 in earnings, and pays out $1 in dividends.

As its growth rate is 4%, its ROE must be 10%, as ROE x rr = g, or 10% x 40% = 4%.

Now, let’s analyze how the value of the stock increases based on the company’s investments, that is, the value of its growth opportunities.

This firm expects to earn $1.6667 per share in year 1, that is EPS*1* = $1.6667.

It plans to retain 40% of its earnings, or $0.6667 per share, and these funds will then be available for it to invest for a 10% return on equity.

What is the value of the investment (assume a perpetuity) in year 1?

The value of the investment in year 1is the net value of the cost of the investment ($0.6667 per share) and the discounted value of the investment’s perpetual returns which equal the investment amount ($0.6667) times the return on equity (0.10) capitalized at the required return to equity(0.09). That is, the value of this investment made in year 1 is $0.07408, or

= -$0.6667 + ($0.6667)(0.10)/.09

= -$0.6667 + ($0.06667)/.09 =-$0.6667 + $0.74078 = $0.07408

Now, this firm’s earnings per share will grow by 4%, so that it expects to earn $1.7333368 per share in year 2, that is EPS*2* = $1.733368 (EPS*1* = $1.6667 times 1.04).

And, as before, it plans to retain 40% of its earnings, or $0.6933472 per share for year 2, and these funds will also then be available for it to invest for a 10% return on equity.

Thus, the value of the investment (assume a perpetuity) in year 2 is $0.07703857, or

= -$0.6933472 + ($0.6933472)(0.10)/.09

= -$0.6933472 + ($0.06933472)/.09 =-$0.6933472 + $0.77038577 = $0.07703857

These results concerning the value of the investments the firm makes from its retained earnings in year 1 and 2 are summarized below.

Value of investment in year 1 year 2

$0.07408 $0.07703857

Notice that the growth rate in the value of the investments that the firm makes from its retention policy is also 4%, that is, the growth from $0.07408 to $0.07703857 is 4%.

As a result, the value of the firm’s growth opportunities - the combined value of all the investments it makes through time given its retention policy – can be found resorting once again to the constant growth model, because the growth in the value of the investments is constant at 4%, as can be shown if one continued the investment of retention track.

Therefore, the firm’s net present value of its growth opportunities (NPVGO) is:

NPVGO = $0.07408 / (1.09)1 + $0.07703857 / (1.09)2 + to perpetuity

or

NPVGO = $0.07408 / (.09 - .04) = $1.482

1. To simplify, multiply both sides of (6.2) by (1+*ke*) / (1+*g*), such that:

   

   Simplify to:

   

   Now, subtracting (3.3) from this equation, such that

   

   simplify, such that

   

   Now, if instead of 3 years out, had we gone out a much longer time period (to infinity),

   the last term on the right hand side would vanish as it approaches zero, that is the exponent is then infinitely large rather than 3. And we are left with:

   

   Or with algebraic manipulation

   

   Or

   

   Or

   

   Or

   

   Or finally, obtain the constant growth model

    [↑](#footnote-ref-1)
2. The idea behind the growth rate being equal to the Return on Equity (ROE) times the Retention Rate (rr) is the following. Imagine that one has $1,000 in a Treasury bill paying 5% or $50 in interest annually. The Return on Equity for this investment is 5%. Now, if one retains 0%, that is withdraws the $50 that has been paid, the beginning of the next year value for this investment is $1,000, such that it has grown by 0%. But, if one retains 100%, that is reinvests the $50 that has been paid, the beginning of the next year value for this investment is $1,050, such that it has grown by 5%. [↑](#footnote-ref-2)