UNIVERSITY OF RICHMOND
Robins School of Business™

§12. STOCK VALUATION

FIN 360: PRINCIPLES OF FINANCIAL MANAGEMENT

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COMMON STOCK VALUATION

Much like the valuation of projects and bonds, the value of a share of common stock can be determined using present value computations. However, finding the value for a share of common stock is challenging given the cash flows to which stocks are entitled are not guaranteed like the cash flows for bonds (dividends vs. coupon payments). Further, there is no "maturity" date. Regardless, the intuition remains the same: *the security's value is determined by the cash flows the security is entitled to receive.*

DIVIDEND DISCOUNT MODEL

The **Dividend Discount Model (DDM)** equates the **intrinsic value** or "true" value of a stock to the present value of all future dividends paid to the stockholder. We will consider multiple cases:

I. Dividends over a discrete period (one → many)
II. Constant dividend growth
III. Multistage growth (begins as I., then becomes II.)

I. Dividends Over a Discrete Period

Recall the present value of a single future cash flow is:

$$PV = \frac{FV}{(1+r)^t}$$

When this formula is applied to valuation by the dividend discount model, we let FV reflect the dividend and price of the stock in the future.

EXAMPLE: Assume you own a share of common stock that will pay a $10 dividend in one year. Once you collect that dividend, you will immediately sell the stock. Based on your economic and market forecasts, you think the stock will be selling for $70 at that time. Given this stock is relatively risky, you have a **required return** of 25%. How much is this stock worth today?

SOLUTION: Using the formula for the present value:

$$PV = \frac{FV}{(1+r)^t} = \frac{10+70}{(1+0.25)^1} = \$64$$

Or, **N** = 1, **FV** = 10 + 70, **I/Y** = 25, <**CPT**> **PV** = -64

INTERPRETATION: This stock, given the dividend, holding period, and required rate of return assumptions, is worth $64 today.

We can therefore rewrite the formula as:

$$V_0 = P_0 = \frac{D_1 + P_1}{(1+k)^t}$$

Where:

V_0 = the *estimate* of the intrinsic value of the share *now*

P_0 = the price of the share *now*

D_1 = the dividend at the end of the period

P_1 = the *estimate* of the price you can sell the stock for in the future

k = the required rate of return

t = the number of discount periods

If you wanted to hold this stock for three years, selling it at a forecasted \$90 at that time, and assuming the stock pays dividends of \$10, then \$11, then \$12 over the next three years:

$$V_0 = P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3 + P_3}{(1+k)^3}$$

$$V_0 = P_0 = \frac{10}{(1+0.25)^1} + \frac{11}{(1+0.25)^2} + \frac{12+90}{(1+0.25)^3} = \$67.264$$

Or, **CFo** = 0, **C01** = 10, **C02** = 11, **C03** = 102, **I** = 25, <**CPT**> **NPV** = \$67.264

By market efficiency, Price = Value. If we find Price < Value (specifically, our *estimate* of Value), there is a potential buying opportunity. The shares are **undervalued** by investors and traders. If we find Price > Value, perhaps the shares should be sold. The shares may be **overvalued** by market participants.

We can expand this formula for as many periods as we like:

$$V_0 = P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots + \frac{D_t + P_t}{(1+k)^t}$$

which simplifies to

$$V_0 = P_0 = \sum \frac{D_t}{(1+k)^t}$$

implying that the value of stock today is equal to the present value of all future dividends.

Where's P_t? By the formula above, notice that the value of a stock is the infinite sum of the dividends a stock pays. The stock's price in the future does not appear in the formula. This does not imply that the stock's future price does not matter. The stock price at any point in time is, itself, the sum of all the future dividends. Thus, the stock price in the future is embedded in the formula above.

II. Constant Dividend Growth

If a firm pays a dividend that is not fixed or constant, but grows at a constant growth rate g, we may determine the value of the shares as:

$$V_0 = P_0 = \frac{D_0(1+g)}{k-g} = \frac{D_1}{k-g}$$

We divide the dividend in the next period by the required rate of return minus the growth rate. This method is known as the **Gordon Growth Model**, after Professor Myron Gordon. This formula should be familiar: we have previously used it to value **preferred stock** and **dividend aristocrats** with growing dividends.

EXAMPLE: If a firm *just paid* a dividend of $10, and it expects to grow that dividend at 3% forever, assuming a discount rate of 15% the stock should be worth:

$$V_0 = P_0 = \frac{D_0(1+g)}{k-g} = \frac{D_1}{k-g} = \frac{10 \times 1.03}{0.15-0.03} = \frac{10.30}{0.15-0.03} = \$85.83$$

Note that in the Gordon Growth Model, you use the *next* dividend paid, not the most recent dividend in the numerator. If given the dividend just paid, you must compute the dividend in the next period using *g*.

III. Multistage Growth

In practice, common stock valuation usually combines the method shown in (**I.**) with the method shown in (**II.**) That is, the financial analyst will forecast the dividends for the near term, and then assume some constant growth rate into the future thereafter. Begin with the formula from (**I.**):

$$V_0 = P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3 + P_3}{(1+k)^3} \tag{1}$$

At time 3, we can assume that dividends will begin to grow at a constant rate. Using the Gordon Growth Model from (**II.**), we know that:

$$P_0 = \frac{D_1}{k-g} \tag{2}$$

Implying that at time period 3,

$$P_3 = \frac{D_3(1+g)}{k-g} = \frac{D_4}{k-g} \tag{3}$$

Putting it all together, we plug in Equation (3) into Equation (1) to get:

$$V_0 = P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3 + \frac{D_4}{k-g}}{(1+k)^3}$$

PRACTICE: You forecast T. Rowe Price, a financial services firm, will pay dividends of $6, $7.50, $9.40, and $11.72 over the next four years, at which point they will grow their dividends at 3% forever. Assuming a discount rate, or **required rate of return** given your perception of T. Rowe Price's risk, of 12%, how much are these shares worth? T. Rowe shares currently trade for about $109 in markets, so should you buy or sell these shares based on your calculation?

SOLUTION: We have the formula

$$V_0 = P_0 = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \frac{D_4 + \frac{D_5}{k-g}}{(1+k)^4}$$

$$V_0 = P_0 = \frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad} + \frac{\quad}{\quad + \quad}$$

Or, **CFo** = , **C01** = , **C02** = , **C03** = , **C04** =

I =

<**CPT**> **NPV** =

INTERPRETATION: We computed that these shares are worth _____, but they trade in markets for $109. By our calculations, these shares are **undervalued/overvalued** in markets, and we should **buy/sell** them. In perfectly efficient markets, we would expect the intrinsic value and price to be the same.

Required Rate of Return

To this point, we have assumed discounting dividends at a **required rate of return**, or the return investors require from an investment in order for them to commit money, given the investment's level of risk. The higher the risk, the higher the required return. But how do we determine this required return?

Dividend and Capital Gain Yields

One way in which we can determine the required rate of return is to rearrange the formula:

$$P_0 = \frac{D_1}{k - g} \quad \rightarrow \quad k = \frac{D_1}{P_0} + g$$

That is, the return we "require" of a stock is a function of the stock's expected **dividend yield**, D_1/P_0, and **capital gains yield** g, or expectation of the growth in the security's price.

> Think about the return an investment provides or "delivers" through its dividends and its capital gains as the return we as investors "require" of the security. If the stock is risky, investors will pay *less* for it such that its potential gain g is greater.

The Capital Asset Pricing Model (CAPM)

We can also determine the required rate of return by using a formula known as the **Capital Asset Pricing Model**, or **CAPM**. The CAPM is a hallmark and foundational relationship in modern finance. The expected return on a stock, and therefore our **required or expected return** is:

$$E(R) = k = r_f + \beta(E(R_M) - r_f)$$

where

r_f = **risk-free** rate of return, or the yield on 90-day T-bills

$E(R_M)$ = **expected return of the stock market** overall

β = stock's **beta**, a measure of the stock's risk

Beta tells us how much a stock moves relative to the market overall. You multiply a stock's beta by the movement of the market to get an estimate of how the stock moves given the market's movement.

EXAMPLE: Citigroup's beta is 1.43, Morgan Stanley's beta is 1.35, Allstate's beta is 0.50, and American Coastal Insurance's beta is -0.33. Therefore:

Historically and *on average*:

- If the market goes down 1%, Citigroup stock goes down _____%.
- If the market goes up 1%, Morgan Stanley stock goes up _____%.
- If the market goes down 2%, Allstate stock goes down _____%.
- If the market goes up 3%, American Coastal stock goes down _____%.

The average beta of the market is 1 (all stocks' movement combined *is* the market's movement), with typical stock betas between 0 and 2. Therefore, stocks with betas greater than (less than) 1 "swing" with greater (less) magnitude than the market overall. Stocks with betas near zero do not appear to be correlated much with the market, while stocks with betas less than zero (which is rare) move in the *opposite direction* of the market.

PRACTICE: What is the appropriate discount rate to use for Allstate's dividend discount model? Use the CAPM, and assume the yield on 90-day T-bills is 4%, and that you expect the market to return 10% this year.

SOLUTION: By the CAPM formula,

$$E(R_i) = k = r_f + \beta(E(R_M) - r_f)$$

We have the following for Allstate:

INTERPRETATION: The CAPM produces an expectation of what a stock should return, *given its level of risk*. We can therefore use these values in the dividend discount model as an appropriate discount rate k for each stock to compute the intrinsic value for each share. Notice that the higher the beta, the greater the risk and expected return, all else equal.

We can find the current **risk-free rate** on the St. Louis Fed's FRED website: https://fred.stlouisfed.org/series/TB3MS. The **expected return of the market** can be estimated based on market research, forecasts, and projections, keeping in mind that historically the market overall returns about 8-12% per year, and is on average about 5% more than the risk-free rate. **Beta** can be found on various financial data websites, including Yahoo! Finance and Finviz.

OTHER DISCOUNTED CASH FLOW MODELS

About 50% of publicly traded companies do not pay dividends. Further, the dividend discount model often understates the value of share if the firm doesn't have a high dividend **payout ratio**. Alternative methods of discounted cash flow valuation include taking the present value of the **free cash flows** (similar to the **cash flow from assets** we have computed) per share. These methods tend to be more applicable in practice than the dividend discount method. While the inputs differ, the math remains the same.[1]

For additional practice and a DDM calculator, see the Excel file *Dividend Discount Model* at www.josephfarizo.com/fin360.html.

VALUATION BY COMPARABLES

Financial analysts also employ a market-based approach to determine the value of a firm's common stock shares, much like the average selling price-per-square-foot of recently sold homes in your neighborhood can be used to estimate the selling price of *your* house. This is used to find a stock's **implied price**, or what the price should theoretically be based on current market valuations. A firm's valuation ratios can be compared to the average or median valuation ratios of firms in the same industry, or the firm's industry **comps** – comparable firms.

Popular valuation ratios include:

1. **Price-to-Earnings (P/E) Ratio** = price per share ÷ earnings per share
2. **Price-to-Book (P/B) Ratio** = price per share ÷ book value of equity per share
3. **Price-to-Sales (P/S) Ratio** = price per share ÷ sales or revenue per share
4. **Enterprise Value to EBITDA** = (Market Cap + Debt – Cash) ÷ EBITDA

Enterprise Value is a measure of the company's total value, and **EBITDA** is the earnings before interest, taxes, depreciation and amortization.

EXAMPLE: A firm has a stock price of $100, EPS = $4, book value of equity per share = $50, revenue per share = $66.67, cash = $30 million, and debt of $30 million, EBITDA = $9.17 million, and 1.1 million shares:

	Firm	Industry Average	Implied Stock Price	Over/Under Valued
P/E	25x	20x	$80	Over
P/B	2x	3x	$150	Under
P/S	1.5x	2x	$133.34	Under
EV/EBITDA	12x	10x	$83.36	Over

To find the implied price using the P/E ratio:

$$Implied\ Price_{P/E} = Industry\ Average\ PE \times Firm's\ EPS$$

$$Implied\ Price_{P/E} = 20 \times 4 = \$80$$

For P/B and P/S:

$$Implied\ Price_{P/B} = 3 \times 50 = \$150$$

$$Implied\ Price_{P/S} = 2 \times 66.67 = \$133.34$$

For EV/EBITDA:

$$Implied\ EV = 10 \times EBITDA = 10 \times \$9.17M = \$91.7M$$

$$\$91.7M = Market\ Cap + Debt - Cash = Market\ Cap + \$30M - \$30M$$

$$\Rightarrow Market\ Cap = \$91.7M$$

$$\Rightarrow Implied\ Price_{EV/EBITDA} = \frac{\$91.7M}{1.1\ M\ Shares} = \$83.36$$

INTERPRETATION: By some measures, this stock is **undervalued,** which may represent a buy opportunity: the shares should *theoretically* be worth more than they are trading. By other measures, this stock is **overvalued** which may signal that the stock's price is too high relative to what it should be, signaling a sell opportunity.

IN SUMMARY

Stock prices "reacting" to information in efficient markets is the consequence of millions of traders and investors interpreting information and recomputing appropriate valuations for securities. Investors then buy and sell on their estimates, such that their buying and selling of the stock is reflected in the price.

Markets exist *because* different investors reach different conclusions as to whether a stock is undervalued or overvalued. Some traders believe a stock is "priced correctly" while others may believe it to be far from its intrinsic value. The models and math are the same from investor to investor. It is the *inputs and assumptions* to the models that result in different conclusions among different investors.

These valuation techniques are just a few of the many tools used to determine the value of equity securities. Valuation is an art and science, and there is no way to verify if an investor is "right."

CRITICAL THINKING & CONCEPTUAL QUESTIONS

1. What is a stock's "intrinsic" value?
2. Explain the concept of a required rate of return, and why we are willing to pay *less* for riskier securities (given some future payoff) – which results in them offering potentially greater returns.
3. Explain why we use the required rate of return as our discount rate.
4. Looking at the dividend discount model formula for stock valuation, what happens to the price of a share of stock if (all else equal):
    a. The dividends we forecast the stock to pay increase? What if the dividends we forecasted are too high and we revise our model with lower dividends?
    b. The discount rate k rises? What if it falls?
    c. A stock's beta rises? What if it falls?
    d. The FED raises interest rates (Hint: think about the risk-free rate)? What if the FED lowers rates?
5. Explain how valuing common stock is similar to valuing bonds. How is it different?
6. Explain why market efficiency implies that the price of a share of stock equals the intrinsic value of the share.
7. How is the value of a share the "sum of an infinite stream of dividends"? Doesn't the price you sell the stock for in the future matter?
8. If you determine that a share is "undervalued" by the dividend discount model, what should you do? What if it is "overvalued"?
9. How should investors value stocks if they do not pay dividends?
10. Why is it important that we use an industry or "comparable company" ratio when finding a stock's implied price when doing valuation by comps?
11. How do you determine an implied price using ratios?
12. What is enterprise value? What is EBITDA? How can you use the two to determine the value of a stock?
13. Why might a price lower than the implied price be desirable for an investor looking to buy the stock?
14. How is it possible for different investors to reach different conclusions when calculating a stock's intrinsic value if they use the same formulas?
15. Can you write the formula for the CAPM, describe it, and indicate where you obtain its components?
16. Why is the beta of the stock market overall equal to 1?
17. Explain how a stock's beta represents risk.
18. If you know, with certainty, that the markets are going to rise significantly today, would you prefer to hold a high or low beta stock?
19. Explain why markets *require* different investors to reach slightly different conclusions about whether a stock is under- or over- valued.

ANALYTICAL QUESTIONS

Below is an output from finviz.com. Show that an estimate of the intrinsic value of this company below is approximately $94.78 by the Gordon Growth Model. Note that the dividend reported is the *estimated* next period dividend, and it averages dividend growth of 2% per year. The market has yielded about 9.75% each year over the last 20 years, and the current yield on 90-day T-bills is about 5.345%. Is this company over or undervalued by your estimates?

Held by VNQ VTI VOO IVV VTV SCHH IY			Scroll to Statements ↓
Index	S&P 500	Perf Week	2.09%
Market Cap	45.99B	Perf Month	-2.52%
Income	1.50B	Perf Quarter	-8.84%
Sales	6.98B	Perf Half Y	17.98%
Book/sh	14.70	Perf Year	-16.99%
Cash/sh	0.64	Perf YTD	-8.13%
Dividend Est.	6.26 (5.92%)	Beta	0.74
Dividend TTM	6.26 (5.92%)	ATR (14)	2.24
Dividend Ex-Date	Mar 14, 2024	Volatility	1.66% 1.91%
Employees	4700	Target Price	116.38
Option/Short	Yes / Yes	Prev Close	105.59
Sales Surprise	0.96%	Price	105.83
SMA20	-1.93%	Change	0.23%

NOTES & REFERENCES

[1] The discount rate varies depending on the type of cash flows being discounted. For free cash flows to the firm, the discount rate reflects the risks associated with those cash flows and is typically the weighted average cost of capital (WACC). For dividends, the discount rate reflects the risks to equity holders and is often estimated using the capital asset pricing model (CAPM) to determine the cost of equity.