

Calculating Intrinsic Value With the Dividend Growth Model

By Z. Joe Lan, CFA

Article Highlights

- The dividend discount model uses dividends to calculate a stock's intrinsic, or fair, value.
- Two versions of the model can be used: a constant growth and a multi-stage.
- Changes in the required rate of return or forecast growth will alter the calculated valuation.

Valuing a stock or company is one of the most difficult tasks in investing.

Even the most seasoned investors may shy away from the challenge for a variety of reasons. However, determining whether a stock is trading at an attractive valuation is paramount to investment success. In this installment of the Financial Statement Analysis series, I continue to review valuation metrics, specifically the dividend discount model, which is one of the many methods used to determine fair value. I also delve into some of the challenges associated with calculating “intrinsic” value using this model.

The valuation (stock price) obtained using these formulas can vary substantially, so it is difficult to use the figures as exact buy or sell prices. However, there are several benefits that you can gain by valuing stocks yourself. It forces you, as an investor, to place a specific price on a stock that can be used as a gauge. Perhaps more importantly, valuing stocks enables you to take a deeper look at factors that drive stock price. Characteristics such as growth and fundamental elements such as income play a huge role in stock price value. You will be able to see how these metrics affect the share price determined through the dividend discount model.



ren Buffett has become arguably the greatest investor of all time by being able to pick stocks that have a higher intrinsic value than their current market value.

Intrinsic value is frequently calculated by discounting a set of future cash flows or income expected to be generated by a company or stock back to its present value. In other words, present value represents the current value or worth of future cash flows.

For example, \$1,000 today is worth more than \$1,000 dollars five years from now because of the time value of money. (Inflation erodes the future ability to buy goods and services for the same amount of dollars.) This is why investors would rather receive a sum of money today than wait for an uncertain amount of future cash flow without being adequately compensated for taking the risk.

The dividend discount model uses dividends (or income) to generate an intrinsic value. The formula takes the future expected dividend stream of a company and discounts it back to its present value. There are numerous variations of the dividend discount model and we discuss two of the more basic, but more easily calculated by individual investors, in this article. Note that the dividend discount model will not work for companies that do not pay a dividend.

Intrinsic Value

Intrinsic value is the underlying or “fair” value of a company, determined through fundamental analysis. War-

Constant Growth Model

The constant growth dividend discount model assumes

that a company is growing at a constant rate. It is best used for large, stable companies that have consistent earnings and dividends. However, small- and medium-sized firms that are growing their earnings and dividends steadily can be valued using this approach as well. The formula for the constant growth model is:

$$\text{Stock Price} = D_1 \div (k - g)$$

Where:

D_1 = dividend for the coming year

k = required rate of return; k must be greater than g

g = growth rate of dividends

(Decimals and not percentages must be used for the model to work.)

As with any model, the output generated is only as good as the quality of the factors going into the calculation. Dividends and earnings information is widely available, but the required rate of return and growth rate of dividends require assumptions to be made.

A common formula for estimating the possible required rate of return is:

$$\begin{aligned} \text{Required rate of return for equity} = \\ \text{risk-free rate} + (\text{market risk premium} \\ \times \text{beta for equity}) \end{aligned}$$

The risk-free rate used in this calculation is the yield on long-term Treasuries, such as a 30-year Treasury bond. The reasoning behind using a long-term bond is that equities are thought of as indefinite holdings; therefore, the risk-free rate should be a very long-term risk-free rate. According to Ibbotson Associates, long-term 'Treasuries' annualized total return from 1926 to 2012 was 5.7%.

The market risk premium is the expected return of the stock market less the risk-free rate. In short, it is the return required to entice investors to purchase risky assets instead of simply purchasing risk-free assets. A good estimate of this figure is the historical market risk premium of the S&P 500 index. According to Ibbotson Associates, the S&P 500 gained 9.9% annually from 1926 to 2012.

Therefore, the market risk premium is 4.2% (9.9% – 5.7%). It is worth noting that there are a number of economists who believe our stock market will not be able to achieve the same type of returns we have experienced over the long run. However, this opinion is hard to substantiate, and using a long-term historical market risk premium is considered a sound procedure.

Let's look closely at an example using Microsoft Corp. (MSFT) which closed at \$36.56 per share on February 7, 2014. *Stock Investor Pro*, AAI's fundamental stock screening and research database, shows a three- to five-year expected growth rate for continuing earnings (based on six analysts) of 7.5%. Earnings from continuing operations are used because this figure excludes one-time expenses and income and the figure is more representative of the company's core business operations going forward. The long-term projected earnings growth rate serves as a proxy for future dividend growth, assuming the payout ratio stays unchanged.

In 2013, Microsoft paid \$0.92 per share in dividends. Assuming a 7.5% growth rate, the company will pay \$0.99 per share ($\0.92×1.075) in 2014. The 7.5% growth in dividends assumes that dividends are growing at the same pace as earnings, which means the payout ratio is staying the same. The figure \$0.99 per share is used for D_1 in the dividend discount model.

Beta, the only other figure needed, is a measure of a stock's volatility relative to the market. A beta of 1.0 means the stock is as volatile as the market. Stocks with betas over 1.0 are more volatile than the market, whereas stocks with betas less than 1.0 are less volatile than the market. According to *Stock Investor Pro*, Microsoft has a beta of 0.97.

Using the above-mentioned risk-free rate and market risk premium, the required rate of return (k) for Microsoft is:

$$\begin{aligned} &= 5.7\% + (4.2\% \times 0.97) \\ &= 9.8\% \text{ (rounded)} \end{aligned}$$

Using a rounded 9.8% required rate

of return, the estimated dividend next year and the expected growth rate, the calculated stock price of Microsoft using the constant growth model is:

$$\begin{aligned} &= \$0.99 \div (0.098 - 0.075) \\ &= \$43.04 \end{aligned}$$

This valuation for Microsoft is significantly higher than the current stock price of \$36.56, leading to the assumption that Microsoft shares may be undervalued.

It is important to keep in mind that there are shortcomings in the constant growth model. While a growth rate of 7.5% does not seem overly ambitious, the U.S. economy only grew at 3.2% annually from 1947 through 2013, according to Trading Economics. Using 7.5% for the constant growth rate for Microsoft implies that the company will grow at more than double the rate of the U.S. economy in perpetuity, which is likely an unsustainable pace.

In addition, the risk premium used is also an assumption based on the historical market risk premium. Changes to either of these rates will greatly affect the outcome of Microsoft's valuation. For example, if the market risk premium is raised to 5.2% and the expected growth rate of Microsoft is lowered to 6.5%, mere 1% changes to both inputs, the valuation drops dramatically. In this example, the rounded required rate of return is:

$$\begin{aligned} &= 5.7\% + (5.2\% \times 0.97) \\ &= 10.7\% \end{aligned}$$

Assuming a dividend next year of \$0.98 based on the 6.5% expected growth rate results in a new calculated price of Microsoft of:

$$\begin{aligned} &= \$0.98 \div (0.107 - 0.065) \\ &= \$23.33 \text{ per share} \end{aligned}$$

Multi-Stage Growth Model

An alternative to the constant growth model is the multi-stage growth model. This model is more complicated and requires more estimates. It can,

however, account for anticipated future changes in growth rates.

In our previous example, the assumption was that Microsoft would grow at a 7.5% pace into perpetuity. The growth rate used was the three- to five-year expected growth rate found in *Stock Investor Pro*. Since we know this pace of growth will be difficult to sustain indefinitely, we can update our model by estimating that Microsoft will grow at a 7.5% pace for the next four years and then grow at a rate of 4.5% over the long run, a slightly faster rate than the historical average growth rate of the U.S. economy. I used this figure because, in addition to the U.S. economy, Microsoft's business operations are affected by many other faster-growing economies, such as emerging markets.

The calculation for the multi-stage growth model involves adding the present value of dividends paid during the high-growth period to the present value of the company's terminal value.

The terminal value of a company is the stock's valuation at the beginning of the stable growth period. Rather than forecast dividends far into the future, the terminal value provides a valuation at the point when dividend growth is expected to be stable. Forecasting dividends beyond a certain point is impractical. Furthermore, future dividends are discounted so much that they do not significantly alter the valuation of a stock.

The present value of dividends during the high-growth period is shown in Table 1. The dividends for Y_1 through Y_4 are calculated by multiplying the growth rate (7.5%) by the previous dividend. The present values of these dividends are then found by discounting each dividend by the required rate of return over the number of compounding periods. The formula for calculating the present value factor to discount each dividend by is:

$$1 \div (1 + k)^n$$

Where:

k = required rate of return

n = the number of compounding periods

In our case, each year is a compounding period. For example, the present value of the dividend in Y_1 is simply $\$0.99 \times 0.911$ while the present value of the dividend in Y_2 is $\$1.06 \times 0.829$ and the present value of the dividend in Y_3 is $\$1.14 \times 0.755$, etc., as shown in Table 1. The total present value of dividends for Y_1 through Y_4 is \$3.49.

Using the required rate of return of 9.8% and expected growth rate of 4.5%, the terminal value of Microsoft at Y_4 is calculated as:

$$\begin{aligned} &= D_5 \div (k - g) \\ &= ([\$1.23 \times (1 + 0.045)]) \div (0.098 - 0.045) \\ &= \$24.34 \text{ (rounded)} \end{aligned}$$

Adding the present value of dividends for the first four years (\$3.49) to the present value of the terminal value gives a stock price valuation of:

$$\begin{aligned} &= \$3.49 + \$16.75 \\ &= \$20.24 \end{aligned}$$

Using a two-stage dividend discount model provides us with an intrinsic value of \$20.24, suggesting that Microsoft is currently overvalued at \$36.56.

The discrepancy between values derived from the constant growth model (\$43.04) and the two-stage model (\$20.24) is significant. Let's now take a closer look at the two different models to try to understand the elements driving the valuations.

Comparing the Models

The calculated stock prices using the two dividend discount models leads to an obvious question: Why is there a huge divergence?

In the constant growth model, the as-

sumption is that Microsoft would grow at a 7.5% pace indefinitely. Though a 7.5% pace does not seem incredibly high, it is more than twice the pace at which the U.S. economy has grown since 1947.

In our multi-stage growth model, the assumption is that Microsoft will grow at 7.5% for four years, then immediately slow to a 4.5% pace indefinitely. However, this is also highly unlikely in reality. More likely, Microsoft's growth will slowly fall over a long period of time to close to the pace of growth for the markets in which it operates. As stated, Microsoft already operates in a number of emerging markets and it is possible that the company's growth will not fall to 4.5% for a significant period of time. Additionally, if Microsoft is able to release new and innovative products, its growth may spike for a few years and then slowly fall back to a more sustainable rate.

Unfortunately, choosing which model to use is no simple task. Generally, the constant growth model is a better formula for valuating mature companies that are long past their growth phases. Multi-stage models are better choices when valuating companies that are growing rapidly.

Table 1. Calculating Present Value of Dividends and Terminal Value

Assumptions:

Dividend (Y_0) = \$0.92

Required rate of return (k) = 9.8%

High growth rate = 7.5%

Stable growth rate = 4.5%

Time Period	Dividends Per Share (\$)	Present Value Factor*	Present Value (\$)
1	0.99	0.911	0.90
2	1.06	0.829	0.88
3	1.14	0.755	0.86
4	1.23	0.688	0.85
Terminal Value: \$24.34		0.688	16.75
Total Present Value			20.24

*Present value factor is calculated as $1 \div (1+k)^n$, where n is the number of compounding periods.
All figures are rounded.

Determined an Appropriate Required Rate of Return

The required rate of return plays a large role in the valuation of companies. In our example, the required rate of return was estimated using the 9.9% average historical return of the S&P 500. If the 9.9% return going forward sounds too ambitious, we can scale back the expected market return to, say, 8.5%. This means that our equity risk premium would be 2.8% (8.5% – 5.7%) and the required rate of return would be 8.4% instead of 9.8%. This figure would give us with a much higher valuation for Microsoft using both models. On the other hand, a higher required rate of return would give us a lower valuation.

Varying the risk-free rate used to calculate the required rate of return will also affect the valuation. The historical long-term Treasury rate was used in our examples, but the current long-term Treasury rate of 3.7% is much lower than the historical averages. Generally, a higher risk-free rate increases the required rate of return for equities, leading to a lower valuation for the stock.

In addition, beta plays a key role in valuation as it also affects the required rate of return. Companies with higher betas would have higher required rates of return and lower valuations, and companies with lower betas would have lower required rates of return and higher valuations.

Required rate of return is very difficult to determine accurately. The

methodology used in these examples offers a good formula to estimate the required rate of return, but other approaches exist. A full discussion of calculating required rates of return is beyond the scope of this article.

Caveats

A number of assumptions are made in the dividend discount model.

First, a consistent dividend is assumed to be paid by the company. If a dividend is not paid, an earnings valuation model can be used. The formula is:

$$\text{Stock Price} = E_1 \times (D/E) \div (k - g)$$

Where:

E_1 = next fiscal year's earnings

D/E = dividends ÷ earnings, the expected long-term payout ratio

This formula requires an estimate for the long-term payout ratio (which is difficult to predict), meaning that there is a reasonable expectation that the company will start paying a dividend in the future. If the expected yield or payout ratio is zero or future intentions to start paying a dividend cannot reasonably be forecast, the company cannot be valued using either formula.

Second, the dividend discount model works best if earnings and dividends are growing at a similar pace so that the payout ratio is steady. A company that is increasing dividends faster than earnings will eventually be

unable to pay its dividend in full. On the other hand, a company that is growing dividends at a much slower rate than earnings will accumulate too much cash and cause the dividend discount model to underestimate its worth.

Generally smaller companies in high-growth phases do not pay dividends, as most earnings are retained in order to fund expansion. Even some mature companies do not pay dividends and choose to return cash to investors through share repurchases. Needless to say, these companies also cannot be valued using the dividend discount model.

Third, it is important to note that the dividend discount model is based on a number of projections that are highly uncertain. These models work best as a test to gauge whether a perceived valuation of a company is reasonable, rather than as a determinant of an actual target price.

Conclusion

The dividend discount model allows investors to place a specific valuation on company share price, but there are a number of challenges associated with its use. Even seemingly small changes in the estimates and assumptions will provide vastly different valuation figures. Nonetheless, the model does allow investors to look closely at some of the factors driving the value of a stock.

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Z. Joe Lan, CFA, is an assistant financial analyst at AAI. Find out more at www.aaii.com/authors/joe-lan.