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# **Multiple Approaches to a Valuation: The Use of Sensitivity Analysis**

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by **BRIAN C. BECKER**

## **Introduction and Overview**

It is common practice to use multiple methods when valuing privately held businesses. Since no one method is universally accepted as the best measure in all (or any) situations, multiple valuations allow the appraiser to analyze different results and the results themselves often provide the appraiser with important information about the company being valued. Once a set of valuation estimates has been made, however, economics and logic do not always provide for a clear choice of method(s). Many appraisers will employ a weighting mechanism to determine the results of numerous methods (e.g., 60/40 weighting between a price/earnings ratio analysis and a market/book analysis), but the decision as to relative weights is generally left to the subjectivity of the appraiser. In this sense, appraisers can call on their experience and the specifics of the company being valued, but very little theory has been provided regarding such difficult decisions. The following paper does not attempt to answer, or suggest how to answer, these decisions, but provides a mechanism (sensitivity analysis) that can be used by an appraiser when making decisions between methods.

## **Market vs. DCF**

Two of the primary approaches to valuation include the "market" approach (applying a price/earnings, market/book, or some other price-related ratio of guideline companies to the target company) and the discounted cash flow (DCF) approach (determine the net present value of the projected future streams of cash flowing to the target company). The market approach and the DCF approach bring different types of information and different perspectives to bear on the valuation. Both make use of information (e.g., financial ratios, Betas, etc.) from guideline companies to provide comparisons for valuing the target company. In addition, the market approach implicitly assumes that (or adjusts for) the target company will have a similar future growth rate to the guideline companies (the "guidelines"), while the DCF approach explicitly estimates growth and discount rates for the target company. In determining the relative reliability of the two methods, the appraiser can consider the estimates and assumptions used for each method, but ultimately the determination of overall value is a subjective determination of the appraiser.

Comparing the results of a market method with a DCF method can involve many criteria. One objective consideration would be to examine how sensitive each result is. That is, how much would the overall valuation of each change if the guidelines' results were to change. Varying the set of guideline companies (adding or subtracting from the original group) and looking at the resulting differences in value can provide an indication of which method's results are more sensitive to the specific set of companies chosen, and therefore which method provides more consistent results as the guidelines change. Such a procedure can be employed when comparing two different types of market methods. Since it is rare that two appraisers will ever agree on the same set of guidelines, such sensitivity analysis can be important. All else being equal, a less sensitive method may be more reliable than a more sensitive one.

## **Total Capital DCF vs. Equity DCF**

DCF measures are performed differently under different fact patterns, but generally two broad categories of DCFs exist: (1) DCF based on total capital which uses a weighted average cost of

capital to determine the total value of invested capital (debt and equity) for the target company, and (2) DCF based on equity which directly determines the value of equity by discounting the projected cash flows to equity by a discount rate appropriate for the target company's equity. There is no *a priori* preference for performing one of these methods over the other, but under some circumstances, the employment of these two methods yields very different results. However, very similar results can be computed as well. In such cases, the decision over which is the appropriate "answer" is clearly of much less importance in the overall valuation.

Once of the most common reasons for the disparity in the two results is the disparity in their terminal values. That is, the present values of the discounted cash flows for the 5 or 10 year period under examination may be similar, but the liquidation or "terminal" value of that company at the end of the period can be very different under the two DCF methodologies. If the target company had an annual cash flow that was expected to remain constant at C, a "terminal value" of T at the end of "n" years, and a discount rate of  $\delta$ , the present value of its cash flows can be calculated using the following formula:

$$\frac{T}{(1 + \delta)^n} + \sum_{i=1}^n \frac{C}{(1 + \delta)^i}$$

This formula will provide (1) the value of the target company's equity under the cash-flow-to-equity approach and (2) the value of the target company's total capital under the total capital approach. Under the latter approach, to determine the firm's equity value, the value of its current debt must be subtracted from this value of total capital.

To understand this concept, a terminal value "T" at the end of "n" years of projections can be described as follows (where g is the growth rate for cash flow in the projections,  $\delta$  is the discount rate being used and  $C_n$  is the projected cash flow for the nth year):<sup>1</sup>

$$T = \frac{C_n * (1 + g)}{\delta - g}$$

Thus, the terminal value is particularly dependent on the difference between the discount rate and the growth rate (i.e., the denominator in the equation above). As would be expected, when the discount rate and the growth rate are equal, the terminal value for the target company would be infinite. In such situations, one can expect to earn the same discounted cash flow every year forever, leading to an infinite terminal valuation. Similarly, as the two rates (discount and growth) get closer together, relatively large terminal values would ensue. On occasions where the rates diverge, a relatively low terminal value would be computed. For a projected nth year cash flow of 100, and a growth rate of 6 percent, the terminal value is estimated as 5,300 and 1,514 respectively for discount rates of 8 and 13 percent respectively.

In addition to the significant differences across methods, there can be significant variation in the application of one method for relatively small changes in the growth and discount rates. In this sense, both the growth rate and discount rates are merely "best guesses," and looking at a variety of rates often helps provide a clearer picture of the value of the target company. Typically, the growth rates used in both the equity and total capital methods are similar, but the discount rates differ because the former method relies only on the return to equity, while the latter relies on the weighted average cost of capital.

Studying the results of the analysis based on small changes to the calculated rates (i.e., a sensitivity analysis) often shows that there is much more sensitivity under one method than another. In fact, the method with the greater sensitivity is the one in which the discount rate is closer to the

projected growth rate. Since the growth rate is typically smaller than the discount rate, the method with the smaller discount rate, therefore, will be more sensitive. Under most circumstances, the after-tax cost of debt is lower than the cost of capital, which causes the discount rate for total capital to be lower than that for equity. Thus, under most circumstances, the DCF total capital measure is more sensitive to slight variations in the inputs than is the DCF equity measure. While this is not strong (or even weak) evidence of the overall superiority of the equity method, it does point out an issue that can often be significant. Growth rates can be taken from projections, interviews with company personnel, published industry reports, or other sources, while discount rates are typically calculated from Betas, debt/equity ratios, and the after-tax cost of debt.

## Examples

While the theory of sensitivity analysis employs fairly straightforward logic, the consideration of an example helps to show the disparity that can result. For the purposes of this example, suppose that this year's cash flow to equity was 100 and to total capital was 150. Further assume a constant growth rate of 5 percent, a cost of equity of 14 percent, a total cost of capital of 10 percent, and the current value of debt of 300. Using a ten year period for cash flow, the firm is valued at 1,167 under the equity method and 2,850 under the debt method. The first value is made up of 614 (54.5 percent) from the terminal value. The second value, however, is made up of 1,172 (37.2 percent) from the cash flow and 1,978 (62.8 percent) from the terminal value, less 300 for the current value of debt. Clearly, these are quite disparate results, but ex-ante there is no guide as to which is the "right" answer. The facts of the case will dictate the appropriate choice/weighting of methods, and in this regard a sensitivity analysis is helpful. The tables below show valuation estimates based on different inputs for the equity and total capital methods, respectively. The sensitivity analysis is performed by varying both the growth and discount rates by up to 2 percent in either direction (above or below) from their respective computed values.

<b>Cash Flow to Equity: Valuation Estimates Based on Various Growth and Discount Rates</b>					
<b>Growth/Discount</b>	<b>12%</b>	<b>13%</b>	<b>14%</b>	<b>15%</b>	<b>16%</b>
<b>3 percent</b>	1,146	1,032	943	860	794
<b>4 percent</b>	1,303	1,158	1,047	948	869
<b>5 percent</b>	1,495	1,308	<b>1,167</b>	1,045	950
<b>6 percent</b>	1,772	1,519	1,334	1,182	1,063
<b>7 percent</b>	2,148	1,790	1,539	1,342	1,193

<b>Cash Flow to Total Capital: Valuation Estimates Based on Various Growth and Discount Rates</b>					
<b>Growth/Discount</b>	<b>8%</b>	<b>9%</b>	<b>10%</b>	<b>11%</b>	<b>12%</b>
<b>3 percent</b>	2,795	2,279	1,918	1,634	1,420
<b>4 percent</b>	3,608	2,827	2,313	1,933	1,654
<b>5 percent</b>	4,942	3,630	<b>2,850</b>	2,318	1,943
<b>6 percent</b>	7,674	5,016	3,695	2,890	2,358
<b>7 percent</b>	15,807	7,753	5,077	3,727	2,921

These corresponding tables show a much greater sensitivity in the application of the total capital method. The estimated target company values have a variance of only slightly more than 1,350 (i.e., 2,148 - 794) under the equity method, but a variance of more than 14,000 (i.e., 15,807 - 1,420) is seen on the total capital table. A closer inspection shows that as one moves farther into the bottom left corner of either table, the sensitivity of the results increases dramatically. For example, using the total capital table, moving from a growth rate:discount rate structure of 6 percent:8 percent to 7 percent:8 percent increases the value of the company by more than 8,000. However, moving from a growth/discount rate structure of 3 percent:12 percent to 4 percent:12 percent increases the company's value by only 234!

Such a result is not specific to this case. As explained above, as the discount rate and growth rate come together, the terminal value increases dramatically. In this sense, the sensitivity of a result is highly dependent on the difference between the discount and growth rates. Since DCFs are, by their nature, speculative and these rates are merely "best guesses" by the appraiser, at least some consideration should be given to this phenomenon. A similar argument could be made when comparing a market method with a DCF method, but the comparison is less clear. That is, one could look at the sensitivity in a DCF analysis for different growth and discount rates. Even if there was more sensitivity for changes in the price/earnings ratio than the DCF inputs, or vice versa, it would not be clear what conclusion to draw from this. In other words, is moving from a price/earnings ratio of 15 to 16 comparable to moving from a discount rate of 8 to 9 percent? For this type of comparison, the best way to have an "apples to apples" sensitivity comparison would be to evaluate the results of the two methods when changing the sets of guideline companies (i.e., the method used to compare numerous market methods).

## Summary

Multiple approaches provide the appraiser with more information and with a more complete valuation analysis. Unfortunately, the implementation of multiple methods implies that one (or a combination of results) must be chosen to determine the value of the target company. While the choice of method is clearly case-specific and fully subject to the discretion of the appraiser, the use of sensitivity analysis as described above may provide a useful tool for the analyst in this task. Sensitivity can be analyzed using market methods by varying the set of guideline companies or by varying the inputs when considering different DCF methods.

## Endnotes

1. See, for example, Pratt, Shannon P., Robert F. Reilly, and Robert P. Schweihs, *Valuing a Business: The Analysis and Appraisal of Closely Held Companies*, 3rd ed., Chicago: Irwin Professional Publishing, p. 185.

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