# The Ratio of Depreciation and Capital Expenditures in DCF Terminal Values 

Almost all business valuation practitioners are familiar with the discounted cash flow method (the "DCF") for valuating a corporation's common equity. In this technique a business valuator projects a company's annual equity or debt-free cash flows for several years (the "horizon"), estimates the terminal value of the company's common equity or capital at the end of the horizon and then calculates their present values at an appropriate discount rate. If the present value of the cash flows and the terminal value are based on debt-free cash flows, the valuator subtracts the market value of the company's senior securities to determine the value of the common equity.

Calculating the terminal value is critical in DCF. Often, the present value of the terminal value equals between 80 percent and 90 percent of the total value. There are two principal methods for computing the terminal value using a market multiple and using the Dividend Discount Model (the "DDM," also known as the Gordon Growth Model).

## THE MARKET MULTIPLE*

Most investment bankers and security analysts compute the terminal value using a market multiple of sales, EBITDA (earnings before interest, depreciation, amortization and taxes) EBIT (earnings before interest and taxes) or earnings per share. The banker chooses the multiple based on the expected economic conditions in the terminal year and the company's risks and prospects in the terminal year, including its expected growth rate. The banker usually does not explicitly consider the ratio of depreciation to capital expenditures.

## THE DDM MODEL

The DDM is different. This final term is a perpetuity model. It equals all the company's future cash flows after the horizon. It assumes the company will have a constant annual revenue growth rate, constant margins, a constant ratio of working capital to revenues, a constant ratio of capital expenditures to revenues and a constant ratio of depreciation to capital expenditures.

## DDM Model <br> FCF $\times(1+G)$ <br> (K-G)

## Where:

FCF = Elther Debt-free net Income or net Income avallable for common stock plus depreclatlon and other noncash charges minus Increase In working capital, minus capltal expenditures and other Increases In net assets which do not affect the income statement and, in the case of common equity cash flow, minus the net changes in the company's senior capital.
$G=$ The company's perpetual growth rate.
$\mathrm{K}=$ The discount rate appropriate to the cash flows.


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Most valuators know that depreciation, under a normalized situation, cannot exceed capital expenditures in perpetuity. ${ }^{1}$ If deprecation exceeds capital expenditures, eventually there will be no assets left to depreciate. To solve this problem, many valuators set depreciation equal to capital expenditures in calculating the FCF. However, for almost all growing companies, capital expenditures should exceed depreciation. Gilbert E. Mathews, CFA, discussed this point in an article that appeared in the March 2002 issue of Shannon Pratt's Business Valuation Update.

Many financial projections use straight-line depreciation. ${ }^{2}$ The table on the next page shows the ratio of depreciation and capital expenditures if a company has a 5.5 percent growth rate, uses straight-line depreciation, and has assets with a depreciable life of 10 years. Capital expenditures occur evenly throughout the year.

At the end of the 10-year depreciation cycle in 2017, depreciation equals only 77.4 percent of capital ex-
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experi III
DCF terminal year assumptions can have a large impact on the prerall value of a business.

penditures- 22.6 percent less than many valuators would assume. As a result of setting depreciation equal to capital expenditures, many users of the DDM may be significantly overstating the terminal value. ${ }^{3}$

## A SIMPLE FORMULA FOR THE DDM

While Mr. Matthews and others have pointed out this problem, there is a straightforward solution if the financial projection uses straight-line depreciation.

The company's capital expenditure at the end of a depreciation cycle equals its capital expenditure at the beginning of the cycle compounded at the company's growth rate. The Excel ${ }^{\circledR}$ formula is:

## Capital Expenditures $=$ Initial CapEx * <br> (1+Growth Rate)^Life

The company's depreciation at the end of a depreciation cycle equals the
future value of an annuity using the following Excel® formula:

Depreciation = FV (Growth Rate, Life, Initial Annual Straight Line Depreciation) (1+1/2 times Growth Rate)

The ratio of the results of these two formulas provides the ratio of depreciation to capital expenditures after one depreciation cycle and into perpe-
tuity. The table at the bottom of this page shows the calculation.

The ratio is independent of the company's depreciation and capital expenditures. It can be calculated using a hypothetical \$1,000 for capital expenditures, the company's terminal value growth rate and the weighted life of its depreciable assets.

## A CAVEAT

In the table below, the annual growth rate in expenditures equals the perpetual growth rate of the company. Occasionally, because of improved efficiencies, capital expenditures will not be expected to grow as fast as the revenues and income of the company. In this case, the annual growth in capital expenditures may be used. However, the valuator must be careful that a reduced growth rate for capital expenditures will not result in the company having insufficient depreciable assets for its business in later years. so

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## *EDITOR'S NOTE:

Many valuation analysts believe that using an exit multiple in a terminal-year calculation can be difficult to defend in a dispute because it can be viewed as turning an income approach method into a narket approach method.

## Calculating the Ratio

| Assumed Initial Capital Expenditures | $\$ 1,000$ |
| :--- | ---: |
| LIfe of Asset (Years) | 10 |
| Annual Growth Rate In Capltal Expenditures and Assumptions | $5.5 \%$ |
| Initial Annual Stralght Line Depreciation | $\$ 100$ |
| Depreclation | $\$ 1,323$ |
| Capital Expenditures | $\underline{\$ 1,708}$ |
| Ratlo | $\underline{77.4 \%}$ |


[^0]:    ' There may be some situations where depreciation and amoritization are expected to exceed capital expenditures for a fairly long time. Given the small size of present value factors $15-20$ years out, the problem of setting depreciation equal to capital expenditures may be quite small.
    ${ }^{2}$ Many analysts also use tax depreciation figures.
    ${ }^{3}$ However, many other factors and assumptions affect terminal value, and the assumption of depreciation equal to cap ex is just a simplifying assumption that may or may not be correct.

