# *THE VALUATION HANDBOOK*
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# CHAPTER 9: THE ECONOMIC PROFIT APPROACH TO SECURITIES VALUATION


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This chapter provides a foundation on the economic profit (EVA®[1]) approach to securities valuation. The EVA model differs from other well-known approaches to securities valuation such as the dividend discount model (DDM) and the free cash flow (FCF) model because it provides a *direct* measure of the value added to invested capital.[2] In financial terms, the wealth added to invested capital is called the firm's net present value (NPV). Assuming market efficiency, the firm's market value added (MVA) will be equal to the intrinsic value added measured by its net present value. As shown by Grant (2003), the firm's NPV is equal to the present value of the anticipated future economic profit stream.[3]

In turn, the question of whether economic profit is positive or negative is of interest to corporate managers and securities analysts, as it relates to the period in which a company can actually generate a return on capital (ROC) that exceeds the opportunity weighted average cost of capital (WACC). Common assumptions about economic profit beyond a forecast period are that (1) EVA is zero due to competitive forces, (2) EVA decays over time to zero, (3) EVA is perpetuity, or (4) EVA is growing at some long-term rate that is less than WACC.

In the next sections, we will look at several economic profit valuation models with the goal of assessing the firm's NPV, corporate value, and the intrinsic value of common stock. During our economic profit journey we will look at similarities and differences of EVA valuation to the traditional free cash flow (FCF) model. We will also look at the sensitivity of economic profit valuation to changes in economic profit assumptions (the so-called numerator effects) and the risky discount rate (the so-called denominator effects). We will also discuss how to estimate EVA with standard accounting adjustments, and we'll apply the EVA valuation model to companies that populate a well-known stock market index.

# Basics of Economic Profit Valuation

In the economic profit approach to securities valuation, the firm's enterprise value can be expressed as:

$V = C + \text{NPV}$

In this expression, $V$ is enterprise value, $C$ is net invested capital,[4] and NPV is net present value. As shown by Grant (2003), the firm's NPV can be expressed as a discounted stream of economic profit according to:

NPV = Present value of EVA

$= \sum \text{EVA}_t/(1 + \text{WACC})^t \quad (t = 1 \text{ to } \infty)$

In turn, EVA is the estimated economic profit at time period $t$, and WACC is the familiar weighted average cost of debt and equity capital.

In practice, EVA is expressed in two forms: in NOPAT form and in EVA spread form according to:

$\text{EVA} = \text{NOPAT} - \text{WACC} \times \text{Capital}$

$= (\text{ROC} - \text{WACC}) \times \text{Capital}$

In the first expression, EVA is equal to NOPAT (net operating profit after tax) less the dollar cost of capital. In the second expression, EVA is equal to the EVA spread (after-tax return on capital less the cost of capital) times the amount of invested capital.

Assuming other things the same,[5] we see that managers create wealth by making discounted positive economic profit—positive NPV—decisions. They destroy wealth by making discounted negative EVA—negative NPV—decisions. Moreover, the firm's economic profit is positive when the estimated after-tax return on capital, ROC, exceeds the cost of capital, WACC. That is, EVA is positive when the EVA spread is positive. However, economic profit—and its discounted NPV equivalent—is negative when corporate managers invest in assets (both tangible and intangible) having an after-tax return that falls short of the WACC.

For example, if we assume a NOPAT of $14.95, initial (net[6]) capital of $40, and a cost of capital of 10 percent, we see that the firm's assessed economic profit is $10.95:[7]

$\text{EVA} = \text{NOPAT} - \text{WACC} \times C$

$= \$14.95 - 0.10 \times \$40.00 = \$10.95$

We can also express the EVA of $10.95 in terms of a return on capital of 37.38 percent ($14.95/$40), a cost of capital of 10 percent, and the assumed invested capital of $40 (noted as *C*):

$$\text{EVA} = (\text{ROC} - \text{WACC}) \times C$$

$$= (\text{NOPAT}/C - \text{WACC}) \times C$$

$$= (14.95/40 - 0.10) \times 40$$

$$= (0.3738 - 0.10) \times 40 = \$10.95$$

We will use this EVA figure as a one-step-ahead forecast in the following discussion of the constant growth EVA valuation model and the variable growth EVA valuation model. In the latter valuation model, we look at EVA valuation with forecast and residual value periods, whereby EVA is forecasted during a horizon period and a residual period.

# Economic Profit Models

Like any discounted cash flow (DCF) model, there are several ways of expressing the EVA valuation model. In this section, we discuss and apply four conventional EVA valuation models:

1. Constant growth EVA model.
2. Variable growth EVA model.
3. Forecast EVA valuation model.
4. *T*-period EVA model.

We also look at reconciliation of EVA valuation models. Following that, we see how EVA valuation relates to the traditional free cash flow model. We also discuss how to estimate EVA with standard accounting adjustments, and we apply EVA valuation to a well-known stock market index.

## Constant Growth EVA Model

We will begin our EVA valuation journey with the constant growth EVA valuation model. Rather than estimating the annual economic profit during forecast and residual periods, EVA growth models are used as a convenient way to simplify the discounted cash flow process. There are two well-known EVA growth models that are used in practice: (1) the constant growth EVA valuation model (a variation of the classic Gordon model) and (2) the variable growth EVA valuation model. We begin with the constant growth EVA model.

The constant growth EVA valuation model makes the simplifying assumption that the estimated one-step-ahead EVA is growing at some long-term rate of growth ($g$) per period, where, of course, $g$ is less than WACC. In the constant growth EVA model, the firm's NPV can be expressed as:

$$\text{NPV} = \text{EVA}(1)/(\text{WACC} - g)$$

In this expression, EVA(1) is the estimated economic profit one year from the current period, and $g$ is the *annualized* EVA growth rate, where $g$ is less than WACC. As an application, suppose that the one-step-ahead EVA forecast of $10.95 (our prior example) is expected to grow at a rate of 6.17 percent each year, forever (we assume this growth rate for illustrative purposes only). With constant long-term growth, the firm's estimated NPV is equal to $285.90.

$$\text{NPV} = \$10.95/(0.10 - 0.0617)$$

$$= \$285.90$$

Equivalently, the *implied* constant EVA growth rate that is embedded in the above NPV equals:

$$g = \text{WACC} - \text{EVA}(1)/\text{NPV}$$

$$= 0.10 - 10.95/285.90 = 0.0617$$

In this expression, $g$ is the implied constant EVA growth rate, EVA(1)/NPV is the EVA yield, and WACC is the cost of capital. In turn, with initial capital at $40, the firm's enterprise value is $325.90.

$$V = C + \text{EVA}(1)/(\text{WACC} - g)$$

$$= \$40 + \$285.90 = \$325.90$$

Note that at $285.90, the estimated NPV with constant growth is considerably higher than EVA perpetuity (or zero-growth assumption) of $109.50 ($10.95/0.10). This presumes that a company not only has the ability to earn positive economic profit (whereby ROC is greater than WACC), but that it can actually grow economic profit at some long-term rate. Generating economic profit is difficult for any company, let alone growing EVA at some constant rate (forever!). Moreover, in terms of price multiples, the term (WACC – $g$) in the constant growth EVA model can be interpreted as the EVA cap rate, while 26.11 [1/(WACC – $g$)] can be viewed as the EVA multiplier (or EVA capitalization factor). Hence, EVA-linked NPV analysis reconciles to price multiple analyses.

# Variable Growth EVA Model

The variable growth EVA valuation model is another form of the discounted cash flow model. In the two-phase variable growth model, there are two growth rates that serve to capture the pattern of EVA flows during horizon and residual periods. In this context, it is common to assume that EVA is growing at a relatively high rate during the horizon years (due to competitive or comparative advantages) while EVA growth settles down to either zero or a mature growth rate during the residual years.[8] We can make a simple change to the EVA assumption in the previous constant growth example to see how this model works.

Specifically, suppose that a company's *one-step-ahead* economic profit, EVA(1) of $10.95, is expected to grow at 7.5 percent for just one year, followed by a long-term or mature growth rate of 6.17 percent. In this case, there are two steps to estimating the firm's NPV (and enterprise value) with variable growth assumptions:

> **Step 1:** Calculate the present value of the estimated EVA generated during the first growth phase—we'll interpret this result as the NPV generated during the horizon period (forecast period), NPV-HV.
>
> **Step 2:** Calculate the present value of the EVA earned during the mature growth phase. We'll express this value as NPV-RV. Then, calculate the present value of the firm's residual (or terminal) NPV value.

With variable growth, the present value of EVA during the horizon years can be expressed as:

$$\text{NPV-HV} = \Sigma\ \text{EVA}_t x(1+ g_{NT})^{t-1}/(1+\text{WACC})^t$$

$$(t = 1 \text{ to } N)$$

In this expression, $\text{EVA}_t$ is the estimated economic profit at period $t$, $g_{NT}$ is the *near*-term growth rate in EVA during the horizon period, and WACC is the discount rate or cost of capital. With just two periods ($N = 2$) during the horizon period, we can express the NPV horizon value as:

$$\text{NPV-HV} = \text{EVA}(1)/(1 + \text{WACC}) + \text{EVA}(2)/(1 + \text{WACC})^2$$

$$= \text{EVA}(1)/(1 + \text{WACC}) + \text{EVA}(1)(1 + g_{NT})/(1 + \text{WACC})^2$$

The net present value of the estimated EVA flow for the two-year horizon period is $19.68:

$$\text{NPV-HV} = \$10.95/(1.10) + \$10.95(1.075)/(1.10)^2$$

$$= \$9.95 + \$11.77/1.21$$

$$= \$9.95 + \$9.73$$

$$= \$19.68$$

In turn, the firm's residual NPV at the end of period 2, NPV-RV(2), can be calculated by noting that (1) the EVA forecast for period 3 can be viewed as EVA(2) growing at the *long*-term EVA growth rate, and that (2) the one-step-ahead forecast for period 3 is growing at the mature or competitive growth rate, $g_{LT}$. With these assumptions, the *three-step-ahead* economic profit, EVA(3), can be estimated according to:

$$EV(3) = EVA(2)(1 + g_{LT})$$

$$= EVA(1)(1 + g_{NT})(1 + g_{LT})$$

$$= \$10.95(1.075)(1.0617) = \$12.50$$

With constant EVA growth for the residual period, the firm's residual NPV value at the end of the two-year horizon period can be expressed as:

$$NPV\text{-}RV(2) = EVA(3)/(WACC–g_{LT})$$

Upon substituting the estimated EVA for period 3, EVA(3) of $12.50, into the preceding expression yields NPV-RV(2), at $326.37:

$$RV(2) = \$12.50/(0.10 – 0.0617)$$

$$= \$12.50/0.0383$$

$$= \$326.37$$

Moreover, upon combining the NPV results for horizon and (discounted) residual periods, we obtain the total NPV, at $289.41:

$$NPV = NPV\text{-}HV + PV \text{ of } NPV\text{-}RV(2)$$

$$= \$19.68 + NPV\text{-}RV(2)/(1 + WACC)^2$$

$$= \$19.68 + \$326.37/(1 + 0.10)^2$$

$$= \$19.68 + \$326.37/1.21$$

$$= \$19.68 + \$269.73$$

$$= \$289.41$$

Notice that the variable growth NPV of $289.41 differs by a *small* amount from the 6.17 percent constant growth EVA model result of $285.90.[9] This minor difference in net present value results because we assumed only a 7.5 percent rate of growth in EVA for year 2. All other EVA values were assumed to be growing at 6.17 percent, as in the previous constant growth example. With initial capital of $40, the firm's estimated enterprise value is $329.41.

## Forecast EVA Valuation Model

In practice, corporate managers and securities analysts like to forecast the annual economic profit over some discrete time period, say five or ten years. They then assess the residual value of economic profit based on varying assumptions about EVA during the so-called out years, particularly in light of the firm's presumed competitive or comparative advantages, *if any*. As before, the NPV of economic profit over the horizon years *plus* the present value of the residual NPV determines the firm's overall net present value—or net creation of wealth. The firm's enterprise value is equal to invested capital *plus* the present value of all future EVA (which is NPV).

To illustrate the forecast EVA valuation model, we use the EVA estimates (NOPAT, capital, and WACC) obtained from a revenue forecasting model described by Grant (2003). Later on, we will look at the details of economic profit estimation with standard accounting adjustments. For now, let's see how economic profit estimates during a forecast period get rolled up into the firm's enterprise value and intrinsic value of common stock. In this context, Exhibit 9.1 shows EVA estimates over a 10-year forecast or horizon period. As before, with NOPAT(1) at $14.95, initial capital of $40, and a cost of capital of 10 percent, the firm's assessed economic profit for year 1 is $10.95:[10]

$$\text{EVA}(1) = \text{NOPAT}(1) - \text{WACC} \times C(0)$$

$$= \$14.95 - 0.10 \times \$40.00 = \$10.95$$

Likewise, economic profit for year 2, at $12.74, is just NOPAT less the capital charge on invested capital at the end of year 1 (or BOY capital at year 2).

$$\text{EVA}(2) = \text{NOPAT}(2) - \text{WACC} \times C(1)$$

$$= \$17.19 - 0.10 \times \$44.50 = \$12.74$$

At $44.50, the capital at the start of year 2 is a reflection of the initial capital, $C(0)$ of $40, *plus* the net investment in capital (including physical and intangible capital) of $4.50 that occurred during year 1.

**Exhibit 9.1 Forecasting Economic Profit (EVA) [table - in text]**

| Year | Yearly Net Investment | Total Net Capital | NOPAT | Capital Charge* | Economic Profit |
|---|---|---|---|---|---|
| 0 | | 40.00 | | | |
| 1 | 4.50 | 44.50 | 14.95 | 4.00 | 10.95 |
| 2 | 5.18 | 49.68 | 17.19 | 4.45 | 12.74 |
| 3 | 5.95 | 55.63 | 19.77 | 4.97 | 14.80 |
| 4 | 6.84 | 62.47 | 22.74 | 5.56 | 17.18 |
| 5 | 7.87 | 70.34 | 26.15 | 6.25 | 19.90 |
| 6 | 9.05 | 79.39 | 30.07 | 7.03 | 23.04 |

| | | | | | |
|---|---|---|---|---|---|
| 7 | 10.41 | 89.80 | 34.58 | 7.94 | 26.64 |
| 8 | 11.97 | 101.77 | 39.77 | 8.98 | 30.79 |
| 9 | 13.77 | 115.54 | 45.73 | 10.18 | 35.55 |
| 10 | 15.83 | 131.37 | 52.59 | 11.55 | 41.04 |
| 11 Plus | | | 54.17 | 13.13 | 41.04 |

*WACC = 10 percent.

Exhibit 9.1 shows how to estimate economic profit for the rest of the horizon period, covering years 3 to 10. Notice that the estimated economic profit for year 11 is $41.04 (actually 41.036). This figure equals the assessed NOPAT for year 11, at $54.17, less the capital charge, at $13.13, on the beginning of year 11 (or end of year 10) invested capital. Moreover, the one-step-ahead EVA figure for the residual period results because of a simplifying (yet reasonable) assumption that the marginal return on invested capital (MROC) at the end of the horizon period equals the (marginal) cost of invested capital, namely WACC. Equivalently, the economic profit (and resulting NPV) on new invested capital at year 10 equals zero, such that the overall projected EVA remains unchanged, at $41.04 (or 41.036).[11] We'll use these EVA estimates to estimate the NPV generated during the forecast period.

Exhibit 9.2 shows how to roll up the economic profit estimates in Exhibit 9.1 into the NPV generated during the horizon (or forecast) years and the NPV generated during the residual (or terminal value) period. The sum of these two NPV figures is the total net creation of wealth (NPV) that has been added to the firm's invested capital. Holding market forces constant, this is a reflection of the wealth that has been created (or destroyed) by the firm's internal (organic) and external (corporate acquisitions) investment decisions.

**Exhibit 9.2 Valuation of Economic Profit [Table - in text]**

| **Year** | **EVA** | **Present Value*** | **Cumulative PV(0)** |
|---|---|---|---|
| 1 | 10.95 | 9.95 | 9.95 |
| 2 | 12.74 | 10.53 | 20.48 |
| 3 | 14.80 | 11.12 | 31.60 |
| 4 | 17.18 | 11.73 | 43.34 |
| 5 | 19.90 | 12.36 | 55.69 |
| 6 | 23.04 | 13.00 | 68.70 |

| | | | |
|---|---|---|---|
| 7 | 26.64 | 13.67 | 82.37 |
| 8 | 30.79 | 14.36 | 96.73 |
| 9 | 35.55 | 15.08 | 111.81 |
| 10 | 41.04 | 15.82 | 127.63 |
| Residual Value | | 410.36 (at year 10) | 158.21 |
| | | | |
| NPV | | | 285.84 |
| Capital | | | 40.00 |
| Corporate Value | | | 325.84 |
| | | | |
| Long-Term Debt | | | 12.00 |
| Equity | | | 313.84 |
| Shares Outstanding | | | 5.00 |
| Price | | | 62.77 |

*WACC = 10 percent.

Exhibit 9.2 shows that the cumulative present value of the estimated economic profit stream during the horizon period is $127.63. This figure can be interpreted as the NPV generated from economic profit during the forecast years. Assuming economic profit perpetuity of $41.04 commencing in year 11, we see that the firm's residual EVA value (or NPV at year 10) is $410.40 (or $410.36 when internally generated). With our simplifying assumptions, this NPV figure is calculated as:

NPV-RV(10) = EVA(11)/WACC

= $41.04/0.10 = $410.40

Upon discounting the residual NPV value back to the current period, we obtain the NPV of the economic profit stream generated during the post-horizon years, at $158.21. As before, upon adding up the NPV of economic profit generated during horizon *and* residual years, we obtain the firm's overall net creation of wealth from existing and anticipated future assets *not* currently in place:

NPV(0) = NPV(Horizon years) + NPV(Residual years)

= $127.63 + $158.21 = $285.84

With an initial capital base of $40, the firm's estimated enterprise value is (again[12]) $325.84:

EV = *C* + NPV

= $40.00 + $285.84 = $325.84

Moreover, with debt at say $12 and five shares of common stock outstanding, the firm's intrinsic stock price is:

Intrinsic stock price = (EV – Debt)/Shares

= ($325.84 – 12)/5 = $62.77

As explained earlier, the EVA approach to enterprise valuation provides managers and investors with a *direct* assessment of the wealth that is being added—via discounted economic profit on existing and anticipated future growth assets—to the firm's invested capital. As we will see later, the enterprise value and the intrinsic stock price are the same figures that would be obtained using the traditional free cash flow approach to securities valuation.

## Investment Opportunities and the *T*-Period EVA Model

In the EVA valuation model, the firm's enterprise value is defined as invested capital *plus* aggregate net present value. With a simple rearrangement, we can see the part of the firm's enterprise value that is attributed to economic profit generated by existing assets *and* the EVA contribution due to future investment (or growth) opportunities. Taken together, the two economic profit sources determine the firm's total net present value.

In this context, the firm's enterprise value can be split into two components: (1) the present value of a NOPAT perpetuity generated by existing assets, NOPAT/WACC, and (2) the net present value of the firm's anticipated investment opportunities, $G_f$, according to:[13]

$V$ = NOPAT/WACC + $G_f$

The obvious question at this point is how to estimate the NPV contribution of the firm's anticipated investment opportunities, $G_f$. While several DCF approaches exist to estimate the market value of future investment opportunities, we will estimate growth opportunities with a simplified version of the *T*-period EVA model.[14]

# Growth Opportunities and the *T*-Period EVA Model

In the *T*-period EVA model, the investor makes an assessment of the number of periods that the firm can generate positive economic profit on its anticipated future assets. This boils down to an estimate of the number of positive EVA periods (if any) that managers and investors perceive that the firm can invest in real assets having an after-tax return on capital (ROC) that exceeds the opportunity weighted average cost of capital, WACC. Whether or not a company can actually earn positive (or negative) EVA in the residual years (or out years) is determined by the competitive nature of the industry as it relates to the firm's potential competitive or comparative advantage. We will assume that the length of the economic profit period, *T*, is greater than zero, at least for illustrating how this EVA valuation model works.

In formal terms, the *T*-period economic profit model can be expressed as:

$G_f$ = [Avg. EVA(Future)/WACC × *T*] × 1/(1 + WACC)

In this expression, Avg. EVA(Future) is an economic profit perpetuity generated on new investment opportunities, *T* is the number of periods that a firm can realistically earn positive economic profit on future investments, and WACC is the cost of capital, assuming risk constancy of future cash flows.

To illustrate the *T*-period EVA model,[15] we make the simplifying assumption that economic profit earned during the horizon years is attributed entirely to existing assets,[16] while any economic profit generated during the residual period is due to future assets *not* currently in place. Also, we will make the simple assumption that the estimated economic profit for year 11, at $41.04, can be used to proxy the average economic profit generated during the residual years. Based on these simplifications, the *T*-period EVA model suggests that a large portion of the firm's NPV and enterprise value can be determined by estimating the number of periods that it can generate positive economic profit during the residual years.

For example, with no restriction on the number of years that the firm can earn economic profit of $41.04 during the residual period, we found that the firm's estimated NPV at year 10 was $410.40 [$41.04/0.10]. This residual EVA value has a current NPV of $158.21. Notice, too, that in the absence of economic profit growth during the residual years the NPV of $158.21 is the maximum *current* value of the firm's estimated EVA stream during the post-horizon years. This, in turn, sets upper limit values on both the firm's aggregate NPV and its intrinsic enterprise value. Drawing values from before, we have $285.84 and $325.84, respectively.

In general, the *T*-period EVA model assumes that a firm's opportunity to earn positive economic profit during the residual period is limited by technological obsolescence and/or competition in the market for goods and services. In this model, managers and investors must make an assessment of the number of periods that a company can *realistically* earn positive economic profit for the future. By implication, we can say that investors will not pay for negative EVA generated during the residual period covering years *T* +1 to infinity. Moreover, if the return on future investment opportunities is equal to the cost of capital, then growth opportunities per se make no contribution whatsoever to the firm's overall NPV. In this case the firm's NPV is solely driven by the EVA generated on its existing assets.

In lieu of these restrictions, Exhibit 9.3 shows how the NPV of the firm's future growth opportunities varies as the number of positive EVA periods goes from (say) 5 to 100 years. At $410.40 (rounded), the exhibit shows the upper limit value of the economic profit stream generated during the residual period. Notice how the residual value changes as *T* varies from 5 to 100 years of positive economic profit. Based on present value dynamics, we see that the residual value function, RV(*T*), *asymptotically* approaches a line that represents the value of an EVA perpetuity.

**Exhibit 9.3 *T*-Period EVA Model [Table - in text]**

| Residual Period | Annuity | RV(*T*) | RV(0) | NPV(0)* | EV | Stock Price | Price Ratio % |
|---|---|---|---|---|---|---|---|
| 5 | 41.04 | 155.56 | 59.97 | 187.61 | 227.61 | 43.12 | 68.70 |
| 10 | 41.04 | 252.15 | 97.21 | 224.85 | 264.85 | 50.57 | 80.56 |
| 20 | 41.04 | 349.36 | 134.69 | 262.33 | 302.33 | 58.07 | 92.51 |
| 30 | 41.04 | 386.84 | 149.14 | 276.78 | 316.78 | 60.96 | 97.11 |
| 40 | 41.04 | 401.29 | 154.72 | 282.35 | 322.35 | 62.07 | 98.89 |
| 50 | 41.04 | 406.86 | 156.86 | 284.50 | 324.50 | 62.50 | 99.57 |
| 60 | 41.04 | 409.01 | 157.69 | 285.32 | 325.32 | 62.66 | 99.83 |
| 70 | 41.04 | 409.84 | 158.01 | 285.64 | 325.64 | 62.73 | 99.94 |
| 80 | 41.04 | 410.16 | 158.13 | 285.77 | 325.77 | 62.75 | 99.98 |
| 90 | 41.04 | 410.28 | 158.18 | 285.81 | 325.81 | 62.76 | 99.99 |
| 100 | 41.04 | 410.33 | 158.20 | 285.83 | 325.83 | 62.77 | 100.00 |
| *Infinite* | *41.04* | *410.36* | *158.21* | *285.84* | *325.84* | *62.77* | *100.00* |

WACC = 10 percent; horizon years = 10.
*NPV(0) reflects present value of EVA during horizon and residual years.

Exhibit 9.3 shows that with just five years of positive EVA in post-horizon years, the NPV of future EVA opportunities is only $59.97. When expressed in terms of the firm's enterprise value and its warranted stock price, we obtain

$227.61 and $43.12, respectively. In contrast, with 20 and 30 years of positive economic profit during the residual period, the NPV values of future EVA opportunities are $134.69 and $149.14. The exhibit also shows that with *T* of 20 and 30 years, the firm's enterprise values are $302.33 and $316.78. Also, the corresponding stock price estimates are $58.07 and $60.96, respectively.

With *unlimited* positive economic profit in the residual years, we see that the firm's estimated enterprise value is $325.84 and its intrinsic stock price is $62.77. These are the values that we obtained before. Notice that with five years of positive EVA in residual years that the estimated stock price is only 69 percent ($43.12/$62.77) of the price obtained with unlimited positive economic profit. With 20 and 30 years of positive economic profit in post-horizon years, the intrinsic stock prices are 93 percent and 97 percent, respectively, of the price obtained with unlimited positive economic profit.[17] Thus, managers and investors must make an accurate assessment of the number of periods that a company can earn economic profit for the future in order to have a realistic view of enterprise value and stock price.

## Market-Implied Investment Period

In practice, the *T*-period EVA model can be rearranged to solve for the market-implied number of years of positive economic profit on future investment opportunities. The following inputs are required to solve for market-implied *T* that is embedded in a firm's NPV and enterprise value:

- Enterprise value (outstanding debt plus equity values[18]).
- NOPAT perpetuity (or annualized equivalent of periodic NOPAT on existing assets).
- Average economic profit on new investments.
- Cost of capital (WACC).

Upon solving for the market-implied number of growth periods, *T*, that the firm expects to earn positive economic profit, we obtain:

$T = [G_f \times \text{WACC} \times (1 + \text{WACC})]/\text{Avg. EVA (future)}$

Upon calculating market-implied *T*, managers and investors can assess whether this figure is consistent with a company's intrinsic number of periods to earn positive economic profit on future investments.

Based on our previous illustration, if the actual number of positive EVA periods were, say, 10 years rather than 30 years, then the firm's enterprise value and stock price would be *overvalued* in the capital market. Based on the figures supplied before, the firm's stock price would fall over time from $60.96 to $50.57—unless of course the firm's managers could preempt the decline by surprising investors positively about the number of periods that firm could earn positive economic profit on its investment opportunities. Conversely, a company's stock would be *undervalued* if investors incorrectly perceived that the number of positive EVA periods was, say, 10 years when in fact the intrinsic EVA period was longer.

# Reconciliation of EVA Models

While examining the EVA model, we focused on two general formulations of the firm's enterprise value. In this context, we said that the firm's enterprise value is equal to (1) invested capital, $C$, *plus* aggregate NPV and (2) the present value of a NOPAT perpetuity on existing assets *plus* the NPV of all future investment opportunities—as captured by $G_f$. We can reconcile these EVA valuation models for the firm's enterprise value as follows.

To begin, note that NOPAT can be expressed as a capital charge earned on the firm's existing assets *plus* the EVA generated by existing assets already in place. From this, we see why the firm's enterprise value is equal to invested capital, $C$, plus the NPV of all future economic profit arising from both existing assets, EVA/WACC, and expected future assets, $G_f$, according to:

$$V = \text{NOPAT/WACC} + G_f$$

$$= (\text{WACC} \times C + \text{EVA})/\text{WACC} + G_f$$

$$= C + (\text{EVA/WACC} + G_f)$$

$$= C + \text{NPV}$$

Thus, the firm's enterprise value is in fact equal to invested capital *plus* aggregate NPV. In turn, the firm's aggregate net present value is equal to the present value of all future economic profit.

# Cost of Capital Effects

Based on the preceding developments, we see that a company's NPV has two primary sources: (1) the present value of economic profit generated by the firm's existing assets—namely, EVA/WACC—and (2) the NPV contribution attributed to economic profit improvement from anticipated future assets not currently in place, as captured by $G_f$ in the enterprise valuation model. Moreover, economic profit—whether earned on existing or future assets—is positive *if and only if* the firm invests in real assets having and after-tax return on capital that on average exceeds the weighted average cost of capital.

As with future growth opportunities, the cost of capital is an EVA factor that is central to enterprise valuation. In practice, it is important to recognize that seemingly small changes in WACC can have a large impact on enterprise value and intrinsic stock price. Exhibit 9.4 shows what happens to the key components of enterprise value—including the NPV of economic profit generated during the horizon and residual years—when the cost of capital rises by 100 basis points due to unforeseen raises in interest rates and/or heightened business uncertainty[19] or falls by 100 basis points due to declining interest rates and/or reduced business risk.

**Exhibit 9.4 Enterprise Value and the Cost of Capital: EVA Model [exh0904.png]**

With a 10 percent cost of capital, we found that the firm's enterprise value was $325.84. This figure includes the initial $40 capital investment *and* the NPV of economic profit generated during the horizon and post-horizon years—at $127.63 and $158.21, respectively. At that discount rate, the firm's warranted stock price is $62.77. However, Exhibit 9.4 reveals (actual values not shown) that if the cost of capital were to decline from 10 percent to 9 percent—due perhaps to a general decline in interest rates or a decline in the required business risk premium—then the firm's enterprise value and intrinsic stock price would rise to $376.98 and $73.00. This 100 basis point change in WACC translates into a 15.69 percent rise in the firm's enterprise value.

However, if the firm's cost of capital were to rise by 100 basis points—from 10 percent to 11 percent—then Exhibit 9.4 shows that the firm's enterprise value and intrinsic stock price would decline to $284.92 and $54.58, respectively. This in turn represents a 12.56 percent decline in the firm's warranted enterprise value. As with the present value impact of changes in a company's future investment opportunities, we see that enterprise value and intrinsic stock price are impacted in a *non*linear way by fluctuations in the firm's cost of capital. This valuation result is the essence of equity duration when viewed through an economic profit lens.

# Pricing Implications

The investment opportunities and cost of capital illustrations provide some strategic pricing insight for managers and investors. Specifically, we see that uncertainty about the number of years that a firm can generate positive economic profit on new investments and/or uncertainty about the firm's *true* cost of capital can have a material impact on both its enterprise value and its intrinsic stock price.

These valuation effects arise from so-called numerator and denominator effects. Moreover, there are changes in *T* and WACC that can produce the same impact on the price of any company's stock. For example, the intrinsic stock price—see Exhibits 9.3 and 9.4, respectively—drops from $62.77 to about $51 when *T* declines to 10 years or the cost of capital, WACC, rises to 11.5 percent.[20] Hence, anything that managers can do to increase the positive EVA investment period and/or decrease the opportunity weighted average cost of capital will surprise investors positively and have a meaningful impact on both enterprise value and stock price.

# EVA Accounting Adjustments

In practice, there are several value-based accounting adjustments that can be made to calculate economic profit. While a detailed treatment of VBM accounting adjustments is beyond the scope of this chapter, there are several standard accounting adjustments that are often made by corporate managers and securities analysts when estimating economic profit. In this context, Exhibit 9.5 shows the standard income statement adjustments that are made to basic NOPAT (tax-adjusted operating earnings), while Exhibit 9.6 shows the corresponding balance sheet adjustments that are made to basic EVA capital (balance sheet debt and equity capital).[21] As shown, there are equivalent top-down and bottom-up approaches to estimating NOPAT, while there are equivalent assets and financing approaches to estimating EVA capital.

## NOPAT Estimation

Exhibit 9.5 shows the bottom-up approach to estimating NOPAT. In this approach, the analyst begins with net operating profit before taxes. This is just the familiar earnings before interest and taxes (EBIT) figure on a company's income statement.[22] To this amount, several value-based accounting adjustments are made to move toward a better representation of the firm's pretax cash operating profit. For example, the increase in LIFO reserve account is added back to operating profit to adjust for the overstatement of cost of goods sold (COGS)—due to an overstatement of product costing—in a period of rising prices (inflation), while the *net* increase in research and development expenditures is added back to pretax operating profit to recognize that R&D expenditures should be capitalized (meaning put on the EVA balance sheet), as they presumably generate a future stream of economic benefits.[23]

**Exhibit 9.5 Calculation of NOPAT from Financial Statement Data [Table - in text]**

| | |
|---|---|
| **A. Bottom-up approach** | |
| Begin: | Operating profit after depreciation and amortization (EBIT) |
| Add: | Implied interest expense on operating leases |
| | *Increase (decrease)in equity reserve accounts, including:* |
| | Increase in LIFO reserve |
| | Increase in accumulated intangibles amortization |
| | Increase in bad debt reserve |
| | Increase in capitalized research and development |
| | Increase in cumulative write-offs of special items |
| Equals: | Adjusted operating profit before taxes |
| Subtract: | Cash operating taxes |
| Equals: | NOPAT |
| **B. Top-down approach** | |
| Begin: | Net sales |
| Subtract: | Cost of goods sold |
| | Selling, general, and administrative expenses |
| | Depreciation |
| Add: | Implied interest expense on operating leases |
| | *Increase (decrease)in equity reserve accounts (see previous listing)* |
| | Other operating income |
| Equals: | Adjusted operating profit before taxes |
| Subtract: | Cash operating taxes |
| Equals: | NOPAT |

End of exhibit.

Likewise, the increase in accumulated intangibles amortization is added back to pretax cash operating profit to reflect the fact that intangibles (patents, copyrights, etc.) are a form of capital investment that need to earn a cost of capital return just like expenditures on physical capital. The *net* increase in bad debt reserve is added back to pretax operating profit to more accurately reflect a company's expected default experience. In addition, the implied interest expense on operating leases is added back to operating results to remove the effects of debt-related financing decisions. Moreover, the rise in reengineering and restructuring expenditures is added back to pretax operating profit because these expenditures are viewed in the value-based realm as reengineering or restructuring investments.

Exhibit 9.5 also shows the top-down approach to estimating NOPAT. In this approach, the manager or investor begins with net sales and then adds the increase in several equity reserve accounts, including the LIFO reserve and accumulated intangibles accounts, the bad debt reserve account, and the rise in other equity reserve accounts noted earlier. As with the bottom-up approach to estimating NOPAT, the implied interest expense on operating leases is added to the EVA-based income statement. Information on LIFO (and other) reserve and leasing accounts is generally found in the footnotes to financial statements. In the top-down approach, the manager or investor subtracts from net sales the usual accounting income statement items such as cost of goods sold (COGS); selling, general, and administrative expenses (SG&A); and depreciation. Also, other operating income (if any) shown on the income statement is included in the calculation of pretax cash operating profit while other *non*operating income is excluded.

In the EVA tax calculation, the manager or investor begins with reported income tax expense on the income statement. To this amount, one subtracts (or adds) the increase (or decrease) in the deferred income tax account obtained from the balance sheet. The tax benefit received from interest expense (tax rate × interest expense) and the tax benefit received from implied interest expense on operating leases is added to the reported income tax figure to remove the tax benefit obtained from debt-related financing decisions. Also, taxes on *non*operating income (or tax benefits received from nonoperating expenses) must be subtracted from (or added to) reported income taxes to obtain an accurate measure of cash operating taxes. Upon subtracting cash operating taxes from pretax net operating profit (from either the bottom-up or the top-down approach), one obtains net operating profit after taxes (NOPAT).

# Invested Capital

Exhibit 9.6 shows the EVA accounting adjustments that are necessary in the equivalent asset and financing approaches to estimating invested capital. In the assets approach, the manager or investor begins with net short-term operating assets (basically, net working capital). This reflects moneys tied up in current assets like accounts receivables and inventories as well as a normal amount of cash needed for operations.[24] Current liabilities such as accounts payable, accrued expenses, and income taxes payable are of course netted from the short-term operating asset accounts. Short-term notes payable (a current liability account) are excluded because they represent a source of debt financing. Interest-bearing debt is reflected in the sources of financing approach, and the debt-interest tax subsidy is reflected in the calculation of a company's (dollar) cost of capital.

**Exhibit 9.6 Calculation of Capital from Financial Statement Data [Table - in text]**

| | |
|---|---|
| **A. Asset approach** | |
| Begin: | Net short-term operating assets |
| Add: | Net plant, property, and equipment |
| | Other assets |
| | Goodwill (net) |
| | *Equity reserve accounts, including:* |
| | LIFO reserve |
| | Accumulated intangibles amortization |
| | Bad-debt reserve |
| | Capitalized research and development |
| | Cumulative write-offs of special items |
| | Leased operating assets (Present value of operating leases from debt equivalents) |
| Equals: | Capital |
| **B. Sources of financing approach** | |
| Begin: | Book value of common equity |
| Add other equity and equivalents: | Preferred stock |
| | Minority interest |
| | Deferred income tax |
| | *Equity reserve accounts (see previous listing)* |
| Add debt and debt equivalents: | Interest bearing short-term debt |
| | Current portion of long-term debt due |
| | Long-term debt |
| | Other liabilities |
| | Capitalized lease obligations |
| | Present value of operating leases |
| Equals: | Capital |

End of exhibit.

# Capital Estimation

Net plant, property, and equipment; goodwill; and other assets are then added to net short-term operating assets. As shown in Exhibit 9.6, several equity reserve accounts are added to basic invested capital, including LIFO reserve, accumulated intangibles amortization (from patents, copyrights, etc), net capitalized research and development, cumulative bad debt reserve, and the cumulative write-off of special items like reengineering and restructuring costs. Also, the present value of operating leases (shown as leased operating assets) is added back to arrive at invested capital on the EVA balance sheet.

In the sources of financing approach (Exhibit 9.6), the manager or investor begins with the book value of common equity. This is just the familiar common at par, capital surplus, and retained earnings amounts on the balance sheet net of treasury stock (if any). To this sum, one adds several equity equivalent accounts, including those already listed on a company's balance sheet—such as preferred stock, minority interest, and deferred income taxes—as well as the companion equity reserve accounts mentioned in the assets approach to estimating invested capital—namely, LIFO reserve, accumulated intangibles amortization, net capitalized research and development, bad debt reserve, and the cumulative write-offs of special items.

Debt and debt equivalents are then added to arrive at an EVA-based figure for invested capital. These debt-related accounts include those listed on the balance sheet—including interest-bearing short-term debt, long-term debt, other liabilities, and capitalized lease obligations—and off-balance-sheet debt items[25] such as the present value of operating leases. With the engagement of several EVA accounting adjustments, we see that the asset *and* financing approaches to estimating invested capital produce a robust measure (compared with basic EVA capital, or on-balance sheet capital) of economic capital that is actually tied up in a business.

# EVA Application: JLG Dow Fundamental

To illustrate the results of an EVA valuation in practice, Exhibit 9.7 shows a snapshot of the JLG Dow Fundamental[26] versus the Dow Jones Industrial Average (DJIA) from February 20 to May 1, 2008. The JLG Dow Fundamental provides a bottom-up, EVA-based assessment of where the market should be trading based on underlying economic profit and risk characteristics. While past performance is not indicative of future returns, the JLG Dow Fundamental during the reporting period was a leading fundamental indicator of stock market performance.

**Exhibit 9.7 JLG Dow Fundamental versus Dow Actual**
**[exh0907.png]**

Specifically, Exhibit 9.7 shows convergence between the Dow Jones Industrial Average and the JLG Dow Fundamental. In terms of valuation statistics, the estimated cost of capital for the Dow Industrials was 7.77 percent, while the EVA-based future growth component of NPV for the market index was 36 percent. This suggests that 64 percent of estimated NPV was due to economic profit generated by existing assets while the balance of intrinsic value added was due to the presumed EVA generated from future growth opportunities (NPV from assets *not* currently in place). As of April 25, 2008, there were 10 active buy opportunities and 10 active sell or short-sell opportunities within the JLG Dow Fundamental.

Due to the onset of the global financial crisis, stock market performance in the summer and fall of 2008 was impacted negatively by several adverse financial events, as reflected in an unprecedented rise in the base equity risk premium to an all-time high of 9.0 percent.[27] As of January 12, 2009, the JLG Dow Fundamental stood at 8736, some 3% higher than the quoted value of the Dow Jones Industrial Average, at 8474. However, due to the lingering effects of the global financial crisis the market continued to abate until reaching the lows of early March 2009, and did not reach the January value indicated by the JLG Dow Fundamental until June 1, 2009.

# EVA Link to FCF Valuation

Given the preceding developments on EVA, it is helpful for managers and investors to know how EVA valuation relates to other DCF approaches such as the free cash flow model. There are a couple of things to keep in mind regarding the similarities and differences between economic profit valuation and, say, free cash flow valuation. The first observation is obvious—namely, that EVA and FCF valuation models (as well as DDM models for that matter) *must* produce the same intrinsic value of the firm and its common stock. That is, the value of the firm is driven by the present value of a cash flow stream generated by the firm's existing assets and its future growth opportunities (assets *not* current in place). Having said that, it is worth emphasizing that EVA valuation provides managers and investors with a *direct* measure of how the firm creates or destroys shareholder value as reflected in NPV.

The second observation about EVA versus FCF valuation pertains to the capital charge on invested capital. Specifically, in the economic profit approach to securities valuation an *explicit* charge on the beginning of year (BOY) capital is assessed each year and deducted from NOPAT. In contrast, in free cash flow model, the present value of the capital charge on the firm's periodic investment is *implicitly* recognized in the year that the capital expenditure is incurred. To see this, suppose that a company spends \$4.50 in capital improvement during a particular year. In the free cash flow model, the entire net investment would be subtracted from the net operating profit (NOPAT) in the year incurred. As mentioned, this is equivalent to recognizing the present value of the yearly capital charge that would be assessed in the EVA model. Assuming the capital charge can be expressed as perpetuity, this yields:

Net investment (year 1) = \$4.50

= (\$4.50 × WACC)/WACC = \$4.50

Hence, the free cash flow model subtracts the entire investment of \$4.50 from NOPAT. In the EVA approach, the periodic capital charge of \$0.45 (assuming a 10 percent cost of capital) would be deducted from each year's NOPAT, beginning in the first year *following* the capital expenditure. Of course, the investment expenditure (assumed at \$4.50) is added to the end of year 1 capital base to arrive at beginning of year (BOY) capital for the second year.

# Free Cash Flow Valuation

For comparative purposes, let's take a look at free cash flow valuation.[28] In this widely used model, the enterprise value of the firm can be expressed as the present value of the anticipated cash flow stream generated by the firm's existing assets and its expected future growth assets not currently in place. In general, the FCF model is expressed as:

$$V = \sum FCF_t /(1+WACC)^t$$

$$(t = 1 \text{ to } \infty)$$

In this expression, $V$ is the firm's enterprise or corporate value, $FCF_t$ is the assessed free cash flow for year $t$, and WACC is the weighted average cost of debt and equity capital. In turn, the firm's assessed free cash flow at year $t$, $FCF_t$, can be viewed as the anticipated net operating profit after tax, NOPAT, *less* the annual net investment, INV, to support the firm's growth.

If, as before, NOPAT is \$14.95 and the net investment is \$4.50, then the one-step-ahead FCF is \$10.45.

FCF(1) = NOPAT(1) – INV(1)

= \$14.95 – \$4.50 = \$10.45

Note that net investment refers to gross capital expenditures at year $t$ less the required maintenance expenditures (measured by economic depreciation) on the firm's existing assets. As with gross investment, net investment includes the required change in working capital (measured by the year-over-year change in operating current assets less the associated change in operating current liabilities) to support a growing revenue and earnings stream.

# FCF Valuation: Horizon Years

To illustrate FCF valuation, we'll use the 10-year stream of free cash flow estimates produced by the revenue-forecasting model used by Grant (2003). Exhibit 9.8 shows how to roll up the 10 years of free cash flow estimates for the horizon years. The exhibit reports NOPAT, net annual investment, free cash flow, the present value of free cash flow for any given year, and the *cumulative* present value of the free cash flow estimates over the horizon period. Using a cost of capital (discount rate) of 10 percent, we see that the $10.45 free cash flow estimate for year 1 has a currently assessed market value of $9.50.

**Exhibit 9.8 FCF Valuation: Horizon Years [table - in text]**

| **Year** | **NOPAT** | **Net Investment** | **FCF** | **Present Value*** | **Cumulative PV** |
|---|---|---|---|---|---|
| 1 | 14.95 | 4.50 | 10.45 | 9.50 | 9.50 |
| 2 | 17.19 | 5.18 | 12.01 | 9.93 | 19.43 |
| 3 | 19.77 | 5.95 | 13.82 | 10.38 | 29.81 |
| 4 | 22.74 | 6.84 | 15.90 | 10.86 | 40.67 |
| 5 | 26.15 | 7.87 | 18.28 | 11.35 | 52.02 |
| 6 | 30.07 | 9.05 | 21.02 | 11.87 | 63.88 |
| 7 | 34.58 | 10.41 | 24.17 | 12.40 | 76.29 |
| 8 | 39.77 | 11.97 | 27.80 | 12.97 | 89.26 |
| 9 | 45.73 | 13.77 | 31.96 | 13.55 | 102.81 |
| 10 | 52.59 | 15.83 | 36.76 | 14.17 | 116.98 |
| 11 Plus* | 54.17 | | | | |

*WACC = 10 percent.

Upon calculating the present value of the 10 years of free cash flow estimates and cumulating these values, we see that the firm's horizon value is $116.98. However, stopping here in the enterprise valuation process would be unduly conservative because it presumes that the firm is unable to generate discounted positive free cash flow beyond the horizon period. Such an unfortunate state of affairs might exist for a company's shareholders if (1) the firm's existing capital assets at that time (year-end 10 in our case) were completely obsolete, and if (2) the NPV on all future investments were zero; since the EVA on future investment opportunities is zero when the marginal return on future investments equals the cost of capital.

# FCF Valuation: Residual Years

While several assumptions can be made about free cash flow generation during the post-horizon years,[29] we'll make the simplifying (and economically consistent) assumption that the marginal return on the *net* investment at end of the horizon period earns a cost of capital return. This is tantamount to saying that (1) free cash flow for post-horizon years is equal to the one-period-ahead estimate of NOPAT, and (2) that economic profit generated by the end-of-horizon period net investment (and the EVA on any future investment) is equal to zero. With this zero-NPV assumption, the firm's residual (or continuing) value at year $T$ can be expressed in simple terms as:

$$V_T = \text{NOPAT}_{T+1}/\text{WACC}$$

While the resulting perpetuity is a convenient way out of a complex terminal value pricing process, we still need to estimate the *one-step-ahead* NOPAT as of the end of the horizon period. Fortunately, we can obtain this forecast with knowledge of (1) the firm's plow-back or net investment-to-NOPAT ratio, and (2) the marginal return on invested capital (MROC). With this information, we can express the firm's growth in NOPAT, $g_N$, as:

$$g_N = \text{PBR} \times \text{MROC}$$

In this expression, $g_N$ is the estimated year-over-year growth rate in NOPAT from the end of the horizon period, PBR is the plowback ratio, measured by *net* investment during the last year of the horizon period over the end-of-horizon period net operating profit after tax, $\text{NOPAT}_T$.[30]

Assuming that the investment at year 10, at \$15.83 (again, Exhibit 9.8), earns a cost of capital return, we obtain an estimated NOPAT growth rate for the residual or continuing period of 3 percent.

$$g_N = (\$15.83/\$52.59) \times 0.10$$

$$= 0.3010 \times 0.10 = 0.0301 \text{ (or 3.01\%)}$$

It is now a simple matter to estimate the one-step-ahead NOPAT according to:

$$\text{NOPAT}_{11} = \text{NOPAT}_{10} \times (1 + g_N)$$

$= \$52.59 \times (1.0301) = \$54.17$

Note that this is the same continuing value for NOPAT as indicated in Exhibits 9.1 and 9.8. Thus, the firm's residual value at year 10 is equal to $541.73. This is obtained by discounting the one-step-ahead NOPAT perpetuity by the 10 percent cost of capital. Equivalently, this residual value figure is obtained by multiplying the estimated NOPAT perpetuity of $54.17 by a price-to-NOPAT multiplier of 10 (equal to 1/WACC).

$V_{10} = \$54.17/0.10$

$= \$54.17 \times 10 = \$541.73$

Moreover, upon discounting the residual value back 10 periods, we obtain the intrinsic value, at $208.86, of the free cash flow generated during the residual or continuing years. As summarized in Exhibit 9.9, we see that the enterprise value of the firm is $325.84. This value consists of $116.98 in horizon value *plus* $208.86 of current residual value. With long-term debt at $12, and five shares of common stock outstanding, the warranted stock price is $62.77. Not surprisingly, the firm's enterprise value of $325.84 and its intrinsic stock price of $62.77 are the *same* values that we obtained in the EVA valuation model.

**Exhibit 9.9 FCF Valuation: Residual Years [Table - in text]**

| Year | NOPAT | Net Investment | FCF | Present Value* | Cumulative PV |
|---|---|---|---|---|---|
| 1 | 14.95 | 4.50 | 10.45 | 9.50 | 9.50 |
| 2 | 17.19 | 5.18 | 12.01 | 9.93 | 19.43 |
| 3 | 19.77 | 5.95 | 13.82 | 10.38 | 29.81 |
| 4 | 22.74 | 6.84 | 15.90 | 10.86 | 40.67 |
| 5 | 26.15 | 7.87 | 18.28 | 11.35 | 52.02 |
| 6 | 30.07 | 9.05 | 21.02 | 11.87 | 63.88 |
| 7 | 34.58 | 10.41 | 24.17 | 12.40 | 76.29 |
| 8 | 39.77 | 11.97 | 27.80 | 12.97 | 89.26 |
| 9 | 45.73 | 13.77 | 31.96 | 13.55 | 102.81 |
| 10 | 52.59 | 15.83 | 36.76 | 14.17 | 116.98 |
| 11 Plus | 54.17 | | | | |
| Residual Value | | | | 541.73 (at year 10) | 208.86 |

| | | | | | |
|---|---|---|---|---|---|
| Corporate Value | | | | | 325.84 |
| Long-Term Debt | | | | | 12.00 |
| Equity | | | | | 313.84 |
| Shares Outstanding | | | | | 5.00 |
| Price | | | | | 62.77 |

*WACC = 10 percent.

Before concluding, it is interesting to see that the current residual value, at $208.86, makes up some 64 percent of the firm's warranted corporate value. This large residual value impact is a common finding among discounted cash flow approaches—whether dividend discount model (DDM), free cash flow (FCF), or economic profit approaches—to estimate enterprise value and stock price. In practice, the residual value (or terminal value) impact is especially pronounced for growth-oriented companies.[31] Examples include companies operating in the technology and health care sectors of the economy since most of their enterprise value comes from distant—and often very difficult to predict—free cash flow and EVA generated on current and future R&D investments.

# Summary

Like any DCF model, the EVA valuation model has both attractive features and some limitations. On the positive side, the economic profit model provides a *direct* means by which managers and investors can assess the NPV contribution from existing assets as well as future growth opportunities. In this context, the firm's wealth creation—as measured by its NPV—is equal to the present value of all future economic profit generated by existing assets and anticipated future assets (growth opportunities) not currently in place. With discounted positive economic profit, a company is a wealth creator, while with discounted negative economic profit a company is—unfortunately–a wealth destroyer.

While EVA valuation is intuitively appealing, managers and investors need to realize that the resulting estimates of enterprise value and intrinsic stock price are highly sensitive to the model inputs. We found that a seemingly small change in the length of the firm's economic profit period ($T$) and/or its cost of capital (WACC) via equity duration effects can have a meaningful impact on the value of the firm and its outstanding shares. With uncertainty about model inputs, it is clear that managers must do everything within their responsibility and control to (honestly!) surprise investors *positively* about key economic profit drivers such as the return on capital, the cost of capital, and the length of the economic profit period.

We recognized several value-based accounting adjustments that should be taken into consideration when estimating economic profit. We also provided an application of EVA valuation in the context of the JLG Dow Fundamental. Finally, we argued that EVA valuation must reconcile to other well-known discounted cash flow approaches such as the dividend discount model and the traditional free cash flow model.

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# Notes

1. EVA® is a registered trademark of Stern Stewart & Co.
2. However, this does not mean that the EVA approach to securities valuation gives a better answer than that obtained from other valuation models.
3. Grant (2003).
4. As explained later, invested capital or EVA capital can be obtained using an equivalent assets or financing approach.
5. When evaluating companies, investors must be keenly aware of economic profit influences from industry, sector, and general market effects.
6. Since NOPAT is net of depreciation on the EVA income statement, we must use net (of accumulated depreciation) operating assets on the EVA balance sheet. Equivalently, we could use gross operating profit after tax (GOPAT) and gross investment to obtain the same EVA results.
7. The dollar units assumed in the EVA illustration are a matter of detail rather than substance.
8. Some investors use a three-stage EVA growth model, with transitional or decay rate of cash flow growth between horizon and residual stages. The so-called “H (or half-life)” model is popular in this regard.
9. A variable-growth EVA model can produce an answer that is substantially different from that obtained with a constant-growth model. The goal here is to show that the present value dynamics of a variable-growth model are different from those of a constant-growth model.
10. Again, the dollar units assumed in the illustration are a matter of detail rather than substance.
11. In other words, if MROC equals WACC, then the change in EVA from period $T$ to $T + 1$ is zero because the change in NOPAT, at $1.58, is equal to the dollar capital charge on the end-of-horizon-period net investment of $15.83.

12. With long-term growth of precisely 6.1692 percent in the constant-growth EVA model, we obtain the same value—at $285.84—as that shown in the two-stage variable-growth model. This NPV value is marginally different from the $285.90 figure that we obtained before with the assumed constant EVA growth rate of 6.17 percent.

13. The enterprise valuation model presented here is based on the classic "investment opportunities approach to valuation" described by Fama and Miller—see Eugene F. Fama and Merton H. Miller, *The Theory of Finance* (New York: Holt, Rinehart & Winston, 1972).

14. For an insightful discussion of the *T*-period EVA model, see G. Bennett Stewart III, *The Quest for Value* (New York: HarperCollins, 1991).

15. In the previous EVA illustration, we assumed no future investment opportunities beyond the horizon period. While we utilize the same numbers in the *T*-period EVA illustration that follows, the goal here is to shed basic insight on EVA investment opportunities (or periods) without getting bogged down in detailed formulas that model the firm's investment opportunities.

16. This simplification presumes that the firm's existing capital is worthless at the end of the 10-year horizon period.

17. Notice, too, that with 50 years of positive EVA during residual years the stock price is virtually the same as the perpetuity result, at $62.77. While wealth-creating managers should focus on long-term EVA rather than just short-term EVA, this sheds some interesting light on how long is "long."

18. In practical application of enterprise valuation models, long-term debt is often measured at book value while equity capitalization—number of shares of stock outstanding times stock price—is used for the common stock.

19. As a real-world example, one would expect a significant rise in the equity risk premium (a component of the cost of equity) due to the tragic events of September 11, 2001. If correct, this would go a long way in helping to explain the sharp decline in stock prices that occurred in the aftermath of 9/11.

20. Specifically, if *T* falls from infinity to 10 years, or WACC rises from 10 percent to 11.5 percent, then the stock price declines from $62.77 to about $51—actually, the price is $50.57 with *T* at 10 years, and $51.09 with WACC at 11.5 percent, separately.

21. See JLG Research at www.jlgresearch.com for software that calculates EVA with standard value-based accounting adjustments.

22. Net operating profit before taxes (EBIT) is also the same as operating profit after depreciation and amortization.

23. R&D expenditures should be capitalized and amortized over a useful time period such as five years, rather than expensed on the current year income statement as if these expenditures have no future cash flow benefit.

24. Estimates of a normal amount of cash required for operations vary by industry—such as 0.5 percent to 2 percent of net sales. Also, one can make a distinction between invested capital and operating capital. Operating capital is generally viewed as invested capital net

of excess cash and marketable securities and goodwill arising from premiums paid in corporate acquisitions

25. The EVA recognition of *all* forms of debt including off-balance-sheet debt is important. While EVA accounting uses information that is deemed accurate from a company's published financial reports, EVA cannot possibly reflect off-balance-sheet debts arising from hidden liabilities or fraudulent accounting transactions as in the notorious case of Enron.

26. See www.jlgresearch.com for equity valuation software and updates on the JLG Dow Fundamental.

27. For explanation of the base equity risk premium on an "approximately-certainty-earnings (ACE) portfolio," see Abate, Grant, and Rowberry, "Understanding the Required Return under New Uncertainty," *Journal of Portfolio Management*, Fall 2006.

28. See Alfred Rappaport, "Strategic Analysis for More Profitable Acquisitions," *Harvard Business Review* (July/August 1979) for a pioneering application of the free cash flow model.

29. Such possibilities include constant growth in free cash flow during the residual years (at a growth rate less than WACC) and some form of competitive decay in the estimated free cash flow during post-horizon years.

30. The growth in NOPAT, $g_N$, can be expressed as the product of the net investment plow-back ratio (PBR) times the marginal return on net invested capital, MROC, because (1) PBR measures net investment over NOPAT (at end of the horizon period), and (2) MROC equals the change in NOPAT over net investment.

31. The term *growth-oriented companies* is taken to mean companies that can earn substantially positive EVA on future investment opportunities. They do so because the estimated after-tax rate of return on future investment opportunities widely exceeds the WACC.

# Reference

Grant, James L. *Foundations of economic value added.* 2nd ed. Hoboken, NJ: John Wiley & Sons, 2003.