CHAPTER 5

RESIDUAL INCOME VALUATION

LEARNING OUTCOMES

*After completing this chapter, you will be able to do the following:*

- Calculate and interpret residual income and related measures (e.g., economic value added and market value added).
- Discuss the use of residual income models.
- Calculate future values of residual income given current book value, earnings growth estimates, and an assumed dividend payout ratio.
- Calculate the intrinsic value of a share of common stock using the residual income model.
- Discuss the fundamental determinants or drivers of residual income.
- Explain the relationship between residual income valuation and the justified price-to-book ratio based on forecasted fundamentals.
- Calculate and interpret the intrinsic value of a share of common stock using a single-stage (constant-growth) residual income model.
- Calculate an implied growth rate in residual income given the market price-to-book ratio and an estimate of the required rate of return on equity.
- Explain continuing residual income and list the common assumptions regarding continuing residual income.
- Justify an estimate of continuing residual income at the forecast horizon given company and industry prospects.
- Calculate and interpret the intrinsic value of a share of common stock using a multistage residual income model, given the required rate of return, forecasted earnings per share over a finite horizon, and forecasted continuing residual earnings.
- Explain the relationship of the residual income model to the dividend discount and free cash flow to equity models.
- Contrast the recognition of value in the residual income model to value recognition in other present value models.
- Discuss the strengths and weaknesses of the residual income model.
- Justify the selection of the residual income model for equity valuation, given characteristics of the company being valued.
- Discuss the major accounting issues in applying residual income models (e.g., clean surplus violations, variations from fair value, intangible asset effects on book value, and nonrecurring items) and appropriate analyst responses to each issue.
1. INTRODUCTION

Residual income models of equity value have become widely recognized tools in both investment practice and research. Conceptually, residual income is net income less a charge (deduction) for common shareholders’ opportunity cost in generating net income. It is the residual or remaining income after considering the costs of all of a company’s capital. The appeal of residual income models stems from a shortcoming of traditional accounting. Specifically, although a company’s income statement includes a charge for the cost of debt capital in the form of interest expense, it does not include a charge for the cost of equity capital. A company can have positive net income but may still not be adding value for shareholders if it does not earn more than its cost of equity capital. Residual income models explicitly recognize the costs of all the capital used in generating income.

As an economic concept, residual income has a long history, dating back to Alfred Marshall in the late 1800s. As far back as the 1920s, General Motors used the concept in evaluating business segments. More recently, residual income has received renewed attention and interest, sometimes under names such as economic profit, abnormal earnings, or economic value added. Although residual income concepts have been used in a variety of contexts, including the measurement of internal corporate performance, this chapter focuses on the residual income model for estimating the intrinsic value of common stock. Among the questions we will study to help us apply residual income models are the following:

- How is residual income measured, and how can an analyst use residual income in valuation?
- How does residual income relate to fundamentals, such as return on equity and earnings growth rates?
- How is residual income linked to other valuation methods, such as a price-multiple approach?
- What accounting-based challenges arise in applying residual income valuation?

The chapter is organized as follows: Section 2 develops the concept of residual income, introduces the use of residual income in valuation, and briefly presents alternative measures used in practice. Section 3 presents the residual income model and illustrates its use in valuing common stock. This section also shows practical applications, including the single-stage (constant-growth) residual income model and a multistage residual income model. Section 4 describes the relative strengths and weaknesses of residual income valuation compared to other valuation methods. Section 5 addresses accounting issues in the use of residual income valuation. Section 6 summarizes the chapter and practice problems conclude it.

2. RESIDUAL INCOME

Traditional financial statements, particularly the income statement, are prepared to reflect earnings available to owners. As a result, the income statement shows net income after deducting an expense for the cost of debt capital, that is, interest expense. The income statement does not, however, deduct dividends or other charges for equity capital. Thus,
traditional financial statements essentially let the owners decide whether earnings cover their opportunity costs. Conversely, the economic concept of residual income explicitly deducts the estimated cost of equity capital, the finance concept that measures shareholders’ opportunity costs. The cost of equity is the marginal cost of equity, which is also referred to as the required rate of return on equity. The cost of equity is a marginal cost because it represents the cost of additional equity, whether generated internally or by selling more equity interests. Example 5-1 illustrates, in a stylized setting, the calculation and interpretation of residual income.³

### EXAMPLE 5-1 Calculation of Residual Income

Axis Manufacturing Company, Inc. (AXCI), a very small company in terms of market capitalization, has total assets of €2 million financed 50 percent with debt and 50 percent with equity capital. The cost of debt is 7 percent before taxes; this example assumes that interest is tax deductible, so the after-tax cost of debt is 4.9 percent.⁴ The cost of equity capital is 12 percent. The company has earnings before interest and taxes (EBIT) of €200,000 and a tax rate of 30 percent. Net income for AXCI can be determined as follows:

<table>
<thead>
<tr>
<th>EBIT</th>
<th>€200,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less: Interest Expense</td>
<td>70,000</td>
</tr>
<tr>
<td>Pretax Income</td>
<td>€130,000</td>
</tr>
<tr>
<td>Less: Income Tax Expense</td>
<td>39,000</td>
</tr>
<tr>
<td>Net Income</td>
<td>€91,000</td>
</tr>
</tbody>
</table>

With earnings of €91,000, AXCI is clearly profitable in an accounting sense. But was the company’s profitability adequate return for its owners? Unfortunately, it was not. To incorporate the cost of equity capital, compute residual income. One approach to calculating residual income is to deduct an equity charge (the estimated cost of equity capital in money terms) from net income. Compute the equity charge as follows:

\[
\text{Equity charge} = \text{Equity capital} \times \text{Cost of equity capital} = 1,000,000 \times 12\% = 120,000
\]

³To simplify this introduction, we assume that net income accurately reflects clean surplus accounting, which is explained later in this chapter. The discussions in this chapter assume that companies’ financing only consists of common equity and debt. In the case of a company that also has preferred stock financing, the calculation of residual income would reflect the deduction of preferred stock dividends from net income.

⁴In countries where corporate interest is not tax deductible, the after-tax cost of debt would equal the pretax cost of debt.
As stated, residual income is equal to net income minus the equity charge:

<table>
<thead>
<tr>
<th></th>
<th>Approach 1</th>
<th>Reconciliation</th>
<th>Approach 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>€91,000</td>
<td>Plus the after-tax interest</td>
<td>Net operating</td>
</tr>
<tr>
<td>Less: Equity charge</td>
<td>120,000</td>
<td>expense of €49,000</td>
<td>profit after tax</td>
</tr>
<tr>
<td>Residual income</td>
<td>€(29,000)</td>
<td></td>
<td>€140,000</td>
</tr>
</tbody>
</table>

AXCI did not earn enough to cover the cost of equity capital. As a result, it has negative residual income. Although AXCI is profitable in an accounting sense, it is not profitable in an economic sense.

In Example 5-1, residual income is calculated based on net income and a charge for the cost of equity capital. Analysts will also encounter another approach to calculating residual income that yields the same results under certain assumptions. In this second approach, which takes the perspective of all providers of capital (both debt and equity), a capital charge (the company’s total cost of capital in money terms) is subtracted from the company’s after-tax operating profit. In the case of AXCI in Example 5-1, the capital charge is €169,000:

- Equity charge: 0.12 × €1,000,000 = €120,000
- Debt charge: 0.07(1 – 0.30) × €1,000,000 = 49,000
- Total capital charge: €169,000

The company’s net operating profit after taxes (NOPAT) is €140,000 (€200,000 – 30% taxes). The capital charge of €169,000 is higher than the after-tax operating profit of €140,000 by €29,000, the same figure obtained in Example 5-1.

As illustrated in the following table, both approaches yield the same results in this case because of two assumptions. First, this example assumes that the marginal cost of debt equals the current cost of debt, that is, the cost used to determine net income. Specifically, in this instance, the after-tax interest expense incorporated in net income [€49,000 = €70,000 × (1 – 30%)] is equal to the after-tax cost of debt incorporated into the capital charge. Second, this example assumes that the weights used to calculate the capital charge are derived from the book value of debt and equity. Specifically, it uses the weights of 50 percent debt and 50 percent equity.

<table>
<thead>
<tr>
<th></th>
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<td></td>
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<tr>
<td>Less: Equity charge</td>
<td>120,000</td>
<td>Plus the after-tax capital charge</td>
<td>Less: Capital charge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for debt of €49,000</td>
<td>169,000</td>
</tr>
<tr>
<td>Residual income</td>
<td>€(29,000)</td>
<td>Residual income</td>
<td>€(29,000)</td>
</tr>
</tbody>
</table>

That the company is not profitable in an economic sense can also be seen by comparing the company’s cost of capital to its return on capital. Specifically, the company’s capital charge
is greater than its after-tax return on total assets or capital. The after-tax net operating return on total assets or capital is calculated as profits divided by total assets (or total capital). In this example, the after-tax net operating return on total assets is 7 percent (€140,000/€2,000,000), which is 1.45 percentage points less than the company's effective capital charge of 8.45 percent (€169,000/€2,000,000).

2.1. The Use of Residual Income in Equity Valuation

A company that is generating more income than its cost of obtaining capital—that is, one with positive residual income—is creating value. Conversely, a company that is not generating enough income to cover its cost of capital—that is, a company with negative residual income—is destroying value. Thus, all else equal, higher (lower) residual income should be associated with higher (lower) valuations.

To illustrate the effect of residual income on equity valuation using the case of AXCI presented in Example 5-1, assume the following:

- Initially, AXCI equity is selling for book value of €1 million with 100,000 shares outstanding. Thus, AXCI’s book value per share and initial share price are both €10.
- Earnings per share (EPS) is €0.91 (€91,000/100,000 shares).
- Earnings will continue at the current level indefinitely.
- All net income is distributed as dividends.

Because AXCI is not earning its cost of equity, as shown in Example 5-1, the company’s share price should fall. Given the information, AXCI is destroying €29,000 of value per year, which equals €0.29 per share (€29,000/100,000 shares). Discounted at 12 percent cost of equity, the present value of the perpetuity is €2.42 (€0.29/12%). The current share price minus the present value of the value being destroyed equals €7.58 (€10 – €2.42).

Another way to look at these data is to note that the earnings yield (E/P) for a no-growth company is an estimate of the expected rate of return. Therefore, when price reaches the point at which E/P equals the required rate of return on equity, an investment in the stock is expected to just cover the stock’s required rate of return. With EPS of €0.91, the earnings yield is exactly 12 percent (AXCI’s cost of equity) when its share price is €7.58333 (i.e., €0.91/€7.58333 = 12%). At a share price of €7.58333, the total market value of AXCI’s equity is €758,333. When a company has negative residual income, shares are expected to sell at a discount to book value. In this example, AXCI’s price-to-book ratio (P/B) at this level of discount from book value would be 0.7583. In contrast, if AXCI were earning positive residual income, then its shares should sell at a premium to book value. In summary, higher residual income is expected to be associated with higher market prices (and higher P/Bs), all else being equal.

Residual income (RI) models have been used to value both individual stocks (Fleck et al. 2001) and the Dow Jones Industrial Average (Lee and Swaminathan 1999; Lee et al. 1999). The models have also been proposed as a solution to measuring goodwill impairment by accounting standard setters. Recall that impairment in an accounting context means downward adjustment, and goodwill is an intangible asset that may appear on a company’s balance sheet as a result of its purchase of another company.

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5 After-tax net operating profits as a percent of total assets or capital has been called return on invested capital (ROIC). Residual income can also be calculated as (ROIC – Effective capital charge) × Beginning capital.
Residual income and residual income models have been referred to by a variety of names. Residual income has sometimes been called economic profit because it is an estimate of the profit of the company after deducting the cost of all capital: debt and equity. In forecasting future residual income, the term abnormal earnings is also used. Under the assumption that in the long term the company is expected to earn its cost of capital (from all sources), any earnings in excess of the cost of capital can be termed abnormal earnings. The residual income model has also been called the discounted abnormal earnings model and the Edwards-Bell-Ohlson model after the names of researchers in the field. This chapter focuses on a general residual income model that can be used by analysts using publicly available data and nonproprietary accounting adjustments. A number of commercial implementations of the approach, however, are also very well known. Before returning to the general residual income model in Section 3, we briefly discuss one such commercial implementation and the related concept of market value added.

2.2. Commercial Implementations

One example of several competing commercial implementations of the residual income concept is economic value added (EVA). The previous section illustrated a calculation of residual income starting from net operating profit after taxes, and economic value added takes the same broad approach. Specifically, economic value added is computed as

\[ \text{EVA} = \frac{\text{NOPAT}}{\text{TC}} - (\frac{\text{C}}{\text{TC}} \times \text{TC}) \]  

(5-1)

where

- NOPAT = the company's net operating profit after taxes
- C% = the cost of capital
- TC = total capital

In this model, both NOPAT and TC are determined under generally accepted accounting principles and adjusted for a number of items. Some of the more common adjustments include the following:

- Research and development (R&D) expenses are capitalized and amortized rather than expensed (i.e., R&D expense is added back to earnings to compute NOPAT).
- In the case of strategic investments that are not expected to generate an immediate return, a charge for capital is suspended until a later date.
- Goodwill is capitalized and not amortized (i.e., amortization expense is added back in when calculating NOPAT, and accumulated amortization is added back to capital).
- Deferred taxes are eliminated such that only cash taxes are treated as an expense.
- Any inventory LIFO (last in, first out) reserve is added back to capital, and any increase in the LIFO reserve is added in when calculating NOPAT.
- Operating leases are treated as capital leases, and nonrecurring items are adjusted.

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6The acronym is trademarked by Stern Stewart & Company and is generally associated with a specific set of adjustments proposed by Stern Stewart & Co. The goal of these adjustments is to produce a value that is a good approximation of economic profit. For a complete discussion, see Stewart (1991) and Peterson and Peterson (1996).

7See, for example, Ehrbar (1998).
Because of the adjustments made in calculating EVA, a different numerical result will be obtained, in general, than that resulting from the use of the simple computation presented in Example 5-1. In practice, general (nonbranded) residual income valuation also considers the effect of accounting methods on reported results. Analysts' adjustments to reported accounting results in estimating residual income, however, will generally reflect some differences from the set specified for EVA. Section 5 of this chapter explores accounting considerations in more detail.

Over time, a company must generate economic profit for its market value to increase. A concept related to economic profit (and EVA) is market value added (MVA):

\[
MVA = \text{Market value of the company} - \text{Accounting book value of total capital}
\]  

(5-2)

A company that generates positive economic profit should have a market value in excess of the accounting book value of its capital.

Research on the ability of value-added concepts to explain equity value and stock returns has reached mixed conclusions. Peterson and Peterson (1996) found that value-added measures are slightly more highly correlated with stock returns than are traditional measures, such as return on assets and return on equity. Bernstein and Pigler (1997) and Bernstein, Bayer, and Pigler (1998) found that value-added measures are no better at predicting stock performance than are such measures as earnings growth.

A variety of commercial models related to the residual income concept have been marketed by other major accounting and consulting firms. Interestingly, the application focus of these models is not, in general, equity valuation. Rather, these implementations of the residual income concept are marketed primarily for measuring internal corporate performance and determining executive compensation.

3. THE RESIDUAL INCOME MODEL

In Section 2, we discussed the concept of residual income and briefly introduced the relationship of residual income to equity value. In the long term, companies that earn more than the cost of capital should sell for more than book value, and companies that earn less than the cost of capital should sell for less than book value. The **residual income model** of valuation analyzes the intrinsic value of equity as the sum of two components:

1. The current book value of equity.
2. The present value of expected future residual income.

Note that when the change is made from valuing total shareholders' equity to directly valuing an individual common share, earnings per share rather than net income is used. According to the residual income model, the intrinsic value of common stock can be expressed as follows:

\[
V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{E_t - rB_{t-1}}{(1+r)^t}
\]

(5-3)

where

\[
\begin{align*}
V_0 & = \text{value of a share of stock today (} t = 0 \text{)} \\
B_0 & = \text{current per-share book value of equity} \\
B_t & = \text{expected per-share book value of equity at any time } t \\
r & = \text{required rate of return on equity investment (cost of equity)}
\end{align*}
\]
\[ E_t = \text{expected EPS for period } t \]
\[ \text{RI}_t = \text{expected per-share residual income, equal to } E_t - rB_{t-1} \]

The per-share residual income in period \( t \), \( \text{RI}_t \), is the EPS for the period, \( E_t \), minus the per-share equity charge for the period, which is the required rate of return on equity times the book value per share at the beginning of the period, or \( rB_{t-1} \). Whenever earnings per share exceed the per-share cost of equity, per-share residual income is positive; and whenever earnings are less, per-share residual income is negative. Example 5-2 illustrates the calculation of per-share residual income.

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**EXAMPLE 5-2 Per-Share Residual Income Forecasts**

David Smith is evaluating the expected residual income as of the end of September 2007 of Carrefour SA (NYSE Euronext Paris: FR0000120172), a France-based operator of hypermarkets and other store formats in Europe, the Americas, and Asia. Using an adjusted beta of 0.72 relative to the CAC 40 Index, a 10-year government bond yield of 4.3 percent, and an estimated equity risk premium of 7 percent, Smith uses the capital asset pricing model (CAPM) to estimate Carrefour’s required rate of return, \( r \), at 9.3 percent [4.3 percent + 0.72(7 percent)]. Smith obtains the following data from Bloomberg as of the close on 24 September 2007:

<table>
<thead>
<tr>
<th>Current market price</th>
<th>€48.83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book value per share as of 31 December 2006</td>
<td>€13.46</td>
</tr>
<tr>
<td>Consensus annual earnings estimates</td>
<td></td>
</tr>
<tr>
<td>FY 2007 (ending December)</td>
<td>€2.71</td>
</tr>
<tr>
<td>FY 2008</td>
<td>€2.86</td>
</tr>
<tr>
<td>Annualized dividend per share forecast</td>
<td></td>
</tr>
<tr>
<td>FY 2007</td>
<td>€1.03</td>
</tr>
<tr>
<td>FY 2008</td>
<td>€1.06</td>
</tr>
</tbody>
</table>

What is the forecast residual income for fiscal years ended December 2007 and December 2008?

**Solution:** Forecasted residual income and calculations are shown in Exhibit 5-1.

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**EXHIBIT 5-1 Carrefour SA**

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasting book value per share</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginning book value ( (B_{t-1}) )</td>
<td>€13.46</td>
<td>€15.14</td>
</tr>
<tr>
<td>Earnings per share forecast ( (E_t) )</td>
<td>€2.71</td>
<td>€2.86</td>
</tr>
<tr>
<td>Less dividend forecast ( (D_t) )</td>
<td>1.03</td>
<td>1.06</td>
</tr>
</tbody>
</table>
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The use of Equation 5-3, the expression for the estimated intrinsic value of common stock, is illustrated in Example 5-3.

### EXAMPLE 5-3  Using the Residual Income Model (1)

Bugg Properties’ expected EPS is $2.00, $2.50, and $4.00 for the next three years. Analysts expect that Bugg will pay dividends of $1.00, $1.25, and $1.25 for the three years. The last dividend is anticipated to be a liquidating dividend; analysts expect Bugg will cease operations after year 3. Bugg’s current book value is $6.00 per share, and its required rate of return on equity is 10 percent.

1. Calculate per-share book value and residual income for the next three years.
2. Estimate the stock’s value using the residual income model given in Equation 5-3:

   \[ V_0 = B_0 + \sum_{t=1}^{\infty} \frac{E_t - rB_{t+1}}{(1+r)^t} \]

3. Confirm your valuation estimate in question 2 by using the discounted dividend approach (i.e., estimating the value of a share as the present value of expected future dividends).
**Solution to 1:** The book value and residual income for the next three years are shown in Exhibit 5-2.

**EXHIBIT 5-2**  Bugg Properties

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning book value per share ($B_{t-1}$)</td>
<td>$6.00</td>
<td>$7.00</td>
<td>$8.25</td>
</tr>
<tr>
<td>Net income per share (EPS)</td>
<td>2.00</td>
<td>2.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Less dividends per share ($D$)</td>
<td>1.00</td>
<td>1.25</td>
<td>12.25</td>
</tr>
<tr>
<td>Change in retained earnings (EPS – $D$)</td>
<td>1.00</td>
<td>1.25</td>
<td>–8.25</td>
</tr>
<tr>
<td>Ending book value per share ($B_{t-1} +$ EPS – $D$)</td>
<td>$7.00</td>
<td>$8.25</td>
<td>$0.00</td>
</tr>
<tr>
<td>Net income per share (EPS)</td>
<td>2.00</td>
<td>2.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Less per-share equity charge ($rB_{t-1}$)</td>
<td>0.60</td>
<td>0.70</td>
<td>0.825</td>
</tr>
<tr>
<td>Residual income (EPS – Equity charge)</td>
<td>$1.40</td>
<td>$1.80</td>
<td>$3.175</td>
</tr>
</tbody>
</table>

**Solution to 2:** The value using the residual income model is

\[
V_0 = 6.00 + \frac{1.40}{(1.10)} + \frac{1.80}{(1.10)^2} + \frac{3.175}{(1.10)^3} \\
= 6.00 + 1.2727 + 1.4876 + 2.3854 \\
= $11.15
\]

**Solution to 3:** The value using a discounted dividend approach is

\[
V_0 = \frac{1.00}{(1.10)} + \frac{1.25}{(1.10)^2} + \frac{12.25}{(1.10)^3} \\
= 0.9091 + 1.0331 + 9.2036 \\
= $11.15
\]

Example 5-3 illustrates two important points about residual income models. First, the RI model is fundamentally similar to other valuation models, such as the dividend discount model (DDM), and given consistent assumptions will yield equivalent results. Second, recognition of value typically occurs earlier in RI models than in DDM. In Example 5-3, the RI model attributes $6.00 of the $11.15 total value to the first time period. In contrast, the DDM model attributes $9.2036 of the $11.15 total value to the final time period. The rest of Section 3 develops the most familiar general expression for the RI model and illustrates the model’s application.
3.1. The General Residual Income Model

The residual income model has a clear relationship to other valuation models, such as the dividend discount model. In fact, the residual income model given in Equation 5-3 can be derived from the DDM. The general expression for the DDM is

\[ V_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \ldots \]

The clean surplus relation states the relationship among earnings, dividends, and book value as follows:

\[ B_t = B_{t-1} + E_t - D_t \]

In other words, the ending book value of equity equals the beginning book value plus earnings minus dividends, apart from ownership transactions. The condition that income (earnings) reflects all changes in the book value of equity other than ownership transactions is known as clean surplus accounting. By rearranging the clean surplus relation, the dividend for each period can be viewed as the net income minus the earnings retained for the period, or net income minus the increase in book value:

\[ D_t = E_t + B_{t-1} - B_t \]

Substituting \( B_{t-1} - B_t \) for \( D_t \) in the expression for \( V_0 \) results in:

\[ V_0 = E_1 + \frac{B_0 - B_1}{(1+r)^1} + \frac{E_2 + B_1 - B_2}{(1+r)^2} + \frac{E_3 + B_2 - B_3}{(1+r)^3} + \ldots \]

Expressed with summation notation, the following equation restates the residual income model given in Equation 5-3:

\[ V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{E_t - rB_{t-1}}{(1+r)^t} \]

According to the expression, the value of a stock equals its book value per share plus the present value of expected future per-share residual income. Note that when the present value of expected future per-share residual income is positive (negative), intrinsic value, \( V_0 \), is greater (smaller) than book value per share, \( B_0 \).

The residual income model used in practice today has its origins largely in the academic work of Ohlson (1995) and Feltham and Ohlson (1995) along with the earlier work of Edwards and Bell (1961), although in the United States this method has been used to value small businesses in tax cases since the 1920s. In tax valuation, the method is known as the excess earnings method. For example, see Hitchner (2006) and U.S. IRS Revenue Ruling 68-609.

\[ \text{Equation 5-4 is equivalent to the expressions for } V_0 \text{ given earlier because in any year, } t, \]

\[ RI_t = (\text{ROE}_t - r)B_{t-1}. \]

Other than the required rate of return on common stock, the inputs

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8In tax valuation, the method is known as the excess earnings method. For example, see Hitchner (2006) and U.S. IRS Revenue Ruling 68-609.

9See, for example, Hirst and Hopkins (2000).
to the residual income model come from accounting data. Note that return on equity (ROE) in this context uses beginning book value of equity in the denominator, whereas in financial statement analysis ROE is frequently calculated using the average book value of equity in the denominator. Example 5-4 illustrates the estimation of value using Equation 5-4.

**EXAMPLE 5-4 Using the Residual Income Model (2)**

To recap the data from Example 5-3, Bugg Properties has expected earnings per share of $2.00, $2.50, and $4.00 and expected dividends per share of $1.00, $1.25, and $12.25 for the next three years. Analysts expect that the last dividend will be a liquidating dividend and that Bugg will cease operating after year 3. Bugg’s current book value per share is $6.00, and its estimated required rate of return on equity is 10 percent.

Using this data, estimate the value of Bugg Properties’ stock using a residual income model of the form:

\[
V_0 = B_0 + \sum_{t=1}^{\infty} \frac{(\text{ROE}_t - r)B_{t-1}}{(1+r)^t}
\]

**Solution:** To value the stock, forecast residual income. Exhibit 5-3 illustrates the calculation of residual income. (Note that Exhibit 5-3 arrives at the same estimates of residual income as Exhibit 5-2 in Example 5-3.)

**EXHIBIT 5-3 Bugg Properties**

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings per share</td>
<td>$2.00</td>
<td>$2.50</td>
<td>$4.00</td>
</tr>
<tr>
<td>Divided by beginning book value per share</td>
<td>$6.00</td>
<td>$7.00</td>
<td>$8.25</td>
</tr>
<tr>
<td>ROE</td>
<td>0.3333</td>
<td>0.3571</td>
<td>0.4848</td>
</tr>
<tr>
<td>Less required rate of return on equity</td>
<td>-0.1000</td>
<td>-0.1000</td>
<td>-0.1000</td>
</tr>
<tr>
<td>Abnormal rate of return (ROE - r)</td>
<td>0.2333</td>
<td>0.2571</td>
<td>0.3848</td>
</tr>
<tr>
<td>Multiply by beginning book value per share</td>
<td>$6.00</td>
<td>$7.00</td>
<td>$8.25</td>
</tr>
<tr>
<td>Residual income (ROE - r) × Beginning BV</td>
<td>$1.400</td>
<td>$1.800</td>
<td>$3.175</td>
</tr>
</tbody>
</table>

Estimate the stock value as follows:

\[
V_0 = 6.00 + \frac{1.40}{(1.10)^1} + \frac{1.80}{(1.10)^2} + \frac{3.175}{(1.10)^3} = 6.00 + 1.2727 + 1.4876 + 2.3854 = $11.15
\]

Note that the value is identical to the estimate obtained using Equation 5-3, as illustrated in Example 5-3, because the assumptions are the same and Equations 5-3 and 5-4 are equivalent expressions:

\[
V_0 = B_0 + \sum_{t=1}^{\infty} \frac{E_t - rB_{t-1}}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{(\text{ROE}_t - r)B_{t-1}}{(1+r)^t}
\]

**Equation 3**

**Equation 4**
Chapter 5  Residual Income Valuation

Example 5-4 shows that residual income value can be estimated using current book value, forecasts of earnings, forecasts of book value, and an estimate of the required rate of return on equity. The forecasts of earnings and book value translate into ROE forecasts.

EXAMPLE 5-5  Valuing a Company Using the General Residual Income Model

Robert Sumargo, an equity analyst, is considering the valuation of Cisco Systems (NASDAQ-GS: CSCO), which closed at $28.02 on 11 December 2007. Sumargo notes that in general CSCO had a fairly high ROE during the past 10 years and that consensus analyst forecasts for EPS for the next two fiscal years reflect an expected ROE of around 29 percent. Sumargo expects that a high ROE may not be sustainable in the future. Sumargo usually takes a present value approach to valuation. As of the date of the valuation, CSCO does not pay dividends; although a discounted dividend valuation is possible, Sumargo does not feel confident about predicting the date of a dividend initiation. He decides to apply the residual income model to value CSCO, and uses the following data and assumptions:

- According to the CAPM, CSCO has a required rate of return of approximately 10.5 percent.
- CSCO's book value per share on 28 July 2007 was $5.02.
- ROE is expected to be 29 percent for fiscal year-end July 2008. Because of competitive pressures, Sumargo expects CSCO's ROE to decline in the following years and incorporates an assumed decline of slightly less than 1 percent (0.9 percent) each year until it reaches the CAPM required rate of return.
- CSCO does not currently pay a dividend. Sumargo does not expect the company to pay a dividend in the foreseeable future, so all earnings will be reinvested. In addition, Sumargo expects that share repurchases will approximately offset new share issuances.

Compute the value of CSCO using the residual income model (Equation 5-4).

Solution: Book value per share is initially $5.02. Based on an ROE forecast of 29 percent in the first year, the forecast EPS would be $1.46. Because no dividends are paid and the clean surplus relation is assumed to hold, book value at the end of the period is forecast to be $6.48 ($5.02 + $1.46). For 2008, residual income is measured as projected EPS of $1.46 minus an equity charge of $0.53, or $0.93. This is equivalent to the beginning book value per share of $5.02 times the difference between ROE of 29 percent and $r$ of 10.5 percent [i.e., $5.02(0.29 - 0.105) = $0.93]. The present value of $0.93 at 10.5 percent for one year is $0.84. This process is continued year by year as presented in Exhibit 5-4. The value of CSCO using this residual income model would be the present value of each year's residual income plus the current book value per share. Because residual income is zero starting in 2029, no forecast is required beyond that period. The estimated value under this model is $27.79, as shown in Exhibit 5-4.
EXHIBIT 5-4  Valuation of CSCO Using the Residual Income Model

<table>
<thead>
<tr>
<th>Year</th>
<th>Projected Income EPS</th>
<th>Projected Dividend per Share</th>
<th>Book Value per Share</th>
<th>ROE (based on beginning book value)</th>
<th>Cost of Equity Charge</th>
<th>Equity Charge</th>
<th>Residual Income (RI)</th>
<th>PV of BV and RI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>$1.46</td>
<td>$0.00</td>
<td>$6.48</td>
<td>29.0%</td>
<td>10.5%</td>
<td>$0.53</td>
<td>$0.93</td>
<td>0.84</td>
</tr>
<tr>
<td>2009</td>
<td>1.82</td>
<td>0.00</td>
<td>8.30</td>
<td>28.1</td>
<td>10.5</td>
<td>0.68</td>
<td>1.14</td>
<td>0.93</td>
</tr>
<tr>
<td>2010</td>
<td>2.26</td>
<td>0.00</td>
<td>10.56</td>
<td>27.2</td>
<td>10.5</td>
<td>0.87</td>
<td>1.39</td>
<td>1.03</td>
</tr>
<tr>
<td>2011</td>
<td>2.78</td>
<td>0.00</td>
<td>13.34</td>
<td>26.3</td>
<td>10.5</td>
<td>1.11</td>
<td>1.67</td>
<td>1.12</td>
</tr>
<tr>
<td>2012</td>
<td>3.39</td>
<td>0.00</td>
<td>16.73</td>
<td>25.4</td>
<td>10.5</td>
<td>1.40</td>
<td>1.99</td>
<td>1.21</td>
</tr>
<tr>
<td>2013</td>
<td>4.10</td>
<td>0.00</td>
<td>20.83</td>
<td>24.5</td>
<td>10.5</td>
<td>1.76</td>
<td>2.34</td>
<td>1.29</td>
</tr>
<tr>
<td>2014</td>
<td>4.91</td>
<td>0.00</td>
<td>25.74</td>
<td>23.6</td>
<td>10.5</td>
<td>2.19</td>
<td>2.73</td>
<td>1.36</td>
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<td>2015</td>
<td>5.84</td>
<td>0.00</td>
<td>31.58</td>
<td>22.7</td>
<td>10.5</td>
<td>2.70</td>
<td>3.14</td>
<td>1.41</td>
</tr>
<tr>
<td>2016</td>
<td>6.89</td>
<td>0.00</td>
<td>38.47</td>
<td>21.8</td>
<td>10.5</td>
<td>3.32</td>
<td>3.57</td>
<td>1.45</td>
</tr>
<tr>
<td>2017</td>
<td>8.04</td>
<td>0.00</td>
<td>46.51</td>
<td>20.9</td>
<td>10.5</td>
<td>4.04</td>
<td>4.00</td>
<td>1.47</td>
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<tr>
<td>2018</td>
<td>9.30</td>
<td>0.00</td>
<td>55.81</td>
<td>20.0</td>
<td>10.5</td>
<td>4.88</td>
<td>4.42</td>
<td>1.47</td>
</tr>
<tr>
<td>2019</td>
<td>10.66</td>
<td>0.00</td>
<td>66.47</td>
<td>19.1</td>
<td>10.5</td>
<td>5.86</td>
<td>4.80</td>
<td>1.45</td>
</tr>
<tr>
<td>2020</td>
<td>12.10</td>
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<td>78.57</td>
<td>18.2</td>
<td>10.5</td>
<td>6.98</td>
<td>5.12</td>
<td>1.40</td>
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<tr>
<td>2021</td>
<td>13.59</td>
<td>0.00</td>
<td>92.16</td>
<td>17.3</td>
<td>10.5</td>
<td>8.25</td>
<td>5.34</td>
<td>1.32</td>
</tr>
<tr>
<td>2022</td>
<td>15.11</td>
<td>0.00</td>
<td>107.28</td>
<td>16.4</td>
<td>10.5</td>
<td>9.68</td>
<td>5.44</td>
<td>1.22</td>
</tr>
<tr>
<td>2023</td>
<td>16.63</td>
<td>0.00</td>
<td>123.91</td>
<td>15.5</td>
<td>10.5</td>
<td>11.26</td>
<td>5.36</td>
<td>1.09</td>
</tr>
<tr>
<td>2024</td>
<td>18.09</td>
<td>0.00</td>
<td>142.00</td>
<td>14.6</td>
<td>10.5</td>
<td>13.01</td>
<td>5.08</td>
<td>0.93</td>
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<tr>
<td>2025</td>
<td>19.45</td>
<td>0.00</td>
<td>161.45</td>
<td>13.7</td>
<td>10.5</td>
<td>14.91</td>
<td>4.54</td>
<td>0.75</td>
</tr>
<tr>
<td>2026</td>
<td>20.67</td>
<td>0.00</td>
<td>182.11</td>
<td>12.8</td>
<td>10.5</td>
<td>16.95</td>
<td>3.71</td>
<td>0.56</td>
</tr>
<tr>
<td>2027</td>
<td>21.67</td>
<td>0.00</td>
<td>203.79</td>
<td>11.9</td>
<td>10.5</td>
<td>19.12</td>
<td>2.55</td>
<td>0.35</td>
</tr>
<tr>
<td>2028</td>
<td>22.42</td>
<td>0.00</td>
<td>226.20</td>
<td>11.0</td>
<td>10.5</td>
<td>21.40</td>
<td>1.02</td>
<td>0.13</td>
</tr>
<tr>
<td>2029</td>
<td>23.75</td>
<td>0.00</td>
<td>249.95</td>
<td>10.5</td>
<td>10.5</td>
<td>23.75</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$27.79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: PV is present value and BV is book value. This table was created in Excel, so numbers may differ from what will be obtained using a calculator, because of rounding.

Example 5-5 refers to the assumption of clean surplus accounting. The residual income model, as stated earlier, assumes clean surplus accounting. The clean surplus accounting assumption is illustrated in Exhibit 5-4, for example, in which ending book value per share is computed as beginning book value plus net income minus dividends. Under International Financial Reporting Standards (IFRS) and U.S. generally accepted accounting principles (U.S. GAAP), several items of income and expense occurring during a period, such as
changes in the market value of certain securities, bypass the income statement and affect a company’s book value of equity directly.\textsuperscript{10} Strictly speaking, residual income models involve all items of income and expense (income under clean surplus accounting). If an analyst can reliably estimate material differences from clean surplus accounting expected in the future, an adjustment to net income may be appropriate. Section 5.1 explores violations of the clean surplus accounting assumption in more detail.

3.2. Fundamental Determinants of Residual Income

In general, the residual income model makes no assumptions about future earnings and dividend growth. If constant earnings and dividend growth are assumed, a version of the residual income model that usefully illustrates the fundamental drivers of residual income can be derived. The following expression is used for justified price-to-book ratio (P/B) based on forecasted fundamentals, assuming the Gordon (constant growth) DDM and the sustainable growth rate equation,

\[ g = b \times ROE \]

which is mathematically equivalent to:

\[ \frac{P_0}{B_0} = 1 + \frac{ROE - r}{r - g} \]

The justified price is the stock’s intrinsic value \((P_0 = V_0)\). Therefore, using the previous equation and remembering that residual income is earnings less the cost of equity, or \((ROE \times B_0) - (r \times B_0)\), a stock’s intrinsic value under the residual income model, assuming constant growth, can be expressed as:

\[ V_0 = B_0 + \frac{ROE - r}{r - g} B_0 \]  \hspace{1cm} (5-5)

Under this model, the estimated value of a share is the book value per share \((B_0)\) plus the present value \([(ROE - r)B_0/(r - g)]\) of the expected stream of residual income. In the case of a company for which ROE exactly equals the cost of equity, the intrinsic value is equal to the book value per share. Equation 5-5 is considered a single-stage (or constant-growth) residual income model.

In an ideal world, where the book value of equity represents the fair value of net assets and clean surplus accounting prevails, the term \(B_0\) reflects the value of assets owned by the company less its liabilities. The second term, \((ROE - r)B_0/(r - g)\), represents additional value expected because of the company’s ability to generate returns in excess of its cost of equity; the second term is the present value of the company’s expected economic profits.

\textsuperscript{10} Under IFRS, income and expense items that bypass the income statement include revaluation surpluses, particularly gains and losses arising from translating the financial statements of a foreign operation, and gains or losses on remeasuring available-for-sale financial assets. In U.S. financial statements, items that bypass the income statement (dirty surplus items) are referred to as other comprehensive income (OCI). The relationship is Comprehensive income = Net income + Other comprehensive income.

\textsuperscript{11} Note that the sustainable growth rate formula itself can be derived from the clean surplus relation.
Unfortunately, both U.S. and international accounting rules allow companies to exclude some liabilities from their balance sheets, and neither set of rules reflects the fair value of many corporate assets. Internationally, however, a move toward fair value accounting is occurring, particularly for financial assets. Further, controversies, such as the failure of Enron Corporation in the United States, have highlighted the importance of identifying off-balance-sheet financing techniques.

The residual income model is most closely related to the P/B ratio. A stock’s justified P/B ratio is directly related to expected future residual income. Another closely related concept is Tobin’s \( q \), the ratio of the market value of debt and equity to the replacement cost of total assets:\[12\]

\[
Tobin’s \ q = \frac{\text{Market value of debt and equity}}{\text{Replacement cost of total assets}}
\]

Although similar to P/B, Tobin’s \( q \) also has some obvious differences. The numerator includes the market value of total capital (debt as well as equity). The denominator uses total assets rather than equity. Further, assets are valued at replacement cost rather than at historical accounting cost; replacement costs take into account the effects of inflation. All else equal, Tobin’s \( q \) is expected to be higher the greater the productivity of a company’s assets.\[13\]

One difficulty in computing Tobin’s \( q \) is the lack of information on the replacement cost of assets. If available, market values of assets or replacement costs can be more useful in a valuation than historical costs.

### 3.3. Single-Stage Residual Income Valuation

The single-stage (constant-growth) residual income model assumes that a company has a constant return on equity and constant earnings growth rate through time. This model was given in Equation 5-5:

\[
V_0 = B_0 + \frac{ROE - r}{r - g} B_0
\]

**EXAMPLE 5-6 Single-Stage Residual Income Model (1)**

Joseph Yoh is evaluating a purchase of Canon, Inc. (NYSE: CAJ). Current book value per share is $18.81, and the current price per share is $51.90 (from Value Line, 2 November 2007). Yoh expects long-term ROE to be 16 percent and long-term growth to be 8 percent. Assuming a cost of equity of 11 percent, what is the intrinsic value of Canon stock calculated using a single-stage residual income model?

**Solution:**

\[
V_0 = 18.81 + \frac{0.16 - 0.11}{0.11 - 0.08} (18.81)
\]

\[= 50.16\]

---

\[12\] See Tobin (1969) or more recent work such as Landsman and Shapiro (1995).

\[13\] Tobin theorized that \( q \) would average to 1 for all companies because the economic rents or profits earned by assets would average to zero.
Similar to the Gordon growth DDM, the single-stage RI model can be used to assess the market expectations of residual income growth—that is, an implied growth rate—by inputting the current price into the model and solving for $g$.

**EXAMPLE 5-7 Single-Stage Residual Income Model (2)**

Joseph Yoh is curious about the market-perceived growth rate, given that he is comfortable with his other inputs. By using the current price per share of $51.90 for Canon, Yoh solves the following equation for $g$:

$$51.90 = 18.81 + \frac{0.16 - 0.11}{0.11 - g} (18.81)$$

He finds an implied growth rate of 8.16 percent.

In Examples 5-6 and 5-7, the company was valued at more than twice its book value because its ROE exceeded its cost of equity. If ROE was equal to the cost of equity, the company would be valued at book value. If ROE was lower than the cost of equity, the company would have negative residual income and be valued at less than book value. (When a company has no prospect of being able to cover its cost of capital, a liquidation of the company and redeployment of assets may be appropriate.)

In many applications, a drawback to the single-stage model is that it assumes the excess ROE above the cost of equity will persist indefinitely. More likely, a company's ROE will revert to a mean value of ROE over time, and at some point, the company's residual income will be zero. If a company or industry has an abnormally high ROE, other companies will enter the marketplace, thus increasing competition and lowering returns for all companies. Similarly, if an industry has a low ROE, companies will exit the industry (through bankruptcy or otherwise) and ROE will tend to rise over time. As with the single-stage DDM, the single-stage residual income model also assumes a constant growth rate through time.

In light of these considerations, the residual income model has been adapted in practice to handle declining residual income. For example, Lee and Swaminathan (1999) and Lee, Myers, and Swaminathan (1999) used a residual income model to value the Dow 30 by assuming that ROE fades (reverts) to the industry mean over time. Lee and Swaminathan found that the residual income model had more ability than traditional price multiples to predict future returns. Fortunately, other models are available that enable analysts to relax the assumption of indefinite persistence of excess returns. The following section describes a multistage residual income model.

### 3.4. Multistage Residual Income Valuation

As with other valuation approaches, such as DDM and free cash flow, a multistage residual income approach can be used to forecast residual income for a certain time horizon and then estimate a terminal value based on continuing residual income at the end of that time horizon. **Continuing residual income** is residual income after the forecast horizon. As with other valuation models, the forecast horizon for the initial stage should be based on the ability to explicitly forecast inputs in the model. Because ROE has been found to revert to mean levels over time and may decline to the cost of equity in a competitive environment, residual
income approaches often model ROE fading toward the cost of equity. As ROE approaches the cost of equity, residual income approaches zero. An ROE equal to the cost of equity would result in residual income of zero.

In residual income valuation, the current book value often captures a large portion of total value, and the terminal value may not be a large component of total value because book value is larger than the periodic residual income and because ROE may fade over time toward the cost of equity. This contrasts with other multistage approaches (DDM and DCF), in which the present value of the terminal value is frequently a significant portion of total value.

Analysts make a variety of assumptions concerning continuing residual income. Frequently, one of the following assumptions is made:

- Residual income continues indefinitely at a positive level.
- Residual income is zero from the terminal year forward.
- Residual income declines to zero as ROE reverts to the cost of equity through time.
- Residual income reflects the reversion of ROE to some mean level.

The following examples illustrate several of these assumptions.

One finite-horizon model of residual income valuation assumes that at the end of time horizon \( T \), a certain premium over book value \((P_T - B_T)\) exists for the company, in which case, current value equals the following (Bauman 1999):

\[
V_0 = B_0 + \sum_{t=0}^{T} \frac{(E_t - rB_{t-1})}{(1+r)^t} + \frac{P_T - B_T}{(1+r)^T}
\]  

(5-6)

Alternatively,

\[
V_0 = B_0 + \sum_{t=1}^{T} \frac{(\text{ROE}_t - r)B_{t-1}}{(1+r)^t} + \frac{P_T - B_T}{(1+r)^T}
\]

(5-7)

The last component in both specifications represents the premium over book value at the end of the forecast horizon. The longer the forecast period, the greater the chance that the company’s residual income will converge to zero. For long forecast periods, this last term may be treated as zero. For shorter forecast periods, a forecast of the premium should be calculated.

EXAMPLE 5-8 Multistage Residual Income Model (1)

Diana Rosato, CFA, is considering an investment in Taiwan Semiconductor Manufacturing Ltd., a manufacturer and marketer of integrated circuits. Listed on the Taiwan Stock Exchange (Code: 2330), the company’s stock is also traded on the New York Stock Exchange (NYSE: TSM). Rosato obtained the following facts and estimates as of early 2007:

- Current price equals TW$62.9.
- Cost of equity (COE) equals 15 percent.
- Taiwan Semiconductor’s ROE has ranged from 18.4 percent to 22.7 percent during the period 2004–2006, which reflects a recovery from the difficult period of 2001–2003, when ROE averaged 7.1 percent.
• In 2005 the company instituted a cash dividend of TWD2.9846 for 2006.
• Book value per share was TWD19.59 at the end of 2006.
• Rosato expects Taiwan Semiconductor’s ROE to be 25 percent from 2009 through 2016 and then decline to 20 percent through 2026.
• For the period after 2008, Rosato assumes an earnings retention ratio of 70 percent.
• Rosato assumes that after 2026, ROE will be 15 percent and residual income will be zero; therefore, the terminal value would be zero. Rosato’s residual income model is shown in Exhibit 5-5.

**EXHIBIT 5-5  Taiwan Semiconductor**

<table>
<thead>
<tr>
<th>Year</th>
<th>Book Value (TWD)</th>
<th>Projected Income (TWD)</th>
<th>Dividend per Share (TWD)</th>
<th>Forecasted ROE (beg. equity, %)</th>
<th>COE (%)</th>
<th>COE (TWD)</th>
<th>Residual Income (TWD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>19.5900</td>
<td></td>
<td></td>
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<td>19.59</td>
</tr>
<tr>
<td>2007</td>
<td>20.8460</td>
<td>4.2560</td>
<td>3.0000</td>
<td>21.73</td>
<td>15.00</td>
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<td>2008</td>
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<td>5.5560</td>
<td>3.2840</td>
<td>26.65</td>
<td>15.00</td>
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<td>1.7339</td>
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<td>3.4677</td>
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<td>25.00</td>
<td>15.00</td>
<td>4.7876</td>
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<td>2012</td>
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<td>9.3757</td>
<td>2.8127</td>
<td>25.00</td>
<td>15.00</td>
<td>5.6254</td>
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<td>2013</td>
<td>51.7773</td>
<td>11.0164</td>
<td>3.3049</td>
<td>25.00</td>
<td>15.00</td>
<td>6.6099</td>
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<td>2014</td>
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<td>12.9443</td>
<td>3.8833</td>
<td>25.00</td>
<td>15.00</td>
<td>7.7666</td>
<td>5.1777</td>
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<td>2015</td>
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<td>15.2096</td>
<td>4.5629</td>
<td>25.00</td>
<td>15.00</td>
<td>9.1258</td>
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<td>17.8713</td>
<td>5.3614</td>
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<td>15.00</td>
<td>10.7228</td>
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<td>2017</td>
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<td>16.7990</td>
<td>5.0397</td>
<td>20.00</td>
<td>15.00</td>
<td>12.5992</td>
<td>4.1997</td>
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<td>2018</td>
<td>109.1598</td>
<td>19.1509</td>
<td>5.7453</td>
<td>20.00</td>
<td>15.00</td>
<td>14.3631</td>
<td>4.7877</td>
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<tr>
<td>2019</td>
<td>124.4422</td>
<td>21.8320</td>
<td>6.5496</td>
<td>20.00</td>
<td>15.00</td>
<td>16.3740</td>
<td>5.4580</td>
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<td>2020</td>
<td>141.8641</td>
<td>24.8884</td>
<td>7.4665</td>
<td>20.00</td>
<td>15.00</td>
<td>18.6663</td>
<td>6.2221</td>
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<tr>
<td>2021</td>
<td>161.7251</td>
<td>28.3728</td>
<td>8.5118</td>
<td>20.00</td>
<td>15.00</td>
<td>21.2796</td>
<td>7.0932</td>
</tr>
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<td>2022</td>
<td>184.3666</td>
<td>32.3450</td>
<td>9.7035</td>
<td>20.00</td>
<td>15.00</td>
<td>24.2588</td>
<td>8.0863</td>
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<td>2023</td>
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<td>36.8733</td>
<td>11.0620</td>
<td>20.00</td>
<td>15.00</td>
<td>27.6550</td>
<td>9.2183</td>
</tr>
<tr>
<td>2024</td>
<td>239.6029</td>
<td>42.0356</td>
<td>12.6107</td>
<td>20.00</td>
<td>15.00</td>
<td>31.5267</td>
<td>10.5089</td>
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<tr>
<td>2025</td>
<td>273.1473</td>
<td>47.9206</td>
<td>14.3762</td>
<td>20.00</td>
<td>15.00</td>
<td>35.9404</td>
<td>11.9801</td>
</tr>
<tr>
<td>2026</td>
<td>311.3879</td>
<td>54.6295</td>
<td>16.3888</td>
<td>20.00</td>
<td>15.00</td>
<td>40.9721</td>
<td>13.6574</td>
</tr>
</tbody>
</table>

Terminal Premium = 0.00

**Present value TWD 44.38**
• The market price of TWD62.9 exceeds the estimated value of TWD44.38. The market price reflects higher forecasts of residual income during the period to 2026, a higher terminal premium than Rosato forecasts, and/or a lower cost of equity. If Rosato is confident in her forecasts she may conclude that the company is overvalued in the current marketplace.

Lee and Swaminathan (1999) and Lee, Myers, and Swaminathan (1999) have presented a residual income model based on explicit forecasts of residual income for three years. Thereafter, ROE is forecast to fade to the industry mean value of ROE. The terminal value at the end of the forecast horizon \( T \) is estimated as the terminal-year residual income discounted in perpetuity. Lee and Swaminathan stated that this assumes any growth in earnings after \( T \) is value neutral. Exhibit 5-6 presents sector ROE data from Hemscott Americas, retrieved from Yahoo.com. (ROE data for specific industries can be retrieved from the same source.) In forecasting a fading ROE, the analyst should also consider any trends in industry ROE.

### EXHIBIT 5-6  U.S. Sector ROEs

<table>
<thead>
<tr>
<th>Sectors</th>
<th>ROE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>23.21</td>
</tr>
<tr>
<td>Conglomerates</td>
<td>20.10</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>20.83</td>
</tr>
<tr>
<td>Financial</td>
<td>20.22</td>
</tr>
<tr>
<td>Health Care</td>
<td>15.49</td>
</tr>
<tr>
<td>Industrial Goods</td>
<td>17.37</td>
</tr>
<tr>
<td>Services</td>
<td>14.55</td>
</tr>
<tr>
<td>Technology</td>
<td>14.37</td>
</tr>
<tr>
<td>Utilities</td>
<td>14.44</td>
</tr>
</tbody>
</table>


### EXAMPLE 5-9 Multistage Residual Income Model (2)

Rosato’s supervisor questions her assumption that Taiwan Semiconductor will have no premium at the end of her forecast period. Rosato assesses the effect of a terminal value based on a perpetuity of year 2026 residual income. She computes the following terminal value:

\[
TV = \frac{TWD13.6574}{0.15} = TWD91.0491
\]

The present value of this terminal value is as follows:

\[
PV = \frac{TWD91.04901}{(1.15)^{20}} = TWD5.5631
\]
Adding TWD5.56 to the previous value of TWD44.38 (for which the terminal value was zero) yields a total value of TWD49.94. Because the current market price of TWD62.9 is greater than TWD49.94, market participants expect a positive continuing residual income at an even higher level than her new assumptions, and/or are forecasting a higher interim ROE. Again, if Rosato is confident in her forecasts, she may conclude that the company is overvalued.

Another multistage model assumes that ROE fades over time to the cost of equity. In this approach, ROE can be explicitly forecast each period until reaching the cost of equity. The forecast would then end and the terminal value would be zero.

Dechow, Hutton, and Sloan (1999) presented an analysis of a residual income model in which residual income fades over time:14

\[
V_0 = B_0 + \sum_{t=1}^{T-1} \left( \frac{E_t - rB_{t-1}}{(1 + r)^t} \right) + \frac{E_T - rB_{T-1}}{(1 + r - V)(1 + r)^{T-1}}
\]

This model adds a persistence factor, \( \omega \), which is between zero and one. A persistence factor of one implies that residual income will not fade at all; rather, it will continue at the same level indefinitely (i.e., in perpetuity). A persistence factor of zero implies that residual income will not continue after the initial forecast horizon. The higher the value of the persistence factor, the higher the stream of residual income in the final stage, and the higher the valuation, all else being equal. Dechow et al. found that in a large sample of company data from 1976 to 1995, the persistence factor equaled 0.62, which was interpreted by Bauman (1999) as equivalent to residual income decaying at an average rate of 38 percent a year. The persistence factor considers the long-run mean-reverting nature of ROE, assuming that in time ROE regresses toward \( r \) and that resulting residual income fades toward zero. Clearly, the persistence factor varies from company to company. For example, a company with a strong market leadership position would have a lower expected rate of decay (Bauman 1999). Dechow et al. provided insight into some characteristics, listed in Exhibit 5-7, that can indicate a lower or higher level of persistence.

**EXHIBIT 5-7  Final-Stage Residual Income Persistence**

<table>
<thead>
<tr>
<th>Lower Residual Income Persistence</th>
<th>Higher Residual Income Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme accounting rates of return (ROE)</td>
<td>Low dividend payout</td>
</tr>
<tr>
<td>Extreme levels of special items (e.g., nonrecurring items)</td>
<td>High historical persistence in the industry</td>
</tr>
<tr>
<td>Extreme levels of accounting accruals</td>
<td></td>
</tr>
</tbody>
</table>

Example 5-10 illustrates the assumption that continuing residual income will decline to zero as ROE approaches the required rate of return on equity.

---

EXAMPLE 5-10  Multistage Residual Income Model (3)

Rosato extends her analysis to consider the possibility that ROE will slowly decay toward \( r \) in 2027 and beyond, rather than using a perpetuity of year 2026 residual income. Rosato estimates a persistence parameter of 0.60. The present value of the terminal value is determined as

\[
\frac{E_r - rB_{r-1}}{(1 + r - V)(1 + r)^{T-1}}
\]

with \( T \) equal to 21 and year 2027 residual income equal to 15.5714 percent (13.6574 \times 1.14), in which the 1.14 growth factor reflects a 14 percent growth rate calculated as the retention ratio times ROE, or \((0.70)(20\%) = 0.14\).

\[
\frac{15.57}{(1 + 0.15 - 0.60)(1.15)^{20}} = 1.73
\]

Total value is TWD46.11, calculated by adding the present value of the terminal value, TWD1.73, to TWD44.38. Rosato concludes that if Taiwan Semiconductor’s residual income does not persist at a stable level past 2026 and deteriorates through time, the shares are even more overvalued.

4. RESIDUAL INCOME VALUATION IN RELATION TO OTHER APPROACHES

Before addressing accounting issues in using the residual income model, we briefly summarize the relationship of the residual income model to other valuation models.

Valuation models based on discounting dividends or on discounting free cash flows are as theoretically sound as the residual income model. Unlike the residual income model, however, the discounted dividend and free cash flow models forecast future cash flows and find the value of stock by discounting them back to the present by using the required return. Recall that the required return is the cost of equity for both the DDM and the free cash flow to equity (FCFE) model. For the free cash flow to the firm (FCFF) model, the required return is the overall weighted average cost of capital (WACC). The RI model approaches this process differently. It starts with a value based on the balance sheet, the book value of equity, and adjusts this value by adding the present values of expected future residual income. Thus, in theory, the recognition of value is different, but the total present value, whether using expected dividends, expected free cash flow, or book value plus expected residual income, should be consistent.  

Example 5-11 again illustrates the important point that the recognition of value in residual income models typically occurs earlier than in dividend discount models. In other words, residual income models tend to assign a relatively small portion of a security’s total present value to the earnings that occur in later years. Note also that this example makes use of the fact that the present value of a perpetuity in the amount of \( X \) can be calculated as \( X/r \).

15See, for example, Shrieves and Wachowicz (2001).
EXAMPLE 5-11 Valuing a Perpetuity with the Residual Income Model

Assume the following data:

• A company will earn $1.00 per share forever.
• The company pays out all earnings as dividends.
• Book value per share is $6.00.
• The required rate of return on equity (or the percent cost of equity) is 10 percent.

1. Calculate the value of this stock using the DDM.
2. Calculate the level amount of per-share residual income that will be earned each year.
3. Calculate the value of the stock using an RI model.
4. Create a table summarizing the year-by-year valuation using the DDM and the RI model.

Solution to 1: Because the dividend, $D$, is a perpetuity, the present value of $D$ can be calculated as $D/r$.

$$V_0 = \frac{D}{r} = \frac{1}{0.10} = 10.00 \text{ per share}$$

Solution to 2: Because each year all net income is paid out as dividends, book value per share will be constant at $6.00. Therefore, with a required rate of return on equity of 10 percent, for all future years, per-share residual income will be as follows:

$$RI_t = E_t - rB_{t-1} = 1.00 - 0.10(6.00) = 1.00 - 0.60 = 0.40$$

Solution to 3: Using a residual income model, the estimated value equals the current book value per share plus the present value of future expected residual income (which in this example can be valued as a perpetuity):

$$V_0 = \text{Book value} + \text{PV of expected future per-share residual income}$$

$$= 6.00 + \frac{0.40}{0.10}$$

$$= 6.00 + 4.00 = 10.00$$

Solution to 4: Exhibit 5-8 summarizes the year-by-year valuation using the DDM and the RI models.

EXHIBIT 5-8 Value Recognition in the DDM and the RI Model

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend Discount Model</th>
<th>Residual Income Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$D_t$</td>
<td>PV of $D_t$</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>$6.00$</td>
</tr>
<tr>
<td>1</td>
<td>$1.00</td>
<td>$0.909</td>
</tr>
<tr>
<td>2</td>
<td>1.00</td>
<td>0.826</td>
</tr>
</tbody>
</table>
In the RI model, most of the total value of the stock is attributed to the earlier periods. Specifically, the current book value of $6.00 represents 60 percent of the stock’s total present value of $10.

In contrast, in the DDM, value is derived from the receipt of dividends, and typically, a smaller proportion of value is attributed to the earlier periods. Less than $1.00 of the total $10 derives from the first year’s dividend, and collectively, the first five years’ dividends ($0.909 + $0.826 + $0.751 + $0.683 + $0.621 = $3.79) contribute only about 38 percent of the total present value of $10.

As shown earlier and illustrated again in Example 5-11, the dividend discount and residual income models are in theory mutually consistent. Because of the real-world uncertainty in forecasting distant cash flows, however, the earlier recognition of value in a residual income approach relative to other present value approaches is a practical advantage. In the dividend discount and free cash flow models, a stock’s value is often modeled as the sum of the present value of individually forecasted dividends or free cash flows up to some terminal point plus the present value of the expected terminal value of the stock. In practice, a large fraction of a stock’s total present value, in either the discounted dividend or free cash flow models, is represented by the present value of the expected terminal value. Substantial uncertainty, however, often surrounds the terminal value. In contrast, residual income valuations typically are less sensitive to terminal value estimates. (In some residual income valuation contexts the terminal value may actually be set equal to zero.) The derivation of value from the earlier portion of a forecast horizon is one reason residual income valuation can be a useful analytical tool.

4.1. Strengths and Weaknesses of the Residual Income Model

Now that the implementation of the residual income model has been illustrated with several examples, a summary of the strengths and weaknesses of the residual income approach follows.

The strengths of residual income models include the following:

- Terminal values do not make up a large portion of the total present value, relative to other models.
- RI models use readily available accounting data.
• The models can be readily applied to companies that do not pay dividends or to companies that do not have positive expected near-term free cash flows.
• The models can be used when cash flows are unpredictable.
• The models have an appealing focus on economic profitability.

The potential weaknesses of residual income models include the following:

• The models are based on accounting data that can be subject to manipulation by management.
• Accounting data used as inputs may require significant adjustments.
• The models require that the clean surplus relation holds, or that the analyst makes appropriate adjustments when the clean surplus relation does not hold. Section 5.1 discusses the clean surplus relation (or clean surplus accounting).
• The residual income model’s use of accounting income assumes that the cost of debt capital is reflected appropriately by interest expense.

4.2. Broad Guidelines for Using a Residual Income Model

The preceding list of potential weaknesses helps explain this chapter’s focus in the following section on accounting considerations. In light of its strengths and weaknesses, the following are broad guidelines for using a residual income model in common stock valuation.

A residual income model is most appropriate when

• A company does not pay dividends, or its dividends are not predictable;
• A company’s expected free cash flows are negative within the analyst’s comfortable forecast horizon; or
• Great uncertainty exists in forecasting terminal values using an alternative present value approach.

Residual income models are least appropriate when

• Significant departures from clean surplus accounting exist; or
• Significant determinants of residual income, such as book value and ROE, are not predictable.

Because various valuation models can be derived from the same underlying theoretical model, when fully consistent assumptions are used to forecast earnings, cash flow, dividends, book value, and residual income through a full set of pro forma (projected) financial statements, and the same required rate of return on equity is used as the discount rate, the same estimate of value should result when using each model. Practically speaking, however, it may not be possible to forecast each of these items with the same degree of certainty. 16 For example, if a company has near-term negative free cash flow and forecasts for the terminal

16 For a lively debate on this issue, see Penman and Sougiannis (1998), Penman (2001), Lundholm and O’Keefe (2001a), and Lundholm and O’Keefe (2001b).
value are uncertain, a residual income model may be more appropriate. But a company with positive, predictable cash flow that does not pay a dividend would be well suited for a discounted free cash flow valuation.

Residual income models, just like the discounted dividend and free cash flow models, can also be used to establish justified market multiples, such as price-to-earnings ratio (P/E) or P/B. For example, the value can be determined by using a residual income model and dividing by earnings to arrive at a justified P/E.

A residual income model can also be used in conjunction with other models to assess the consistency of results. If a wide variation of estimated value is found and each model appears appropriate, the inconsistency may lie with the assumptions used in the models. The analyst would need to perform additional work to determine whether the assumptions are mutually consistent and which model is most appropriate for the subject company.

5. ACCOUNTING AND INTERNATIONAL CONSIDERATIONS

To most accurately apply the residual income model in practice, the analyst may need to adjust book value of common equity for off-balance-sheet items and adjust reported net income to obtain comprehensive income (all changes in equity other than contributions by, and distributions to, owners). In this section, we discuss issues relating to these tasks.

Bauman (1999) has noted that the strength of the residual income model is that the two components (book value and future earnings) of the model have a balancing effect on each other, provided that the clean surplus relationship is followed:

All other things held constant, companies making aggressive (conservative) accounting choices will report higher (lower) book values and lower (higher) future earnings. In the model, the present value of differences in future income is exactly offset by the initial differences in book value. (Bauman 1999, 31)

Unfortunately, this argument has several problems in practice because the clean surplus relationship does not prevail, and analysts often use past earnings to predict future earnings. IFRS and U.S. GAAP permit a variety of items to bypass the income statement and be reported directly in stockholders’ equity. Further, off-balance-sheet liabilities or nonoperating and nonrecurring items of income may obscure a company’s financial performance. The analyst must thus be aware of such items when evaluating the book value of equity and return on equity to be used as inputs into a residual income model.

With regard to the possibility that aggressive accounting choices will lead to lower reported future earnings, consider an example in which a company chooses to capitalize an expenditure in the current year rather than expense it. Doing so overstates current-year earnings as well as current book value. If an analyst uses current earnings (or ROE) naively in predicting future residual earnings, the RI model will overestimate the value of the company. Take, for example, a company with $1,000,000 of book value and $200,000 of earnings before taxes, after expensing an expenditure of $50,000. Ignoring taxes, this company has
an ROE of 20 percent. If the company capitalized the expenditure rather than expensing it immediately, it would have an ROE of 23.81 percent ($250,000/$1,050,000). Although at some time in the future this capitalized item will likely be amortized or written off, thus reducing realized future earnings, analysts’ expectations often rely on historical data. If capitalization of expenditures persists over time for a stable size company, ROE can decline because net income will normalize over the long term, but book value will be overstated. For a growing company, for which the expenditure in question is increasing, ROE can continue at high levels over time. In practice, because the RI model uses primarily accounting data as inputs, the model can be sensitive to accounting choices, and aggressive accounting methods (e.g., accelerating revenues or deferring expenses) can result in valuation errors. The analyst must, therefore, be particularly careful in analyzing a company’s reported data for use in a residual income model.

Two principal drivers of residual earnings are ROE and book value. Analysts must understand how to use historical reported accounting data for these items to the extent they use historical data in forecasting future ROE and book value. Other chapters have explained the DuPont analysis of ROE, which can be used as a tool in forecasting, and discussed the calculation of book value. We extend these discussions in the pages that follow, with specific application to residual income valuation, particularly in addressing the following accounting considerations:

- Violations of the clean surplus relationship.
- Balance sheet adjustments for fair value.
- Intangible assets.
- Nonrecurring items.
- Aggressive accounting practices.
- International considerations.

In any valuation, close attention must be paid to the accounting practices of the company being valued. The following sections address the aforementioned issues as they particularly affect residual income valuation.

5.1. Violations of the Clean Surplus Relationship

One potential accounting issue in applying a residual income model is a violation of clean surplus accounting. Violations may occur when accounting standards permit charges directly to stockholders’ equity, bypassing the income statement. An example is the case of changes in the market value of available-for-sale investments. Under both IFRS (IAS 39, paragraph 55[b]) and U.S. GAAP (SFAS No. 115, paragraph 13), investments considered to be “available for sale” are shown on the balance sheet at market value. Any change in their market value, however, is reflected directly in stockholders’ equity rather than as income on the income statement.

As stated earlier, comprehensive income is defined in U.S. GAAP as all changes in equity other than contributions by, and distributions to, owners. Comprehensive income includes net income reported on the income statement and other comprehensive income, which is the result of other events and transactions that result in a change to equity but are not reported
on the income statement. Items that commonly bypass the income statement include (see Frankel and Lee 1999):

- Foreign currency translation adjustments.
- Certain pension adjustments.
- Fair value changes of some financial instruments.

An identical concept exists in IFRS, although the term *other comprehensive income* is not used. Under both international and U.S. standards, such items as fair value changes for some financial instruments and foreign currency translation adjustments bypass the income statement. In addition, under IFRS, which unlike U.S. GAAP permits revaluation of fixed assets (IAS 16, paragraph 39–42), some changes in the fair value of fixed assets also bypass the income statement and directly affect equity.

In all of these cases in which items bypass the income statement, the book value of equity is stated accurately, but net income is not, from the perspective of residual income valuation. The analyst should be most concerned with the effect of these items on forecasts of net income and ROE (which has net income in the numerator), and hence residual income. Because some items (including those just listed) bypass the income statement, they are excluded from historical ROE data. As noted by Frankel and Lee (1999), bias will be introduced into the valuation only if the present expected value of the clean surplus violations do not net to zero. In other words, reductions in income from some periods may be offset by increases from other periods. The analyst must examine the equity section of the balance sheet and the related statements of shareholders’ equity and comprehensive income carefully for items that have bypassed the income statement. The analyst can then assess whether amounts are likely to be offsetting and can assess the effect on future ROE.

---
**EXAMPLE 5-12  Evaluating Clean Surplus Violations**

Excerpts from two companies’ statements of changes in stockholders’ equity are shown in Exhibits 5-9 and 5-10. The first statement, prepared under IFRS as of 31 December 2006, is for Nokia Corporation (NYSE: NOK), a leading manufacturer of mobile phones headquartered in Finland and with operations in four business segments: mobile phones, multimedia, enterprise solutions, and networks. The second statement, prepared under U.S. GAAP as of 31 December 2006, is for SAP AG (NYSE: SAP), which is headquartered in Germany and is a worldwide provider of enterprise application software, including enterprise resource planning, customer relationship management, and supply chain management software.

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### EXHIBIT 5-9  
Nokia Corporation Statement of Changes in Stockholders’ Equity (Excerpt)  
(€ millions)

<table>
<thead>
<tr>
<th>Group</th>
<th>Share Capital</th>
<th>Premium Shares</th>
<th>Treasury Shares</th>
<th>Translation Differences</th>
<th>Fair Value and Other Reserves</th>
<th>Retained Earnings Before Minority Interests</th>
<th>Minority Interests</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance at 31 December 2005</td>
<td>266</td>
<td>2,458</td>
<td>−3,616</td>
<td>69</td>
<td>−176</td>
<td>13,308</td>
<td>12,309</td>
<td>205</td>
</tr>
<tr>
<td>Tax benefit on stock options exercised</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess tax benefit on share-based compensation</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translation differences</td>
<td>−141</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−141</td>
<td>−13</td>
<td>−154</td>
</tr>
<tr>
<td>Net investment hedge gains, net of tax</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Cash flow hedges, net of tax</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>171</td>
<td></td>
<td>171</td>
</tr>
<tr>
<td>Available-for-sale investments, net of tax</td>
<td>−9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−9</td>
<td></td>
<td>−9</td>
</tr>
<tr>
<td>Other decrease</td>
<td>−52</td>
<td>−52</td>
<td>−1</td>
<td>−53</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net profit</td>
<td>4,306</td>
<td>4,306</td>
<td>60</td>
<td>4,366</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total recognized income and expense</td>
<td>0</td>
<td>37</td>
<td>0</td>
<td>−103</td>
<td>162</td>
<td>4,254</td>
<td>4,350</td>
<td>46</td>
</tr>
<tr>
<td>Total of other equity movements</td>
<td>−20</td>
<td>212</td>
<td>1,556</td>
<td>0</td>
<td>0</td>
<td>−6,439</td>
<td>−4,691</td>
<td>−159</td>
</tr>
<tr>
<td>Balance at 31 December 2006</td>
<td>246</td>
<td>2,707</td>
<td>−2,060</td>
<td>−34</td>
<td>−14</td>
<td>11,123</td>
<td>11,968</td>
<td>92</td>
</tr>
</tbody>
</table>

Source: www.nokia.com/A4126243.
### Accumulated Other Comprehensive Income/Loss

**31 December 2005**

<table>
<thead>
<tr>
<th></th>
<th>Additional Paid-in Capital</th>
<th>Retained Earnings</th>
<th>Foreign Currency Translation Adjustment</th>
<th>Unrealized Gains/Losses on Marketable Securities</th>
<th>Unrecognized Pension Plan Cost</th>
<th>Unrealized Gains/Losses on Hedges</th>
<th>Currency Effects from Intercompany Long-term Investment Transactions</th>
<th>Treasury Stock</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>372,767</td>
<td>5,986,186</td>
<td>–202,260</td>
<td>11,168</td>
<td>–9,975</td>
<td>42,449</td>
<td>–1,741,810</td>
<td>6,135,855</td>
<td>5,782,238</td>
</tr>
<tr>
<td>Total comprehensive income/loss</td>
<td>1,661,675</td>
<td>17,611</td>
<td>17,611</td>
<td>0</td>
<td>3,658</td>
<td>4,008</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**31 December 2006**

<table>
<thead>
<tr>
<th></th>
<th>Additional Paid-in Capital</th>
<th>Retained Earnings</th>
<th>Foreign Currency Translation Adjustment</th>
<th>Unrealized Gains/Losses on Marketable Securities</th>
<th>Unrecognized Pension Plan Cost</th>
<th>Unrealized Gains/Losses on Hedges</th>
<th>Currency Effects from Intercompany Long-term Investment Transactions</th>
<th>Treasury Stock</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>352,642</td>
<td>6,594,809</td>
<td>–350,828</td>
<td>4,476</td>
<td>–19,741</td>
<td>14,029</td>
<td>14,741</td>
<td>–1,741,810</td>
<td>6,135,855</td>
</tr>
</tbody>
</table>

**Source:** [http://www.sap.com/about/investor/index.epx](http://www.sap.com/about/investor/index.epx).
For Nokia, items that have bypassed the income statement in 2006 are those that are summed to obtain “Total recognized income and expense” in the columns labeled “Share Issue Premium,” “Translation Differences,” and “Fair Value and Other Reserves.” For SAP, the amounts that bypassed the income statement in 2006 appear in the five columns below the heading “ Accumulated Other Comprehensive Income/Loss.”

To illustrate the issues in interpreting these items, consider the columns “Translation Differences” (Nokia) and “Foreign Currency Translation Adjustment” (SAP). The amounts in these columns reflect currency translation adjustments to equity that have bypassed the income statement. For Nokia, the adjustment for the year 2006 was –€103 million. Because this is a negative adjustment to stockholders’ equity, this item would have decreased income if it had been reported on the income statement. The balance is not increasing, however; it appears to be reversing to zero over time. For SAP, the translation adjustment for the year 2006 was –€148 million. Again, because this is a negative adjustment to stockholders’ equity, this item would have decreased income if it had been reported on the income statement. In this case, the negative balance appears to be accumulating: It does not appear to be reversing (netting to zero) over time. If the analyst expects this trend to continue and has used historical data as the basis for initial estimates of ROE to be used in residual income valuation, a downward adjustment in that estimated future ROE might be warranted. It is possible, however, that future exchange rate movements will reverse this accumulation.

The examples in this chapter have used the actual beginning equity and a forecasted level of ROE (return on beginning equity) to compute the forecasted net income. Because equity includes accumulated other comprehensive income (AOCI), the assumptions about future other comprehensive income (OCI) will affect forecasted net income and thus residual income. To illustrate, Exhibit 5-11 shows a hypothetical company’s financials for a single previous year, labeled year $t-1$, followed by three different forecasts for the following two years. In year $t-1$, the company reports net income of $120, which is a 12 percent return on beginning equity of $1,000. The company paid no dividends, so ending retained earnings equal $120. In year $t-1$, the company also reports OCI of –$100, a loss, so the ending amount shown in AOCI is –$100. (Companies typically label this line item “accumulated other comprehensive income (loss),” indicating that the amount is an accumulated loss when given in parentheses.)

All three forecasts in Exhibit 5-11 assume that ROE will be 12 percent and use this assumption to forecast net income for year $t$ and $t+1$ by using the expression $0.12 \times$ Beginning book value. Each forecast, however, incorporates different assumptions about future OCI. Forecast A assumes that the company will have no OCI in year $t$ or year $t+1$, so the amount of AOCI does not change. Forecast B assumes that the company will continue to have the same amount of OCI in year $t$ and year $t+1$ as it had in the prior year, so the amount of AOCI becomes more negative each year. Forecast C assumes that the company’s OCI will reverse in year $t$, so at the end of year $t$, AOCI will be zero. As shown, because the forecasts use the assumed ROE to compute forecasted net income, the forecasts for net income and residual income in year $t+1$ vary significantly.
Because this example assumes all earnings are retained, a forecast of 12 percent ROE also implies that net income and residual income will grow at 12 percent. Only the year \( t \) to year \( t + 1 \) under forecast A, which assumes no future OCI, correctly reflects that relationship. Specifically, in forecast A, both net income and residual income increase by 12 percent from year \( t \) to year \( t + 1 \). Net income grows from $122.40 to $137.09, an increase of 12 percent \([($137.09/$122.40) – 1]\); and residual income grows from $20.40 to $22.85, an increase of 12 percent \([($22.85/$20.40) – 1]\). In contrast to forecast A, neither forecast B nor forecast C correctly reflects the relationship between ROE and growth in income (net and residual). Growth in residual income from year \( t \) to year \( t + 1 \) was 2.2 percent under forecast B and 21.8 percent under forecast C.

If, alternatively, the forecasts of future ROE and the residual income computation had incorporated total comprehensive income (net income plus OCI), the results of the residual income computation would have differed significantly. For example, suppose that in forecast B, which assumes the company will continue to have the same amount of OCI, the estimated future ROE was 2.0 percent, using total comprehensive income \([($120 – $100)/$1,000 = $20/$1,000]\). If the residual income computation had then also used forecasted total comprehensive income at time \( t \), the amount of residual income would be negative. Specifically, for time \( t \), forecast comprehensive income would be $22.40 (ROE of 2.0 percent times beginning equity of $1,020), the equity charge would be $102 (required return of 10 percent times beginning equity of $1,020), and residual income would be $–79.86 (comprehensive income of $22.40 minus equity charge of $102). Clearly, residual income on this basis significantly falls short of the positive $20.40 when the violation of clean surplus is ignored. As this example demonstrates, using an ROE forecast or a net income forecast that ignores violations of clean surplus accounting will distort estimates of residual income. Unless the present value of such distortions net to zero, using those forecasts will also distort valuations.

### Exhibit 5-11 Hypothetical Company: Alternative Forecasts with Different Assumptions about Comprehensive Income

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Forecast A</th>
<th>Forecast B</th>
<th>Forecast C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( t - 1 )</td>
<td>( t )</td>
<td>( t + 1 )</td>
<td>( t )</td>
</tr>
<tr>
<td><strong>Beginning Balance Sheet</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assets</td>
<td>$1,000.00</td>
<td>$1,020.00</td>
<td>$1,142.40</td>
<td>$1,020.00</td>
</tr>
<tr>
<td>Liabilities</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Common stock</td>
<td>1,000.00</td>
<td>1,000.00</td>
<td>1,000.00</td>
<td>1,000.00</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>—</td>
<td>120.00</td>
<td>242.40</td>
<td>120.00</td>
</tr>
<tr>
<td>AOCI</td>
<td>—</td>
<td>(100.00)</td>
<td>(100.00)</td>
<td>(100.00)</td>
</tr>
<tr>
<td>Total equity</td>
<td>1,000.00</td>
<td>1,020.00</td>
<td>1,142.40</td>
<td>1,020.00</td>
</tr>
<tr>
<td>Total liabilities and total equity</td>
<td>$1,000.00</td>
<td>$1,020.00</td>
<td>$1,142.40</td>
<td>$1,020.00</td>
</tr>
<tr>
<td>Net income</td>
<td>120.00</td>
<td>122.40</td>
<td>137.09</td>
<td>122.40</td>
</tr>
<tr>
<td>Dividends</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Other comprehensive income</td>
<td>(100.00)</td>
<td>—</td>
<td>—</td>
<td>(100.00)</td>
</tr>
</tbody>
</table>

*Continued*
What are the implications for implementing a residual-income-based valuation? If future OCI is expected to be significant relative to net income and if the year-to-year amounts of OCI are not expected to net to zero, the analyst should attempt to incorporate these items so that residual income forecasts are closer to what they would be if the clean surplus relation held. Specifically, when possible, the analyst should incorporate explicit assumptions about future amounts of OCI.

Example 5-13 illustrates, by reference to the DDM value, the error that results when OCI is omitted from residual income calculations (assuming an analyst has a basis for forecasting future amounts of OCI). The example also shows that the growth rate in residual income is generally not equal to the growth rate of net income or dividends.

EXAMPLE 5-13 Incorporating Adjustments in the Residual Income Model

Exhibit 5-12 gives per-share forecasts for Mannistore, Inc., a hypothetical company operating a chain of retail stores. The company’s cost of capital is 10 percent.

\[\text{Equity charge at 10 percent} = \frac{\text{Net income}}{\text{Cost of capital}} = \frac{120.00}{100.00} = 120.00\]

\[\text{Residual income} = \text{Net income} - \text{Equity charge} = 120.00 - 120.00 = 0.00\]
1. Assuming the forecasted terminal price of Mannistore’s shares at the end of year 5 (time $t = 5$) is $68.40, estimate the value per share of Mannistore using the DDM.

2. Given that the forecast terminal price of Mannistore’s shares at the end of year 5 (time $t = 5$) is $68.40, estimate the value of a share of Mannistore using the RI model and calculate residual income based on
   A. Net income without adjustment.
   B. Net income plus other comprehensive income.

3. Interpret your answers to 2A and 2B.

4. Assume that a forecast of the terminal price of Mannistore’s shares at the end of year 5 (time $t = 5$) is not available. Instead, an estimate of terminal price based on the Gordon growth model is appropriate. You estimate that the growth in net income and dividends from $t = 5$ to $t = 6$ will be 8 percent. Predict residual income for year 6, and based on that 8 percent growth estimate, determine the growth rate in forecasted residual income from $t = 5$ to $t = 6$.

**Solution to 1:** The estimated value using the DDM is:

$$V_0 = \frac{0.26}{(1.10)^1} + \frac{0.29}{(1.10)^2} + \frac{0.29}{(1.10)^3} + \frac{0.29}{(1.10)^4} + \frac{0.38}{(1.10)^5} + \frac{68.40}{(1.10)^5} = $43.59$$

**Solution to 2:**

A. Calculating residual income as net income (NI) minus the equity charge, which is beginning shareholders’ equity (SE) times the cost of equity capital ($r$), gives the following for years 1 through 5:

<table>
<thead>
<tr>
<th>Year</th>
<th>RI = NI - (SE$_{t-1}$ × r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.14</td>
</tr>
<tr>
<td>2</td>
<td>1.45</td>
</tr>
<tr>
<td>3</td>
<td>2.30</td>
</tr>
<tr>
<td>4</td>
<td>2.00</td>
</tr>
<tr>
<td>5</td>
<td>2.77</td>
</tr>
</tbody>
</table>

So the estimated value using the RI model (using Equation 5-6), with residual income calculated based on net income, is:
Chapter 5  Residual Income Valuation

B. Calculating residual income as net income adjusted for OCI (NI + OCI) minus the equity charge, which equals beginning shareholders’ equity (SE) times the cost of equity capital (r), gives the following for years 1 through 5:

<table>
<thead>
<tr>
<th>Year</th>
<th>RI = (NI + OCI) – (SE_{t-1} \times r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1.14</td>
</tr>
<tr>
<td>2</td>
<td>$0.45</td>
</tr>
<tr>
<td>3</td>
<td>$2.30</td>
</tr>
<tr>
<td>4</td>
<td>$2.00</td>
</tr>
<tr>
<td>5</td>
<td>$2.77</td>
</tr>
</tbody>
</table>

So the estimated value using the RI model, with residual income based on net income adjusted for OCI, is:

\[ V_0 = 8.58 + \frac{1.14}{(1.10)^1} + \frac{1.45}{(1.10)^2} + \frac{2.30}{(1.10)^3} + \frac{2.00}{(1.10)^4} + \frac{2.77}{(1.10)^5} + \frac{68.40 - 22.04}{(1.10)^5} \]

\[ V_0 = 8.58 + 35.84 = $44.42 \]

Solution to 3: The first calculation (2A) incorrectly omits an adjustment for a violation of the clean surplus relation. The second calculation (2B) includes an adjustment and yields the correct value estimate, which is consistent with the DDM estimate.

Solution to 4: Given the estimated 8 percent growth in net income and dividends in year 6, the estimated year 6 net income is $4.92 ($4.56 \times 1.08), and the estimated amount of year 6 dividends is $0.42 ($0.38 \times 1.08).

Residual income will then equal $2.72 (which is net income of $4.92 minus the equity charge of beginning book value of $22.04 times the cost of capital of 10 percent). So the growth rate in residual income is negative at approximately –2 percent ($2.72/$2.77 – 1).

Lacking a basis for explicit assumptions about future amounts of OCI, the analyst should nonetheless be aware of the potential effect of OCI on residual income and adjust ROE accordingly. Finally, as previously noted, the analyst may decide that an alternative valuation model is more appropriate.

5.2. Balance Sheet Adjustments for Fair Value

To have a reliable measure of book value of equity, an analyst should identify and scrutinize significant off-balance-sheet assets and liabilities. Additionally, reported assets and liabilities should be adjusted to fair value when possible. Off-balance-sheet assets and liabilities may become apparent through an examination of the financial statement footnotes. Examples
include the use of operating leases and the use of special-purpose entities to remove both
debt and assets from the balance sheet. Some items, such as operating leases, may not affect
the amount of equity (because leases involve both off-balance-sheet assets that offset the
off-balance-sheet liabilities) but can affect an assessment of future earnings for the residual
income component of value. Other assets and liabilities may be stated at values other than
fair value. For example, inventory may be stated at LIFO and require adjustment to restate to
current value. (LIFO is not permitted under IFRS.) The following are some common items
to review for balance sheet adjustments. Note, however, that this list is not inclusive: 19

- Inventory.
- Deferred tax assets and liabilities.
- Operating leases.
- Special-purpose entities.
- Reserves and allowances (for example, bad debts).
- Intangible assets.

Additionally, the analyst should examine the financial statements and footnotes for items
unique to the subject company.

5.3. Intangible Assets

Intangible assets can have a significant effect on book value. In the case of specifically identi-
ifiable intangibles that can be separated from the entity (e.g., sold), it is appropriate to include
these in the determination of book value of equity. If these assets are wasting (declining in
value over time), they will be amortized over time as an expense. Intangible assets, however,
require special consideration because they are often not recognized as an asset unless they are
obtained in an acquisition. For example, advertising expenditures can create a highly valuable
brand, which is clearly an intangible asset. Advertising expenditures, however, are shown as
an expense and the value of a brand would not appear as an asset on the financial statements
unless the company owning the brand was acquired.

To demonstrate this, consider a simplified example involving two companies, Alpha and
Beta, with the following summary financial information (all amounts in thousands, except
per-share data):

<table>
<thead>
<tr>
<th></th>
<th>Alpha</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>€1,600</td>
<td>€100</td>
</tr>
<tr>
<td>Property, plant, and equipment</td>
<td>3,400</td>
<td>900</td>
</tr>
<tr>
<td>Total assets</td>
<td>€5,000</td>
<td>€1,000</td>
</tr>
<tr>
<td>Equity</td>
<td>5,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Net income</td>
<td>€600</td>
<td>€150</td>
</tr>
</tbody>
</table>

19 See also Chapter 17 of White, Sondhi, and Fried (1998).
Each company pays out all net income as dividends (no growth), and the clean surplus relation holds. Alpha has a 12 percent ROE and Beta has a 15 percent ROE, both expected to continue indefinitely. Each has a 10 percent required rate of return. The fair market value of each company’s property, plant, and equipment is the same as its book value. What is the value of each company in a residual income framework?

Using total book value rather than per-share data, the value of Alpha would be €6,000, determined as follows:\textsuperscript{20}

\[
V_0 = B_0 + \frac{\text{ROE} - r}{r - g} B_0 = 5,000 + \frac{0.12 - 0.10}{0.10 - 0.00} (5,000) = 6,000
\]

Similarly, the value of Beta would be €1,500:

\[
V_0 = B_0 + \frac{\text{ROE} - r}{r - g} B_0 = 1,000 + \frac{0.15 - 0.10}{0.10 - 0.00} (1,000) = 1,500
\]

The value of the companies on a combined basis would be €7,500. Note that both companies are valued more highly than the book value of equity because they have ROE in excess of the required rate of return. Absent an acquisition transaction, the financial statements of Alpha and Beta do not reflect this value. If either is acquired, however, an acquirer would allocate the purchase price to the acquired assets, with any excess of the purchase price above the acquired assets shown as goodwill.

Suppose Alpha acquires Beta by paying Beta’s former shareholders €1,500 in cash. Alpha has just paid €500 in excess of the value of Beta’s total reported assets of €1,000. Assume that Beta’s property, plant and equipment is already shown at its fair market value of €1,000, and that the €500 is considered to be the fair value of a license owned by Beta, say an exclusive right to provide a service. Assume further that the original cost of obtaining the license was an immaterial application fee, which does not appear on Beta’s balance sheet, and that the license covers a period of 10 years. Because the entire purchase price of €1,500 is allocated to identifiable assets, no goodwill is reported. The balance sheet of Alpha immediately after the acquisition would be:\textsuperscript{21}

<table>
<thead>
<tr>
<th></th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>€200</td>
</tr>
<tr>
<td>Property, plant, and equipment</td>
<td>€4,300</td>
</tr>
<tr>
<td>License</td>
<td>€500</td>
</tr>
<tr>
<td>Total assets</td>
<td>€5,000</td>
</tr>
<tr>
<td>Equity</td>
<td>€5,000</td>
</tr>
</tbody>
</table>

Note that the total book value of Alpha’s equity did not change, because the acquisition was made for cash and thus did not require Alpha to issue any new shares.

\textsuperscript{20}Results would be the same if calculated on a per-share basis.
\textsuperscript{21}For example, cash of €200 is calculated as €1,600 (cash of Alpha) + €100 (cash of Beta) − €1,500 (purchase price of Beta).
Making the assumption that the license is amortized over a 10-year period, the combined company's expected net income would be €700 (€600 + €150 - €50 amortization). If this net income number is used to derive expected ROE, the expected ROE would be 14 percent. Under a residual income model, with no adjustment for amortization, the value of the combined company would be:

\[ V_o = B_o + \frac{ROE - r}{r - g} B_o = 5,000 + \frac{0.14 - 0.10}{0.10 - 0.00} (5,000) = 7,000 \]

Why would the combined company be worth less than the two separate companies? If the assumption is made that a fair price was paid to Beta's former shareholders, the combined value should not be lower. The lower value using the residual income model results from a reduction in ROE as a result of the amortization of the intangible license asset. If this asset were not amortized (or if the amortization expense was added back before computing ROE), net income would be €750 and ROE would be 15 percent. The value of the combined entity would be:

\[ V_o = B_o + \frac{ROE - r}{r - g} B_o = 5,000 + \frac{0.15 - 0.10}{0.10 - 0.00} (5,000) = 7,500 \]

This amount, €7,500, is the same as the sum of the values of the companies on a separate basis.

Would the answer be different if the acquiring company used newly issued stock rather than cash in the acquisition? The form of currency used to pay for the transaction should not impact the total value. If Alpha used €1,500 of newly issued stock to acquire Beta, its balance sheet would be

<table>
<thead>
<tr>
<th></th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>€1,700</td>
</tr>
<tr>
<td>Property, plant, and equipment</td>
<td>4,300</td>
</tr>
<tr>
<td>License</td>
<td>500</td>
</tr>
<tr>
<td>Total assets</td>
<td>€6,500</td>
</tr>
<tr>
<td>Equity</td>
<td>€6,500</td>
</tr>
</tbody>
</table>

Projected earnings, excluding the amortization of the license, would be €750, and projected ROE would be 11.538 percent. Value under the residual income model would be:

\[ V_o = B_o + \frac{ROE - r}{r - g} B_o = 6,500 + \frac{0.11538 - 0.10}{0.10 - 0.00} (6,500) = 7,500 \]

The overall value remains unchanged. The book value of equity is higher but offset by the effect on ROE. Once again, this example assumes that the buyer paid a fair value for the acquisition. If an acquirer overpays for an acquisition, the overpayment should become evident in a reduction in future residual income.
Research and development (R&D) costs provide another example of an intangible asset that must be given careful consideration. Under U.S. GAAP, R&D is generally expensed to the income statement directly (except in certain cases such as SFAS No. 87 which permits the capitalization of R&D expenses related to software development after product feasibility has been established). Also, under IFRS, some R&D costs can be capitalized and amortized over time. R&D expenditures are reflected in a company’s ROE, and hence residual income, over the long term. If a company engages in unproductive R&D expenditures, these will lower residual income through the expenditures made. If a company engages in productive R&D expenditures, these should result in higher revenues to offset the expenditures over time. In summary, on a continuing basis for a mature company, ROE should reflect the productivity of R&D expenditures.

IFRS and U.S. GAAP differ in accounting for in-process R&D, which can be recognized as an acquired finite-life intangible asset or as part of goodwill under IFRS, but must be expensed immediately under U.S. GAAP. Does the difference matter? Bauman (1999) found that when purchased in-process R&D is capitalized and then amortized in a short period, overall value is not affected compared with the immediate expensing of R&D in a residual income framework. Further, Lundholm and Sloan (2007) explain that including and subsequently amortizing an asset that was omitted from a company’s reported assets has no effect on valuation under a residual income model. Such an adjustment would increase the estimated equity value by adding the asset to book value at time zero but decrease the estimated value by an equivalent amount, which would include (1) the present value of the asset when amortized in the future and (2) the present value of a periodic capital charge based on the amount of the asset times the cost of equity. Expensing R&D, however, results in an immediately lower ROE vis-à-vis capitalizing R&D. But expensing R&D will result in a slightly higher ROE relative to capitalizing R&D in future years because this capitalized R&D is amortized. Because ROE is used in a number of expressions derived from the residual income model and may also be used in forecasting net income, the analyst should carefully consider a company’s R&D expenditures and their effect on long-term ROE.

5.4. Nonrecurring Items

In applying a residual income model, it is important to develop a forecast of future residual income based on recurring items. Companies often report nonrecurring charges as part of earnings or classify nonoperating income (e.g., sale of assets) as part of operating income. These misclassifications can lead to overestimates and underestimates of future residual earnings if no adjustments are made. No adjustments to book value are necessary for these items, however, because nonrecurring gains and losses are reflected in the value of assets in place. Hirst and Hopkins (2000) noted that nonrecurring items sometimes result from accounting rules and at other times result from “strategic” management decisions. Regardless, they highlighted the importance of examining the financial statement notes and other sources for items that may warrant adjustment in determining recurring earnings, such as

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22 See Henry and Gordon, “Long-Lived Assets” (2009), particularly the case of NOW Inc. in Example 1, for an illustration of the principles involved.
• Unusual items.
• Extraordinary items.
• Restructuring charges.
• Discontinued operations.
• Accounting changes.

In some cases, management may record restructuring or unusual charges in every period. In these cases, the item may be considered an ordinary operating expense and may not require adjustment.

Companies sometimes inappropriately classify nonoperating gains as a reduction in operating expenses (such as selling, general, and administrative expenses). If material, this inappropriate classification can usually be uncovered by a careful reading of financial statement footnotes and press releases. Analysts should consider whether these items are likely to continue and contribute to residual income in time. More likely, they should be removed from operating earnings when forecasting residual income.

5.5. Other Aggressive Accounting Practices

Companies may engage in accounting practices that result in the overstatement of assets (book value) and/or overstatement of earnings. We discussed many of these practices in the preceding sections. Other activities that a company may engage in include accelerating revenues to the current period or deferring expenses to a later period. Both activities simultaneously increase earnings and book value. For example, a company might ship unordered goods to customers at year-end, recording revenues and a receivable. As another example, a company could capitalize rather than expense a cash payment, resulting in lower expenses and an increase in assets.

Conversely, companies have also been criticized for the use of cookie jar reserves (reserves saved for future use), in which excess losses or expenses are recorded in an earlier period (for example, in conjunction with an acquisition or restructuring) and then used to reduce expenses and increase income in future periods. The analyst should carefully examine the use of reserves when assessing residual earnings. Overall, the analyst must evaluate a company’s accounting policies carefully and consider the integrity of management when assessing the inputs in a residual income model.

5.6. International Considerations

Accounting standards differ internationally. These differences result in different measures of book value and earnings internationally and suggest that valuation models based on accrual accounting data might not perform as well as other present value models in international contexts. It is interesting to note, however, that Frankel and Lee (1999) found that the residual income model works well in valuing companies on an international basis. Using a simple

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23See, for example, Schilit (1993).
residual income model without any of the adjustments discussed in this chapter, they found that their residual income valuation model accounted for 70 percent of the cross-sectional variation of stock prices among 20 countries. Exhibit 5-13 shows the model’s explanatory power by country.

<table>
<thead>
<tr>
<th>Explanatory Power</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–50 percent</td>
<td>Germany</td>
</tr>
<tr>
<td></td>
<td>Japan (Parent company reporting)</td>
</tr>
<tr>
<td>60–70 percent</td>
<td>Australia</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
</tr>
<tr>
<td></td>
<td>Japan (Consolidated reporting)</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
</tr>
<tr>
<td>More than 70 percent</td>
<td>France</td>
</tr>
<tr>
<td></td>
<td>United States</td>
</tr>
</tbody>
</table>

Source: Frankel and Lee (1999).

Germany had the lowest explanatory power. Japan had low explanatory power for companies reporting only parent company results; the explanatory power for Japanese companies reporting on a consolidated basis was considerably higher. Explanatory power was highest in France, the United Kingdom, and the United States. Frankel and Lee concluded that there are three primary considerations in applying a residual income model internationally:

1. The availability of reliable earnings forecasts.
2. Systematic violations of the clean surplus assumption.
3. “Poor quality” accounting rules that result in delayed recognition of value changes.

Analysts should expect the model to work best in situations in which earnings forecasts are available, clean surplus violations are limited, and accounting rules do not result in delayed recognition. Because Frankel and Lee found good explanatory power for a residual income model using unadjusted accounting data, one expects that if adjustments are made to the reported data to correct for clean surplus and other violations, international comparisons should result in comparable valuations. For circumstances in which clean surplus violations exist, accounting choices result in delayed recognition, or accounting disclosures do not permit adjustment, the residual income model would not be appropriate and the analyst should consider a model less dependent on accounting data, such as an FCFE model.

It should be noted, however, that IFRS is increasingly becoming widely used. By 2011, the number of countries that either require or permit the use of IFRS in preparation of financial statements in their countries is expected to reach 150. Furthermore, standard setters in numerous countries have started to work toward convergence between IFRS and home-country GAAP. In time, concerns about the use of different accounting standards should become less severe. Nonetheless, even within a single set of accounting standards, companies make choices and estimates that can affect valuation.
6. SUMMARY

This chapter has discussed the use of residual income models in valuation. Residual income is an appealing economic concept because it attempts to measure economic profit, which is profit after accounting for all opportunity costs of capital.

- Residual income is calculated as net income minus a deduction for the cost of equity capital. The deduction is called the equity charge and is equal to equity capital multiplied by the required rate of return on equity (the cost of equity capital in percent).
- Economic value added (EVA) is a commercial implementation of the residual income concept.

\[
\text{EVA} = \text{NOPAT} - (\text{C\%} \times \text{TC})
\]

where

\[
\text{NOPAT} = \text{net operating profit after taxes}
\]

\[
\text{C\%} = \text{the percent cost of capital}
\]

\[
\text{TC} = \text{total capital}
\]

- Residual income models (including commercial implementations) are used not only for equity valuation but also to measure internal corporate performance and for determining executive compensation.
- We can forecast per-share residual income as forecasted earnings per share minus the required rate of return on equity multiplied by beginning book value per share. Alternatively, per-share residual income can be forecasted as beginning book value per share multiplied by the difference between forecasted ROE and the required rate of return on equity.
- In the residual income model, the intrinsic value of a share of common stock is the sum of book value per share and the present value of expected future per-share residual income. In the residual income model, the equivalent mathematical expressions for intrinsic value of a common stock are

\[
V_0 = B_0 + \sum_{t=1}^{\infty} \frac{\text{RI}_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{E_t - r B_{t-1}}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{(\text{ROE}_t - r) B_{t-1}}{(1+r)^t}
\]

where

\[
V_0 = \text{value of a share of stock today (t = 0)}
\]

\[
B_0 = \text{current per-share book value of equity}
\]

\[
\text{RI}_t = \text{expected per-share residual income at any time t}
\]

\[
r = \text{required rate of return on equity (cost of equity)}
\]

\[
E_t = \text{expected earnings per share for period t}
\]

\[
B_t = \text{expected per-share book value of equity at any time t}
\]

- In most cases, value is recognized earlier in the residual income model compared with other present value models of stock value, such as the dividend discount model.
- Strengths of the residual income model include the following:
  - Terminal values do not make up a large portion of the value relative to other models.
  - The model uses readily available accounting data.
Chapter 5  Residual Income Valuation

- The model can be used in the absence of dividends and near-term positive free cash flows.
- The model can be used when cash flows are unpredictable.

• Weaknesses of the residual income model include the following:
  - The model is based on accounting data that can be subject to manipulation by management.
  - Accounting data used as inputs may require significant adjustments.
  - The model requires that the clean surplus relation holds, or that the analyst makes appropriate adjustments when the clean surplus relation does not hold.

• The residual income model is most appropriate in the following cases:
  - A company is not paying dividends or it exhibits an unpredictable dividend pattern.
  - A company has negative free cash flow many years out but is expected to generate positive cash flow at some point in the future.
  - A great deal of uncertainty exists in forecasting terminal values.

• The fundamental determinants or drivers of residual income are book value of equity and return on equity.

• Residual income valuation is most closely related to P/B. When the present value of expected future residual income is positive (negative), the justified P/B based on fundamentals is greater than (less than) one.

• When fully consistent assumptions are used to forecast earnings, cash flow, dividends, book value, and residual income through a full set of pro forma (projected) financial statements, and the same required rate of return on equity is used as the discount rate, the same estimate of value should result from a residual income, dividend discount, or free cash flow valuation. In practice, however, analysts may find one model easier to apply and possibly arrive at different valuations using the different models.

• Continuing residual income is residual income after the forecast horizon. Frequently, one of the following assumptions concerning continuing residual income is made:
  - Residual income continues indefinitely at a positive level. (One variation of this assumption is that residual income continues indefinitely at the rate of inflation, meaning it is constant in real terms.)
  - Residual income is zero from the terminal year forward.
  - Residual income declines to zero as ROE reverts to the cost of equity over time.
  - Residual income declines to some mean level.

• The residual income model assumes the clean surplus relation of \( B_t = B_{t-1} + E_t - D_t \). In other terms, the ending book value of equity equals the beginning book value plus earnings minus dividends, apart from ownership transactions.

• In practice, to apply the residual income model most accurately, the analyst may need to
  - Adjust book value of common equity for
    • Off-balance-sheet items.
    • Discrepancies from fair value.
    • The amortization of certain intangible assets.
  - Adjust reported net income to reflect clean surplus accounting.
  - Adjust reported net income for nonrecurring items misclassified as recurring items.
PROBLEMS

1. Based on the following information, determine whether Vertically Integrated Manufacturing (VIM) earned any residual income for its shareholders:
   - VIM had total assets of $3,000,000, financed with twice as much debt capital as equity capital.
   - VIM’s pretax cost of debt is 6 percent and cost of equity capital is 10 percent.
   - VIM had EBIT of $300,000 and was taxed at a rate of 40 percent.

   Calculate residual income by using the method based on deducting an equity charge.

2. Use the following information to estimate the intrinsic value of VIM’s common stock using the residual income model:
   - VIM had total assets of $3,000,000, financed with twice as much debt capital as equity capital.
   - VIM’s pretax cost of debt is 6 percent and cost of equity capital is 10 percent.
   - VIM had EBIT of $300,000 and was taxed at a rate of 40 percent. EBIT is expected to continue at $300,000 indefinitely.
   - VIM’s book value per share is $20.
   - VIM has 50,000 shares of common stock outstanding.

3. Palmetto Steel, Inc. (PSI) maintains a dividend payout ratio of 80 percent because of its limited opportunities for expansion. Its return on equity is 15 percent. The required rate of return on PSI equity is 12 percent, and its long-term growth rate is 3 percent.

   Compute the justified P/B based on forecasted fundamentals, consistent with the residual income model and a constant growth rate assumption.

4. Because New Market Products (NMP) markets consumer staples, it is able to make use of considerable debt in its capital structure; specifically, 90 percent of the company’s total assets of $450,000,000 are financed with debt capital. Its cost of debt is 8 percent before taxes, and its cost of equity capital is 12 percent. NMP achieved a pretax income of $5.1 million in 2006 and had a tax rate of 40 percent.

   What was NMP’s residual income?

5. In 2007, Smithson-Williams Investments (SWI) achieved an operating profit after taxes of €10 million on total assets of €100 million. Half of its assets were financed with debt with a pretax cost of 9 percent. Its cost of equity capital is 12 percent, and its tax rate is 40 percent.

   Did SWI achieve a positive residual income?

6. Calculate the economic value added (EVA) or residual income, as requested, for each of the following:

   A. NOPAT = $100
      Beginning book value of debt = $200
      Beginning book value of equity = $300
      WACC = 11 percent
      Calculate EVA.

   B. Net income = €5.00
      Dividends = €1.00
      Beginning book value of equity = €30.00
      Required rate of return on equity = 11 percent
      Calculate residual income.

   C. Return on equity = 18 percent
      Required rate of return on equity = 12 percent
Beginning book value of equity = €30.00
Calculate residual income.

7. Jim Martin is using economic value added (EVA) and market value added (MVA) to measure the performance of Sundanci. Martin uses the following fiscal year 2000 information for his analysis:
   • Adjusted net operating profit after tax (NOPAT) is $100 million.
   • Total capital is $700 million (no debt).
   • Closing stock price is $26.
   • Total shares outstanding is 84 million.
   • The cost of equity is 14 percent.
Calculate the following for Sundanci. Show your work.
   A. EVA for fiscal year 2000.
   B. MVA as of fiscal year-end 2000.

8. Protected Steel Corporation (PSC) has a book value of $6 per share. PSC is expected to earn $0.60 per share forever and pays out all of its earnings as dividends. The required rate of return on PSC’s equity is 12 percent. Calculate the value of the stock using the following:
   A. Dividend discount model.
   B. Residual income model.

9. Notable Books (NB) is a family controlled company that dominates the retail book market. NB has book value of $10 per share, is expected to earn $2.00 forever, and pays out all of its earnings as dividends. Its required return on equity is 12.5 percent. Value the stock of NB using the following:
   A. Dividend discount model.
   B. Residual income model.

10. Simonson Investment Trust International (SITI) is expected to earn $4.00, $5.00, and $8.00 for the next three years. SITI will pay annual dividends of $2.00, $2.50, and $20.50 in each of these years. The last dividend includes a liquidating payment to shareholders at the end of year 3 when the trust terminates. SITI’s book value is $8 per share and its required return on equity is 10 percent.
    A. What is the current value per share of SITI according to the dividend discount model?
    B. Calculate per-share book value and residual income for SITI for each of the next three years and use those results to find the stock’s value using the residual income model.
    C. Calculate return on equity and use it as an input to the residual income model to calculate SITI’s value.

11. Foodsco Incorporated (FI), a leading distributor of food products and materials to restaurants and other institutions, has a remarkably steady track record in terms of both return on equity and growth. At year-end 2007, FI had a book value of $30 per share. For the foreseeable future, the company is expected to achieve an ROE of 15 percent (on trailing book value) and to pay out one-third of its earnings in dividends. The required return is 12 percent. Forecast FI’s residual income for the year ending 31 December 2012.

12. Lendex Electronics (LE) had a great deal of turnover of top management for several years and was not followed by analysts during this period of turmoil. Because the company’s performance has been improving steadily for the past three years, technology analyst
Steve Kent recently reinitiated coverage of LE. A meeting with management confirmed Kent’s positive impression of LE’s operations and strategic plan. Kent decides LE merits further analysis.

Careful examination of LE’s financial statements revealed that the company had negative other comprehensive income from changes in the value of available-for-sale securities in each of the past five years. How, if at all, should this observation about LE’s other comprehensive income affect the figures that Kent uses for the company’s ROE and book value for those years?

13. Retail fund manager Seymour Simms is considering the purchase of shares in upstart retailer Hot Topic Stores (HTS). The current book value of HTS is $20 per share, and its market price is $35. Simms expects long-term ROE to be 18 percent, long-term growth to be 10 percent, and cost of equity to be 14 percent. What conclusion would you expect Simms to arrive at if he uses a single-stage residual income model to value these shares?

14. Dayton Manufactured Homes (DMH) builds prefabricated homes and mobile homes. Favorable demographics and the likelihood of slow, steady increases in market share should enable DMH to maintain its ROE of 15 percent and growth rate of 10 percent through time. DMH has a book value of $30 per share and the required rate of return on its equity is 12 percent. Compute the value of its equity using the single-stage residual income model.

15. Use the following inputs and the finite horizon form of the residual income model to compute the value of Southern Trust Bank (STB) shares as of 31 December 2007:
   - ROE will continue at 15 percent for the next five years (and 10 percent thereafter) with all earnings reinvested (no dividends paid).
   - Cost of equity equals 10 percent.
   - \( B_0 = \$10 \) per share (at year-end 2007).
   - Premium over book value at the end of five years will be 20 percent.

16. Shunichi Kobayashi is valuing United Parcel Service (NYSE: UPS). Kobayashi has made the following assumptions:
   - Book value per share is estimated at $9.62 on 31 December 2007.
   - EPS will be 22 percent of the beginning book value per share for the next eight years.
   - Cash dividends paid will be 30 percent of EPS.
   - At the end of the eight-year period, the market price per share will be three times the book value per share.
   - The beta for UPS is 0.60, the risk-free rate is 5.00 percent, and the equity risk premium is 5.50 percent.

The current market price of UPS is $59.38, which indicates a current P/B of 6.2.

A. Prepare a table that shows the beginning and ending book values, net income, and cash dividends annually for the eight-year period.
B. Estimate the residual income and the present value of residual income for the eight years.
C. Estimate the value per share of UPS stock using the residual income model.
D. Estimate the value per share of UPS stock using the dividend discount model. How does this value compare with the estimate from the residual income model?
17. Boeing Company (NYSE: BA) has a current stock price of $49.86. It also has a P/B of 3.57 and book value per share of $13.97. Assume that the single-stage growth model is appropriate for valuing the company. Boeing’s beta is 0.80, the risk-free rate is 5.00 percent, and the equity risk premium is 5.50 percent.

A. If the growth rate is 6 percent and the ROE is 20 percent, what is the justified P/B for Boeing?
B. If the growth rate is 6 percent, what ROE is required to yield Boeing’s current P/B?
C. If the ROE is 20 percent, what growth rate is required for Boeing to have its current P/B?