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John A. Doukas, *Editor*

Corporate Valuation Using the Free Cash Flow Method Applied to Coca-Cola

Carl B. McGowan, Jr.

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Abstract

The value of a corporation is the discounted present value of future cash flows provided by the company to the shareholders. The valuation process requires that the corporate financial decision maker determine the future free cash flow to equity, the short-term growth rate, the long-term growth rate, and the required rate of return based on market beta. The objective of this book is to provide a template for demonstrating corporate valuation using a real company—Coca-Cola. The data used in this book comes from the financial statements of Coca-Cola available on EDGAR. Other data are from SBBI, Yahoo! Finance, the U.S. Bureau of Economic Analysis, *Stocks*, *Bonds*, *Bills*, *and Inflation*, *Market Results for 1926–2010*, *2011 Yearbook*, *Classic Edition*, Morningstar, and US Department of the Treasury.

Keywords

free cash flow to equity, long term growth rate, market beta, required rate of return, sustainable growth rate, valuation

Contents

Preface

The objective of this book is to show how to use the free cash flow to equity (FCFE) valuation model to value a real company, specifically, Coca-Cola. The value of a corporation is the discounted present value of FCFE, provided by the company to the shareholders and can be represented by $V_0 = \text{FCFE}_1/(k - g)$, which is anticipated FCFE divided by the required rate of return minus the anticipated growth rate. As shown in Figure 1, the valuation process requires the corporate financial decision maker to determine the future FCFE, the short-term growth rate, the long-term growth rate, and the required rate of return based on market beta.

We use the super-normal growth rate model of valuation. FCFE is equal to net income plus net capital expenditures minus the change in working capital plus net debt issues. The short-term growth rate is calculated using the extended DuPont system of financial analysis to calculate the sustainable growth rate. The long-term growth rate is calculated from the long-term growth rate of GDP. The required rate of return is calculated using the Security Market Line with a five-year beta and the stock market rate of return and the risk-free rate of return data from *Stocks, Bonds, Bills, and Inflation, Market Results for 1926–2010, 2011 Yearbook,* and the U.S. Treasury website data.

To implement the valuation process, a financial decision maker must determine the future FCFE, the short-term growth rate of the FCFE, the long-term growth rate of FCFE, and the required rate of return based on the company's systematic risk, beta. We use a five-year super-normal growth rate model to determine the value of Coca-Cola.

$$V_0 = \frac{\text{FCFE}_1}{(1+k)^1} + \frac{\text{FCFE}_2}{(1+k)^2} + \frac{\text{FCFE}_3}{(1+k)^3} + \frac{\text{FCFE}_4}{(1+k)^4} + \frac{\text{FCFE}_5}{(1+k)^5} + \frac{V_5}{(1+k)^5}$$

The data used in this book come from the financial statements of Coca-Cola, available on EDGAR. Other data are from Yahoo! Finance; the U.S. Bureau of Economic Analysis; *Stocks, Bonds, Bills, and Inflation,*

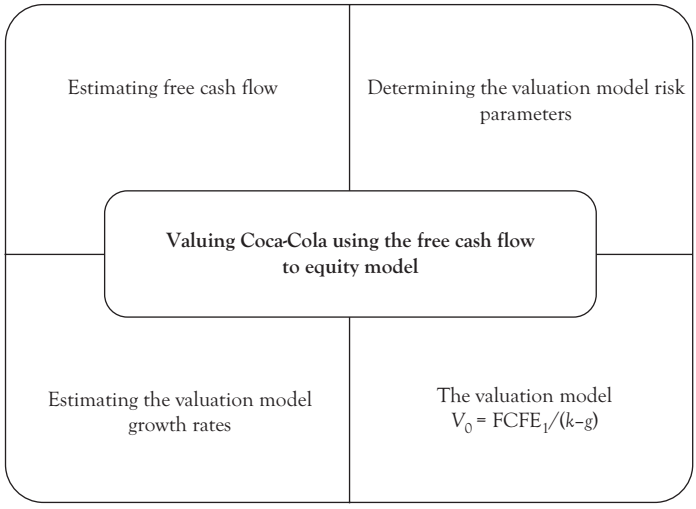

Figure 1 A model to value Coca-Cola using the free cash flow to equity model

Market Results for 1926–2012, 2013 Yearbook, Classic Edition; and the U.S. Department of the Treasury. This book demonstrates how to acquire, download, and use the data needed to value Coca-Cola using the FCFE model.

Acknowledgments

The objective of this book is to provide a template for corporate valuation using a real company—Coca-Cola. The data used in this book come from the financial statements of Coca-Cola available on EDGAR at the SEC website. Other data are from Yahoo! Finance; the U.S. Bureau of Economic Analysis; *Ibbotson SBBI, 2014 Classic Yearbook*; *Market Results for Stocks, Bonds, Bills, and Inflation, 1926–2013*; Morningstar; and the U.S. Department of the Treasury.

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CHAPTER 1

Introduction: An Overview of Corporate Financial Management

Corporate financial management can be defined as the efficient acquisition and allocation of funds. The efficient acquisition of funds requires the firm to acquire funds at the lowest possible cost, and the efficient allocation of funds requires investing funds at the highest possible expected rate of return. If the firm acquires funds at the lowest possible cost and invests funds at the highest possible return, net cash flow to the firm will be maximized. The objective of corporate financial management is to maximize the value of the firm. The value of the firm is the market capitalization of the firm, which is the number of common equity shares times the price per share. The value of the firm is determined by the risk and return characteristics of the firm. The relationship between risk and return is positive and linear. Firms that want to earn higher rates of return must be willing to assume greater levels of risk, and firms that want to have lower levels of risk must be willing to accept a lower rate of return. The risk and return characteristics of the firm are determined by the decisions made by the managers.

Corporate financial management decisions fall into three categories. Managers make decisions about

1. investing;
2. financing;
3. paying dividends.

Investing decisions determine the specific assets purchased by the firm, and the assets purchased by the firm determine the asset structure of the firm or the left-hand side of the balance sheet, assets. The financing decisions

determine the extent to which the firm uses fixed cost financing. Fixed cost financing is the use of bonds that have a cost to the firm that does not change over the life of the bond, that is, the interest payment is fixed for the life of the bond. The financing decisions determine the right-hand side of the balance, liabilities and owners' equity. The dividend decision is separate because, on the one hand, the dividend decision is an allocation of funds but is not an investment decision because no assets are purchased. On the other hand, the dividend decision affects the right-hand side of the balance sheet, specifically, retained earnings, but is not a financing decision. In addition, the dividend decision affects firm valuation through a number of mechanisms.

Once the firm's financial managers have made a set of decisions, we have a firm that can be represented by the financial statements—the balance sheet and the income statement. The financial statement information can be used to estimate the level and the riskiness of expected future cash flows for the firm. The cash flows are represented by a probability distribution of all possible cash flows and the probability of each of the possible cash flows. The degree of operating leverage is determined by the amount of fixed cost assets used by the firm, and the degree of financial leverage is determined by the amount of fixed cost financing used by the firm. The combine leverage effect is represented in the required rate of return for the firm.

The value of the firm is the discounted present value of all of the future cash flows discounted at the required rate of return. Cash flow today is worth more than cash flow in the future because the firm can invest cash flow and earn a rate of return on cash currently in one's possession, which means that next year's cash level will be higher than today's cash level. Alternatively, cash in the future is worth less than cash today. The more risky the cash flow is further into the future, the less the cash flow is worth today. Each cash flow in the future, free cash flow to equity $(\text{FCFE})_t$, which will grow from FCFE_0, which is the current dividend, at an estimated rate, g, must be discounted by the required rate of return, $(1 + k)$, to reflect the amount of risk and the time in the future. The sum of the growing and discounted future cash flows from time zero to time infinity is as follows:

$$P_0 = \Sigma \text{FCFE}_0 (1 + g)^t / (1 + k)^t \qquad (1.1)$$

We can simplify this expression after making a number of simplifying assumptions to the following expression:

$$P_0 = \frac{\text{FCFE}_1}{(k - g)} \tag{1.2}$$

That is, the value of a share of stock is equal to the expected dividend at time $t = 1$ divided by the required rate of return minus the expected future growth rate.

The information and process to value a company require finding financial data, stock price and dividend data, and bond data. FCFE is derived from the balance sheet, the income statement, and the statement of cash flows. Short-term growth is estimated using sustainable growth, and long-term growth is estimated using gross domestic product (GDP) growth. The required rate of return is calculated using the security market line with market beta, Treasury bond rates, and the long-term rate of return on the stock market.

Table 1.1 shows the relationship among value, expected cash flow, and the discount rate for a firm that does not grow. As the expected net cash flows increase, for a given discount rate, the value of the firm increases. Alternatively, as the required rate of return decreases for a given expected net cash flow, the value of the firm increases.

The Valuation Process

The value of a company is the discounted present value of future cash flows generated by that company. In order to estimate future cash flows,

Table 1.1 The relationship among value, expected net cash flow, required rate of return, and required rate of expected net cash flow return

(percent)	100	200	300
20	500	1,000	1,500
10	1,000	2,000	3,000
5	2,000	4,000	6,000

Example: If the expected net cash flow is 100 and the required rate of return is 20 percent, the value of the firm = 500 = 100/0.20

the decision maker needs to determine if past cash flows are useful to generate future cash flows. Chapter 2 discusses how to calculate short-term growth rates using the extended DuPont system of financial analysis. Chapter 3 discusses how to estimate the long-term future growth of FCFE using the growth rate of GDP. Chapter 4 discusses how to calculate the required rate of return using the beta coefficient for a stock. Chapter 5 discusses how to compute the weighted average cost of capital for a company. Chapter 6 combines all the information gathered in chapters 1 to 5 to find the value of Coca-Cola.

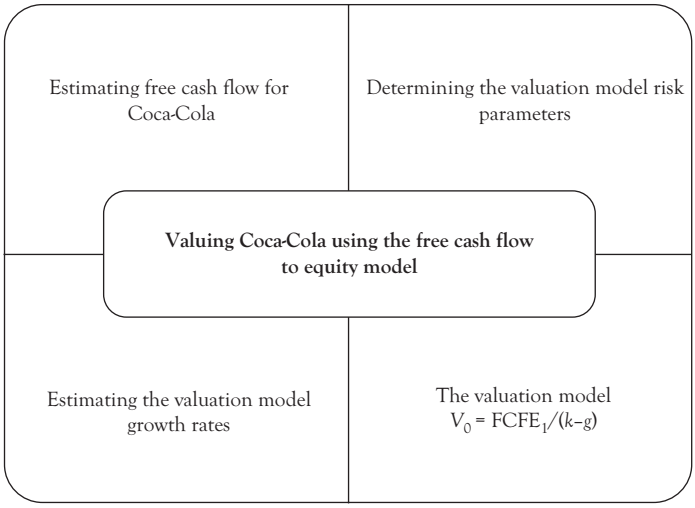


Figure 1.1 Valuing Coca-Cola using the free cash flow to equity (FCFE) model: The value of an investment, in this case, Coca-Cola, is the discounted present value of the estimated FCFE discounted at a rate of return commensurate with the riskiness of the investment. To value Coca-Cola, the financial analyst needs to estimate FCFE, the valuation model risk parameters, and the valuation growth model discount rate. These values are used in the valuation model to determine the value for Coca-Cola

CHAPTER 2

Determining the Short-Term Growth Rate Using the Extended DuPont System of Financial Analysis

The DuPont system of financial analysis uses a financial model that is based on the return on equity (ROE) of a firm. The DuPont system of financial analysis is used to examine a firm's financial statements and the condition in which the firm functions. According to the formula, the three elements of ROE are net profit margin (NPM), total asset turnover (TAT), and the equity multiplier (EM). NPM measures a company's overall profitability. NPM is the ratio of net income, sales minus costs, to sales. A firm with a higher NPM would be more efficient than a firm with a lower NPM. TAT is a measure of a company's efficiency in using assets to generate sales. A firm with a higher TAT ratio generates more sales per dollar of assets than a firm with a lower TAT. The EM is the ratio of total assets to owners' equity (OE) and measures financial leverage for a firm. A higher EM ratio shows that a firm is relying more heavily on debt financing to obtain funds to finance assets. ROE is a measure of return to the owners of a firm. Financial managers can use the ratios for the DuPont system of financial analysis to create pro forma financial statements.

ROE can be decomposed into return on assets (ROA) and the EM. ROA can be further disaggregated into NPM and TAT:

$$\text{ROE} = (\text{ROA}) * (\text{EM}) \tag{2.1}$$

$$\text{ROA} = (\text{NPM}) * (\text{TAT}) \tag{2.2}$$

$$\text{ROE} = (\text{NPM}) * (\text{TAT}) * (\text{EM}) \tag{2.3}$$

where,

ROE = return on equity
ROA = return on assets
EM = equity multiplier
NPM = net profit margin
TAT = total asset turnover

NPM is net profit (loss) divided by sales. TAT is sales divided by total assets. The EM is total assets divided by total OE:

$$NPM = (NI)/(S) \tag{2.4}$$

$$TAT = (S)/(TA) \tag{2.5}$$

$$EM = (TA)/(OE) \tag{2.6}$$

where,

NPM = net profit margin
NI = net income
S = sales
TAT = total asset turnover
TA = total assets
EM = equity multiplier
OE = owners' equity

The DuPont system of financial analysis is based on the ROE model that disaggregates ROE into three components: NPM, TAT, and the EM. The NPM ratio allows the financial analyst to forecast the income statement and the components of the income statement, both revenue and expenses. Achievement of the target ROE requires the firm to determine the net income required to achieve the target ROE. Total revenue is predicted from the required net income based on the NPM ratio. TAT allows the financial analyst to forecast the left-hand side of the balance sheet: assets. The firm uses the total revenue projection to predict total asset requirements. Based on the firm's operating leverage, corporate managers can determine the ratio of current assets to total assets and the composition of assets. The EM allows the

financial analyst to forecast the right-hand side of the balance sheet because liabilities and OE must equal total assets. The corporation must issue debt so that the leverage ratio remains constant. From the DuPont system of financial analysis, the company is able to develop pro forma financial statements, particularly, the income statement and the balance sheet.

The DuPont system of financial analysis fulfills three functions. First, the DuPont system allows the firm to project future operations through the pro forma financial statements developed as a budget or financial plan. The second function performed by the DuPont system is as a control mechanism. As the firm progresses through the year, the firm can use the pro forma financial statements to monitor performance. If the firm's operating performance deviates from the budget, the firm can take corrective action. If the deviation is negative, managers can correct the problem or adjust their forecasts. If the deviation is positive, managers can analyze and potentially enhance the positive change. The third function of the DuPont system is in the postperformance audit function. After the planning year ends, the firm can compare actual operating performance with planned operating performance to determine the deviation from the plan. In the long term, effective performance budgeting should result in the deviation from the budget being near zero. Otherwise, the firm will be underbudgeting or overbudgeting.

ROE analysis provides a system for planning and for analyzing a company's performance. The NPM allows the analyst to develop a pro forma income statement, as in Figure 2.1. The top box of Figure 2.1 shows an abbreviated income statement where net income is equal to revenues minus expenses. Given a target ROE, the financial manager can determine the net income needed to achieve the target ROE. From the target ROE, the financial manager can determine the revenue level necessary to achieve the net income target. The middle box of Figure 2.1 shows how the financial manager can use the TAT ratio to project the total asset level necessary to generate the projected revenue level. Given a level of projected revenue, the financial manager can project the level of total assets needed to produce the projected level of revenues. The total asset requirement can be used to project the pro forma levels of all of the asset accounts. The fundamental equation of accounting is that assets equal

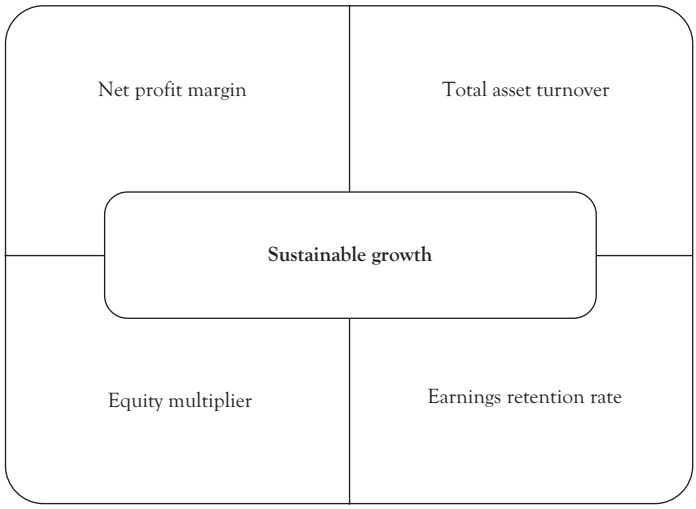


Figure 2.1 Calculating sustainable growth: Sustainable growth is the maximum rate at which earnings can grow without external financing, while retaining the existing financial structure for the firm. The figure shows the input variables needed to compute sustainable growth for Coca-Cola. Sustainable growth is return on equity times the earnings retention rate. Alternatively, sustainable growth is net profit margin times total asset turnover times the equity multiplier times the earnings retention rate

liabilities plus OE. The bottom box of Figure 2.1 shows how the financial manager uses the EM ratio to project the pro forma financial needs and the financial structure of the company. Total liabilities and equity must be equal to the projected total asset requirements.

The DuPont system of financial analysis has three uses. First, the DuPont system of financial analysis can be used to construct pro forma financial statements for Coca-Cola for planning purposes. Second, the DuPont system of financial analysis allows the firm to monitor performance during the planning period. Third, the DuPont system of financial analysis can be used to audit the planning process. Over the period from 2004 to 2013, the NPM for Coca-Cola was 0.2148. The TAT and EM averages for Coca-Cola were 0.6529 and 2.1571. ROE averaged at 0.2915 for the period from 2004 to 2013.

Sustainable Growth

Sustainable growth is the maximum rate at which a company can increase sales while maintaining the target or optimal leverage ratio without any additional external equity financing. The sustainable growth model assumes that total OE for a company can only increase when retained earnings increase. The impact of this limitation on sales growth can be derived from the fundamental equation of accounting, which states that assets must be equal to liabilities plus OE.

$$\text{Assets} = \text{liabilities} + \text{equity} \tag{2.7}$$

As a result of this assumption requiring that assets equal liabilities plus OE, any changes in assets must be equal to changes in liabilities plus changes in OE.

$$\Delta\text{Assets} = \Delta\text{liabilities} + \Delta\text{equity} \tag{2.8}$$

Furthermore, the sustainable growth model assumes that any change in equity can only result from a change in retained earnings. Therefore, the firm cannot sell additional OE.

$$\Delta\text{Assets} = \Delta\text{liabilities} + \Delta\text{retained earnings} \tag{2.9}$$

This means that the company's future increase in assets is equal to the future increase in retained earnings plus the additional debt that is supported by the additional OE as determined by the EM. The EM is equal to total assets divided by OE.

$$\Delta\text{Assets} = (\Delta\text{retained earnings})\ (\text{equity multiplier}) \tag{2.10}$$

An increase in total revenue must be accompanied by a proportionate increase in total assets. Since any increase in total revenue is limited by the increase in total assets, growth in total revenue is limited by

the increase in retained earnings. TAT is equal to sales divided by total assets.

$$\Delta\text{Total revenue} = (\Delta\text{total assets})\ (\text{total asset turnover}) \tag{2.11}$$

The net income required to achieve the target ROE is determined by total revenue times the NPM. NPM is equal to net income divided by total revenue.

$$\Delta\text{Net income} = (\Delta\text{total revenue})\ (\text{net profit margin}) \tag{2.12}$$

Earnings retention is equal to retained earnings divided by net income.

$$\text{Earnings retention} = \text{retained earnings/net income} \tag{2.13}$$

Sustainable growth is equal to ROE times the earnings retention rate (RR) of the company.

$$\text{Sustainable growth} = (\text{return on equity})\ (\text{earnings retention}) \tag{2.14}$$

Computing Sustainable Growth

This model is called the DuPont system of financial analysis and the extended DuPont system is used to compute sustainable growth. Sustainable growth, *G*, is equal to ROE times the RR, which is 1 minus the payout ratio.

$$G = \text{ROE}\ (\text{RR}) = (\text{NI/OE})/(1 - \text{D/NI}) \tag{2.15}$$

where,

G = sustainable growth
ROE = return on equity
RR = dividend RR

NI = net income
OE = owners' equity
D = dividends

Sustainable growth is the maximum growth rate that the firm can achieve without additional external financing beyond what is justified by the growth in retained earnings. The sustainable growth model assumes that the firm will maintain the target capital structure. The target capital structure will be the capital structure that minimizes the weighted average cost of capital for the firm that maximizes the value of the firm.

Analysis of Return on Equity and Sustainable Growth for Coca-Cola

Table 2.1 contains the data and ratios for the DuPont system financial analysis of ROE and the analysis of sustainable growth of Coca-Cola based on the annual data for the years from 2004 to 2013. The first five lines from total revenue to dividends contain the raw data needed to compute the ratios used in the DuPont system of financial analysis and for the sustainable growth rate. Over the period from 2004 to 2013, total revenue for Coca-Cola increased from $21,742 million to $48,108 million. Total revenue for Coca-Cola increased every year over the sample period except 2009. Net income rose from $4,847 million to $8,584 million and increased every year except 2008, 2011, and 2013. Total assets rose from $31,441 million to $90,055 but did not increase every year, that is, total assets declined in both 2005 and 2008. Total OE rose from $15,935 million in 2004 to $33,440 million in 2013. Total OE rose every year except 2008 and 2011. Dividends rose from $2,429 million in 2004 to $4,969 in 2013. Dividends rose every year from 2004 to 2013.

The next four lines in Table 2.1 contain NPM, TAT, the EM, and the earnings RR, which are the ratios needed to compute ROE, and sustainable growth, G. ROE is computed by two methods. The first line of ROE is computed by dividing net income by total OE and averages 0.2915 for the period from 2004 to 2013. The second line of ROE is computed by multiplying NPM by TAT by EM and equals 0.2915, also. If the two computations for ROE are the same, then the analysis is correct and is

*Table 2.1 Extended DuPont analysis of Coca-Cola, 2004–2013**

KO	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Sales	21,742	23,104	24,088	28,857	31,944	30,990	35,119	46,542	48,107	48,108	33,860
Net income	4,847	4,872	5,080	6,027	5,874	6,906	11,859	8,572	9,019	8,584	7,164
Total assets	31,441	29,427	29,963	43,269	40,519	48,671	72,921	79,974	86,174	90,055	55,241
Total owners' equity	15,935	16,355	16,920	21,744	20,862	25,346	31,317	31,291	33,168	33,440	24,638
Dividends (–)	2,429	2,678	2,911	3,149	3,521	3,800	4,068	4,300	4,595	4,969	3,642
NPM	0.2229	0.2109	0.2109	0.2089	0.1839	0.2228	0.3377	0.1842	0.1875	0.1784	0.2148
TAT	0.6915	0.7851	0.8039	0.6669	0.7884	0.6367	0.4816	0.5820	0.5583	0.5342	0.6529
EM	1.9731	1.7993	1.7709	1.9899	1.9422	1.9203	2.3285	2.5558	2.5981	2.6930	2.1571
RR	0.4989	0.4503	0.4270	0.4775	0.4006	0.4498	0.6570	0.4984	0.4905	0.4211	0.4771
ROE	0.3042	0.2979	0.3002	0.2772	0.2816	0.2725	0.3787	0.2739	0.2719	0.2567	0.2915
G	0.1517	0.1341	0.1282	0.1324	0.1128	0.1225	0.2488	0.1365	0.1334	0.1081	0.1409

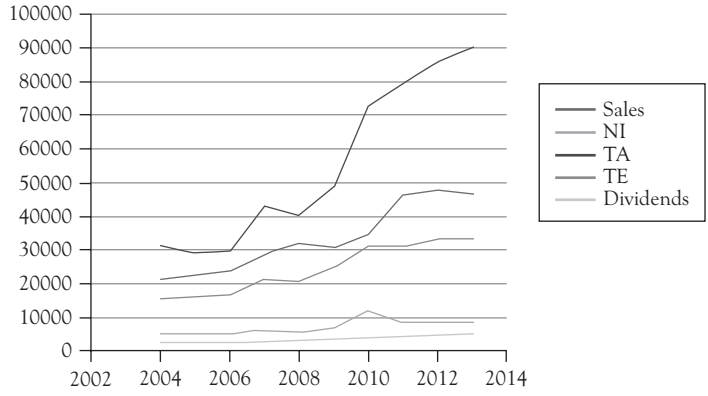
*EM, equity multiplier; G, sustainable growth; NPM, net profit margin, ROE, return on equity; RR, retention rate; TAT, total asset turnover.

verified. The last line in Table 2.1 is the value of sustainable growth, G, that is calculated by multiplying sustainable growth by the dividend RR.

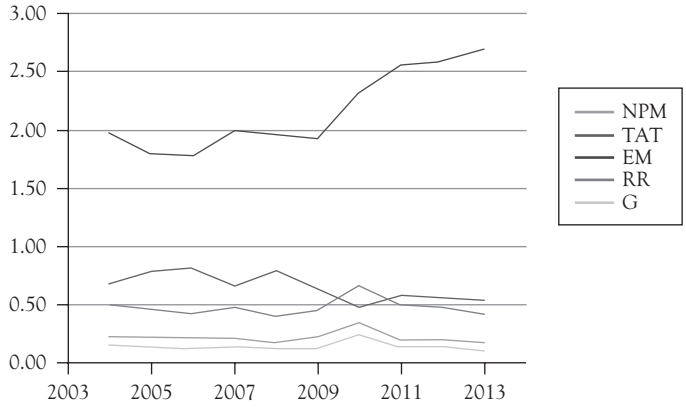
The NPM went from 22.29 percent in 2004 to 17.84 percent in 2013. The highest NPM was 33.77 percent in 2010 and the lowest NPM was in 2013 and equaled 17.84 percent. The average NPM is 21.48 percent. The TAT was 0.6915 in 2004 and varied over the sample period ending at 0.5342 in 2013. The average TAT was 0.6529. TAT is the most volatile of the three variables affecting ROE. The EM was 1.9731 in 2004 and fell to 1.7709 in 2006 and rose to 2.6930 in 2013 but not monotonically. The average EM is 2.1571. ROE was 0.2567 in 2013 and averaged at 0.2915 over the sample period.

The dividend RR averaged at 0.4771 over the entire analysis period with a low value of 0.4006 in 2008 and a high value of 0.6570 in 2010. Sustainable growth was lowest in 2013 at 10.81 percent and highest in 2010 at 24.88 percent. Average sustainable growth is 14.09 percent.

Figure 2.1 shows the variables needed to compute ROE: NPM, TAT, and EM. Graph 2.1 shows that NPM and EM are relatively stable but that TAT declines over the analysis period. Thus, ROE is relatively stable averaging at 29.15 percent. Graph 2.2 shows sustainable growth for Coca-Cola and ROE and RR, which are used to compute G. The RR and sustainable growth rate were stable from 2003 to 2007.



Graph 2.1 Financial data for Coca-Cola, 2004–2013. NI, net income; TA, total assets; TE, total equity



Graph 2.2 DuPont ratios for Coca-Cola, 2004–2013. EM, equity multiplier; G, sustainable growth; NPM, net profit margin, RR, retention rate; TAT, total asset turnover

Summary and Conclusions

Sustainable growth is the maximum rate at which a company can grow while maintaining the target or optimal financial leverage rate without additional external equity financing. Assets can only increase by the amount of retained earnings in the firm plus the additional debt that can be supported by the additional equity. In this chapter, we demonstrated how to compute sustainable growth for Coca-Cola for the period from 2001 to 2010 and discussed the impact of the different variables on sustainable growth of Coca-Cola.

This chapter uses actual financial data from Coca-Cola Corporation to do the financial analysis. As a class project, students are required to collect data for Coca-Cola, enter the data into an Excel spreadsheet, and analyze the data including graphing the data. If students are required to display their results in a PowerPoint presentation, this case analysis meets several course objectives and program goals for a student majoring in accounting or finance: collecting data, entering data into a spreadsheet, manipulating the data to compute financial ratios, graphing the data, and doing a PowerPoint-based oral presentation. Additionally, the student would be required to write a short paper on the results.

CHAPTER 3

Determining the Long-Term Growth Rate

Valuation of a company requires the use of both intermediate-term growth rates for growth for the next five years. However, long-term growth rates should approximate the long-term growth rates of the economy as a whole. Figure 3.1 shows the process needed to compute the long-term growth rate of Coca-Cola based on GDP. It is not possible for the sales of a company to grow at a higher rate than the average growth rate of the economy forever. Large, mature companies will grow at the average growth rate of GDP eventually.

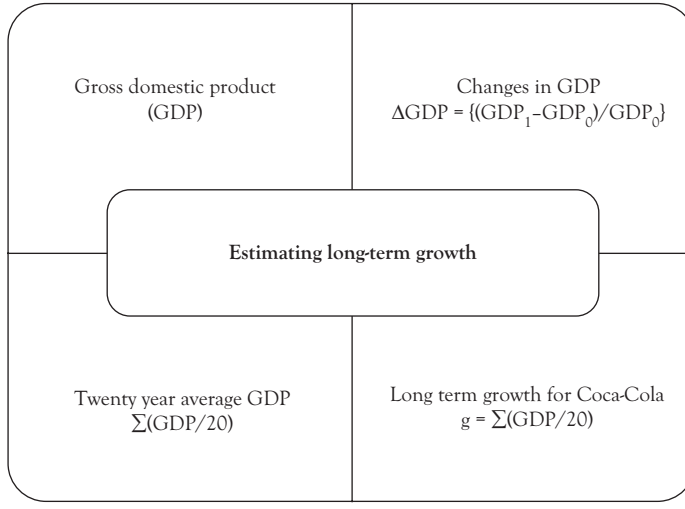


Figure 3.1 Shows the process used to compute the long-term growth rate of Coca-Cola based on GDP. The change in GDP is equal to GDP minus the GDP for the previous year. The difference is divided by the previous-year GDP. The change in GDP is computed for the 10-year time period ending on the valuation date. The long-term growth rate of Coca-Cola is the sum of the changes in GDP divided by 10

To estimate the long-term growth rate of a company, the financial analyst needs to estimate long-term growth of the economy. We use the "Current-Dollar" and "Real Gross Domestic Product" published by the U.S. Bureau of Economic Analysis. The URL of the Excel spreadsheet that provides these data is www.bea.gov/national/xls/gdplev.xls and provides annual and quarterly "GDP in billions of current dollars" and "GDP in billions of chained 2005 dollars" for the period from 1929 to the present. We use "GDP in billions of current dollars" because we are estimating nominal values.

"GDP measures the value of final goods and services produced in the United States in a given period of time" (Bureau of Economic Analysis [*BEA*] 2007, pp. 2–4). GDP measures the production of goods and services by both the market and nonmarket sectors at market prices. GDP can be measured by expenditures, income, or value added. GDP measures the total output produced in the United States.

We use that last 11 years' GDP to estimate the long-term growth rate of Coca-Cola. The yearly change in GDP, ΔGDP_1, is the difference in GDP from the current year, GDP_1, and GDP from the previous year, GDP_0, divided by GDP from the previous year.

$$\Delta GDP_1 = \{(GDP_1 - GDP_0) / GDP_0\} \tag{3.1}$$

The change in GDP from year 2003 to year 2004 is GDP_{2004} minus GDP_{2003} divided by GDP_{2003}. The change in GDP for 2004 is equal to

$$(12{,}277 - 11{,}512)/11{,}512 = 0.0485 \text{ or } 4.85\%$$

The change in GDP from year 2012 to year 2013 is GDP_{2013} minus GDP_{2012} divided by GDP_{2012}. That is, the change in GDP for 2013 is equal to

$$(16{,}800 - 16{,}245)/16{,}245 = 0.0342 \text{ or } 3.42\%$$

The changes in GDP for each of the 10 one-year time periods are computed the same way.

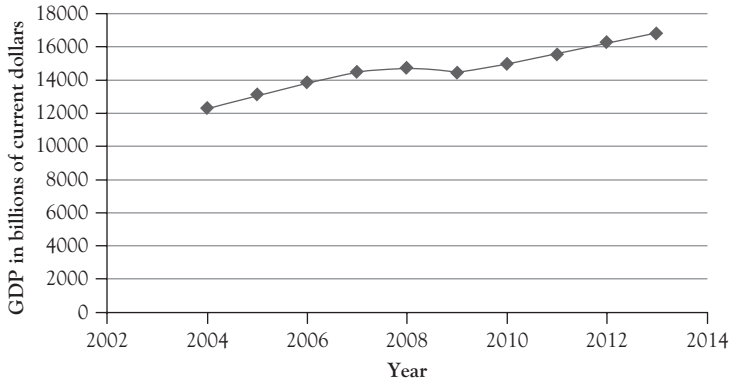
Table 3.1 shows the values of GDP for each of the 20 years from 2004 to 2013 and the change in GDP for each of the 10 years. The average change in GDP for the 10-year period is 3.88 percent. This is the value that is used as the estimate of long-term growth for Coca-Cola.

Graph 3.1 shows GDP for the 10-year time period. The change in GDP is positive for 9 of the 10 years. The only year with negative growth is 2009. Graph 3.2 shows the change in GDP for each of the 10 years.

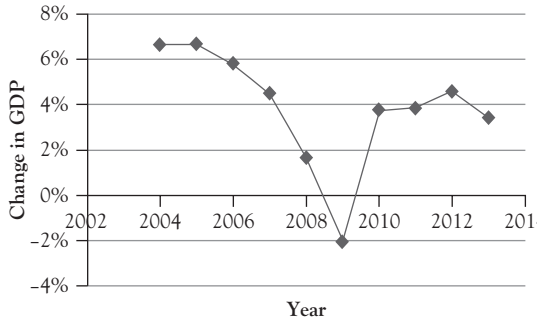
Table 3.1 GDP growth rate, 2004–2013*

Year	GDP in billions of current dollars	Change in GDP (%)
2004	12,277	6.64
2005	13,095	6.67
2006	13,858	5.82
2007	14,480	4.49
2008	14,720	1.66
2009	14,418	−2.05
2010	14,958	3.75
2011	15,534	3.85
2012	16,245	4.58
2013	16,800	3.42
Average	12,011	3.88

**GDP*, gross domestic product.



Graph 3.1 Gross domestic product (GDP) in billions of current dollars, 2004–2013



Graph 3.2 Change in gross domestic product (GDP), 2004–2013

CHAPTER 4

Calculating the Beta Coefficient and Required Rate of Return for Coca-Cola

In Chapter 4, we demonstrate how to compute the required rate of return for Coca-Cola using modern portfolio theory (MPT) with data downloaded from the Internet. We demonstrate how to calculate monthly returns for the S&P 500 stock index and for Coca-Cola and how to use the returns to compute the beta coefficient and the required rate of return using the downloaded data. We show how to validate the data for the market index and the company and how to compute the returns using the dividend and stock split–adjusted prices. We demonstrate how to graph the characteristic line for Coca-Cola and use the graph to check that the regression was run correctly. We use Coca-Cola and the S&P 500 Index in this chapter, but this technique can be used for any company listed on Yahoo! Finance.

Markowitz[1] (1952) began MPT, which can be used to explain the relationship between risk and return for assets, particularly stocks. Stock of companies that have higher rates of return have higher levels of risk. In order to achieve a lower level of risk, an investor must accept a lower expected rate of return. This concept is called the dominance principle and allows for the creation of the efficient frontier. MPT partitions risk into nonsystematic risk, which can be eliminated from a portfolio through diversification, and systematic risk that is market-wide and cannot be diversified.

[1] Markowitz received the Sveriges Riksbank prize in economic sciences in memory of Alfred Nobel 1990.

Nonsystematic risk is company specific and is reduced to zero in a large, well-diversified portfolio. In order to determine systematic risk for a stock, we use the market model developed by Sharpe[2] (1964). The returns for a stock are regressed as the dependent variable against a market index used as the independent variable. The slope coefficient of the regression is the measure of systematic risk for the stock. Systematic risk measures the degree to which a stock moves with the market. A beta coefficient greater than 1 implies that returns for the stock move more than the market and a beta coefficient less than 1 implies that returns for the stock move less than the market. The former is aggressive stock and the latter is defensive stock.

In this chapter, we show how to retrieve data from the Internet, how to compute returns for both the market index and the stock, and how to run a linear regression to determine the beta coefficient to measure the systematic risk for the stock. In addition, we show how to graph the data with a trend line and statistics to verify that the first regression is run correctly, that is, with the correct variable as the independent variable. We show how to do all of this analysis using Excel.

Downloading Data From the Internet

The data used for the analysis discussed in this paper are downloaded from the Internet using the Yahoo! Finance website. The URL for Yahoo! Finance is http://finance.yahoo.com/. Once one arrives at the Yahoo! Finance website, the S&P 500 data can be found by clicking on the "S&P 500" icon and then, clicking on the "Historical Prices" icon. Click on the "monthly" indicator to download monthly data and enter the dates. For this paper we download sixty-one monthly observations, in order to calculate sixty monthly returns. The downloaded data columns are: date, open, high, low, close, average volume, and adjusted close. The index and the Coca-Cola price are adjusted for stock splits and dividends. Move the cursor to the bottom of the data and click on "download to spreadsheet." Save the data to a spreadsheet and repeat the process for the Coca-Cola data. Begin by entering the Coca-Cola ticker symbol, KO, and download and save the data for the save time period.

[2] Sharpe received the Sveriges Riksbank prize in economic sciences in memory of Alfred Nobel 1990.

Calculating Returns for the S&P 500 Index and for Coca-Cola

In this chapter, we use arithmetic monthly returns to compute the beta coefficient for Coca-Cola. Arithmetic returns are calculated by dividing the ending index or stock value ($Value_1$), by the beginning value ($Value_0$), and subtracting 1 as in Equation 5.1. An alternative method to calculate the return is to subtract the beginning value ($Value_0$), from the ending value ($Value_1$), and dividing by the beginning value ($Value_0$), as in Equation 5.2. Both returns are adjusted for dividends and stock splits. The returns used in the regression analysis are arithmetic returns.

$$\text{Return} = [(\text{Value}_1 - \text{Value}_0) - 1] \tag{4.1}$$

$$\text{Return} = [(\text{Value}_1 - \text{Value}_0)/\text{Value}_0)] \tag{4.2}$$

Five years of monthly data are used to generate 60 data points.

Calculating Beta for Coca-Cola

MPT shows that investors are rewarded for the systematic risk of an investment and not for the total risk of an investment because total risk includes firm-specific risk that can be eliminated in a well-diversified portfolio. The systematic risk of an individual stock is measured by the slope coefficient of the characteristic line, which is the regression line between the monthly returns for the individual security and the monthly returns for the market index. Beta coefficient lines are calculated using a 60-month regression. In this example, the beta coefficient for Coca-Cola is calculated using 60 monthly observations of returns for Coca-Cola from January 1, 2004 to December 31, 2013, and returns for the S&P 500 Index for the same time period. Beta is the covariance between returns for Coca-Cola and returns for the S&P 500 divided by the variance for the S&P 500.

$$R_{KO} = \text{Alpha}_{KO} + \text{Beta}_{KO}\ (R_m) \tag{4.3}$$

R_{KO} = the return for Coca-Cola stock

Beta_{KO} = the slope of the regression line between returns for the market and returns for Coca-Cola

Alpha_{KO} = the intercept coefficient for the regression line between returns for the market and returns for Coca-Cola

(R_m) = the return on the S&P 500 stock market index

$(R_m - R_F)$ = the market risk premium is the additional return that stockholders receive for the additional risk of holding stocks rather than the risk-free asset, long-term government bonds.

Table 4.1 contains the data used to compute the Coca-Cola beta and are downloaded from Yahoo! Finance. Column 1 shows the date and columns 2 and 3 contain the stock split and dividend-adjusted index and price values, for the S&P 500 Index and for Coca-Cola stock, respectively. The independent variable is the return for the S&P 500 (column 4) and the dependent variable is the return for Coca-Cola (column 5). The returns are calculated by dividing the ending index or stock value by the beginning value and subtracting 1. An alternative method to calculate the return is to subtract the beginning value from the ending value and dividing by the beginning value. Both returns are adjusted for dividend and stock splits. The returns used are arithmetic returns.

Table 4.2 contains the regression results for the regression between the returns for the S&P 500 and for Coca-Cola using Excel. The independent variable is the return for the S&P 500 (*x*-axis), and the dependent variable is the return for Coca-Cola (*y*-axis). Both returns are adjusted for dividends and stock splits. The adjusted R^2 for the regression is 0.23 and the *F*-statistic is 18.65, both of which are statistically significant at the 0.0000 level. The regression coefficient is 0.7560, has a *t*-statistic of 4.31, and is significant at the 0.0000 level.

Figure 4.1 is a graph of the data used to compute the Coca-Cola beta, which is the characteristic line for Coca-Cola. Figure 4.1 was created in Excel using the chart function. The independent variable is the return for the S&P 500 (*x*-axis), and the dependent variable is the return for Coca-Cola (*y*-axis). Both returns are adjusted for dividends and for stock splits. The chart contains the trend line and R^2. The statistics in the graph are the

Table 4.1 Rates of return for S&P 500 Index and Coca-Cola

Date	S&P	KO	$R_{S\&P}$	R_{KO}
1/2/2014	37.24	1,783	−0.0846	−0.0356
12/2/2013	40.68	1,848	0.0278	0.0236
11/1/2013	39.58	1,806	0.0230	0.0280
10/1/2013	38.69	1,757	0.0445	0.0446
9/3/2013	37.04	1,682	−0.0008	0.0297
8/1/2013	37.07	1,633	−0.0473	−0.0313
7/1/2013	38.91	1,686	−0.0008	0.0495
6/3/2013	38.94	1,606	0.0099	−0.0150
5/1/2013	38.56	1,631	−0.0551	0.0208
4/1/2013	40.81	1,598	0.0467	0.0181
3/1/2013	38.99	1,569	0.0521	0.0360
2/1/2013	37.06	1,515	0.0396	0.0111
1/2/2013	35.65	1,498	0.0274	0.0504
12/3/2012	34.70	1,426	−0.0441	0.0071
11/1/2012	36.30	1,416	0.0269	0.0028
10/1/2012	35.35	1,412	−0.0197	−0.0198
9/4/2012	36.06	1,441	0.0210	0.0242
8/1/2012	35.32	1,407	−0.0742	0.0198
7/2/2012	38.15	1,379	0.0333	0.0126
6/1/2012	36.92	1,362	0.0537	0.0396
5/1/2012	35.04	1,310	−0.0210	−0.0627
4/2/2012	35.79	1,398	0.0311	−0.0075
3/1/2012	34.71	1,408	0.0673	0.0313
2/1/2012	32.52	1,366	0.0344	0.0406
1/3/2012	31.44	1,312	−0.0347	0.0436
12/1/2011	32.57	1,258	0.0406	0.0085
11/1/2011	31.30	1,247	−0.0089	−0.0051
10/3/2011	31.58	1,253	0.0115	0.1077
9/1/2011	31.22	1,131	−0.0346	−0.0718
8/1/2011	32.34	1,219	0.0359	−0.0568
7/1/2011	31.22	1,292	0.0107	−0.0215

(Continued)

Table 4.1 Rates of return for S&P 500 Index and Coca-Cola (Continued)

Date	S&P	KO	$R_{S\&P}$	R_{KO}
6/1/2011	30.89	1,321	0.0144	−0.0183
5/2/2011	30.45	1,345	−0.0094	−0.0135
4/1/2011	30.74	1,364	0.0169	0.0285
3/1/2011	30.23	1,326	0.0453	−0.0010
2/1/2011	28.92	1,327	0.0169	0.0320
1/3/2011	28.44	1,286	−0.0444	0.0226
12/1/2010	29.76	1,258	0.0413	0.0653
11/1/2010	28.58	1,181	0.0374	−0.0023
10/1/2010	27.55	1,183	0.0475	0.0369
9/1/2010	26.30	1,141	0.0554	0.0876
8/2/2010	24.92	1,049	0.0138	−0.0474
7/1/2010	24.58	1,102	0.0998	0.0688
6/1/2010	22.35	1,031	−0.0167	−0.0539
5/3/2010	22.73	1,089	−0.0385	−0.0820
4/1/2010	23.64	1,187	−0.0280	0.0148
3/1/2010	24.32	1,169	0.0514	0.0588
2/1/2010	23.13	1,104	−0.0282	0.0285
1/4/2010	23.80	1,074	−0.0480	−0.0370
12/1/2009	25.00	1,115	−0.0036	0.0178
11/2/2009	25.09	1,096	0.0805	0.0574
10/1/2009	23.22	1,036	−0.0073	−0.0198
9/1/2009	23.39	1,057	0.1101	0.0357
8/3/2009	21.07	1,021	−0.0214	0.0336
7/1/2009	21.53	987	0.0386	0.0741
6/1/2009	20.73	919	−0.0157	0.0002
5/1/2009	21.06	919	0.1421	0.0531
4/1/2009	18.44	873	−0.0207	0.0939
3/2/2009	18.83	798	0.0872	0.0854
2/2/2009	17.32	735	−0.0436	−0.1099
1/2/2009	18.11	826		

S&P, Standard and Poor's 500 Index Value; KO, Coca-Cola adjusted stock price; $R_{S\&P}$, monthly change in the S&P 500 Index; R_{KO}, monthly change in the Coca-Cola stock price.

Table 4.2 Coca-Cola versus the S&P 500 regression of arithmetic means returns from January 2004 to December 2013

Regression statistics					
Multiple *R*	0.489716				
R square	0.239822				
Adjusted *R* square	0.226716				
Standard error	0.039881				
Observations	60				
ANOVA	**df**	**SS**	**MS**	***F***	**Significance *F***
Regression	1	0.0291035	0.0291035	18.30	0.000072
Residual	58	0.0922509	0.0015905		
Total	59	0.1213544			
	Coefficients	**Standard error**	***T* stat**	***P* value**	
Intercept	0.006138	0.005399	1.136945	0.260237	
X variable 1	0.500819	0.117079	4.277607	0.000072	

ANOVA, analysis of variance; Df, degrees of freedom; SS, sum of the squares; MS, mean square; *F*, *F* statistic value.

same as the regression statistics in Table 4.2. The pedagogical purpose of the graph is to display the characteristic line for Coca-Cola and to confirm that the regression was run with the correct independent and dependent variables. If the trend line and statistics in the graph are not identical to the numbers in the regression, the student has reversed the variables.

Calculating the Required Rate of Return for Stocks

Graham and Harvey (2002) found that 73.5 percent of respondents to their survey indicated that the company of the survey respondent used the capital asset pricing model (CAPM) to determine the component cost of common stock equity capital. In this chapter, we use the CAPM to compute the required rate of return for Coca-Cola. The required rate of return for Coca-Cola is the minimum rate of return demanded by

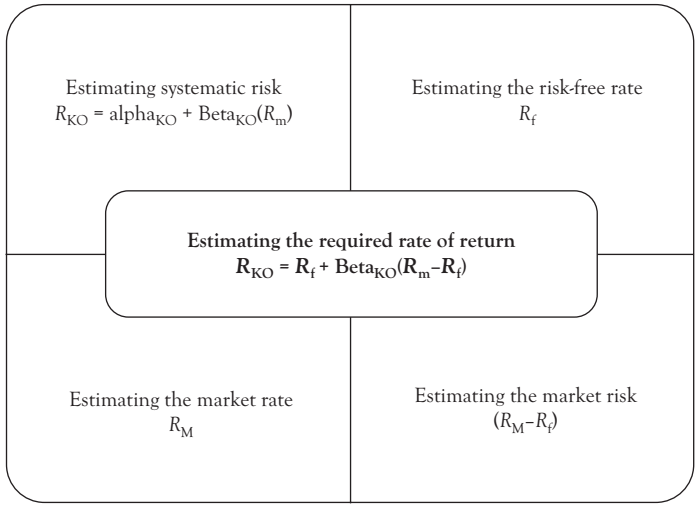


Figure 4.1 Shows the steps needed to compute the beta coefficient for Coca-Cola, which is the systematic risk measure. The regression line defines the monthly return for Coca-Cola, R_{KO}, as being equal to the intercept term, $Alpha_{KO}$, plus the regression coefficient, $Beta_{KO}$, times the return on the market, R_M, which is measured by the S&P 500 Index. The required rate of return for Coca-Cola, R_{KO}, is the risk-free rate of return, R_f, plus the risk premium for Coca-Cola. The risk premium for Coca-Cola is the market price of risk ($R_M - R_f$) times the amount of risk for Coca-Cola, measured by $Beta_{KO}$

stockholders of Coca-Cola stock. The model used in this chapter is based on the CAPM derived from the work of Sharpe (1964).

$$R_{KO} = R_f + \text{Beta}_{KO}\,(R_m - R_F) \tag{4.4}$$

R_{KO} = the required rate of return for Coca-Cola stock

R_f = the risk-free rate of return

Beta_{KO} = the beta coefficient for Coca-Cola

R_m = the rate of return on the stock market

$(R_m - R_F)$ = the market risk premium

The required rate of return for Coca-Cola is the risk-free rate of return plus the risk premium for Coca-Cola. The risk premium is the beta for Coca-Cola times the market price of risk.

Computing the Required Rate of Return for Coca-Cola (KO)

The risk-free rate is the total return (income plus capital appreciation) on long-term government bonds taken from Ibboston SBBI (2014).[3] For the years from 1926 to 2013, SBBI uses the Government Bond File from the Center for Research in Security Prices. For the period from 1976 to 2014, the returns in SBBI 2014 are computed from data taken from the *Wall Street Journal*. The yield for the bond is the discount rate that equates the expected future cash flows, coupon payments, and maturity value to the current price.

We use the security market line to compute the required rate of return for Coca-Cola. As shown in Table 4.3, we use the long-term bond rate taken from SBBI (2007), which equals 5.8 percent and the long-term market return of 12.3 percent. The market risk premium is 6.5 percent. This yields a cost of equity for Coca-Cola of 10.77 percent.

$$R_{KO} = R_f + \text{Beta}_{KO}\,(R_m - R_F) \tag{4.5}$$

$$10.77\% = 5.8\% + 0.7650\,(12.3\% - 5.8\%)$$

$$10.77\% = 5.8\% + 0.7650\,(6.5\%)$$

$$10.77\% = 5.8\% + 4.97\%$$

The required rate of return for Coca-Cola stock is 10.77 percent.

Table 4.3 Input data and sources

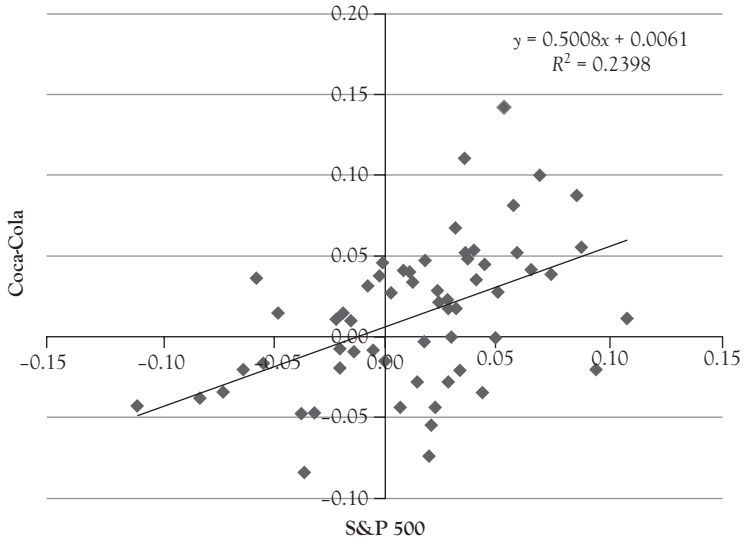
Variable	Value	Source
Beta_{KO}	0.5008	Computed
R_f	0.0590	SBBI, 2014, p. 40
R_m	0.1210	SBBI, 2014, p. 40
K_e	0.1077	Computed

[3] Ibboston SBBI, 2014 classic yearbook, market results for stocks, bonds, bills and inflation, 1926–2013, morningstar.

Summary and Conclusions

In this chapter, we demonstrate how to compute the required rate of return for Coca-Cola using MPT. Data are downloaded from Yahoo! Finance for both Coca-Cola and for the S&P 500 Index. The adjusted stock price for Coca-Cola and the S&P 500 Index are used to compute a five-year, monthly series of returns. The characteristic line is the regression line from the regression in which the monthly returns for the S&P 500 Index are the independent variables and the monthly returns for Coca-Cola are the dependent variables. The regression is run using the Data Analysis Toolpak in Excel and the chart function. We use SBBI 2007 data to compute the required rate of return using the market model. We compute a required rate of return for Coca-Cola equal to 10.77 percent.

The objective of this chapter is to demonstrate how to download the data needed to compute the required rate of return for Coca-Cola using MPT. We demonstrate how to calculate monthly returns for the S&P 500 Index and Coca-Cola and how to use the returns to compute the beta coefficient and the required rate of return using the downloaded data. We show how to validate the data for the market index and the company and



Graph 4.1 Characteristic line for Coca-Cola, January 2006 to December 2010

how to compute the returns using the dividend and stock split–adjusted prices. We demonstrate how to graph the characteristic line for Coca-Cola and use the graph to check that the regression was run correctly. We use Coca-Cola and the S&P 500 Index in this chapter, but any company listed on Yahoo! Finance can be used as the example. This chapter can be used as the basis of a lecture on intermediate corporate finance or investments to demonstrate the process using a real company.

CHAPTER 5

Free Cash Flow to Equity

Corporate Financial Management and Stock Valuation

Corporate financial management encompasses the efficient acquisition and allocation of funds. The objective of corporate financial management is to maximize the value of the firm. Solomon (1963, p. 22, Chapter II) argues that wealth maximization should be the goal of corporate financial management because this criterion maximizes the wealth of the owners of corporations and maximizes the wealth of a society by maximizing economic output. The value of the firm is measured by the market capitalization of the firm. The market capitalization of the firm is calculated by multiplying the total number of shares outstanding times the market price per share. The value of the firm is determined by the risk and return characteristics of the firm. Firms that wish to achieve a higher rate of return must assume a higher level of risk. Firms that wish to have a lower level of risk must accept a lower rate of return. A firm that has a goal of minimizing risk would likely be in an industry such as money market management and invest all of the firm's available funds in treasury bills, while a firm that has a goal of maximizing return would choose an industry like oil-well drilling. The former option has minimal risk while the latter option has high expected return.

The risk and return characteristics of the firm are determined by the decisions made by corporate financial managers. Higher returns require higher levels of risk, and lower risk provides lower rates of return. Decisions made by corporate, financial, managers fall into three categories: investment decisions, financing decisions, and dividend decisions. Investment decisions determine the type of assets purchased and the relationship between current assets and fixed assets. A firm in the money management business would buy treasury bills, and an oil-well drilling company would buy oil-well drilling

equipment. The higher the ratio of current assets to fixed assets in the firm, the lesser is the risk of illiquidity and, consequently, the lesser is the risk of default or insolvency. The higher current asset ratio will lead to a lower return on assets and return on equity (ROE). Financing decisions relate to the extent to which the firm uses fixed cost sources of funding—long-term bonds. More financial leverage leads to higher ROE but more volatility of ROE. The dividend decision is a hybrid decision as it involves the allocation of funds but is not an asset decision while at the same time affecting financial leverage, because the dividend payment affects the level of retained earnings and, thus, the need for more or less external funding.

After a set of decisions has been made, a firm is created that can be represented by the financial statements of the firm. The balance sheet is a cross-sectional representation of the firm at a point in time and the income statement is a representation of what has happened to the firm during the most recent accounting period. The risk and return characteristics of the firm are affected by the amount of fixed cost assets and fixed cost financing used by the firm. The degree of operating leverage, the degree of financial leverage, and the degree of combined leverage measure the impact of fixed cost assets and fixed cost financing on projected cash flows for the firm. Decision makers can use the probability distribution of expected future cash flows to determine the total market capitalization, *value*, of the firm. Firms with higher expected cash flows will have higher value if the cost of funds is held constant, and firms with lower required rates of return will have higher value, holding cash flows constant. The goal of corporate financial management is to make decisions that optimize the probability distribution of expected future cash flows to maximize the value of the firm. The value of the firm increases with higher cash flows and with lower required rate or return, other things being equal.

Decision makers estimate the probability distribution of future cash flows based on accounting information provided by the financial managers. To be useful, accounting information must influence decisions. Beaver, Kennelly, and Voss (1968) argue that accounting information is useful if the information has predictive ability. Managerial accounting information is all information that is available to corporate insiders and includes material, nonpublic information. Individuals who have access to material, nonpublic information such as commercial loan officers, investment

bankers, attorneys, and auditors are constructive insiders, that is, because of access to inside information, these individuals are de facto insiders. The subset of information that is provided to external decision makers constitutes financial accounting information. External decision makers include customers, suppliers, bond holders, and stockholders. Each group must determine whether to provide credit, buy bonds, or buy stock.

Valuing a Company Using the Free Cash Flow Model

The value of a share of stock is determined by the future free cash flow to equity (FCFE) available to the company to pay to shareholders.

$$P_0 = \text{FCFE}_1 + \text{FCFE}_2 + \text{FCFE}_3 + ... \tag{5.1}$$

However, since FCFE relates to the future, each FCFE must be discounted to the present time by the cost of equity, k. That is, the value of a share of stock is equal to the discounted present value of the future stream of FCFE discounted at the cost of equity, which is the opportunity cost of funds to the shareholders.

$$P_0 = \frac{\text{FCFE}_1}{(1+k)^1} + \frac{\text{FCFE}_2}{(1+k)^2} + \frac{\text{FCFE}_3}{(1+k)^3} + ... \tag{5.2}$$

The discounted present value of the future stream of FCFE discounted at the cost of equity can be represented as the sum of each FCFE, FCFE_t, discounted by 1 plus the cost of equity, $(1 + k)^t$, from time 0 to time infinity.

$$P_0 = \Sigma \text{FCFE}_t/(1 + k)^t \tag{5.3}$$

If we assume that the future FCFE will grow at a constant rate, g, each future FCFE is equal to the FCFE at time 0 times 1 plus the growth rate raised to the power of t. $\text{FCFE}_t = \text{FCFE}_0 (1 + g)^t$. We can substitute this value of FCFE_t into formula 5.3.

$$P_0 = \Sigma \text{FCFE}_0(1 + g)^t/(1 + k)^t \tag{5.4}$$

If g and k are constant and k is strictly greater than g, Equation 5.4 can be simplified to Equation 5.5. That is, the value of an investment is equal to the anticipated FCFE at time $t = 1$ discounted at the cost of equity minus the growth rate.

$$P_0 = \text{FCFE}_1/(k - g) \tag{5.5}$$

That is, the value of a share of stock in the firm is equal to the anticipated future dividend divided by the required rate of return for equity minus the expected future growth rate of FCFE for the firm. This model assumes that FCFE will be greater than 0 and that k is strictly greater than g. If FCFE is zero, the implied value of the firm would be zero, which does not occur. High-growth firms often have no dividend payout but have a positive value. Investors are anticipating high dividends in the future, after the high growth period. If $k = g$, the denominator for Equation 5.5 would be 0, which is undefined in mathematics. If g is greater than k, the model implies a value that is negative and the lowest value for a share of stock is 0.

The Super-Normal Growth Model

The valuation formula derived in the previous section assumes that g and k are constant and k is strictly greater than g. If the conditions described by these assumptions are not met, the value of the investment must be determined by computing the value of each FCFE until the conditions assumed in the stock valuation model are met. The super-normal growth period is the time period during which the growth rate will be above average. After the super-normal growth period, the growth in earnings of the firm reverts to the long-term growth rate, which is assumed to be the long-term growth rate for the economy as a whole.

The present value of the shares in the firm is equal to the discounted present value of FCFE_t for the super-normal growth period plus the present value of the future FCFE for the normal growth period. Industry

practice for company valuations is to compute five years of super-normal growth and then assume a constant long-term growth rate.

$$P_0 = \frac{\text{FCFE}_1}{(1+k)^1} + \frac{\text{FCFE}_2}{(1+k)^2} + \frac{\text{FCFE}_3}{(1+k)^3} + \frac{\text{FCFE}_4}{(1+k)^4} + \frac{\text{FCFE}_5}{(1+k)^5} + \frac{P_5}{(1+k)^5} \quad (5.6)$$

The FCFE values for years 1 to 5 are computed using the super-normal growth rate, g^*, and the FCFE for year 6 is computed using the long-term normal growth rate, g. FCFE_1 is equal to the value of FCFE_0 times the growth factor, $\text{FCFE}_0(1 + g^*)^1$. FCFE_2 is equal to the value of FCFE_0 times the growth factor, $\text{FCFE}_0(1 + g^*)$. The rest of the FCFE values until FCFE_5 are computed using the super-normal growth rate. FCFE_6 is equal to the value of FCFE_5 times the normal growth rate, $FCFE_5(1 + g)^1$.

$$\text{FCFE}_1 = \text{FCFE}_0(1 + g^*)^1 \quad (5.7)$$

$$\text{FCFE}_2 = \text{FCFE}_1(1 + g^*)^1 \quad (5.8)$$

$$\text{FCFE}_3 = \text{FCFE}_2(1 + g^*)^1 \quad (5.9)$$

$$\text{FCFE}_4 = \text{FCFE}_3(1 + g^*)^1 \quad (5.10)$$

$$\text{FCFE}_5 = \text{FCFE}_4(1 + g^*)^1 \quad (5.11)$$

$$\text{FCFE}_6 = \text{FCFE}_5(1 + g^*)^1 \quad (5.12)$$

After time = 5, it is assumed that the firm will return to a normal long-term growth rate that is constant, the point at which the financial analyst can use the simplified model. The terminal value of the investment at time = 5 is the discounted present value of all of the future FCFE beginning with FCFE_6. The terminal value, P_5, is equal to the discounted present value of all of the future FCFE. Beginning with FCFE_6, the future cash flows are assumed to grow at a constant rate equal to g.

$$P_5 = \text{FCFE}_6 / (k - g) \quad (5.13)$$

After the future FCFE values are computed for years 1 to 5, and the terminal value at time 5 is computed, each cash flow is discounted to the present time, $t = 0$. The future cash flows are discounted at the cost of equity, k, and discounted for the number of years in the future that the cash flow will be received.

$$PV(FCFE_1) = \text{FCFE}_1 / (1+k)^1 \tag{5.14}$$

$$PV(\text{FCFE}_2) = \text{FCFE}_2 / (1+k)^2 \tag{5.15}$$

$$PV(\text{FCFE}_3) = \text{FCFE}_3 / (1+k)^3 \tag{5.16}$$

$$PV(\text{FCFE}_4) = \text{FCFE}_4 / (1+k)^4 \tag{5.17}$$

$$PV(\text{FCFE}_5) = \text{FCFE}_5 / (1+k)^5 \tag{5.18}$$

$$PV(P_5) = P_5 / (1+k)^5 \tag{5.19}$$

The present value of the investment is equal to the sum of the six present values of the future free cash flow to equity and the future terminal value.

$$\begin{aligned}\text{PV}_0 = {} & \text{PV}(\text{FCFE}_1) + \text{PV}(\text{FCFE}_2) + \text{PV}(\text{FCFE}_3) + \text{PV}(\text{FCFE}_4) \\ & + \text{PV}(\text{FCFE}_5) + \text{PV}(\text{P}_5)\end{aligned} \tag{5.20}$$

Free Cash Flow to Equity

In this chapter, we combine the concept of the super-normal growth rate model of stock valuation with the FCFE model from Damodaran[1] (2006, pp. 491–493). The FCFE model, in Figure 5.1, defines FCFE as net income minus net capital expenditures minus the change in working capital plus net changes in the long-term debt position. Net income is taken from the income statement. Net capital expenditure equals capital expenditures minus depreciation both taken from the statement of cash flows. The change in working capital is the difference of accounts

[1] See damodaran, aswath. "Applied corporate finance," second edition, john wiley & sons, inc., 2006.

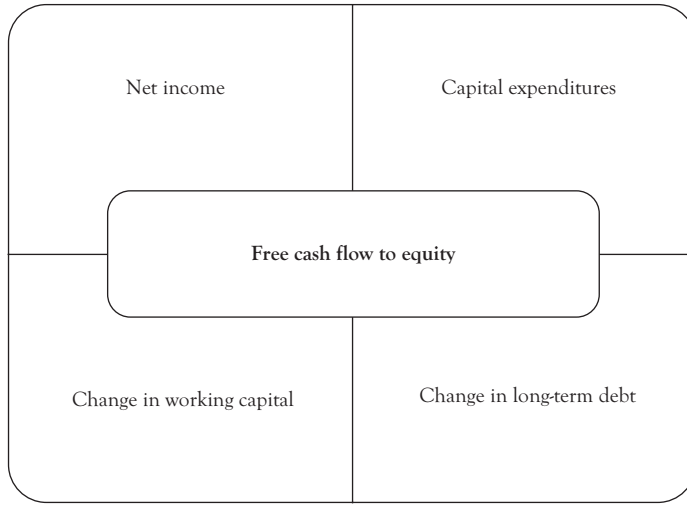


Figure 5.1 Free cash flow to equity (FCFE): FCFE is composed of net time, plus CE – D, plus the change in net working capital, plus the net change in long-term debt. Net income is taken from the income statement. CE – D is calculated as cash spent on new property, plant, and equipment minus proceeds from the sale of old equipment (salvage value) minus depreciation, which is noncash expense. The change in net working capital is the change in each of the working capital accounts, that is, accounts receivable, inventory, and accounts payable. Increases in asset accounts decrease cash and decreases in asset accounts increase cash. Increases in liability accounts increase cash and decreases in liability accounts decrease cash. The change in long-term debt is new sales of long-term debt minus refunding of long-term debt

receivable plus inventory from one year to the next less the difference in accounts payable from one year to the next.

$$\mathbf{FCFE = NI - (CE - D) - (\Delta WC) + (NDI - DR)} \qquad (5.21)$$

FCFE = free cash flow to equity
(CE – *D*) = net capital expenditures
(ΔWC) = changes in noncash working capital accounts: accounts receivable, inventory, and payables

(NDI – DR) = new debt issues are a cash inflow while the repayment of outstanding debt is a cash outflow. The difference is the net effect of debt financing on cash flow.
NI = net income
CE = capital expenditure
D = depreciation
ΔWC = changes in working capital
NDI = new debt issued
DR = debt retired

Computing Free Cash Flow to Equity for Coca-Cola from 2001 to 2010

Table 5.1 shows the computation of FCFE for Coca-Cola for the period from 2004 to 2013 using data taken from Coca-Cola's Form 10-Ks from 2004 to 2014. Net income is taken from the income statement and depreciation is taken from the statement of cash flows. Capital expenditure is the difference between purchases of property, plant and equipment, and depreciation. The change in working capital for each year is calculated by

Table 5.1 FCFE for Coca-Cola

Year	NI	Depr	Cap Exp	ΔWC	FCFE (BD)	NCFFD	FCFE (AD)
2004	4,847	893	–414	24	5,350	168	5,518
2005	4,872	932	–811	49	5,042	–4,107	935
2006	5,080	938	–1,295	39	4,762	–3,672	1,090
2007	5,981	1,163	–1,409	551	6,286	4,122	10,408
2008	5,807	1,228	–1,839	–450	4,746	–464	4,282
2009	6,824	1,236	–1,889	–383	5,788	1,509	7,297
2010	11,809	1,443	–2,081	1234	12,405	553	12,958
2011	8,572	1,954	–2,819	–782	6,925	2,021	8,946
2012	9,019	1,982	–2,637	–340	8,024	1,148	9,172
2013	8,626	1,977	–1,991	770	9,382	4,711	14,093
						Average	7,470

FCFE, free cash flow to equity; NI, net income; ΔWC, changes in working capital

taking the difference in each of the working capital accounts for each year from 2000 to 2010. The working capital accounts are accounts receivable, inventory, and accounts payable, and the change in working capital is defined at the net change in accounts receivable plus inventory minus accounts payable. When net income, depreciation, capital expenditure, and the change in working capital are combined, we have FCFE before changes in debt. Net cash flow from debt equals new debt financing minus old debt retirement, which is added to FCFE before debt to compute FCFE after debt.

CHAPTER 6

Valuing Coca-Cola

Chapter 6 shows calculation of free cash flow to equity (FCFE) for Coca-Cola. In this chapter, we calculate the value of Coca-Cola from the input data that we have calculated in chapters 3 to 5. Table 6.1 displays the FCFE and the present value of FCFE for Coca-Cola, 2013 to 2017. The columns represent the following:

Column 1	Year for which FCFE is estimated from 2011 to 2015.
Column 2	Projected FCFE for years 2011 to 2015, assuming a growth rate of 14.99 percent[1] from Chapter 3.
Column 3	Present value of FCFE for years 2011 to 2015 discounted at the required rate of return for equity for Coca-Cola of 10.77 percent.[2]

The projected FCFE for year 2018 is $14,997 million. The terminal value of Coca-Cola at the end of year 2017 is $292,715 million, which is equal to $14,997 million divided by the required rate of return, 9.00 percent minus the anticipated growth rate of 3.88 percent. The present value of P_5 is $190,201 million.

$$\begin{aligned} FCFE_6 &= FCFE_5(1+g)^1 \\ &= \$14{,}437\ (1+0.1409)^1 \\ &= \$14{,}997 \end{aligned}$$

[1] Gardner, McGowan, and Moeller (2011) demonstrate how to calculate sustainable growth for Coca-Cola.

[2] Gardner, McGowan, and Moeller (2010) show how to calculate the beta and required rate of return for Coca-Cola, and Harper, Jordan, McGowan, and Revello (2010) show how to calculate beta for Dow Chemical Company.

Table 6.1 Free cash flow to equity (FCFE) and the present value of FCFE for Coca-Cola, 2013 to 2017 (estimated)

Year	FCFE	PV(FCFE)
Average	7,470	
2013	8,522	7,818
2014	9,722	8,182
2015	11,092	8,564
2016	12,654	8,963
2017	14,437	9,381

$$
\begin{aligned}
P_5 &= \text{FCFE}_6/(k - g) \\
&= \$14{,}997/(0.0900 - 0.0388) \\
&= \$14{,}997/(0.0512) \\
&= \$292{,}715 \\
\text{PV}(P_5) &= P_5/(1 + k)^5 \\
&= \$293{,}715/(1 + 0.0900)^5 \\
&= \$190{,}201
\end{aligned}
$$

Year	FCFE	P_5	PV(FCFE)
2018	$14,997	$293,715	$190,201

Thus, the current value of Coca-Cola is the sum of the five anticipated FCFE values plus the present value of the firm at time $t = 5$. The discounted present value of the FCFE for the super-normal growth period for the five years from 2011 to 2015 is $28,273 million and the present terminal value is $133.145. The total value of Coca-Cola is $161,417 million. The actual market value for Coca-Cola on December 28, 2010, is $150,185 million. The FCFE model overvalues Coca-Cola by 7.48 percent.

$42,908	PV(FCFE)
$190,201	PV(terminal value)
$233,109	Total value

When we value a stock that has a period of super-normal growth, that value of the equity is the discounted present value of the expected FCFE during the super-normal growth period plus the terminal value of the stock at the end of the super-normal growth period. In the case of the KO valuation, I assume that the super-normal growth period will last for five years. This is standard in the valuation industry. Projections beyond five years are very uncertain. The value of the stock at the end of the super-normal growth period is the discounted present value of all of the future FCFE and is computed from $P_0 = \text{FCFE}_1/(k - g)$. The difference is that the present value of a share of stock at time = t is equal to the anticipated free cash flow to equity at time = $(t + 1)$. Beginning with time = $(t + 1)$, the investment returns to the long-term growth rate with both k and g becoming constant and k being strictly greater than b. Since we are using a super-normal growth period of five years, the terminal value of the stock is $P_5 = \text{FCFE}_6/(k - g)$. The value of P_5 is five years into the future and must be discounted to the present using the cost of equity. The Appendix summarizes these computations.

Summary and Conclusions

In this chapter, we have combined the concepts of equity valuation, super-normal growth, required rate of ROE, and sustainable growth to determine the market value of Coca-Cola Corporation (KO). The value of the equity of a firm is defined as the present value of all future cash flows from the firm to the shareholders. The value of the firm is FCFE divided by the sum of the required rate of return for equity minus the growth rate of the firm's earnings. FCFE is defined as net income minus CE – D minus the change in net working capital plus the net change in long-term debt financing. The required rate of return for equity is computed using the CAPM using a five-year monthly rate of return beta relative to the S&P 500 Index. Sustainable growth for the super-normal growth period is computed with the extended DuPont model. The long-term growth rate is assumed to be the same as the growth rate of the economy. The table in the Appendix summarizes the results of this analysis.

APPENDIX

Calculating the Present Value of Free Cash Flow to Equity for Coca-Cola

$FCFE_0$	$7,470	
RROR	9.00%	
g	3.88%	
(k – g)	5.12%	
g*	14.09%	
Years	5	
Year	**$FCFE_t$ ($)**	**$PV(FCFE_t)$**
2013	7,470	
2014	8,522	7,818
2015	9,722	8,182
2016	11,092	8,564
2017	12,654	8,963
2018	14,437	9,381
2019	14,997	
PV_5	292,715	
$PV(P_5)$		190,201
PV_0		$233,109

$FCFE_0$ = free cash flow to equity at time zero.
FCFE is used as the initial cash flow, $FCFE_0$.
$FCFE_t$ = the FCFE at each year in the future.
$FCFE_1$ to $FCFE_5$ grow at the super-normal growth rate.

We use a super-normal growth rate of 13.43 percent, which is the average growth rate for Coca-Cola over the company's life.

$FCFE_6$ = the FCFE in the sixth year grows over the FCFE in year 5 by the long-term real growth rate of GDP, 3.6 percent. Assume that in the long term, all large firms grow at the GDP growth rate.

RROR = the required rate of return is derived from the CAPM and is 10.08 percent.

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This book provides a template for demonstrating corporate valuation using a real company—Coca-Cola. The data used in this book comes from the financial statements of Coca-Cola available on EDGAR. Other data are from SBBI, Yahoo! Finance, the U.S. Bureau of Economic Analysis, Stocks, Bonds, Bills, and Inflation, Market Results for 1926–2010, 2011 Yearbook, Classic Edition, Morningstar, and US Department of the Treasury.

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