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LAURENCE BOOTH • SEAN

INTRODUCTION TO CORPORATE FINANCE

THIRD EDITION

ABOUT THE AUTHORS

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At the University of Toronto since 1978, Professor Booth has taught graduate courses in business finance, international financial management, corporate financing, mergers and acquisitions, financial management, financial markets, and financial theory, as well as short executive programs on money and foreign exchange markets, business valuation, mergers and acquisitions, and financial strategy. His advice is frequently sought by the media, and he has appeared as an expert financial witness before various regulatory tribunals in Canada.

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Dr. Cleary has taught numerous university finance courses, as well as courses and seminars in many programs designed to prepare students to write exams for all three levels of the CFA program and the CSC. He is the Canadian author of the first three editions of *Investments: Analysis and Management,* and the co-author of the sixth edition of *Finance in a Canadian Setting,* both published by John Wiley & Sons Canada, Ltd. He is also the author of the first four editions of *The Canadian Securities Exam Fast Track Study Guide,* also published by Wiley.

Dr. Cleary has published numerous research articles in various journals, including *Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Financial Management, Journal of Banking and Finance,* and *Journal of Financial Research* among others. He has received several major research grants from the Social Sciences and Humanities Research Council of Canada (SSHRC). He currently serves as Associate Editor (Finance) at Canadian Journal of Administrative Sciences, and Associate Editor for European Journal of Finance.

Dr. Cleary frequently appears in the media on television, on the radio, and in newspapers.

EXAMPLE 7-10 Estimating a Firm's Sustainable Growth Rate Using the DuPont System *(continued)*

Solution

$$ROE = (0.04)(1.25)(1.4) = 0.07 = 7\%$$

$$\text{Payout ratio} = DPS/EPS = \$1/\$4 = 0.25, \text{ so } b = 1 - 0.25 = 0.75$$

$$g = b \times ROE = (0.75)(7\%) = 5.25\%$$

Another method of estimating g is to examine historical rates of growth in dividends and earnings levels, including long-term trends in these growth rates for the company, the industry, and the economy as a whole. Predictions regarding future growth rates can be determined based on these past trends by using arithmetic or geometric averages, or by using more involved statistical techniques, such as regression analysis. Finally, an important source of information regarding company growth, particularly for the near term, can be found in analyst estimates. Investors are often especially interested in "consensus" estimates, because market values are often based to a large extent on these estimates. However, a word of caution is in order: analysts have been shown to be biased—that is, they tend to be overly optimistic—in part because their major source of information is frequently the company itself. Research by Easton and Sommers has put the "optimism" bias in analysts' growth forecasts at an average of 2.84 percent.[5] As a result, analyst forecasts tend to be used with the two-stage growth model (discussed in the next section) to mitigate this optimism.

It is important to remember, when applying any of these approaches, that "future" growth is being estimated, and the inputs require judgement on the part of the analyst. If researchers believe past growth will be repeated in the future, or if they want to eliminate period-to-period fluctuations in b and ROE, they may choose to use three- to five-year averages for these variables. Conversely, if the company has changed substantially, or if analysts have good reason to believe the ratios for the most recent year are the best indicators of future sustainable growth, they will use these figures. In addition, an analysis of macroeconomic, industry-specific, and company-specific factors may lead researchers to develop predicted values for these variables independent of their historical levels.

The Multiple-Stage Growth Version of the DDM

The constant growth DDM relationship holds only when we are able to assume constant growth in dividends from now to infinity. In many situations, it may be more appropriate to estimate dividends for the most immediate periods up to some point (t), after which it is assumed there will be constant growth in dividends to infinity. Several situations lend themselves to this structure. For example, it is reasonable to assume that competitive pressures and business-cycle influences will prevent firms from maintaining extremely high growth in earnings for long periods. In addition, short-term earnings and dividend estimates should be much more reliable than those covering a longer period, which are often calculated using very general estimates of future economic, industry, and company conditions. To use the best information available at any point, it may make the most sense to estimate growth as precisely as possible in the short term before assuming some long-term rate of growth.

Equation 7-13 can be applied when steady growth in dividends to infinity does not begin until period t:

[7-13]
$$P_0 = \frac{D_1}{(1+k_c)^1} + \frac{D_2}{(1+k_c)^2} + \dots + \frac{D_t + P_t}{(1+k_c)^t}$$

[5] Easton, Peter D., and Gregory A. Sommers, "Effect of analysts' optimism on estimates of the expected rate of return implied by earnings forecasts," *Journal of Accounting Research* 45, no. 5 (December 2007), pp. 983–1016.

where $P_t = \dfrac{D_{t+1}}{k_c - g}$

Notice that this is Equation 7-4, with n replaced by t and with an estimate for P_t. Figure 7-2 depicts the cash flows associated with this type of valuation framework.

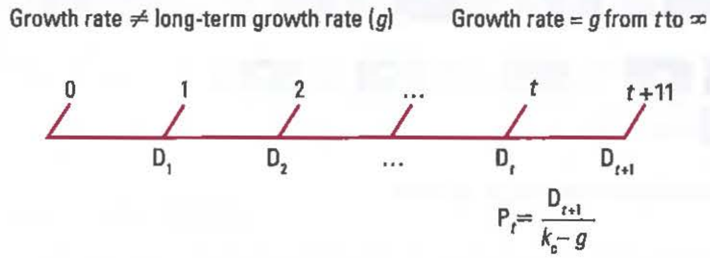


FIGURE 7-2 *The Cash Flow Pattern for Multiple-Stage Growth in Dividends*

Essentially, whenever we use multiple-period growth rates, we estimate dividends up to the beginning of the period in which it is reasonable to assume constant growth to infinity. Then we can use the constant growth DDM to estimate the market price of the share at that time (P_t). Finally, we discount all the estimated dividends up to the beginning of the constant growth period, as well as the estimated market price at that time.[6] This provides us with today's estimate of the share's market price.

EXAMPLE 7-11 Using the Multi-Stage DDM

A company is expected to pay a dividend of \$1.00 at the end of this year, a \$1.50 dividend at the end of year 2, and a \$2.00 dividend at the end of year 3. It is estimated dividends will grow at a constant rate of 4 percent per year thereafter. Determine the market price of this company's common shares if the required rate of return is 11 percent.

Solution

First, estimate dividends up to the start of constant growth to infinity. In this example, they are all given, so no calculations are required:

$D_1 = \$1.00$

$D_2 = \$1.50$

$D_3 = \$2.00$

Second, estimate the price at the beginning of the constant growth to infinity period:

$$D_4 = (\$2.00)(1 + 0.04) = \$2.08$$

$$P_3 = \frac{D_4}{k_c - g} = \frac{\$2.08}{0.11 - 0.04} = \$29.71$$

Third, discount back the relevant cash flows to time 0:

$$P_0 = \frac{1.00}{(1 + 0.11)} + \frac{1.50}{(1 + 0.11)^2} + \frac{2.00 + 29.71}{(1 + 0.11)^3} = 0.90 + 1.22 + 23.19 = \$25.31$$

[6] Recall that P_t represents the present value of all the expected dividends from time $t + 1$ to infinity, so we are essentially discounting *all* the expected future dividends associated with the stock.

EXAMPLE 7-11 Solution Using a Financial Calculator

Input the following variables:

(D_1) PV : N → 1; I/Y → 11%; PMT → 0; FV → − 1.00; CPT PV gives 0.90

(D_2) PV : N → 2; I/Y → 11%; PMT → 0; FV → − 1.50; CPT PV gives 1.22

($D_3 + P_3$) PV : N → 3; I/Y → 11%; PMT → 0; FV → − 31.71; (i.e., 2 + 29.71);
CPT PV gives 23.19

Then we add these figures to get $25.31, as above.

A well-known version of the multiple-growth DDM is the two-stage growth rate model, which assumes growth at one rate for a certain period, followed by a steady growth rate to infinity. This is illustrated in Example 7-12.

EXAMPLE 7-12 Two-Stage Dividend Growth

A company just paid a dividend of $2.00 per share. An investor estimates that dividends will grow at 10 percent per year for the next two years and then grow at an annual rate of 5 percent to infinity. Determine the market price of this company's common shares if the required rate of return is 12 percent.

Solution

First, estimate dividends up to the start of constant growth to infinity. In this example, we use the first-period growth rate of 10 percent:

$D_1 = (\$2.00)(1.1) = \$2.20$

$D_2 = (\$2.20)(1.1) = \$2.42$

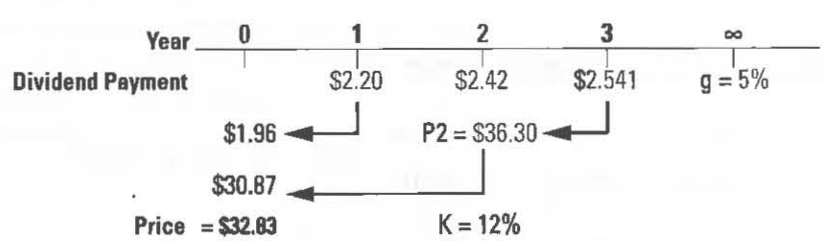
Second, estimate the price at the beginning of the constant growth to infinity period:

$D_3 = (\$2.42)(1 + 0.05) = \$2.541$

$$P_2 = \frac{D_3}{k_c - g} = \frac{\$2.541}{0.12 - 0.05} = \$36.30$$

Third, discount the relevant cash flows back to time 0:

$$P_0 = \frac{2.20}{(1.12)^1} + \frac{2.42 + 36.30}{(1.12)^2} = 1.96 + 30.87 = \$32.83$$



EXAMPLE 7-12 Solution Using a Financial Calculator

Input the following variables:

(P) [PV] ; [N] → 1; [I/Y] → 12%; [PMT] → 0; [FV] → − 2.20; [CPT] [PV] gives 1.96

$(P_2 - P)$ [PV] ; [N] → 2; [I/Y] → 12%; [PMT] = 0; [FV] = − 38.72; (i.e., 2.42 + 36.30);
[CPT] [PV] gives 30.87

Then we add these figures to get $32.83, as above.

Limitations of the DDM

Although the DDM provides significant insight into the factors that affect the valuation of common shares, it is based on several assumptions that are not met by a large number of firms, especially in Canada. In particular, it is best suited for companies that (1) pay dividends based on a stable dividend-payout history that they want to maintain in the future, and (2) are growing at a steady and sustainable rate. As such, the DDM works reasonably well for large corporations in mature industries with stable profits and an established dividend policy. In Canada, the banks and utility companies fit this profile, while in the United States, there are numerous NYSE-listed companies of this nature. Not surprisingly, the DDM does not work well and/or is difficult to apply for many resource-based companies, which are cyclical in nature and often display erratic growth in earnings and dividends. Many of these companies (especially the smaller ones) do not distribute much in the way of profits to shareholders as dividends. The model will also not work well for firms in distress, firms that are in the process of restructuring, firms involved in acquisitions, and private firms. Finally, if a company enters into substantial share-repurchase arrangements, the model will require adjustments, because share repurchases also represent a method of distributing wealth to shareholders.

Due to the limitations of the DDM discussed above, and because common share valuation is a challenging process, involving, as it does, predictions for the future, analysts often use several approaches to value common shares. This is evident from the survey results reported in Table 7-1. The study surveyed the percentage of analysts who use a particular share valuation method, and the fact that the percentages far exceed 100 percent suggests that most analysts use several methods.

In addition to the DDM and the relative valuation approaches discussed in the next section, another discounted cash flow approach—the free cash flow approach—is used frequently, which is obvious from Table 7-1. The free cash flow approach is implemented almost identically to the DDM, except that instead of discounting estimated future dividends, you discount expected future free cash flows. The underlying rationale is that dividends are discretionary, and many firms may choose not to pay out the amount of dividends they could. Therefore, instead of using dividends, you use free cash flow, which is in some sense a measure of what a firm could pay out if it chose, after taking account of expenses, changes in net working capital, and capital expenditures. We will not discuss this model in detail but would note that there are two variations of this approach: (1) using free cash flows to equity holders and discounting them using the required return to equity holders (as in the DDM), and (2) using free cash flows to the firm and discounting them using the firm's weighted average cost of capital (which will be discussed in Chapter 20).[7] This approach is often more appropriate when firms do not pay out a significant portion of their earnings as dividends or pay out well below their capacity.

[7] Free cash flow available to equity holders can be estimated as Net income + Depreciation and Amortization + Deferred taxes − Capital spending +/− Change in net working capital − Principal repayments + New external debt financing. Free cash flow to the firm can be estimated as Net income + Depreciation and Amortization + Deferred taxes − Capital spending +/− Change in net working capital + Interest expense × (1 − Tax rate).

Estimating beta coefficients is tricky, because we are interested in the extent to which the security moves with the market over a future period. As always, we estimate beta coefficients by using historical data, which assumes that what has happened in the past is a good predictor for the future. Typically, betas are estimated using 60 months of monthly returns, but sometimes only 52 weeks of weekly returns are used. Betas change through time as the risk of the underlying security or portfolio changes. This is particularly important for individual securities, the betas for which can change dramatically over relatively short periods. Conversely, betas estimated for large portfolios or for industries are much more stable because they are averaged over many securities. Therefore, estimates of portfolio betas show less change from period to period and are much more reliable than the estimates for individual securities.

If we make some fairly common statistical assumptions, betas can be estimated using Equation 9-7.[7]

$$\beta_i = \frac{COV_{i,M}}{\sigma_M^2} = \frac{\rho_{i,M}\sigma_i}{\sigma_M} \quad (9\text{-}7)$$

Beta measures the risk of an individual stock or portfolio *relative* to the market portfolio. A beta of 1 implies that if the market increased (or decreased) by 1 percent, the return on the security (or portfolio) would increase (decrease) by 1 percent *on average*. Therefore, the market has a beta of 1. A security with a beta of 1.2 has returns that are 1.2 times as volatile as market returns, either up and down. In other words, if the market increased 10 percent, that security's returns would increase by 12 percent, and so on. Securities with betas greater than 1 are generally considered to be more volatile (or risky) than average. Similarly, securities with betas less than 1 are less volatile (risky). The risk-free asset has a beta of zero, because it has a covariance of zero with the market and has no risk. Finally, negative betas are possible, although they are rare. Equation 9-7 shows that negative betas can only occur if a security has a negative correlation coefficient with market returns, which is uncommon.[8]

EXAMPLE 9-4 Estimating Beta

The returns on stock X have a standard deviation of 25 percent and a correlation coefficient of 0.7 with market returns, which have a standard deviation of 20 percent. Estimate the beta for stock X.

Solution

$$\beta_X = \frac{\rho_{X,M}\sigma_X}{\sigma_M} = \frac{(0.70)(25)}{20} = 0.875$$

Notice that even though stock X has a higher standard deviation than the market, its beta is less than one because of the correlation coefficient of 0.7.

Betas tend to vary a great deal between companies in different industries, because they possess different risk profiles. Although betas tend to be more similar for companies operating in the same industry, they can still vary substantially, because even companies within the same industry can differ across various dimensions, such as financial risk, size, and so on. These comments are validated by the betas reported in Table 9-1 for several well-known Canadian companies that operate in a variety of industries. Betas for 2011 range from a low

[7] The technical assumptions required ensure that ordinary least squares (OLS) is the appropriate regression estimation approach to determine the equation of the characteristic line discussed above.

[8] This is the only way a negative beta is possible, because the standard deviation terms in Equation 9-7 are always positive. Gold stocks have sometimes had negative betas because, in the past, the price of gold tended to go in the opposite direction to the market; investors would invest in gold when they were nervous about future market movements. However, this relationship is not as strong as it used to be, and negative betas rarely occur, even for gold stocks.

According to the SML, securities or portfolios with betas greater than the market beta of 1 will have larger risk premiums than the "average" stock and will therefore have larger required rates of return. Conversely, securities with betas less than that of the market are less risky and will have lower required rates of return.

EXAMPLE 9-6 Using the SML

Given that the expected return on the market is 10 percent and the risk-free rate is 4.5 percent, estimate

a. the market risk premium

b. the required return for security X in Example 9-4, which had a beta of 0.875

c. the required return for the portfolio in Example 9-5, which had a beta of 1.08

Solution

a. $ER_M - RF = 10 - 4.5 = 5.5\%$

b. $k_X = RF + (ER_M - RF)\beta_X = 4.5 + 5.5(0.875) = 4.5 + 4.813 = 9.313\%$

Notice that the required return for X is *less* than the expected market return because its beta is less than 1.

c. $k_p = RF + (ER_M - RF)\beta_P = 4.5 + 5.5(1.08) = 4.5 + 5.94 = 10.44\%$

Notice that the required return for this portfolio is *greater* than the expected market return because its beta is greater than 1.

LESSONS TO BE LEARNED

Estimating required returns using the CAPM is fraught with difficulties. We need estimates of beta as well as the expected return on the market. Generally, betas are estimated using past data, with two years of weekly data or five years of monthly data being the most commonly employed approaches. Of course, what we really want is an estimate of beta for future periods, so beta estimates can and do vary through time as illustrated in Table 9-1. In many cases, they might not be good measures of a stock's future market sensitivity over a given period for a variety of reasons—we discuss one such instance in detail in Chapter 20.

Similarly, we often use historical averages to estimate the expected market return. Obviously, such estimates can often be way off the mark for any given period. Consider, for example, that the average Canadian stock market return over the 1938 to 2011 period was 11.35 percent, which is quite different from the –33 percent return experienced by the market in 2008, or the +35 percent return in 2009.

One has to keep in mind that beta represents the "average" market sensitivity and that this sensitivity may vary from one period to the next. The same applies to expected market returns. The realistic approach is to recognize that CAPM does a reasonable job of predicting returns on average, over the long run.

The SML and Market Equilibrium

In equilibrium, the expected return on all properly priced securities will lie *on* the SML, just as the expected return on all portfolios will lie on the CML. As with the CML, when investors expect a return equal to the required return, the security is correctly priced. However, at any given time, some securities may be temporarily mispriced according to CAPM. Whenever analysis suggests that the expected return on a security differs from its required rate of return according to CAPM, then that security is either undervalued or overvalued. Securities or portfolios that have expected returns *greater* than their required rate of return are *undervalued*, because they provide investors with an expected return that is higher than the return required given their risk. As with the CML, undervalued securities will lie *above* the SML, reflecting the fact that the expected return exceeds the required return, which is the return along the SML that corresponds to the beta coefficient. Security A in Figure 9-10 represents an example of an undervalued security. Similarly, securities or portfolios whose expected returns are *less* than their required rate of return, such as B in Figure 9-10, are *overvalued* and will lie below the SML.

This is not totally unreasonable. However, government bond yields were extremely low in early 2012, while bond yield spreads were very high as a result of nervousness at the slow pace of recovery in the United States, and due to recessionary and sovereign debt fears in Europe, as discussed in chapters 1 and 2 and throughout the textbook. Normally A-rated corporate bonds sell at spreads of 100 basis points (bps) above equivalent-maturity long Canada bonds, but currently these spreads are at 180 bps. While this spread is not anywhere near the record highs experienced during the financial crisis, it is still indicative of heightened risk aversion. Researchers at the Bank of Canada indicate that much of this increased spread is due to liquidity problems, but some still reflect increased risk premiums for even low-risk companies like Tim Hortons.[13] Consistent with the research at the Bank of Canada, we add half of the "above average" credit spread or 0.40 percent to our CAPM estimate to account for this time-varying risk premium. We would therefore place the equity cost for Tim Hortons at:

$$k_e = 6.44 + 0.40 = 6.84\%$$

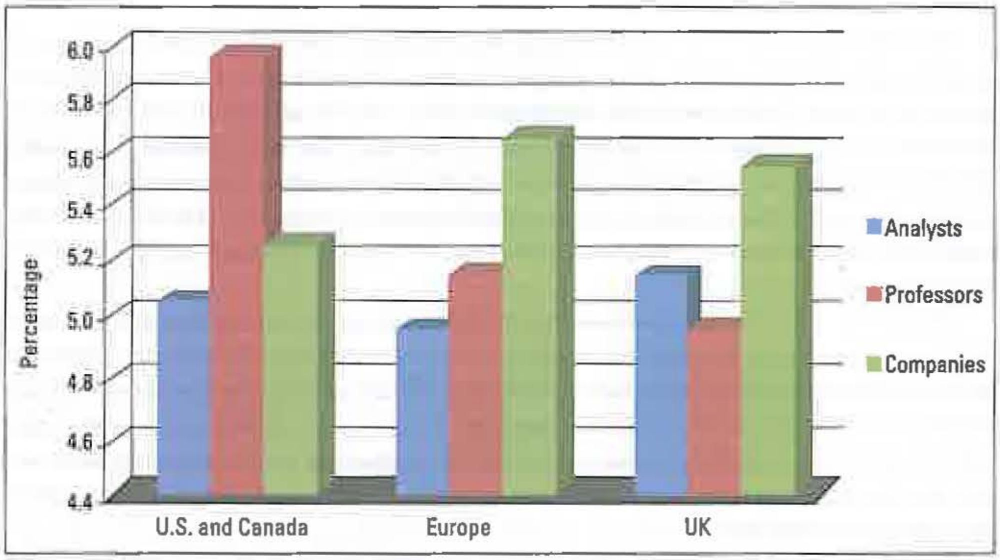


FIGURE 9-11 *Estimated Market Risk Premiums (2010)*

Source: Data from Fernandez, Pablo, and del Campo, Javier, *Market Risk Premium used in 2010 by Analysts and Companies: A Survey with 2,400 Answers*, May 21, 2010. Retrieved from http://www.iese.edu/research/pdfs/DI-0912-E.pdf.

CONCEPT REVIEW QUESTIONS

1. Why is beta a measure of market risk for a security?
2. If a security's correlation with the market return increases, will its beta get larger or smaller?
3. What is a characteristic line, and why is it useful?
4. If the market risk premium increases, will securities become overvalued or undervalued?

9.4 ALTERNATIVE ASSET PRICING MODELS

Learning Objective 9.4
List alternative risk-based pricing models and describe how they differ from the CAPM.

The CAPM is a "single-factor" model because it suggests that the required return on equities is determined by only one risk factor: market risk. The CAPM is often criticized because it is based on several assumptions, many of which are called into question in the real world. In addition, a substantial amount of empirical evidence finds that the CAPM does not hold well in practice. In particular, although empirical estimates of the ex post SML suggest that it is indeed an upward-

[13] Refer to A. Garcia and J. Yang, "Understanding Corporate Bond Spreads Using Credit Default Swaps," *Bank of Canada Review*, Autumn 2009.

sloping straight line, the ex ante y-intercept has been found to be higher than RF, and the slope of the SML is less than that predicted by theory—that is, it is "flatter" than it should be. Although this research remains very controversial, a 1992 study of U.S. stock returns by Fama and French concluded that beta, the sole risk factor in the CAPM, possessed no explanatory power for predicting stock returns.[14] In addition, they found that two other factors (discussed in the next subsection) do a much better job of explaining common stock returns. Indeed, there is a great deal of controversy and debate about the validity of the CAPM, as discussed in *Finance in the News 9-3*.

finance INTHENEWS 9-3 The CFA Institute Centre for Financial Market Integrity Proposed Risk Management Requirement

Benjamin Graham and Risk

Beta is a more or less useful measure of past price fluctuations of common stocks. What bothers me is that authorities now equate the beta idea with the concept of risk. Price variability yes; risk no. Real investment risk is measured not by the percent that a stock may decline in price in relation to the general market in a given period, but by the danger of a loss of quality and earnings power through economic changes or deterioration in management.

—Benjamin Graham

Introduction

This paper draws on diverse sources, including

1. MPT: "Capital Ideas" by Peter Bernstein, recent articles by Harry Markowitz, William Sharpe, and Eugene Fama and Kenneth French,
2. Benjamin Graham: "The Intelligent Investor" by Ben Graham, and "Value Investing from Graham to Buffett and Beyond" by Bruce Greenwald et al.,
3. Behavioural: "Behavioural Investing" by James Montier.

This paper is not intended as another challenge to MPT—that significant body of theory consisting of mean-variance analysis (MVA) (Harry Markowitz-1952), the capital asset pricing model (CAPM) (William Sharpe-1964), and the efficient markets hypothesis (EMH) (Eugene Fama-1965).

There is already ample ongoing debate among very sophisticated commentators, including the above-noted original authors themselves, who acknowledge MPT's limitations and advocate broader perspectives. The paper is intended to discuss the MPT concept of risk, including the advice of the three original authors, discuss the value investors' concept of risk, and in conclusion, advocate the CFAI take a broader investor perspective with respect to its proposed risk management requirement. [. . .] Markowitz, Sharpe, Fama and French all suggest that alternatives to CAPM should be taught in finance courses.

The Evidence

The above sets out the theory of beta as a measure of risk. As noted, a fairly large body of research challenges the theory. Value stocks (those with low price/earnings ratios (P/Es) and low price/book ratios (P/Bs)) have lower betas, but have higher returns than growth stocks. This is contrary to the notion that returns go hand in hand with risk—which is at the heart of MPT. Such research emerged not long after Sharpe's paper in 1964—with the first studies appearing in 1970 . . . and they are still coming. The . . . exhaustive study by Fama and French (2004) examined all NYSE, ASE, and NASDQ listed stocks between 1929 and 2003. It found there was almost no relationship between returns and beta.

As behaviouralist author James Montier says: "There is an overwhelming amount of evidence that CAPM simply does not work . . . CAPM woefully underpredicts the returns to low beta stocks and massively overestimates the returns to high beta stocks."

Benjamin Graham and Value Investors' Concept of Risk

In addition to Benjamin Graham's quote at the very beginning, most value investors have different views on beta.

Warren Buffet says in Berkshire Hathaway's "1993 Annual Report":

We define risk, using the dictionary terms, as "the possibility of loss or injury." Academics . . . like to define investment "risk" differently, averring that it is the relative volatility of a stock or portfolio of stocks . . . compared to a large universe of stocks. Employing data bases and statistical skills, these academics compute with precision the "beta" of a stock . . . and then build . . . investment and capital allocation theories around this calculation . . . for a single statistic to measure risk. . . . For the owners of a business—and that's the way we think of shareholders, the academics' definition of risk is far off the mark.

Charles Brandes says in "Value Investing Today":

Volatility is measurable, uncertainty is not . . . defining volatility as risk (as MPT does) obscures the true definition of investment risk as the possibility of losing money . . . Beta is used primarily by those who are looking at the whole market (or large numbers of stocks within it) and who don't look in detail at the fundamentals of specific companies. As I have shown for value investors, this concept is irrelevant and downright dangerous at worst.

An interesting thing about the value investor's definition of risk is that it is not a theory, nor an equation, but a common sense expression of how to avoid losing money. As Bernstein says in "Capital Ideas":

Ben Graham had devised a method for determining whether a stock is cheap or expensive. That method has stood many if not all the tests of time, but it is still not a theory. Graham told the investor what to do but said little about why his prescriptions would work.

Quite often Warren Buffett uses his investment in the Washington Post Company to explain risk. Buffett says:

continued

[14] See Fama, E., and French, K., "The Cross Section of Expected Stock Returns," *Journal of Finance* 47 (1992), pp. 427–65.

$$V = \frac{PAR(1 + R)P + RECOVER(1 - P)}{(1 + K)} \quad [18\text{-}2]$$

In this equation, par value (PAR) is $1,000, R is the promised yield, P is the probability of not defaulting, $(1 - P)$ is the probability of defaulting, RECOVER is the recovery rate if the company defaults, and K is the investor's required return.

In our example, we simplified this equation by setting RECOVER equal to zero and the investor's required rate of return equal to the T-bill yield. If we continue with these assumptions, we can find the promised yield necessary for the CP to be issued at PAR, that is, PAR = V:

$$R = \frac{(1 + K_{TB})}{P} - 1 \quad [18\text{-}3]$$

where K_{TB} is the required return for investing in T-bills. In the absence of default risk (P = 1), the promised yield on CP would be the same as that on T-bills. However, with the 1 percent chance of default, the promised yield has to be 1.515 percent per month (i.e., 1.005/0.99 – 1) or 18.2 percent per year (i.e., 1.515% × 12).

The difference between the promised yield on CP and the yield on the equivalent-maturity T-bill is called the **default or credit yield spread.** In this case, given a 1 percent chance of default, the yield spread is 12.2 percent (i.e., 18.2% to 6%). The 12.2 percent yield spread is compensation for the fact that if the CP defaults, the investor gets nothing. Obviously, as the probability of default goes up, P goes down and the yield spread increases. The important point to note from this example is the huge impact that default risk has on promised yields. Even if the risk of default drops from 1 percent to 0.1 percent, the monthly promised yield for CP is still 0.6 percent (versus 0.5 percent) for a yield spread of 1.2 percent on an annual basis.

default or credit yield spread the difference between the yield on a default-risky debt instrument and the yield on an equivalent-maturity Government of Canada instrument

For reference purposes, on March 14, 2012, the yields on three-month T-bills and "prime" CP were 0.9 percent and 1.16 percent, respectively, resulting in a yield spread of 0.26 percent. This indicates the extremely low default risk attached to prime CP in Canada.[8] This yield spread had a volatile ride during the financial crisis of 2008–9, for reasons we will discuss shortly. However, it indicates that the actual risk of investing in CP is extremely low, so only the best companies can access the CP market. This is because assessing default risk requires time as well as analytic skills. This outlay may be worthwhile when investing for a long period, but few investors are inclined to do this analysis for an investment with a three-month maturity or less. In this sense, investors in the paper market are not so much investing as simply "parking" money for a short period of time. However, as we noted, default risk does have a huge impact on yields. To solve this problem, the market has developed alternative risk-assessment measures. Credit rating agencies have developed the most basic measure, which provides default or credit ratings to investors, thereby relieving investors of the need to do individual analyses.

The most important credit rating agency in Canada is the Dominion Bond Rating Service (DBRS). Two U.S. rating agencies, Moody's and Standard & Poor's (S&P), also provide ratings on Canadian firms, although they mainly provide ratings on longer-term issues, particularly those issued in the U.S. market, rather than money market instruments. However, S&P, in particular, has evolved into a major competitor to DBRS since it took over the Canadian Bond Rating Service (CBRS) in 2001.

DBRS rates CP, longer-term bonds, and preferred shares and has separate rating categories for each. Generally, the ratings are very similar, but sometimes the short-term risk of investing in CP is less than the longer-term risk of investing in the same company's long-term bonds, so the ratings may differ slightly.

[8] Or it indicates the extremely high recovery rates in the event of default.

18.5 BOND RATINGS

Interpreting Debt Ratings

Learning Objective 18.5
Explain how debt ratings are determined, what they mean, and how useful they are in predicting default and recovery rates associated with public debt issues.

We have already seen that DBRS rates commercial paper and that a rating is essential to access the CP market. When investments have such a short maturity, it makes credit analysis expensive. For longer-term debt issues, most purchasers, like the major institutions mentioned above, do their own credit analysis. However, bond ratings are still important. In Chapter 6, we listed Standard & Poor's (S&P) debt-rating categories; in Table 18-5 we show DBRS's rating structure for long-term debt.

TABLE 18-5 DBRS's Rating Structure for Long-Term Debt

AAA	Highest credit quality
AA	Superior credit quality
A	Satisfactory credit quality
BBB	Adequate credit quality
BB	Speculative
B	Highly speculative
CCC/CC/C	Very highly speculative

investment grade a bond rating that means the issuer is likely to meet payment obligations

junk bonds speculative bonds with ratings below investment grade; often called "high-yield bonds"

In addition, each rating may be modified with a high or low rating. The lowest **investment-grade** bond rating is BBB (low); below this the bonds are commonly referred to as **junk bonds**, although they are more politely referred to as "high-yield bonds."

The long-term bond ratings are similar in meaning to the CP ratings we discussed earlier. In fact, normally there is a direct correspondence, with R-1 (high) being equivalent to AAA, R-1 (mid) to AA, and R-1 (low) to A.

We previously noted that there is currently no R-2-rated CP outstanding in the Canadian money market, where R-2 is equivalent to a BBB long-term bond rating and is still regarded as investment-grade debt. Similarly, until recently there was little BBB-rated original issue long-term debt in Canada. The relatively few issues outstanding were either from smaller regulated utilities or from issuers that started out as some form of A and were subsequently downgraded—the so-called fallen angels. The rule of thumb is that non-investment-grade issuers, below BBB (low), generally raise debt in the U.S. high-yield market and then swap back into the Canadian market, because there are more investors willing to invest in original issue high-yield debt in the United States.

The most common DBRS rating is A, which DBRS defined in the following way:

> Long-term debt rated "A" is of satisfactory credit quality. Protection of interest and principal is still substantial, but the degree of strength is less than that of AA-rated entities. While "A" is a respectable rating, entities in this category are considered to be more susceptible to adverse economic conditions and have greater cyclical tendencies than higher-rated securities.[13]

Determining Bond Ratings

DBRS determines a bond rating after extensive consultation with the company—which includes a site visit in which the company can state its view of its business and future prospects—and after examining at least five years of financial statements. The rating agency also usually has prior knowledge of the company from its extensive industry surveys. DBRS will issue a draft report to the company so it can check for any analytic or data errors before the agency issues a final rating. In determining its rating, DBRS is guided by two basic principles: the stable rating philosophy and the hierarchy principle.

[13] Dominion Bond Rating Service, "Bonds, Long Term Debt and Preferred Share Ratings." DBRS press release, January 2000.

Before we proceed further, it is important to note that equations 20-15 and 20-16 are the same; therefore, if Equation 20-15 does not hold, then neither does Equation 20-16 nor Equation 20-17. We mention this because Equations 20-16 and 20-17 are commonly used to estimate the cost of equity capital, but the assumptions used to derive them are often forgotten. As a result, it is easy to misuse them.

Consider the case of a firm that pays no dividends and is growing at 20 percent per year, a growth rate that is expected to continue for the foreseeable future. A simple application of Equation 20-16 would suggest the cost of equity capital (internal funds) is 20 percent. Yet if we go back to Equation 20-15 and plug in 20 percent as a growth rate for a firm paying no dividends, we get results that make no sense. The reason for this is that 20 percent *cannot* be a long-run growth rate; in deriving Equation 20-15, we assume that the growth rate is constant forever and that the dividends start from a positive amount. If nominal GDP is growing at 5 to 6 percent a year, a firm that is growing at 20 percent will be capturing an ever bigger share of GDP. In fact, it is easy to show that such a firm would eventually be bigger than the whole economy. In this case, the assumption of constant growth used to derive Equation 20-15 is implausible, so using Equation 20-16 or 20-17 to estimate the cost of equity capital is *wrong*.

Unfortunately, people often try to squeeze the data used in equations 20-16 and 20-17 in an attempt to make them work; for example, they assume a small dividend and then reduce the short-run growth forecast to bring it more in line with what is possible in the long run. However, you cannot torture a model that doesn't fit the assumptions of a particular firm. Instead, you need to use a model that better fits the firm, such as the multi-stage growth models that were discussed in Chapter 7. Before discussing how to use these models, let's explore the constant growth model a bit more.

Growth and ROE

In Chapter 7, we pointed out that one way to estimate growth was the sustainable growth method, in which the growth rate is the product of the firm's retention rate (b), defined as one minus the firm's payout ratio, multiplied by its forecast ROE, as shown in Equation 20-18.

$$g = b \times ROE \qquad [20\text{-}18]$$

This equation makes it obvious that even if the firm retains all of its profits and reinvests them in the firm, it is not plausible that it could earn a 20 percent ROE on this investment forever. Such an assumption would imply that no other firm can enter the industry and compete with the firm for these high ROEs. If other firms can enter the market, which will normally be the case, these high ROEs will be reduced to normal levels due to competitive pressures.

We have to remember that Professor Myron Gordon developed the constant growth model for use in public utility regulation, where the allowed ROEs should be reasonable and where the problem of rapid growth rates does not exist. Further, a result of regulation is that all common equity earns virtually the same regulated ROE. In this case, the average and marginal ROE are exactly the same, and every dollar the firm retains earns the same ROE. In contrast, many extremely profitable firms cannot reinvest at the same ROE because they cannot find opportunities as good as their existing ones. In determining the growth rate, the ROE is the return on incremental investment, which may be greater or smaller than what the firm is currently earning.

However, for the time being let's return to the constant growth DDM with the assumption of a constant ROE. Substituting the sustainable growth rate, as expressed in Equation 20-18 (i.e., $b \times$ ROE), into the constant growth DDM in place of g, we get Equation 20-19.

$$P_0 = \frac{D_1}{K_e - b \times ROE} \qquad [20\text{-}19]$$

star a firm with high PVEO and high PVGO

cash cow a firm with high PVEO but low PVGO

turnaround a firm with low PVEO and high PVGO

dog a firm with low PVEO and low PVGO

Firm A would be classified as a **star** in Figure 20-2, having everything going for it—both very good PVEO and excellent PVGO. Firm B would be the **cash cow**, generating significant cash flows from its current opportunities and thus possessing a high PVEO, but with no good investment opportunities, so its PVGO is zero. Firm C is the **turnaround** candidate; its current operations are a drag on performance so PVEO is low, but everything is about the future, so its PVGO is high. Finally, Firm D is the **dog**, with poor current operations so its PVEO is low. On top of that, it has been investing in projects that provide returns lower than its cost of internal equity, so it possesses a negative PVGO.

We developed these four stylistic views of firm valuation to show that for every firm, there is a "story" that has to match its valuation. If you can understand this, then estimating each firm's cost of equity capital becomes easier as you know the biases in using DCF estimates. For example, A has the highest market price because both PVEO and PVGO are high. This could be a large capitalization stock (large cap) such as Apple, where everything is going right. The cash cow would be a utility like TransCanada Pipelines Ltd., with an excellent profitable core business but limited growth prospects. The cash cow might also be called a value stock, depending on its price. The turnaround company could be a pure growth stock, with very limited current value but great growth potential. Classic examples of turnarounds or growth stocks would be the Internet and tech stocks of the late 1990s, or companies like Google Inc. today, where investors are paying a huge premium for the PVGO. Finally, dogs *should* be scarce, since they are candidates for hostile takeovers. Regardless of the poor quality of their current operations (low PVEO), their value could be increased just by stopping them from throwing good money after bad by investing at less than their equity cost.

Note that we valued these four firms using the same 12 percent discount rate, so the cost of equity capital is exactly the same. However, the market-to-book ratio and earnings yield are different for each, as shown in Table 20-10.

TABLE 20-10 The Impact of Growth Opportunities on Share Prices

	Earnings Yield (%)	Market-to-Book
Star	8.84	2.26
Cash cow	12.00	1.67
Turnaround	2.63	0.76
Dog	114.29	0.02

The actual numbers are not that important, but the critical feature is that the star and the turnaround have very low earnings yields (or high price-earnings ratios). Both of these types of companies would be regarded as growth firms, since much of the value comes from PVGO. In the case of the turnaround company, its PVEO actually depresses its stock price. For both of these types of companies, DCF estimation methods are unreliable due to the importance of PVGO. The cash cow gives back the true discount rate, since there is no PVGO, and it may be viewed as a perpetuity. For the dog, the earnings yield is very high, exceeding 100 percent, because it is forecast to lose value from its future investments, which depresses the share price and thus increases the earnings yield.

The point of these examples is to show that you have to understand the type of firm before mechanically applying the DCF formulas; otherwise, it is very easy to make mistakes. The DCF models work best for non-growth firms and for the market as a whole, where growth opportunities are moderate and easiest to estimate. A good example of the latter use for the economy as a whole is the U.S. Federal Reserve System's application of the constant growth model in what is known as the "Fed model," discussed next.

The Fed Model[11]

The Fed model was used to estimate whether the stock market was over- or undervalued and whether the U.S. Fed should "talk down" market values that might be excessive and cause problems if they collapsed. The exact equation used was:

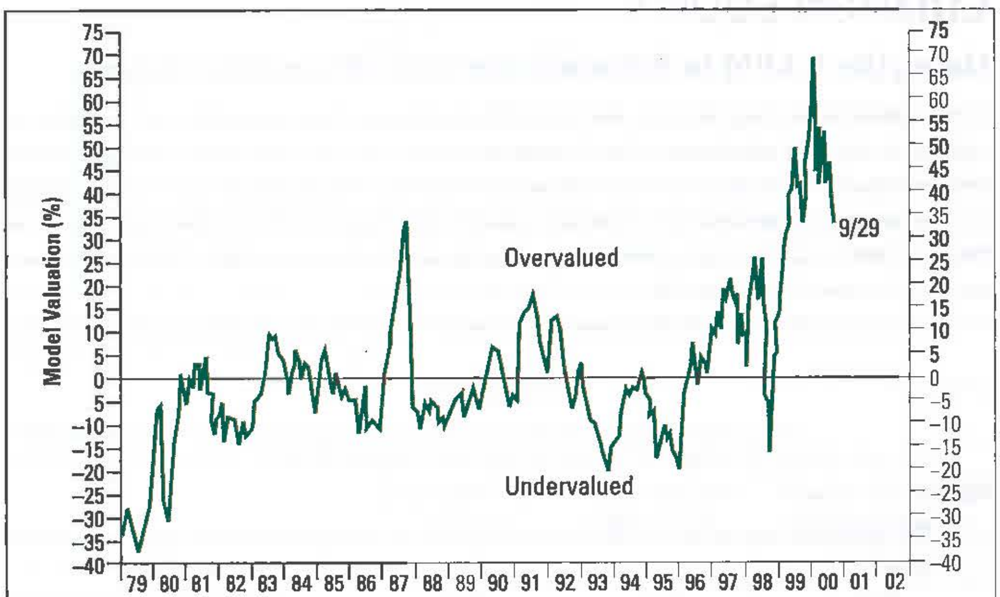
$$\frac{V_{actual}}{V_{Fed}} = \frac{V_{actual}}{Exp\,(EPS)/(K_{TBond} - 1.0\%)} \quad [20\text{-}23]$$

In this equation, V_{actual} was the actual value for the U.S. stock market, and V_{Fed} was the estimate from the Fed's model, which was the expected earnings per share on the Standard & Poor's 500 Index (Exp(EPS)), as reported by security market analysts, divided by the yield on the long-term U.S. treasury bond (K_{TBond}) minus 1 percent. That is,

$$V_{Fed} = \frac{Exp\,(EPS)}{K_{TBond} - 1.0\%} \quad [20\text{-}24]$$

Valuation is easier when you aggregate across all securities, since you remove the "non-systematic risk" attached to individual securities. (This was discussed in chapters 8 and 9.) In the case of the market as a whole, after-tax earnings should grow at approximately the long-run real growth rate of GDP plus inflation, while the cost of equity for the market as a whole should be the treasury bond yield plus a market risk premium. So the Fed model implies that for fair valuation, the market risk premium is 1 percent less than the growth rate in nominal GDP.

The actual "performance" of the Fed model is illustrated in Figure 20-3. We can see that the model tracked the U.S. equity market quite well for much of the period until the late 1990s, when actual market values deviated significantly from the values implied by the Fed model. The stock market actually peaked in August 2000 and then went into a freefall that lasted almost three years. This suggests that investors who used the signals provided by the Fed model and decided to get out of the stock market in 2000, when it indicated significant overvaluation, would have saved themselves from large losses.



* Ratio of S&P 500 Index to I/B/E/S consensus estimates of earnings over the coming 12 months divided by the 10-year U.S. treasury bond yield minus 100. Monthly through December 1994, weekly thereafter. I/B/E/S is the source for earnings data.

FIGURE 20-3 *The U.S. Fed's Stock Valuation Model**

Source: Yardeni, Edward. "US Stock Valuation Models." Deutsche Bank, October 4, 2000, www.yardeni.com.

[11] This discussion follows that in Yardeni, Edward. "US Stock Valuation Models." Deutsche Bank, October 4, 2000.

Denoting Exp(EPS) as X, we can see that if the Fed model is rearranged, it also indicates that the market is fairly valued when the following condition exists:

$$\frac{X}{P_{S\&P500} - 1.0\%} = K_{TBond} - 1.0\% \quad [20\text{-}25]$$

This equation says that the earnings yield on the S&P 500 is equal to the long-term treasury bond yield minus 1 percent. As discussed previously, the earnings yield is the appropriate discount rate for the no-growth case (i.e., for perpetuities), whereas we would expect the market as a whole to grow at the nominal GDP growth rate. So if this nominal GDP growth rate is 5 percent, another way of interpreting the Fed model is to say that the required return on the equity market as a whole averages the long-term treasury bond yield plus a 4 percent risk premium (i.e., the 5% nominal GDP growth rate – 1%). With U.S. treasury bonds yielding about 3 percent on March 22, 2012, this would indicate an overall cost of equity for the U.S. market of 7 percent, which seems reasonable given the very low expected inflation rate consistent with the slow growth experienced by the United States as it works to escape the recession.

CONCEPT REVIEW QUESTIONS

1. Explain how we can use the constant growth DDM to estimate the cost of firms' internal common equity, as well as the cost of new common share issues.
2. Explain the relationship between ROE, retention rates, and firm growth.
3. How can we relate the existence of multiple growth stages to four commonly used firm classifications?
4. Describe the Fed model and how it may be used to estimate the required rate of return of the market as a whole.

20.6 RISK-BASED MODELS AND THE COST OF COMMON EQUITY

Using the CAPM to Estimate the Cost of Common Equity

Learning Objective 20.6
Estimate the cost of equity using risk-based models and describe the advantages and limitations of these models.

risk-based models models that estimate costs based on the associated risks

capital asset pricing model (CAPM) a pricing model that uses one factor, beta, to relate expected returns to risk

risk-free rate of return compensation for the time value of money

market risk premium (MRP) compensation for assuming the risk of the market portfolio

beta coefficient a measure of a firm's systematic or market risk

In the previous section, we saw that the DCF model could be rearranged to estimate the investors' required return on a firm's common shares. We also discussed how the model performs poorly when applied to growth stocks, which pay low dividends and/or display high growth rates. In these situations, it makes sense to rely more heavily on **risk-based models**. The most important risk-based model is the **capital asset pricing model (CAPM)**, which was discussed in detail in Chapter 9.

Equation 20-26 represents the central equation of the CAPM, the security market line (SML).

$$K_e = R_F + MRP \times \beta_e \quad [20\text{-}26]$$

In this equation, the required return by common shareholders (K_e) is composed of three terms:

1. The **risk-free rate of return (R_F)**, which represents compensation for the time value of money
2. The **market risk premium (MRP)**, which is compensation for assuming the risk of the market portfolio and is defined as $E(R_M) - R_F$, where $E(R_M)$ is the expected return on the market
3. The **beta coefficient** (β_e) for the firm's common shares, which measures the firm's systematic or market risk and represents the contribution that this security makes to the risk of a well-diversified portfolio