Harvard Business Review

FINANCIAL ANALYSIS

Does the Capital Asset Pricing Model Work?

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FROM THE JANUARY 1982 ISSUE

An important task of the corporate financial manager is measurement of the company's cost of equity capital. But estimating the cost of equity causes a lot of head scratching; often the result is subjective and therefore open to question as a reliable benchmark. This article describes a method for arriving at that figure, a method spawned in the rarefied atmosphere of financial theory. The capital asset pricing model (CAPM) is an idealized portrayal of how financial markets price securities and thereby determine expected returns on capital investments. The model provides a methodology for quantifying risk and translating that risk into estimates of expected return on equity.

A principal advantage of CAPM is the objective nature of the estimated costs of equity that the model can yield. CAPM cannot be used in isolation because it necessarily simplifies the world of financial markets. But financial managers can use it to supplement other techniques and their own judgment in their attempts to develop realistic and useful cost of equity calculations.

Although its application continues to spark vigorous debate, modern financial theory is now applied as a matter of course to investment management. And increasingly, problems in corporate finance are also benefiting from the same techniques. The response promises to be no less heated. CAPM, the capital asset pricing model, embodies the theory. For financial executives, the proliferation of CAPM applications raises these questions: What is CAPM? How can they use the model? Most important, does it work?

CAPM, a theoretical representation of the behavior of financial markets, can be employed in estimating a company's cost of equity capital. Despite limitations, the model can be a useful addition to the financial manager's analytical tool kit.

The burgeoning work on the theory and application of CAPM has produced many sophisticated, often highly complex extensions of the simple model. But in addressing the above questions I shall focus exclusively on its simple version. Even so, finding answers to the questions requires an investment of time to understand the theory underlying CAPM.

What Is CAPM?

Modern financial theory rests on two assumptions: (1) securities markets are very competitive and efficient (that is, relevant information about the companies is quickly and universally distributed and absorbed); (2) these markets are dominated by rational, risk-averse investors, who seek to maximize satisfaction from returns on their investments.

The first assumption presumes a financial market populated by highly sophisticated, well-informed buyers and sellers. The second assumption describes investors who care about wealth and prefer more to less. In addition, the hypothetical investors of modern financial theory demand a premium in the form of higher expected returns for the risks they assume.

Although these two assumptions constitute the cornerstones of modern financial theory, the formal development of CAPM involves other, more specialized limiting assumptions. These include frictionless markets without imperfections like transaction costs, taxes, and restrictions on borrowing and short selling. The model also requires limiting assumptions concerning the statistical nature of securities returns and investors' preferences. Finally, investors are assumed to agree on the likely performance and risk of securities, based on a common time horizon.

The experienced financial executive may have difficulty recognizing the world postulated by this theory. Much research has focused on relaxing these restrictive assumptions. The result has been more complex versions of the model that, however, are quite consistent with the simple version of CAPM examined in this article.

Although CAPM's assumptions are obviously unrealistic, such simplification of reality is often necessary to develop useful models. The true test of a model lies not just in the reasonableness of its underlying assumptions but also in the validity and usefulness of the model's prescription. Tolerance of CAPM's assumptions, however fanciful, allows the derivation of a concrete, though idealized, model of the manner in which financial markets measure risk and transform it into expected return.

Portfolio diversification

CAPM deals with the risks and returns on financial securities and defines them precisely, if arbitrarily. The rate of return an investor receives from buying a common stock and holding it for a given period of time is equal to the cash dividends received plus the capital gain (or minus the capital loss) during the holding period divided by the purchase price of the security.

Although investors may expect a particular return when they buy a particular stock, they may be disappointed or pleasantly surprised, because fluctuations in stock prices result in fluctuating returns. Therefore common stocks are considered risky securities. (In contrast, because the returns on some securities, such as Treasury bills, do not differ from their expected returns, they are considered riskless securities.) Financial theory defines risk as the possibility that actual returns will deviate from expected returns, and the degree of potential fluctuation determines the degree of risk.

An underpinning of CAPM is the observation that risky stocks can be combined so that the combination (the portfolio) is less risky than any of its components. Although such diversification is a familiar notion, it may be worthwhile to review the manner in which diversification reduces risk.

Suppose there are two companies located on an isolated island whose chief industry is tourism. One company manufactures suntan lotion. Its stock predictably performs well in sunny years and poorly in rainy ones. The other company produces disposable umbrellas. Its stock performs equally poorly in sunny years and well in rainy ones. Each company earns a 12% average return.

In purchasing either stock, investors incur a great amount of risk because of variability in the stock price driven by fluctuations in weather conditions. Investing half the funds in the suntan lotion stock and half in the stock of the umbrella manufacturer, however, results in a return of 12%

regardless of which weather condition prevails. Portfolio diversification thus transforms two risky stocks, each with an average return of 12%, into a riskless portfolio certain of earning the expected 12%.

Unfortunately, the perfect negative relationship between the returns on these two stocks is very rare in the real world. To some extent, corporate securities move together, so complete elimination of risk through simple portfolio diversification is impossible. However, as long as some lack of parallelism in the returns of securities exists, diversification will always reduce risk.

Two types of risk

Some of the risk investors assume is peculiar to the individual stocks in their portfolios—for example, a company's earnings may plummet because of a wildcat strike. On the other hand, because stock prices and returns move to some extent in tandem, even investors holding widely diversified portfolios are exposed to the risk inherent in the overall performance of the stock market.

So we can divide a security's total risk into *unsystematic risk,* the portion peculiar to the company that can be diversified away, and *systematic risk,* the nondiversifiable portion that is related to the movement of the stock market and is therefore unavoidable. Examples of systematic and unsystematic risk factors appear in Exhibit I.

Exhibit I Some unsystematic and systematic risk factors

Unsystematic risk factors
A company's technical wizard is killed in an auto accident.
Revolution in a foreign country halts shipments of an important product ingredient.
A lower-cost foreign competitor unexpectedly enters a company's product market.
Oil is discovered on a company's property.
Systematic risk factors
Oil-producing countries institute a boycott.
Congress votes a massive tax cut.
The Federal Reserve steps up its restrictive monetary policy.
Long-term interest rates rise precipitously.

Exhibit I Some unsystematic and systematic risk factors

Exhibit II graphically illustrates the reduction of risk as securities are added to a portfolio. Empirical studies have demonstrated that unsystematic risk can be virtually eliminated in portfolios of 30 to 40 randomly selected stocks. Of course, if investments are made in closely related industries, more securities are required to eradicate unsystematic risk.

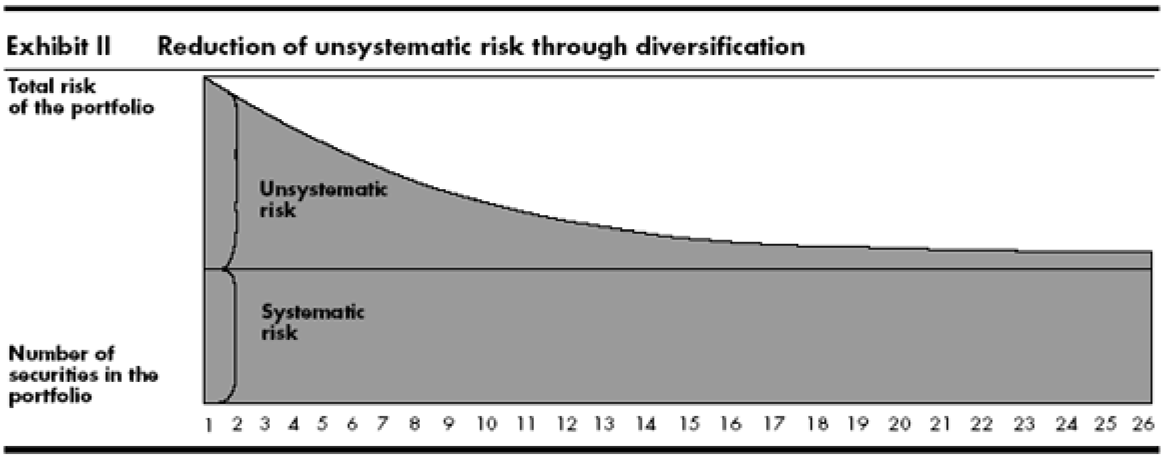

Exhibit II Reduction of unsystematic risk through diversification

The investors inhabiting this hypothetical world are assumed to be risk averse. This notion, which agrees for once with the world most of us know, implies that investors demand compensation for taking on risk. In financial markets dominated by risk-averse investors, higher-risk securities are priced to yield higher expected returns than lower-risk securities.

A simple equation expresses the resulting positive relationship between risk and return. The risk-free rate (the return on a riskless investment such as a T-bill) anchors the risk/expected return relationship.

The expected return on a risky security, R_s, can be thought of as the risk-free rate, R_f, plus a premium for risk:

$$R_s = R_f + \text{risk premium}$$

The reward for tolerating CAPM’s unrealistic assumptions is in having a measure of this risk premium and a method of estimating the market’s risk/ expected return curve. These assumptions and the risk-reducing efficacy of diversification lead to an idealized financial market in which, to minimize risk, CAPM investors hold highly diversified portfolios that are sensitive only to market-related risk.

Since investors can eliminate company-specific risk simply by properly diversifying portfolios, they are not compensated for bearing unsystematic risk. And because well-diversified investors are exposed only to systematic risk, with CAPM the relevant risk in the financial market's risk/expected return tradeoff is systematic risk rather than total risk. Thus an investor is rewarded with higher expected returns for bearing only market-related risk.

This important result may seem inconsistent with empirical evidence that, despite low-cost diversification vehicles such as mutual funds, most investors do not hold adequately diversified portfolios.[1] Consistent with CAPM, however, large investors such as the institutions that dominate trading on the New York Stock Exchange do typically hold portfolios with many securities. These actively trading investors determine securities prices and expected returns. If their portfolios are well diversified, their actions may result in market pricing consistent with the CAPM prediction that only systematic risk matters.

Beta is the standard CAPM measure of systematic risk. It gauges the tendency of the return of a security to move in parallel with the return of the stock market as a whole. One way to think of beta is as a gauge of a security's volatility relative to the market's volatility. A stock with a beta of 1.00—an average level of systematic risk—rises and falls at the same percentage as a broad market index, such as Standard & Poor's 500-stock index.

Stocks with a beta greater than 1.00 tend to rise and fall by a greater percentage than the market—that is, they have a high level of systematic risk and are very sensitive to market changes. Conversely, a stock with a beta less than 1.00 has a low level of systematic risk and is less sensitive to market swings.

The security market line

The culmination of the sequence of conceptual building blocks is CAPM's risk/expected return relationship. This fundamental result follows from the proposition that only systematic risk, measured by beta (β), matters. Securities are priced such that:

$R_s = R_f$ + risk premium

$R_s = R_f + \beta_s (R_m - R_f)$

where:

R_s = the stock's expected return (and the company's cost of equity capital).

R_f = the risk-free rate.

R_m = the expected return on the stock market as a whole.

β_s = the stock's beta.

This risk/expected return relationship is called the security market line (SML). I have illustrated it graphically in Exhibit III. As I indicated before, the expected return on a security generally equals the risk-free rate plus a risk premium. In CAPM the risk premium is measured as beta times the expected return on the market minus the risk-free rate. The risk premium of a security is a function of the risk premium on the market, $R_m - R_f$, and varies directly with the level of beta. (No measure of unsystematic risk appears in the risk premium, of course, for in the world of CAPM diversification has eliminated it.)

Exhibit III The security market line

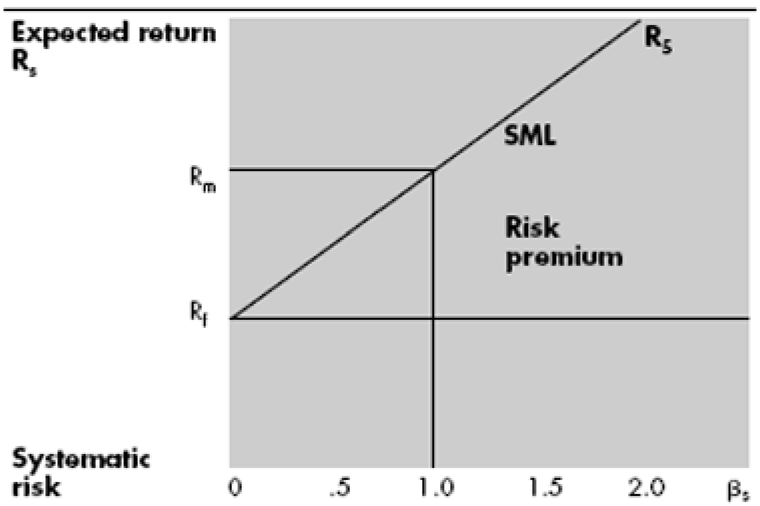

Exhibit III The security market line

In the freely competitive financial markets described by CAPM, no security can sell for long at prices low enough to yield more than its appropriate return on the SML. The security would then be very attractive compared with other securities of similar risk, and investors would bid its price up until its expected return fell to the appropriate position on the SML. Conversely, investors would sell off any stock selling at a price high enough to put its expected return below its appropriate position. The resulting reduction in price would continue until the stock's expected return rose to the level justified by its systematic risk.

(An arbitrage pricing adjustment mechanism alone may be sufficient to justify the SML relationship with less restrictive assumptions than the traditional CAPM. The SML, therefore, can be derived from other models than CAPM.[2])

One perhaps counterintuitive aspect of CAPM involves a stock exhibiting great total risk but very little systematic risk. An example might be a company in the very chancy business of exploring for precious metals. Viewed in isolation the company would appear very risky, but most of its total risk is unsystematic and can be diversified away. The well-diversified CAPM investor would view the stock as a low-risk security. In the SML the stock's low beta would lead to a low risk premium. Despite the stock's high level of total risk, the market would price it to yield a low expected return.

In practice, such counterintuitive examples are rare; most companies with high total risk also have high betas and vice versa. Systematic risk as measured by beta usually coincides with intuitive judgments of risk for particular stocks. There is no total risk equivalent to the SML, however, for pricing securities and determining expected returns in financial markets where investors are free to diversify their holdings.

Let me summarize the conceptual components of CAPM. If the model correctly describes market behavior, the relevant measure of a security's risk is its market-related, or systematic, risk measured by beta. If a security's return bears a strong positive relationship with the return on the market and thus has a high beta, it will be priced to yield a high expected return; if it has a low beta, it will be priced to yield a low expected return.

Since unsystematic risk can be easily eliminated through diversification, it does not increase a security's expected return. According to the model, financial markets care only about systematic risk and price securities such that expected returns lie along the security market line.

How Can It Be Used?

With its insight into the financial markets' pricing of securities and the determination of expected returns, CAPM has clear applications in investment management. Its use in this field has advanced to a level of sophistication far beyond the scope of this introductory exposition.

CAPM has an important application in corporate finance as well. The finance literature defines the cost of equity as the expected return on a company's stock. The stock's expected return is the shareholders' opportunity cost of the equity funds employed by the company.

In theory, the company must earn this cost on the equity-financed portion of its investments or its stock price will fall. If the company does not expect to earn at least the cost of equity, it should return the funds to the shareholders, who can earn this expected return on other securities at the same risk level in the financial marketplace. Since the cost of equity involves market expectations, it is very difficult to measure; few techniques are available.

Cost of equity

This difficulty is unfortunate in view of the role of equity costs in vital tasks such as capital budgeting evaluation and the valuation of possible acquisitions. The cost of equity is one component of the weighted average cost of capital, which corporate executives often use as a hurdle rate in evaluating investments. Financial managers can employ CAPM to obtain an estimate of the cost of equity capital.

If CAPM correctly describes market behavior, the security market line gives the expected return on a stock. Because this expected return, R_s, is by definition the company's cost of equity, k_e, the SML provides estimates of equity costs as well. Thus:

$$k_e = R_s = R_f + \beta_s (R_m - R_f)$$

Arriving at a cost of equity for evaluating cash flows in the future requires estimates of the future values of the risk-free rate, R_f, the expected return on the market, R_m, and beta, β_s.

Over the past 50 years, the T-bill rate (the risk-free rate) has approximately equaled the annual inflation rate. In recent years, buffeted by short-term inflationary expectations, the T-bill rate has fluctuated widely. Although sophisticated techniques could be employed to estimate the future inflation and T-bill rates, for the purposes of this exposition let us make a rough estimate of 10%.

Estimating the expected return on the market is more difficult. A common approach is to assume that investors anticipate about the same risk premium (R_m - R_f) in the future as in the past. From 1926 to 1978, the risk premium on the Standard & Poor's 500-stock index averaged 8.9%.[3] Benchmark estimates of 9% for the risk premium and 10% for the T-bill rate imply an estimated R_m of 19%.

This is substantially higher than the historical average of 11.2%. The difference reflects the long-term inflation rate of 10% incorporated in our estimated T-bill rate. The future inflation rate is assumed to be 7.5% higher than the 2.5% average rate over the 1926–1978 period. Expected returns (in nominal terms) should rise to compensate investors for the anticipated loss in purchasing power. As elsewhere, more sophisticated techniques exist, but an estimate of 19% for R_m is roughly consistent with historical spreads between stock returns and the returns on T-bills, long-term government bonds, and corporate bonds.

Statistical techniques that gauge the past variability of the stock relative to the market can estimate the stock's beta. Many brokerage firms and investment services also supply betas. If the company's past level of systematic risk seems likely to continue, beta calculations from historical data can be used to estimate the cost of equity.

Plugging the assumed values of the risk-free rate, the expected return on the market, and beta into the security market line generates estimates of the cost of equity capital. In Exhibit IV I give the cost of equity estimates of three hypothetical companies.

Exhibit IV Examples of estimating the cost of equity capital

Security market line:

$k_e = R_s = R_f + \beta_s (R_m - R_f)$

$= 10\% + \beta_s (19\% - 10\%)$

$= 10\% + \beta (9\%)$

Electric utility	Chemical company
$\beta_u = .75$	$\beta_c = 1.10$
$R_u = 10\% + \beta_u (9\%)$	$R_c = 10\% + \beta_c (9\%)$
$= 10\% + .75 (9\%)$	$= 10\% + 1.10 (9\%)$
$= 16.75\%$	$= 19.9\%$
$k_e = 17\%$	$k_e = 20\%$

Airline

$\beta_A = 1.55$

$R_A = 10\% + \beta_A (9\%)$

$= 10\% + 1.55 (9\%)$

$= 23.95\%$

$k_e = 24\%$

Assumptions: $R_f = 10\%$, $R_m = 19\%$.

Exhibit IV Examples of estimating the cost of equity capital

The betas in Exhibit IV are consistent with those of companies in the three industries represented. Many electric utilities have low levels of systematic risk and low betas because of relatively modest swings in their earnings and stock returns. Airline revenues are closely tied to passenger miles flown, a yardstick very sensitive to changes in economic activity. Amplifying this systematic variability in revenues is high operating and financial leverage. The results are earnings and returns that vary widely and produce high betas in these stocks. Major chemical companies exhibit an intermediate degree of systematic risk.

I should stress that the methodology illustrated in Exhibit IV yields only rough estimates of the cost of equity. Sophisticated refinements can help estimate each input. Sensitivity analyses employing various input values can produce a reasonably good range of estimates of the cost of equity. Nonetheless, the calculations in this exhibit demonstrate how the simple model can generate benchmark data.

Exhibit V shows the SML risk/expected return spectrum employing the average betas for companies in more than three dozen industries. The result is a pricing schedule for equity capital as a function of risk. The spectrum represents shareholders’ risk/expected return opportunities in the financial markets and, therefore, shareholder opportunity costs to the particular company.

Exhibit V Risk/expected return spectrum

	Estimated cost of equity (Percent)	Beta	Industry	Methodology and assumptions: $k_e = R_s = R_f + \beta_s(R_m - R_f) = 10\% + \beta_s(19\% - 10\%)$					
High-risk stocks	26.20%	1.80	Air transport						1.80
									1.75
			Real property						1.70
				Travel, outdoor recreation					1.65
	24.40	1.60	Electronics	Miscellaneous, finance					1.60
									1.55
				Nondurables, entertainment					1.50
	23.05	1.45	Consumer durables						1.45
				Business machines	Retail, general	Media			1.40
						Insurance	Trucking freight		1.35
	21.70	1.30	Producer goods	Aerospace	Business services	Apparel	Construction	Motor vehicles	1.30
				Photographic, optical		Chemicals	Energy, raw materials	Tires, rubber goods	1.25
	20.80	1.20	Railroads, shipping			Forest products, paper			1.20
	20.35	1.15	Miscellaneous, conglomerate		Drugs, medicine		Domestic oil		1.15
					Soaps, cosmetics				1.10
						Steel	Containers		1.05
Medium-risk stocks	19.00	1.00	Nonferrus metals	Agriculture, food					1.00
									.95
						Liquor			.90
	17.65	.85	International oil	Banks					.85
						Tobacco			.80
Low-risk stocks	16.75	.75		Telephone					.75
									.70
									.65
	15.40	.60		Energy utilities					.60
									.55
									.50
									.45
									.40
	13.15	.35		Gold					.35

Source of betas: Barr Rosenberg and James Guy, “Prediction of Beta from Investment Fundamentals,” *Financial Analysts Journal,* July–August 1976, p. 62.

Exhibit V Risk/expected return spectrum Source of betas: Barr Rosenberg and James Guy, “Prediction of Beta from Investment Fundamentals,” Financial Analysts Journal, July-August 1976, p. 62.

Employment of CAPM

Applications of these concepts are straightforward. For example, when a manager is calculating divisional costs of capital or hurdle rates, the cost of equity component should reflect the risk inherent in the division's operations rather than the parent company's risk. If the division is in one of the risky businesses listed in Exhibit V, a cost of equity commensurate with this risk should be employed even though it may be much higher than the parent's cost of equity.

One approach to estimating a division's cost of equity is to calculate CAPM estimates of the cost of equity for similar, independent companies operating in the same industry. The betas of these companies reflect the risk level of the industry. Of course, refinements may be necessary to adjust for differences in financial leverage and other factors.

A second example concerns acquisitions. In discounted cash flow evaluations of acquisitions, the appropriate cost of equity should reflect the risks inherent in the cash flows that are discounted. Again, ignoring refinements required by changes in capital structure and the like, the cost of equity should reflect the risk level of the target company, not the acquiror.

Does CAPM Work?

As an idealized theory of financial markets, the model's assumptions are clearly unrealistic. But the true test of CAPM, naturally, is how well it works.

There have been numerous empirical tests of CAPM. Most of these have examined the past to determine the extent to which stock returns and betas have corresponded in the manner predicted by the security market line. With few exceptions the major empirical studies in this field have concluded that:

- As a measure of risk, beta appears to be related to past returns. Because of the close relationship between total and systematic risk, it is difficult to distinguish their effects empirically. Nonetheless, inclusion of a factor representing unsystematic risk appears to add little explanatory power to the risk/ return relationship.

- The relationship between past returns and beta is linear—that is, reality conforms to what the model predicts. The relationship is also positively sloped—that is, there is a positive trade-off between the two (high risk equals high return, low risk equals low return).

- The empirical SML appears less steeply sloped than the theoretical SML. As illustrated in Exhibit VI, low-beta securities earn a return somewhat higher than CAPM would predict, and high-beta stocks earn less than predicted. A variety of deficiencies in CAPM and/or in the statistical methodologies employed have been advanced to explain this phenomenon.

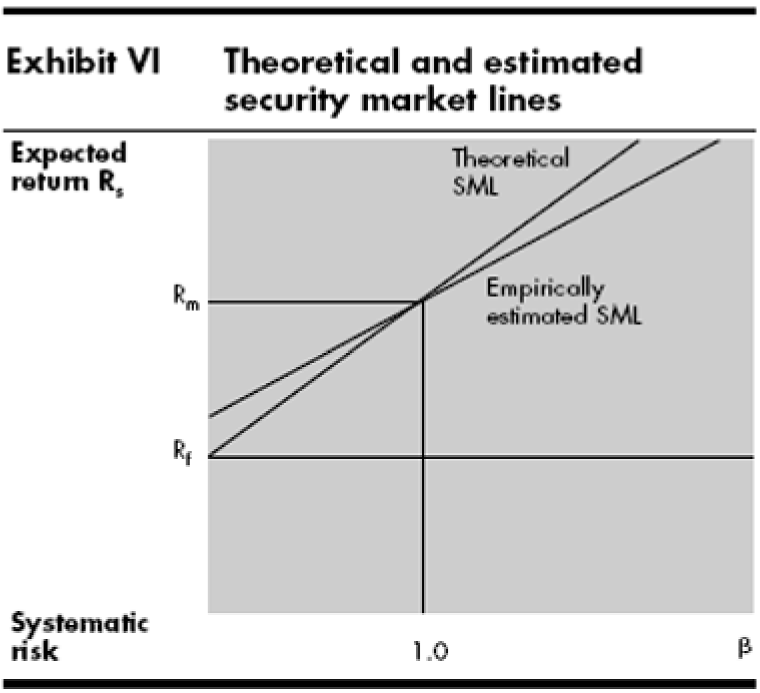

Exhibit VI Theoretical and estimated security market lines

Although these empirical tests do not unequivocally validate CAPM, they do support its main implications. The systematic risk measure, beta, does appear to be related to past returns; a positive risk/ return trade-off does exist; and this risk/return relationship does appear to be linear. The contradictory finding concerning the slope of the SML is a subject of continuing research. Some researchers suggest using a more gradually sloped "empirical market line" based on these findings instead of the theoretical SML.

Recent work in the investment management field has challenged the proposition that only systematic risk matters. In a complex world it would be unlikely to find only one relevant type of risk—market risk.

Much progress has been made in the development of richer asset-pricing models. As of yet, however, none of these more sophisticated models has proved clearly superior to CAPM. This continues to be a fertile area of research, focused primarily on investment management applications.

Application problems

In corporate finance applications of CAPM, several potential sources of error exist. First, the simple model may be an inadequate description of the behavior of financial markets. (As I just noted, empirical work to date does not unequivocally support the validity of CAPM.) In attempts to improve its realism, researchers have developed a variety of extensions of the model.

A second problem is that betas are unstable through time. This fact creates difficulties when betas estimated from historical data are used to calculate costs of equity in evaluating future cash flows. Betas should change as both company fundamentals and capital structures change. In addition, betas estimated from past data are subject to statistical estimation error. Several techniques are available to help deal with these sources of instability.

The estimates of the future risk-free rate and the expected return on the market are also subject to error. Here too, research has focused on developing techniques to reduce the potential error associated with these inputs to the SML.

A final set of problems is unique to corporate finance applications of CAPM. There are practical and theoretical problems associated with employing CAPM, or any financial market model, in capital budgeting decisions involving real assets. These difficulties continue to be a fertile area of research.

Dividend growth model

The deficiencies of CAPM may seem severe. They must be judged, however, relative to other approaches for estimating the cost of equity capital. The most commonly used of these is a simple discounted cash flow (DCF) technique, which is known as the dividend growth model (or the Gordon-Shapiro model).

This approach is based on the proposition that the price of a company's stock equals the present value of future dividends per share discounted by the company's cost of equity capital. With the assumption that future dividends per share are expected to grow at a constant rate and that this growth rate will persist forever, the general present value formula collapses to a simple expression.

$$P = \frac{dps}{k_e - g}$$

where:

P = the current price of the stock.

dps = next year's dividends per share.

g = the perpetuity growth rate in dividends per share.

k_e = the company's cost of equity capital.

If the market is pricing the stock in this manner, we can infer the cost of equity impounded in the stock price. Solving for the cost of equity yields:

$$k_e = \frac{dps}{P} + g$$

The cost of equity implied by the current stock price and the assumptions of the model is simply the dividend yield plus the constant growth rate.

Like CAPM, two of the model's assumptions limit the dividend growth technique. One is the assumption of a constant, perpetual growth rate in dividends per share. Second, to permit the general present value formula to collapse to the simple stock price equation I gave, the perpetual constant growth rate must be less than the company's cost of equity. If this is not the case, the equation is not valid.

These two assumptions sharply limit the applicability of the dividend growth model. The model cannot be used in estimating costs of equity for companies with unstable dividend patterns or for rapidly growing companies where g is likely to be greater than k_e. (Obviously, the model also does not apply to companies paying no dividends.) Unlike CAPM, the model is limited mainly to companies enjoying slow, steady growth in dividends. More complex DCF techniques can, however, handle a wider range of companies.

Another problem with using the dividend growth model to estimate costs of equity is in gauging g. To derive a sound cost of equity figure, one must estimate the growth rate investors are using to value the stock. Thus it is the market's current estimate of g that matters, not the company's. This is a major source of error in the dividend growth model.

In contrast, the only company-specific input to the SML is the beta, which is derived by an objective statistical method. Even more sophisticated DCF techniques require as an input the market's estimate of the company's future dividends per share.

When compared with the dividend growth model and other DCF approaches, CAPM's deficiencies do not appear so severe. There is no reason, however, to consider CAPM and the dividend growth model as competitors. Very few techniques are available for the difficult task of measuring the cost of equity. Despite the shortcomings, investors should use both the DCF and CAPM models as well as sound judgment to estimate the cost of equity.[4]

Imperfect, But Useful

Investment managers have widely applied the simple CAPM and its more sophisticated extensions. CAPM's application to corporate finance is a recent development. Although it has been employed in many utility rate-setting proceedings, it has yet to gain widespread use in corporate circles for estimating companies' costs of equity.

Because of its shortcomings, financial executives should not rely on CAPM as a precise algorithm for estimating the cost of equity capital. Nevertheless, tests of the model confirm that it has much to say about the way returns are determined in financial markets. In view of the inherent difficulty in measuring the cost of equity, CAPM's deficiencies appear no worse than those of other approaches. Its key advantage is that it quantifies risk and provides a widely applicable, relatively objective routine for translating risk measures into estimates of expected return.

CAPM represents a new and different approach to an important task. Financial decision makers can use the model in conjunction with traditional techniques and sound judgment to develop realistic, useful estimates of the costs of equity capital.

1. See Marshall E. Blume, Jean Crockett, and Irwin Friend, "Stock Ownership in the United States: Characteristics and Trends," *Survey of Current Business,* November 1974, p. 16.

2. See Stephen A. Ross, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory,* December 1976, p. 341.

3. See Roger G. Ibbotson and Rex A. Sinquefeld, *Stocks, Bonds, Bills, and Inflation: Historical Returns (1926-1978),* second edition (Charlottesville, Virginia: Financial Analysts Research Foundation, 1979). The rates I have used are arithmetic means. Arguments can be made that geometric mean rates are appropriate for discounting longer-term cash flows.

4. For an exposition of the dividend growth model, see Thomas R. Piper and William E. Fruhan, Jr., "Is Your Stock Worth Its Market Price?" HBR May-June 1981, p. 124.

A version of this article appeared in the January 1982 issue of *Harvard Business Review*.

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