If the CAPM fits…

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The second in a series of three articles explaining the many aspects of cost-of-capital theory

The first article in this series of three ("WACC attack", March 2002) explored the fundamental importance of the cost of capital. It acts as the link between the investment decision and the finance decision, representing the "hurdle rate" return that a business's investors require. If projects discounted at the firm's cost of capital earn positive net present value, then they will add to the investors' wealth and should be accepted.

A major problem with this theory is that new projects inevitably change the risk profile of the company. A firm's existing weighted-average cost of capital (WACC), calculated using traditional theories such as the dividend valuation model, will not necessarily reflect these new risk profiles.

We have seen how the theories of Franco Modigliani and Merton Miller (M&M) allow us to adjust the WACC for different levels of finance risk. This article focuses on how the WACC can be modified to reflect differing business risk levels.

A key problem in using the dividend valuation model to calculate the cost of equity is that there is no obvious way to modify this cost to reflect different business risk profiles. Costs of capital calculated using this model reflect the company "as it is". This discount rate will be inappropriate for assessing projects with different business risk profiles from the existing activities.

The capital asset pricing model (CAPM) provides a solution to this problem by allowing the calculation of risk-adjusted discount rates for use in project appraisals. It works on the simple premise that investors will require at least the risk-free rate of return when investing in a project. They will also require a premium to compensate them for the particular risk of the investment.

Where CAPM is special is in the nature of the risk considered. There are two types of risk to take into account. The first is termed unsystematic, and is a result of company- or industry-specific factors. By definition, shareholders will be able to diversify away much of this risk by spreading their funds across a wide range of securities from different industries.

The second element, known as systematic risk, is caused by general economic factors. These affect all companies in the same way and therefore cannot be removed by diversification. In an efficient market, shareholders are assumed to have well-diversified portfolios and will therefore require return for systematic risk only. As such, only systematic risk is built into the CAPM risk premium.

A common mistake made by students is to assume that, because systematic risk is caused by general economic factors, all companies have the same systematic risk. This is not so. All companies are affected by general economic factors in the same way, but, depending on their characteristics, they are affected to a greater or lesser extent than the market on average. The measure of the sensitivity of a company's returns to economic factors is the beta factor.

Betas for all quoted companies are published quarterly by London Business School's risk measurement service. These factors, together with an estimate of the risk-free rate of return and the market-risk premium (the difference between the market portfolio return and the risk-free rate of return), allow an estimate of the cost of

Figure 1 CAPM summary

Investors' required rate of return = risk-free return + premium for risk of investment

$$r_e = r_f + \beta(r_m - r_f)$$

Beta (ß) is a measure of responsiveness of the returns for a particular investment when compared with the average market return:

ß > 1 indicates more systematic risk than the market
ß < 1 indicates less systematic risk than the market
ß = 1 indicates the same systematic risk as the market
r_f = risk-free rate of return
r_m = market portfolio return
$(r_m - r_f)$ = market-risk premium

Sample betas from London Business School (March 2001)

Whitbread: 1.33 $r_e = 5 + 1.33(10 - 5) = 11.65\%$

Lloyds TSB: 1.47 $r_e = 5 + 1.47(10 - 5) = 12.35\%$

Sainsbury's: 0.48 $r_e = 5 + 0.48(10 - 5) = 7.40\%$

Woolwich: 1.00 $r_e = 5 + 1.00(10 - 5) = 10.00\%$

Assuming a return on risk-free investment of 5 per cent and a market-risk premium of 5 per cent.

equity to be made for all quoted companies. Figure 1 summarises the basic procedure.

As M&M's work has shown, the cost of equity is affected by increased financial risk within the business. Because shareholders are paid after debt providers, their return becomes more variable as the company gears up. This financial risk is therefore part of the systematic risk that affects them, so beta factors need to reflect this.

M&M developed the following with-tax and without-tax equations to adjust any published beta for a different level of gearing:

- without tax: $ß_g = ß_u + (ß_u - ß_d)D \div E$
- with tax: $ß_g = ß_u + (ß_u - ß_d)(1 - T)D \div E$

where

$ß_g$ = equity beta of a geared firm;
$ß_u$ = equity beta of an ungeared firm;
$ß_d$ = beta of debt;
E = market value of equity in geared firm;
D = market value of debt in geared firm;
T = corporation tax rate.

Armed with these equations and data from London Business School's risk measurement service, financial managers have a powerful tool enabling them to construct costs of equity allowing for differing levels of business risk and financial risk:

It would seem that CAPM and the work of M&M now give financial managers the theoretical ability to modify the basic WACC formula to deal with differing business and finance risks, and to create risk-adjusted costs of capital suitable for any situation. The third and final article of this series will combine these theories to give a complete methodology for deriving the value of projects that change both the business and financial risk of a company. ■

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Figure 2 Geared beta illustration

XYZ plc, a food retailing company, has an equity beta of 0.5 and a gearing level, measured as the market value of debt to equity, of 1:5.

It is trying to decide whether or not to invest in a construction project. It has identified a quoted company that undertakes similar operations to the project in question. The construction company has an equity beta of 1.2 and a gearing level of 1:3. Corporation tax is 35 per cent.

The equity beta of the quoted construction company is appropriate for establishing a risk-adjusted discount rate for project appraisal, but must first be modified to reflect XYZ plc's gearing level.

- **Stage one**. Degear the comparator beta.
  $1.2 = ß_u + (ß_u - 0.20)(1 - 0.35)1 \div 3$
  $ß_u = 1.02$

- **Stage two**. Regear asset beta to XYZ plc gearing level.
  $ß_g = 1.02 + (1.02 - 0.20)(1 - 0.35)1 \div 5$
  $ß_g = 1.13$

- **Stage three**. Calculate cost of equity using CAPM.
  $k_e = 5 + 1.13(10 - 5) = 10.65\%$

This cost of equity can now be combined with the existing cost of debt (which should not be particularly affected by the different nature of the project) to obtain a new weighted-average cost of capital that's appropriate for discounting the project.